Testimony of Caswell F. Holloway
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Before the New York City Council
Committees on Fire and Criminal Justice Services, Public Safety, and Technology in Government

September 27, 2011

Good morning Chairpersons Cabrera, Crowley, Vallone and members of the City Council Committees on Technology, Fire and Criminal Justice Services, and Public Safety. I am Cas Holloway, Deputy Mayor for Operations. Thank you for the opportunity today to testify on New York City's ongoing investment in first responder communications and on the need for federal legislation to establish a broadband network dedicated to public safety. I am joined by members of the New York City Police Department (NYPD), the Fire Department (FDNY), and Department of Information Technology and Telecommunications (DoITT), who will be able to answer specific questions on our public safety communications infrastructure.

As you know, the September 11, 2001 terrorist attacks highlighted critical vulnerabilities in the reliability and interoperability of New York City's first responder emergency communications. Over the last 10 years, the City has invested heavily to address these vulnerabilities, allocating over $258 million of Homeland Security funding to strengthen our communications capabilities for first responders within New York City, and with our regional and federal partners. As a result, our capabilities today are stronger than ever, and we continue to build upon and improve our first responder communications.

As the Council recognizes, however, Federal action on this issue is imperative. The 9/11 Commission urged Congress to enact legislation to provide for the expedited and increased assignment of radio spectrum for public safety purposes. Legislation pending before Congress would do just that, establishing a nationwide, interoperable, wireless broadband network for public safety. The Administration supports the efforts of the Council to focus local and national attention to this vital issue through Resolution 870-A; along with you, we hope that Congress will quickly resolve any issues and pass legislation to achieve this critical public safety initiative.

While Congressional action is important, New York City has made significant strides to address vulnerabilities in our first responders' communications capabilities.

Before reviewing the specific investments that Mayor Bloomberg has made in public-safety communications since the 9-11 terrorist attacks, I want to first explain what is perhaps the most important operational change that the City has made since that terrible day—the adoption of a comprehensive, standardized Citywide Incident Management System (CIMS) that requires the establishment of a co-located, unified command when multiple City agencies respond to an incident. CIMS is based on the National Incident Management System (NIMS), which ensures compatibility in incident command systems in use across the 50 states and with federal agencies. NIMS provides a systematic, proactive approach to guide local and state jurisdictions in the prevention, preparation, response and recovery from terrorist attacks, major disasters, and other emergencies and allows all levels of government to work efficiently and effectively together. Through this structure, first responders can leverage the benefits of face to face communication, which is the most effective way to share information. On 9-11, the NYPD and FDNY, following long-standing operating procedures, established separate operational commands. As a result—and regardless of the radio technology then in use by both agencies—FDNY and NYPD conducted parallel responses, rather than a unified response that can help to ensure the safest and most efficient deployment of resources in an emergency situation.

CIMS establishes clear roles for responder agencies in all types of multi-agency responses, from car accidents to a building collapse. And agency participation goes far beyond NYPD and FDNY—the Departments of Health, Environmental Protection, and Buildings (to name just a few)—frequently have responsibilities in a multi-agency response, from testing air quality to assessing structural stability. For example, just last week a façade collapsed at a building being demolished on 125th street. When I arrived on scene, I immediately went to the unified command location, where FDNY, DOB, and NYPD were coordinating the operation. CIMS is designed to be scalable, facilitating the integration of additional organizations, such as private sector and non-profit entities.

Through my continued work with Police Commissioner Kelly, Fire Commissioner Cassano, and OEM Commissioner Bruno, share the view that implementation of CIMS—and specifically the requirement that a unified command be established at any multi-agency response—is among the most important advances in public safety communications since 9-11.

Moving on to radio and other telecommunications systems, ten years ago, the use of disparate spectrum created interoperability problems between the City's first responders. Today, members of the NYPD can not only talk to members of the FDNY, but also to a broad range of local, regional and Federal agencies as needed – including the MTA, Port Authority of New York and New Jersey, Nassau, Suffolk, and Westchester Counties, as well as about a dozen Federal agencies including the FBI, Department of Homeland Security, and Secret Service. In fact, the Department of Homeland Security's Office of Emergency Communications (DHS OEC) recognized New York City's Interagency Communications Committee (ICC) earlier this month as a best-practice model for how sophisticated and innovative governance structures can enhance emergency communications efforts and support major initiatives within a region/multi-state framework. The ICC, which was created in 2002, is a regional consortium of first responders that bring together over 40 local, state and federal agencies to develop, test and implement interoperable communications strategies. The group worked together to establish the Tactical Interoperable Communications Plan (TICP), which consolidates information across agencies, disciplines and jurisdictions by documenting regional communications capabilities in order to provide a usable and accurate regional tactical incident response tool. The TICP met the federal government's mandate in 2004 and 2006 to achieve interoperability within one hour of an incident, which was tested last summer. The Department of Homeland Security conferred its highest rating on the ICC for the coordinated, multi-agency operational planning and mobilization during the Macy's July 2010 Fireworks Show. During this event, more than 5,000 emergency responders and support personnel from more than fifty governmental and non-governmental agencies in New York and New Jersey worked together using a series of mobile command posts along with Tactical and Joint Emergency Operations Centers to communicate and share information on the ground.

New York City's public safety communications infrastructure is characterized by a complex and sophisticated mix of technologies that support day-to-day, mission critical incident response as well as Citywide and regional joint operations. This infrastructure consists of a variety of land mobile radio (LMR) systems and solutions that include conventional, trunked, and point-to-point systems, along with dispatch consoles, fixed and mobile audio bridges and gateways that operate across VHF, UHF and 800 MHz frequency bands. This infrastructure also supports nearly 85,000 radios used by our public safety and essential service agencies. These agencies also rely on a host of wireless and data applications. Our systems and solutions are constantly improving and allow for reliable and secure communications among first responders on a tactical, operational, and command and control level.

On a tactical level, the NYPD and FDNY primarily depend upon point-to-point radio communications. Even on this basic level, our first responders have interoperable capabilities enabling advanced coordination at the incident scene. For example, officers from the NYPD Emergency Service Unit can communicate with the FDNY Fire Rescue Division to stage and execute joint operations on dedicated tactical channels.

On an operational level, DoITT has completed the design and roll-out of the Citywide Radio Network (CRN), which has consolidated many of the separate frequencies previously used by various New York City agencies, providing expanded coverage and interoperability capabilities. It also provides dedicated frequencies for each borough that can be accessed by multiple City agencies at the same time. As a result, CRN gives agencies the ability to communicate in the same band of frequencies. This increases responder safety, situational awareness and command and control. Through CRN, users are able to receive consistent and reliable communications throughout the five boroughs on the same frequency band regardless of location. This network even allows for unprecedented coverage on New York City's waterways. The FDNY is in the process of fully migrating its fire service and EMS dispatch systems to CRN. This network employs narrowaband conventional and Trunked Radio Technologies, which increases channel efficiency during a major emergency or during periods of peak demand. Using CRN, FDNY Command Center personnel and en-route staff can monitor on-scene voice transmissions in real-time, which assists in remote decision-making.

From a Command and Control perspective, communications are supported on the region's Wide Area Interoperability Network, which is managed by the NYPD. This network has 3 dedicated interoperability channels – two specifically for New York City and one region-wide channel, which can be used to support emergency communications north of the City in Westchester County, east of the City in Nassau and Suffolk counties on Long Island and west of the City to Newark, NJ. The Port Authority and MTA can also operate on the network along with federal agencies who may be responding to an incident in New York City. The NYPD is also working on building out an interoperable simulcast channel at the new World Trade Center site, which will be used by various local, regional and federal entities.

Finally, there is the 800-MHz Trunked Radio Network, which supports both day-to-day and emergency communications for the City's public safety and essential service agencies. Using this system, roll calls are conducted every other day by OEM Watch Command amongst 60 City, state, federal, neighboring public safety and essential service agencies and associated jurisdictions, as well as critical infrastructure/key resource subscribers to ensure that all lines of communication are open and operational. A distinct healthcare and medical facility talk group has also been created on the network to make interoperability possible among the OEM Health Response Unit – a consortium of 87 health care and related facilities. This specialized talk group facilitates the real-time exchange of information concerning the availability of medical services, and enhances the City's overall preparedness level. Finally, more than 50 commissioners from the City's Mayoral agencies participate in a supplementary talk group, so that at the request of the Mayor, agency heads can be quickly reached to disseminate information to executive staff and response teams should other channels of communication be unavailable.

Not only has the City become a model of voice interoperability, but we are leading the nation through the development of our state-of-the-art wireless data network, built exclusively for the use of City agencies. NYCWiN is the most aggressive commitment by any municipality in the United States to provide a next-generation public safety infrastructure and has eliminated many of the challenges of sharing data in the urban environment. It was completed in 2009 and has been providing mission critical video, voice and data communications – through portable, mobile and fixed-location technologies – to the City's first responders and essential public services. By enabling secure transfer of critical information, coordination of mobile resources and automation of labor intensive processes, first responders are able to enhance situational awareness, improve responder safety and enable remote decision making. NYCWiN provides its subscribers 24/7 network support, and features strong encryption, multi-level authentication and physically-protected equipment installations. Nearly 400 sites provide ubiquitous coverage to more than 300 square miles spanning all five boroughs. Today, NYCWiN powers more than 300 applications that span 29 City agencies on nearly 750,000 devices.

First responders in the field rely on NYCWiN for access to real-time vital information such as photos, warrants, license plates, maps, and operating procedures. Additionally, incident commanders depend on the network to enhance coordination with on-scene personnel through the use of data transmission, full-motion video streaming and automatic vehicle location. The NYPD Real Time Crime Center leverages this network infrastructure by enabling officers in the field to access and search their databases through NYCWiN. Another innovative use of NYCWiN is the emergence of the FDNY Electronic Command Board, which coordinates fire service resources in the field. Over NYCWiN, fire-ground radios are keyed up to track firefighters in real-time via mobile modem installations on the apparatus and in battalion chief vehicles.

Further enhancing situational awareness is the City's Operational Video System (OVS), an interoperable video platform. This incident-based video is shared across disparate video systems and links the Mayor's Office, NYPD, FDNY, OEM and other authorized agencies. OVS allows for highly coordinated responses and enhances the safety of first responders by bringing feeds from helicopters, watercraft, mobile command vehicles and other deployable cameras. In one instance, the OVS was mobilized in January 2009 when US Airways flight 1549 landed in the

Hudson River. Within 15 minutes, OVS was streaming video from two first responder vehicles to the FDNY Command Center and the feed was shared with other first responder agencies. All of these innovative investments have significantly improved operational control and incident management of emergencies. But it is not enough.

As we look to the future, our nation's first responders need a nationwide broadband network dedicated specifically to public safety. New York City has been a national leader pushing for this critical tool, which is essential to the mission of first responder agencies around the country. For this reason, as discussed earlier, the Administration supports Resolution 870-A, and has been actively lobbying our leaders in Washington for the creation of a common radio spectrum dedicated to public safety. Past experience has proven that our first responders cannot depend on commercial networks for reliable broadband communications. Time and time again, during emergency incidents, cell phone networks have been overwhelmed, making police and fire communications over them virtually impossible.

Finally, as you may know, this year Congress drastically cut the level of Homeland Security funding directed toward state and local governments for FY12. New York City, which remains the number 1 target for terrorist threats, cannot sustain such an arbitrary reduction in funds to many of the City's critical homeland security programs. I hope that the Council will work with us to urge Congress to restore this vital funding.

New York City has worked hard to ensure that our first responders can operate safely and effectively when responding to an emergency. By demanding the highest standards in reliability and interoperability both for voice and data communications, we have improved significantly over the past decade. This in turn has made all New Yorkers safer.

Thank you again for this opportunity to testify and I am happy to answer any questions you may have.

Testimony
on behalf of the Public Safety Alliance (PSA)

Mr. Yucel Ors
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Association of Public-Safety Communications Officials (APCO),
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New York City Council
Joint Hearing of the Committees on Fire and Criminal Justice Services,
Public Safety, and Technology

September 27, 2011

Mr. Chairman, Ranking Member, and all the members of the Committees, thank you on behalf of the leadership of APCO Intl. (The Association of Public-Safety Communications International (APCO) and the Public Safety Alliance (PSA) for this opportunity to appear before you today regarding Proposed Resolution Number 870-A, which calls for Congress to pass and President Obama to sign into law ***S.911; Public Safety Spectrum and Wireless Innovation Act of 2011***.

APCO International is the world's largest organization of public safety communications professionals. It serves the needs of public safety communications practitioners worldwide—and the welfare of the general public as a whole—by providing complete expertise, professional development, technical assistance, advocacy and outreach to nearly 16,000 members.

The Public Safety Alliance is a partnership with the nation's leading public safety associations, which includes the Association of Public-Safety Communications Officials (APCO) International, the International Association of Chiefs of Police, the International Association of Fire Chiefs, the National Sheriffs' Association, the Major Cities Chiefs Association, the Major County Sheriffs' Association, the Metropolitan Fire Chiefs Association, the National Emergency Management Association and the National Association of State EMS Officials. The purpose of the PSA is to ensure law enforcement, fire and EMS agencies are able to use the most technologically advanced communications capabilities that meets the difficult, life-threatening challenges they face everyday as they protect America. The partnership is operated as a program of APCO International.

As you may know, For over two years now, APCO International and the PSA have worked together tirelessly to ensure that our nation's first responders have the best and most up-to-date tools available to them in the event of another natural or man-made disaster. One of the biggest challenges to the public safety community is a lack of adequate spectrum for first responders to communicate with one another across different counties, states, jurisdictions for day-to-day operations as well as acute emergencies. We believe that the passage of S.911, bipartisan legislation introduced by Senators Kay Bailey Hutchison (R-TX) and John "Jay" Rockefeller, IV (D-WV), holds the key to the safety of all first responders. Since introduction, the bill has garnered overwhelming support in the United States Senate Committee of jurisdiction, the Senate Commerce, Science and Transportation Committee, where Senators Rockefeller and Hutchison serve respectively as Chairman and Ranking Member.

Indeed, in re-introducing legislation at the beginning of this 112th Congress on January 25th – the same day that President Obama and his administration formally announced his support for the allocation of D block to public safety as part of his State of the Union address -- Chairman Rockefeller declared resolution of this issue as the committee's top legislative priority for this year. After working through various issues regarding how to fund and oversee the Public Safety Broadband Data Network (PSBN), Rockefeller and Hutchison developed S.911 as a compromise bill this past spring, where it since has been favorably voted out of committee in June by a margin of 21-4. Among the agreements included in S.911 was dedication of a portion of spectrum auction revenue for deficit reduction of up to $10 billion dollars, as well as providing and $11.75 billion dollars over 10 years for the PSBN. S.911 has awaited floor consideration by the entire US Senate since that time. The sponsors and supporters had hoped for its passage into law before the recent 10 Year Remembrance of the tragic events of 9/11, and continue to actively push for its enactment this year. Indeed, Senate Majority Leader Harry Reid (D-NV), a co-sponsor of Senator Rockefeller's legislation in the closing days of the 111th Congress, had included language from S.911 in his debt deal proposal in August, 2011, but the House Republicans opposed its' inclusion in the final bill.

Led by Senators Charles Schumer and Kirsten Gillibrand, as well as Congressman Peter King (R-NY), as Chairman of the House Homeland Security Committee, the State and City of New York's congressional delegation has been among the strongest supporters and advocates in the nation for legislation to finally adopt one of the last unmet recommendations of the 9/11 Commission, that is, to provide public safety and our first responders with additional spectrum to improve the communications and interoperability of our country's emergency communications for both day-to-day and in times of crisis. Indeed, Congressman King sponsored the first piece of legislation to allocate additional spectrum in response to the 9/11 Report as H.R.5081 in April, 2010 in the 111th Congress. HR5081 acquired more than 80 bipartisan co-sponsors last year. Chairman King and Ranking Member Bennie Thompson (D-MS) reintroduced legislation this year, ***H.R.607; the Broadband for First Responders Act of 2011***, which builds upon HR5081 with the addition of funding and governance language for the PSBN. H.R. 607 currently has 46 co-sponsors and sits before the House committee of jurisdiction, the House Energy and Commerce Committee, awaiting further consideration. Just this past week, Congressman King joined with Representative Steve Rothman (D-NJ) to introduce the 7th bill in the 112th Congress to allocate D block to public safety, provide $7-12 billion dollars in funding derived from other spectrum auctions to finance the build out of the

PSBN, and to establish a governance structure to oversee the build out and sustainment of the nationwide network. Let me specify here that none of these proposals would require any new monies from our nation's taxpayers. It is fully funded with revenue derived from new "incentive" and other spectrum auctions that are widely supported by government, industry and consumer groups to free up additional spectrum to meet the dramatic increase in demand for commercial wireless broadband services throughout our country.

As the 9/11 Co-chairs recently testified to Congress regarding their 9/11 Report Card, "Despite considerable progress since 9/11, some major 9/11 Commission recommendations remain unfulfilled. These remaining recommendations require urgent attention", and chief among them "is the provision of additional spectrum for public safety." The 9/11 Commission co-chairs, former New Jersey Governor Thomas Kean (R-NJ) and former Congressman Lee Hamilton (D-NY), have repeatedly testified before Congress urging "immediate allocation of the D-block spectrum to public safety," stating "We must not approach these urgent matters at a leisurely pace. We don't know when the next attack or disaster will strike. Further delay is intolerable. We urge the Congress to act."

As well, our nation's first Secretary of Homeland Security, former Governor and Congressman Tom Ridge (R-PA), recently spoke at a U.S. Chamber of Commerce Homeland Security event declaring that Congress' inaction regarding D block is a "bloody outrage," stating that "Congress has failed first responders."

Industry has also joined in calling for immediate allocation of D block. Leading technology association, TechAmerica, which is composed of our nation's premiere technology corporations and start-up innovators, held a briefing of congressional staff last week calling on Congress to allocate D block to spur the economy and create jobs. Likewise, the Telecommunications Industry Association (TIA) released a study in late August estimating that 100,000 jobs would be created with the build-out of the Public Safety Broadband Network, and later this week, the 9-1-1 Industry Alliance (9IA) is expected to formally endorse legislation to allocate D block to public safety.

Couple this with the fact that all of our nation's first responders and major national public safety associations – including the International Association of Chiefs of Police (IACP), International Association of Fire Chiefs (IAFC), National Sheriffs' Association (NSA), National Emergency Management Associations (NEMA), National Association of State EMS Officials (NASEMSO), Emergency Nurses Association (ENA), Fraternal Order of Police (FOP), National Association of Police Organizations (NAPO), National Troopers Council (NTC), National Volunteer Fire Council (NVFC), Major City Chiefs Association (MCCA), Major County Sheriffs' Association (MCSA), National Criminal Justice Association (NCJA), Metro Fire Chiefs Association (MFCA), National Association of Attorneys Generals (NAAG), Police Executive Research Forum (PERF), National Organization of Black Law Enforcement Executives (NOBLE), and countless others – have all united in support of allocation of D block with funding of the PSBN. Furthermore, all of the major national associations representing state and local government officials have come out in support, including the National Governors

Association (NGA), the U.S. Conference of Mayors (USCM), the National League of Cities (NLC), Council of State Governments (CSG,) the National Association of State Chief Information Officers (NASCIO), the National Association of State Telecommunications Directors (NASTD), the National Association of Counties (NACO), the International City/County Managers Association (ICMA) and the National Council of State Legislatures (NCSL).

At this time, I would like to submit into the record a comprehensive report that APCO Intl. has painstakingly compiled in recent weeks documenting the large volume of reports, studies, field tests, commentary, testimony and legal filings that have become part of the legislative and regulatory record that, when combined, provide an overwhelming and convincing argument why Congress must act now. This report includes a section-by-section analysis of S.911 and the July, 2011 Congressional Budget Office's (CBO) analysis of the bill's costs and other provisions. I want to highlight that the CBO report finds that the network, once built out, would be self-sustained for its continuing operation, so no further costs are anticipated for the nationwide network once its completed.

At this point, you may be asking, who is opposed and why? And why hasn't Congress already enacted this legislation? The answer is simple, "some in Congress still believe that we cannot afford the cost of allocating spectrum to public safety, or as they phrase it, "give away spectrum to public safety" and are weary of directing significant funding to a network right now because of the current economic and fiscal challenges we face nationally and at the federal level. To this, the answer is just as simple, "We cannot afford to wait anymore." As Congressman Bennie Thompson stated at a hearing on this matter some months ago, "It is no time for Congress to be a penny wise and a pound foolish." With sufficient spectrum allocation and funding, this spectrum and this network will save our nation immeasurable real costs, as well as in lives saved, time and efficiency, in the immediate-to-long term future.

We know that it will cost no more to build out a 20 MHz network than a 10 MHz network today, but it will cost more than twice as much to provide this additional spectrum and network capacity later. The Federal Communications Commission (FCC) has been clear in saying that public safety will need more than 10 MHz of spectrum. A recent study by wireless expert Peter Rysavy and results of a comprehensive field test on one of the first "waiver" deployments of a public safety broadband network in greater San Francisco by public safety wireless specialist Andy Seybold back up this claim. Together they show that 10 MHz of spectrum will not provide enough capacity today to allow public safety to fully utilize existing broadband technologies such as streaming video for effective, mission-critical response to the most common and far too routine incidents, such as large fires and bank robberies.

Over the past two years, the record has become quite clear and convincing. Public safety requires (1) this additional spectrum, the D block, (2) a new, independent national governance structure with sufficient state and local government and public safety representation, and (3) sufficient funding to finally realize a nationwide, mission-critical, and interoperable public safety broadband network for two-way transmission of data, text, video, pictures and other large quantities of information to prevent, mitigate and respond to emergency incidents, both everyday and during major critical incidents, including natural disasters and terrorists threats and attacks.

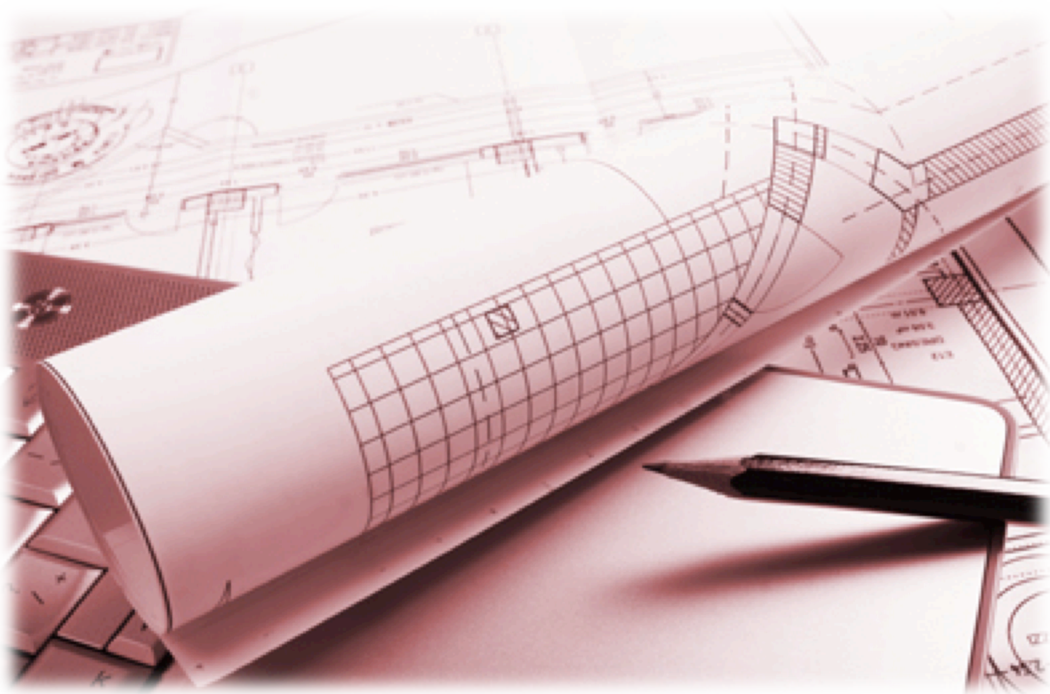
Therefore, the PSA and APCO International urge you and your colleagues in the strongest possible terms to pass Resolution 870-A; and we call upon you to provide this resolution as a model for your colleagues in cities, counties and states nationwide to emulate in formally adopting and submitting similar resolutions to Congress in the coming days and weeks.

Finally, we understand that the Joint Committee on Deficit Reduction, otherwise known as the Super Committee, which Congress created as part of the recently passed Debt Deal, is actively considering inclusion of spectrum auctions and related spectrum policy within their mandated legislative process. We respectfully request that, upon enactment of Resolution 870-A, these committees and the City of New York's entire City Council direct that a copy of the resolution be provided to every member of the Super Committee, as well as the bipartisan House and Senate leadership that appointed them, along with the bipartisan leadership of the House and Senate committees of jurisdiction. Please tell them that they must finally consider and pass this long overdue legislation to keep America and its first responders safe today, tomorrow and well into the future by providing them with the 21st Century technology and communication tools to do their job.

Thank again for this opportunity to provide testimony on behalf of APCO International and the Public Safety Alliance. I am happy to take any questions that the committees may have at this time.

BUILDING A NATIONWIDE PUBLIC SAFETY BROADBAND NETWORK

Prepared for: New York City Council's Committee on Fire and Criminal Justice Services and the Committee on Public Safety and the Committee on Technology
Prepared by: APCO International Staff
Date: SEPTEMBER 26, 2011



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I. EXECUTIVE SUMMARY

Congress, by its actions, has established spectrum policy as a significant national interest, and that electromagnetic spectrum is a finite and increasingly scarce national resource. They have mandated that the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) within the United States Department of Commerce be vested with the authority and responsibility for the management, oversight and enforcement of spectral policy.

Congress further empowered the FCC with the authority to manage, oversee and enforce state and local government assignment and use of spectrum, as well as commercial assignment and use, and has likewise empowered NTIA with those same authorities with respect to the Federal government's assignment and use of spectrum. Congress also charged the FCC with management and oversight of spectrum auction activities.

Since its inception, the FCC has assigned state and local public safety entities with spectrum as needed, and has consistently utilized a policy of interweaving public safety spectrum with industry and other spectrum licensees in an effort to provide public safety with associated economies of scale based on the landscape of traditional voice-centric, Land Mobile Radio (LMR) technology. Therefore, spectrum assignments were traditionally provided to public safety on an "as needed" basis in small slivers of spectrum from throughout the entire spectrum map. The policy resulted in the current patchwork of spectrum that public safety maintains, which has resulted in multiple disparate networks only partially pieced together through expensive patching technologies. (see Appendix titled APCO: Current Public Safety Spectrum Holdings Report for detailed breakdown of public safety's current spectrum assignments)

With the advent of more advanced emergency communications systems, including cellular and wireless broadband technologies, the spectrum assignment policies of the past has put the public's safety, as well as the entire Nation at risk. Instead of utilizing multiple small slivers of spectrum to communicate through a 6.25 KHz or 12.5 KHz Land Mobile Radio (LMR) channel, current and emerging communications will utilize larger swaths of spectrum, commonly referred to broadband. Additionally, the traditional separation between Federal public safety, first responders and state-local public safety entities in a 21st Century post 9/11 world, have become dramatically less effective when coordinating both a day-to-day emergency response and major events/incidents. This requires the work of both the NTIA and FCC to significantly strengthen their cooperation, spectrum management oversight and policy development and implementation.

In the wake of the Oklahoma City bombing in 1995 - which at the time was the biggest terror attack ever struck on US soil - all of the major national public safety and government associations (referred to as the Big 7) came together with one voice to petition Congress, the Administration and the Nation to allocate 24 MHz of additional spectrum to alleviate the over congestion of then-current traditional, voice-centric LMR systems throughout the nation, and to allow for increased interoperability with new and existing LMR systems. Congress approved the assignment of the 24 MHz in 1997, and it was allocated to public safety from spectrum freed up by broadcasters' analog to digital transition. It was not until June, 2009 -- 12 years later -- that public safety finally obtained full access to utilize this spectrum.

In the intervening years, the attacks of 9/11, Hurricane Katrina, the Columbine school shootings and many other incidents further illustrated the need for additional spectrum, beyond the 24 MHz, to allow public safety and first responders to develop and deploy broadband networks for data and video usage. Meanwhile, the FCC had established a spectrum policy that designated 10 MHz of the 24 MHz provided to state and local public safety for development of a public safety broadband network (assigned to the current Public Safety Broadband Licensee, which is the Public Safety Spectrum Trust). This public safety broadband network was to be coupled with 10 MHz of adjacent spectrum (commonly referred to as the D Block) that would be auctioned with public safety encumbrances, including ruthless preemption, to a commercial provider to establish 20 MHz capacity for public safety through a public-private partnership. The subsequent auction of the D block was scheduled for early 2008 as part of the overall auction of the 700 MHz band. By all accounts the auction of the 700 MHz band was a success and derived $19 billion in revenue for the United States Treasury, even as the Congressional Budget Office's analysis projected a revenue of $12 billion dollars. This estimate of $12 billion included the auction of the D block, which in reality failed to receive a minimum bid and was never auctioned.

Once again in 2009, all major state and local public safety, first responder and Big 7 national associations came together with industry and other supporters in the wake of the failed auction of the D block to unify on a single effort to petition Congress and the Administration to allocate the D block to public safety. The overall goal of the coalition is to allocate the D block to public safety, provide sufficient funding derived from the auction of other spectrum, and the creation of an independent, nationwide governance structure with sufficient state and local government and public safety representation to allow for a Public Safety Broadband Network, consistent with the vision of a public-private partnership.

Many leaders in Washington, as well as those in industry, academia, the public and non-profit sectors, have come to support and champion public safety's top legislative priority in the current and previous Congress. Indeed, after a comprehensive, government-wide analysis of the issue, President Obama and his Administration formally added their support in January 2011 as part of the President's State of Union (SOTU) address, as well as Secretary Napolitano's State of Homeland Security Union and the President's Fiscal Year 2012 Budget submission to Congress.

The first piece of bipartisan legislation, introduced in April 2010 during the 111th Congress by Congressman Peter King (R-NY) was ***H.R.5081; Broadband for First Responders Act of 2010***, which focused primarily on allocation of the D block to public safety. HR5081 garnered 81 co-sponsors in less than eight months, roughly evenly divided among House Republicans and Democrats. Additionally, Senators Lieberman (I-CT) and McCain (R-AZ) introduced legislation, ***S. 3625; First Responders Protection Act of 2010***, which provided D block allocation, $11 billion in funding derived from other spectrum auction revenues for build-out of the Public Safety Broadband Network, and an expanded representation on the current PSBL. The final piece of legislation introduced in the last Congress was offered by Senate Commerce, Science and Transportation Committee Chairman John "Jay" Rockefeller, IV, as ***S.3756; Public Safety Spectrum and Wireless Innovation Act of 2010***, which allocated D block to public safety and provided $11 billion in funding derived from "incentive" and other auction revenues.

Chairman Rockefeller reintroduced his legislation in January 2011 as ***S.28; Public Safety Spectrum and Wireless Innovation Act of 2011*** and declared public safety spectrum and the PSBN as his committee's highest priority in the new 112th Congress. In June 2011, the Senate Commerce Committee favorably reported out a bipartisan bill developed by Chairman Rockefeller and Ranking Member Kay Bailey Hutchison, ***S.911; Public Safety Spectrum and Wireless Innovation Act of 2011***, by a vote of 21-4. S.911 allocates D block to public safety, provides $11.75 billion in funding for the PSBN derived from "incentive" and other spectrum auctions, and creates the Public safety Broadband Corporation as an independent non-profit governance entity, as the new PSBL, to oversee the management and implementation of the PSBN. The bill is also designed to provide $10 billion from the aforementioned spectrum auctions to battle deficit reduction. The Congressional Budget Office's (CBO) July report estimated that the bill's auctions would derive $24.5 billion in revenue providing only $6.5 billion in deficit reduction, or $3.5 billion less than the bill sponsors had estimated. Chairman Lieberman and McCain reintroduced their own bill, ***S.1040; Broadband for First Responders Act of 2011***, in May, 2011, which again allocates D block to public safety, provides $11 billion in funding derived from other spectrum auctions revenue, and expands representation within the current PSBL.

Meanwhile, House Homeland Security Chairman Peter King introduced new legislation, ***H.R.607; Broadband for First Responders Act of 2011***, along with Ranking Member Bennie Thompson (D-MS), which allocates D block to public safety and provides $11 billion in funding derived from other spectrum auction revenue. HR607 currently has garnered 46 bipartisan co-sponsors, and awaits action by the House Energy and Commerce Committee, which is the committee with jurisdiction of spectrum policy in the House.

After holding four hearings since April 2011 on spectrum policy and the public safety broadband network, the House Energy and Commerce Committee recently circulated competing Majority and Democratic Staff Discussion Drafts that disagree on whether to auction or allocate D block, on how much funding to provide, where the revenue is acquired, and how the PBSN should be governed. The Democratic Discussion Draft is very similar to S.911, which is overwhelmingly supported by public safety as well as state and local governments. We have asked that the House Energy and Commerce Committee take up and vote on legislation immediately in an effort to move it through the legislative process.

Shortly before the August break, Senate Majority Leader Harry Reid (D-NV) proposed an amendment to the Budget Deal that included language largely taken from S.911, which would have allocated D block to public safety, provided $7 billion for build out of the PSBN as derived from "incentive" and other auctions, while establishing the PSBC and providing $13 billion for deficit reduction. The final agreement did not include the Reid Amendment, but the issue of spectrum policy and the public safety broadband spectrum needs is reportedly under consideration as part of the Joint Select Committee on Deficit Reduction, dubbed the Debt "Super Committee." The Super Committee held its first official meeting on September 8th.

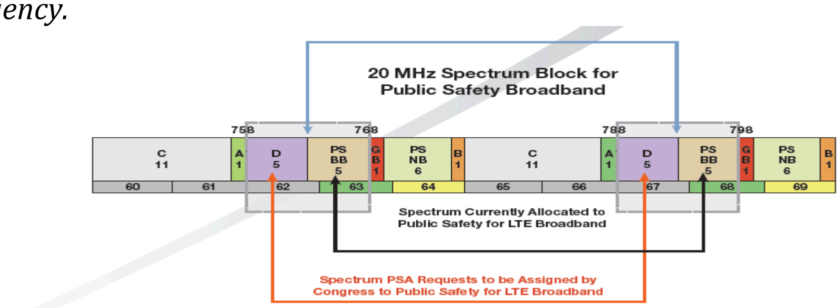
As a solemn reminder to the tragic events of September 11th, a 9/11 Report Card was issued by the Bipartisan Policy Center, and the National Security Preparedness Group Co-Chairs, former Governor Thomas Kean (R-NJ) and former Congressman Lee Hamilton (D-NY), who also chaired the 9/11 Commission. The men urged Congress, once again, to "immediately" allocate the D block spectrum to public safety to finally realize one of the last unmet recommendations of the 9/11 Commission to build a nationwide, interoperable, and mission-critical public safety broadband network before another strike or major disaster happens.

II. WHY THE D BLOCK

Excerpt: Public Safety Alliance, "America's First Responders Need Your Help!" July 2011

Public safety is currently the license holder of 10 MHz of broadband-ready spectrum in the 700 MHz band. As the only remaining portion of unlicensed 700 MHz spectrum on a nationwide basis, public safety must be allocated the D Block, which is directly adjacent to the public safety spectrum, in order to build out a 20 MHz broadband network. From a fiscal standpoint, allocating the D Block to public safety would be the most financially and nationally responsible use of the spectrum, as the build-out of a 20 MHz network split between two separate bands would cost taxpayers billions more than simply building one 20 MHz network on a single spectral band. Allocating the D Block to public safety will allow for a nationwide interoperable broadband network on a contiguous 20 MHz spectrum swath.

The D Block is the only spectrum capable of accommodating public safety's needs, due to the unique propagation characteristics of 700 MHz spectrum. The combined 20 MHz of spectrum would provide the framework for an ideal broadband network for first responders because it would provide enough capacity necessary to transmit mission critical real-time high resolution video, voice and data with the in-building penetration required by police, EMS and fire services when responding to emergencies. The robust network would be strong and efficient enough to provide mission critical-grade communication in the case of a natural disaster, terrorist attack or other emergency.



III. WHY BROADBAND

TODAY'S APPLICATIONS

Excerpt: Dr. Alan R. Shark, D. (2010). 700 MHz "D" Block Public Safety Application Needs Assessment. White Paper, Public Technology Institute.

How the 700 MHz D Block is ultimately allocated to public safety is critical to the deployment of a new and dynamic plethora of advanced high-tech public-safety applications. The 700 MHz band is exceptionally well suited for the new and demanding requirements of a new generation of video/data/voice devices.

The evolution of wireless communications continues at a rapid pace. In mid-2007 the iPhone was first launched - and lost in all the fanfare was that this phone was produced by a computer manufacturer and not a cell phone manufacturer. This device would change everything for consumers as every other manufacturer attempted to match or beat the iPhone. Today there are over 100,000 applications available, and there is no question that these devices have quietly morphed into powerful handheld computers that just happen to offer a decent phone as an "app."

The following applications are either being deployed piecemeal or are being planned for the near future. Because public safety agencies lack a common spectrum for the newer technologies, the cost of equipment is far greater than it would be if the applications highlighted below were located in a single 20 MHz spectrum block, with appropriate rules and standards.

- *Most local enforcement agencies have **mobile crime units** of some kind; some in the form of buses, or vans. For mobile command applications to take better advantage of the latest technologies and communications systems, they will require greater bandwidth and spectrum to better integrate high-speed, high-definition video, data, and voice communications. Typically, the equipment used includes mobile, fingerprint reading and analysis, video crime scene analysis, and blood sample analysis, as well as perimeter protection and monitoring, and scene ID authentication.*
- *When natural disasters, major structural fires, hazmat incidents, hostage situations, or terrorism incidents strike, a **mobile command center** is required to coordinate and establish a mobile command system. The command center serves as the central hub for receiving and analyzing various voice communication paths, data monitoring and analysis, bio-monitoring, 3D building schematics and diagrams, GIS mapping, individual first-responder tracking, vehicle assets placement and tracking (AVL), incident ID authentication.*
- ***Automated license plate reader** technology allows public safety officers to passively or actively scan vehicle license plates, either moving or parked. Data is retrieved from a specialized video camera and automatically sent to a*

database for immediate response. Such devices are particularly helpful with event management, "amber" or "silver" alerts, and seeking out individuals of interest.

- ***Mobile ticket writer*** *systems allow for near-instant license look-up with full driver picture display, along with address, driving record, and any outstanding warrants. This type of system has been proven to dramatically increase productivity in ticket writing and leads to greater law enforcement personnel protection. Moreover, mobile ticket writing systems help ensure officer safety, as he or she would know instantaneously whether the subject is more than merely a traffic violator.*
- ***Streaming video*** *from mobile devices require a huge amount of bandwidth – especially if offered as high-definition broadcast. Streaming video is required for mobile incident feeds and supplies critical visual information to various agencies and sites for improved coordination and multi-agency engagement.*
- *Leading city, county, and state agencies are increasingly relying on accessing* ***geospatial information*** *databases where building schematics, wiring, ventilation systems, street conduits, underground structures, pipelines, subways, and other critical infrastructures are displayed. Mashed-up data is considered essential in being able to quickly respond to incidents and crises requiring immediate analysis and response.*
- ***Mobile Video surveillance*** *offers public safety officials the ability to connect responding units within minutes and receive immediate feeds. The latest mobile video technology provides for extreme lowlight capture plus high-definition resolution. These must-have units also come with a large requirement for intensive bandwidth.*
- *Cities and counties are looking to purchase* ***multi-mode biometrics monitoring devices*** *that are either fixed or mobile. Fixed units are designed to be deployed in or around major transportation hubs as well as in high-risk government buildings and structures, and landmarks. Mobile units are designed to be deployed at planned incidents such as parades, festivals, etc, and to warn of potential threat. Mobile units may also be deployed when an incident may be about to occur or has already occurred, and precise measurements are needed to ascertain site safety for first responders and the general public.*
- *New technology provides* ***fire electronic command boards*** *at the site where they are most needed and shared simultaneously with other command centers. A mobile command center is required to coordinate and establish a mobile command system when natural disasters, major structural fires, hazmat incidents, or terrorism incidents strike. The command board serves as the central hub for receiving and analyzing various voice communication paths, data monitoring and analysis, bio-monitoring, 3D building schematics and diagrams, GIS mapping, individual first-responder tracking, vehicle assets placement and tracking (AVL), and incident ID authentication.*
- *Cities and counties have turned to* ***Automatic Vehicle Location (AVL) and telemetry systems*** *to better coordinate their dispatch of first responder units through improved tracking and system status management. ALS units can also*

broadcast key vital signs to medical experts in other locations, helping to better ensure life-saving care. With patient telemetry hospitals can be better prepared to offer life-saving measures before the patient arrives.

- *With a growing population it is more important than ever before to deploy technologies that can utilize **facial recognition** to seek out persons of interest, or to simply permit passage of authorized first responders to an incident or crime scene. Video analytics scans for visual anomalies, thus helping to track, guard, and monitor buildings, sites and events for suspicious behavior.*
- *Ideally, the benefits are obvious if every public safety vehicle has the capacity to view **floor plans and have access to records, photos, and other 3D graphical displays**. Each vehicle would be required to have a more powerful data terminal and screen capable of viewing high-definition video and audio. The irony here is that many believe the general public will have access to similar features with the next generation of broadband devices - slowed only by network capability and non-public-safety-grade equipment devices.*
- ***Telemedicine** allows emergency and trauma physicians to triage cases remotely, even while patients are in transit. The ability to transmit video and images of the patient in transit can save big dollars considering that each Level 1 trauma activation involves 18 to 20 people and costs the hospital $5,000. If a single physician or nurse triages the case by video, the system can prevent unnecessary trauma calls. (Hospitals and Health Networks (H&HN), 2009)*
- *Bomb disposal units are increasingly relying on **robots** to take over the dangerous task of finding and defusing bombs. But robots are also taking on other hazardous duties, and their capabilities are evolving rapidly.*
- *In recent years, the emphasis on measures to combat terrorism has led to the development of technologies to **detect nuclear, chemical and biological threats**. Sensor capable of identifying nuclear, chemical and biological threats and alerting authorities can potentially reduce the risk from future terrorist actions.*

FUTURE MISSION CRITICAL VOICE COMMUNICATIONS

Excerpt: Seybold, A. M. (2011, June 19). *LTE Support for Mission Critical Voice for Public*

Mission critical voice communication reflects the harsh realities on the emergency management scene: when every other commercial system is down, you expect mission critical voice to be there. The exacting standards for mission critical networks and devices disqualify many nascent technologies and devices in favor of proven, reliable standards. In a mission critical environment, all aspects of a device or technology must achieve interoperability, reliability, coverage, capacity, control and instant, real-time communications.

If LTE broadband can meet both the voice and the data requirements of the first responder community, a single device could be deployed that would provide not only *data/video interoperability, but voice interoperability as well. This would be an ideal situation and one that is worth pursing. However, existing narrowband spectrum should not be reallocated for other uses until such time as LTE broadband can and does meet all of the requirements for Public Safety mission critical voice as well as data and video services.*

LTE or fourth-generation (4G) wireless broadband was designed and implemented primarily as a data over broadband technology. Voice in the form of Voice over IP, which is being designed to implement voice calls in the traditional cellular fashion of dialing a number and completing the call using the LTE network as transport, is being developed. The issue is whether LTE can and will support other types of voice services, specifically Push-To-Talk (PTT) voice and most importantly, PTT off-network [point-to-point], when units are out of coverage of the network or when they need short-range communications in buildings and in other areas where the network does not provide coverage.

The standards for LTE are largely controlled by the 3GPP, an organization made up of hundreds of commercial members including chipset companies, infrastructure vendors, network operators, handset companies, software developers, and others. In order to add mission critical voice requirements to the LTE standard, the Public Safety community must petition the 3GPP for its inclusion AND there must be a number of other members of 3GPP that concur. Once (if) this happens, the amendment to the standard is assigned to a future release of LTE and when that release is being worked on, the amendment will be considered.

In order for the amendment to the standard to be considered, all of the requirements must be defined and support must be garnered from members of the 3GPP. At present, there is no incentive for network operators that largely drive the direction of 3GPP, to embrace mission critical voice, especially the part of mission critical voice that is of paramount importance to Public Safety: The ability to communicate between devices without having to make use of a network. Commercial network operators are not inclined to agree to this type of voice communications because they won't have control of their customers and the minutes of use cannot be billed to the customer.

Therefore, Public Safety will have a difficult time convincing the 3GPP to address the issue of mission critical voice. If a non-standard workaround can be and is developed, it would mean that the devices used by Public Safety would not be nearly as standard as the devices being envisioned today for data and video, thus the cost of these devices would be considerably higher.

However, voice over LTE will happen. It might take longer than many people believe, and it will certainly be implemented in stages. The first voice over LTE smartphones will be available on commercial networks by the end of this year, and the first PTT LTE devices will be tested. Initially, neither of these voice services will meet all of the voice requirements of the Public Safety community. The first PTT service will probably be PTT over LTE for non-mission critical voice communications that will be bridged to *existing narrowband P25 voice systems in order to provide for interoperability between narrowband voice and LTE PTT services.*

For those trying to plan upgrades to or expansion of their existing narrowband voice networks, it is possible that voice over LTE, both on and off-network, will eventually be developed to provide all of the voice requirements for mission critical on and off-network services. ***If there is funding for research and development available from the federal government,*** *the time frame will most likely be shortened. In either case, it will take time to first build out the nationwide broadband network, then it will take time for Public Safety to learn how to incorporate data and video into their everyday incidents and then how to integrate voice over LTE into their systems over time.*

Excerpt: National Public Safety Telecommunications Council Broadband Working Group. (2011). Mission Critical Voice Communications Requirements for Public Safety. White Paper.

LTE will be able to provide some of the voice capabilities needed by the Public Safety community. The questions remaining are how long will it take to implement the rest of these requirements, how much will it cost, and whether it is better in the near future to integrate voice and data services in the back-end network but not necessarily over the airlink. There is a lot of work to be done to transition from traditional narrowband voice to voice over LTE, and at this point no one knows how long it will take or even if all of Public Safety's requirements can be fully met on a broadband network.

The key elements for the definition of Mission Critical voice include the following:

- ***Direct or Talk Around:*** *This mode of communications provides public safety with the ability to communicate unit-to-unit when out of range of a wireless network OR when working in a confined area where direct unit-to-unit communications is required.*
- ***Push-to-Talk (PTT):*** *This is the standard form of public safety voice communications today - the speaker pushes a button on the radio and transmits the voice message to other units. When they are done speaking they release the Push-to-Talk switch and return to the listen mode of operation.*
- ***Full Duplex Voice Systems:*** *This part of the definition describes the use of Public Safety devices. This form of voice communications mimics that in use today on cellular or commercial wireless networks where the networks are interconnected to the Public Switched Telephone Network (PSTN)*
- ***Group Call:*** *This method of voice communications provides communications from one-to-many members of a group and is of vital importance to the Public Safety community*
- ***Talker Identification:*** *This provides the ability for a user to identify who is speaking at any given time and could be equated to caller ID available on most commercial cellular systems today.*

- ***Emergency Alerting:*** *This indicates that a user has encountered a life threatening condition and requires access to the system immediately and is, therefore, given the highest level or priority.*
- ***Audio Quality:*** *A vital ingredient to Mission Critical Voice. The listener MUST be able to understand without repetition, and can identify the speaker, can detect stress in a speaker's voice, and be able to hear background sounds as well without interfering with the prime voice communications.*

Each of these components, which make up the requirements for Mission Critical Voice, are essential. In order to be able to provide Mission Critical Voice over any type of network the definition for each of these elements must be fully understood. It is, however, important to understand that for a network to fully support Public Safety Mission Critical Voice Communications each and every one of these elements must address part of the overall voice communications services supported by the network.

SPECTRUM & CAPACITY

Excerpt: Rysavy, Peter. "Public Safety Spectrum." July 2011.

The amount of capacity in wireless networks depends on a variety of factors, but in general, mobile-broadband networks have significantly lower capacity than fixed-broadband networks. Capacity can be calculated by assessing the spectral efficiency of different wireless technologies, a value that is represented in bits per second per Hertz of spectrum (bps/Hz). While new technologies such as LTE are spectrally more efficient than prior technologies, all wireless technologies are reaching what is called the Shannon bound, a law that dictates the maximum spectral efficiency that a technology can achieve relative to noise. By knowing the radio channel size and the spectral efficiency of the wireless technology, one can estimate the aggregate capacity of a cell site. LTE in its initial deployments has a spectral efficiency value for the downlink of about 1.5 bps/Hz per sector. For the uplink, it is .65 bps/Hz.

Given the application requirements discussed in the next section, these capacity values, even for 20 MHz are quite finite. The capacity in 10 MHz, as is made clear below, is simply too limiting to provide a broadband network that can accommodate the needs of first responders.

There are multiple factors that are fueling growth in data usage including:

- ***Faster networks.*** *The faster that data can be exchanged, the more likely it is that applications will take advantage of the speeds, especially since faster speeds can mean less waiting time for workers.*
- ***More network‐enabled devices.*** *New device categories such as tablets and netbooks are expanding overall data consumption, especially because of the delivery of highquality video. Just as consumers and enterprises are adopting these new device categories, so will first responders.*

- ***Increasing computing speeds.*** *The faster the platform can compute, the more data an application can process in real time.*
- ***Higher screen resolution.*** *Greater screen resolution corresponds to higher resolution video options for users.*
- ***Embedded modems.*** *An increasing number of laptops and tablets come with embedded 4G modems, facilitating the use of mobile broadband service.*

The question is how much bandwidth do applications actually need.

- ***Voice over IP -*** *10 thousand bits per second (kbps) to 20 kbps (both downlink and uplink directions.)*
- ***General-purpose audio to record all sounds*** *- About 100 kbps.*
- ***Video -*** *Ranges from 200 kbps on a small-screen device like a phone, to 1 million bits per second (Mbps) for medium resolution on a laptop, to 5 Mbps for high definition.*
- ***Web browsing*** *- Usually requires about 1 Mbps or higher to provide good response time.*

By comparing these throughput requirements against the capacities listed in the previous section, one can see that just a handful of first responders could easily consume the capacity of a 10 MHz LTE network. LTE in 10 MHz has a downlink capacity of 7.5 Mbps. Thus, 8 downlink streams at 1 Mbps each would consume the capacity of the cell sector. On the uplink capacity is even more constrained at 3.25 Mbps where just 4 uplink streams would consume capacity. For example, these streams could be video from patrol cars at a crime scene.

Public-safety applications will increasingly demand higher bandwidth. The same innovation shown in commercial broadband will extend to public-safety broadband. In the February 2011 report "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2010-2015," Cisco predicts a 92% compound annual growth rate in mobile traffic. There is no reason that such trends do not also apply to Public Safety. Examples of public-safety applications include:

- *Wireless video surveillance.*
- *Aerial video from a helicopter over a scene fed to personnel below.*
- *Video-based training to remote emergency workers.*
- *Real-time license plate recognition.*
- *Testimony based on video transmitted from an emergency-services vehicle or command post.*
- *Sending and receiving high-resolution pictures.*
- *In-field biometrics (such as iris and fingerprint identification).*
- *Automated vehicle location and navigation.*
- *Medical applications such as telemedicine, patient records, and high-resolution video to enable medical services performed at a scene of an accident.*

It is important to note that another aspect of some public-safety applications is that they demand bandwidth continuously. For example, a patrol car in an emergency situation may need to transmit a constant video stream.

PRIORITY vs. PREEMPTION

Excerpt: Rysavy, Peter. "Public Safety Spectrum." July 2011.

There are arguments for alternative approaches to dedicating spectrum for Public Safety, such as sharing commercially-allocated spectrum between first responders and commercial operators, with the commercial operator serving as the primary user or licensee. This is a bad idea for a multitude of reasons.

The first reason is that the needs of commercial customers and Public Safety are inherently different. Commercial networks are developed in a highly competitive environment where operators invest in a way to provide services at the lowest possible cost to customers. These low costs are a major factor in what is driving the broadband market. First responders, however, need hardened networks that are extremely reliable. This hardening includes items such as long term backup power, redundant backhaul, diversified routing, and explosion proof sheltering, thus significantly increasing the cost of the network, and likely not making it viable from a competitive aspect for the private sector.

Sharing of spectrum also assumes that public-safety applications will obtain the bandwidth they need when they need it from the commercial entity. This assumption, however, is fraught with risk for the following reasons:

- *Policies implemented by commercial operators may not sufficiently address public safety needs. Policies, such as reserving certain amounts of bandwidth for commercial customers, may result in insufficient capacity for public-safety applications in emergency situations.*
- *Prioritization schemes may not work correctly. In an emergency situation where there is massive demand on the network from both constituencies, it is possible that prioritization schemes will not work as planned simply because they may never have been tested under such extreme conditions.*
- *Users may defeat prioritization schemes. It is already common for users to hack their devices, especially smart phones, to access services not in their current service plans. These modifications could defeat the prioritization schemes at exactly the time they are most needed.*

Nevertheless, if Public Safety has control of the spectrum and they wish to lease part of their network capacity to other entities, this can be feasible and even desirable for defraying costs, so long as Public Safety can specify the terms of such arrangements, can implement the appropriate preemption capabilities, and so long as the underlying network is built to address the specific requirements of Public Safety.

Excerpt: Seybold, A. M. (2011, September 1). Cell Phones and Nature. Retrieved September 13, 2011, from AndeySeybold: http://andrewseybold.com/2617-cell-phones-and-nature

The East Coast has suffered a double whammy as we all know. First was the 5.8 earthquake followed by Hurricane Irene, which was not as bad as was feared but still bad enough that the damage will take a long time to repair. Both of these events caused problems for the commercial wireless networks but in very different ways, pointing out the major differences between network overload and cell site failures.

In both of these cases there were network issues. During the earthquake the problem was simple: The networks stayed up but they were overloaded and could not process all of the requests for service. This is the same scenario that has been experienced with landline phones for years. Remember how difficult it used to be to get a dial tone on Mother's Day? Perhaps you remember when after an earthquake in California or during the wildland fires you could not get a call through to your relatives using the wired network?

While the cause of wired and wireless phone system overloads are different, the results are the same. The network is up and running but the number of people trying to make calls simply overwhelms the network. In the case of wired phones, the reason is that after your dedicated line reaches the nearest central office your call is joined with all of the other calls on a cable or microwave link. This link transfers the requests and the calls overloaded the link since all of these systems are built on the premise that not all phone users will want to make a phone call at exactly the same time. Therefore, the wired phone systems were designed to handle a normal, expected traffic load with extra capacity for peak call periods, but they were not designed for times when demand is unusually high. The lines and switches were jammed and people could not get dial tone and had to wait until the demand subsided.

For the sake of simplicity, let's assume that within each sector the maximum number of voice calls that can be handled is 100. A sector's normal traffic load might be thirty calls at the same time, peaking at sixty calls in a single cell sector during busy periods. Good cellular design dictates that reserve capacity be built into each cell sector so that others entering that sector from another have capacity on the new sector and are not disconnected as they move from sector to sector.

The sector becomes overloaded when demand for service exceeds the maximum number of calls that can be processed in that sector, in this case 100, so if there are 120 people within the sector some will not have network access. The way you gain access to the network is that your device (or the network in the case of an incoming call) sends a request on what is typically called the signally channel. This channel is not only used to request a call but also for the network to track the location of the device so it can be found during an inbound call as well as to facilitate the hand-off to *the next sector when the phone is moving. In some networks this signaling channel is also used for SMS traffic, which uses some of the capacity of the signaling channel.*

If there are too many devices trying to access the network within a cell sector, the signaling channel becomes overloaded and some customers' requests will not even reach the network (this is one reason priority access for public safety is not a viable option). So there are two issues, the total number of calls a sector is capable of handling, and the amount of traffic on the signaling channel. Even if more spectrum is allocated to a cell sector, while the number of calls that can be handled by that sector increases, there is still a finite number the sector is capable of processing and completing.

On the data side, even fewer data sessions per sector are normally supported. In normal usage, data bursts to and from the device will permit more customers to make use of the broadband data side of the system. However, if a number of customers are streaming video up or down, the total number of broadband data users is diminished greatly. Even in normal times we have seen the results of cell site sector overloading. AT&T had this type of problem as the iPhone took off a few years ago and many of its customers started using a lot of data services. It is possible that one sector or multiple cell sites are completely overloaded due to demand but calls can still be made and received a few miles away where the demand is less.

What happened during the earthquake was that everyone reached for their phones at once. The networks worked perfectly during the aftermath of the quake but they were simply overloaded on both the voice and the data side. Calls could not be made or received, calls were dropped, video taken of damage could not be sent, and SMS messages did not get through. No matter how much spectrum we have or how robust the commercial operators build these networks, we will have network overloading during major events.

This is not a new problem. You might recall that during the Oklahoma bombing the radio and TV stations were telling people within the affected areas not to use their phones so the commercial systems could be used to augment the public safety channels. During the earthquake, I am not aware of a single cell site failure so the bottom line is that in this instance, the problems experienced were network overloading and this will never be solved no matter how much spectrum we throw at it and no matter how many more cell sites are built. It is not possible for anyone to build a commercial wired or wireless network that will not reach saturation at some point, due to some type of major incident. The same is true, by the way, with the Internet for all of you who plan to rely on it and store all of your data in the cloud.

One advantage to the commercial wireless networks is that the network operators can do some on-the-fly network management. Especially the newer 3G and 4G networks have tools built in that enable pro-active traffic management by changing antenna patterns to shrink the radius of a cell site, to overlap cell sectors in a given area, and to try to balance the load. However, even with all of this new technology there comes a *point where a cell sector, and possibly many cell sectors, will be overloaded and this will happen over and over again. It is more severe during an event such as an earthquake because once the event is over, everyone reaches for their phones at once. During a longer incident, say a hurricane, the traffic does not usually peak as quickly and therefore the networks are generally able to handle the additional traffic.*

Two different acts of nature caused incidents resulting in two different types of commercial network issues. During the earthquake, the networks stayed up but were overcrowded, a situation that will be repeated regardless of what we do, and the hurricane saw more spot outages due to power and communications links problems. In both cases these types of problems cannot be fixed by an FCC inquiry or a change in the rules, they will continue to happen. There is no such thing as a network that can withstand overcrowding or wind and flooding.

MIGRATION OF LMR TO BROADBAND

Summary: Sen Hutchison, K. B., & Sen Rockefeller, J. D. (2011). S. 911: The Public Safety Spectrum and Wireless Innovation Act of 2011. United States Senate, U.S. Senate Committee on Commerce, Science, and Transportation.

S. 911 requires the Commission to conduct a study and submit a report to the appropriate committees of Congress and to the Corporation on the spectrum used by public safety licensees or for public safety services pursuant to section 337(f) of the Communications Act of 1934 (47 U.S.C. 337). The report shall inventory the spectrum assigned to public safety use; and include the amount of spectrum allocated to public safety use; the number of licensees and amount of spectrum assigned to each licensee; a general description of technologies and systems in each band; an approximation of network coverage, as appropriate, of major systems (such as an estimation of land mobile radio coverage by population) in major metropolitan areas; and an approximate number of users of major systems, such as the number of first responders using land mobile radio, in major metro areas; assess if spectrum is adequate to meet the current and future needs for public safety services; and assess the opportunity for return of any additional spectrum to the Commission for reallocation.

IV. HOW MUCH WILL IT COST

Excerpt: Public Safety Alliance, "America's First Responders Need Your Help!" July 2011

The Federal Communications Commission's (FCC) National Broadband Plan states that the build-out of a 10-MHz broadband network will cost between $12 and $16 billion over the next ten years. The cost of building a 20-MHz network is the same as building a 10 MHz system, and could actually cost less. The FCC's plan requires the federal government to pay for the build-out.

However, if public safety were able to leverage the excess network capacity, and utilize existing public safety infrastructure when building out the network while securing partnerships with private industry partners, the actual cost to local, state, tribal and federal governments would be considerably less. A combination of leasing excess capacity, prioritized federal grant programs and revenue from other auctioned spectrum would help build and sustain the nationwide interoperable public safety broadband network, while creating a budget neutral funding model.

The recently released Congressional Budget Office (CBO) report on the estimated costs and revenues for S. 911 will provide more than $6.5 billion for deficit reduction. The CBO's estimated costs and revenues for S. 911 indicate that the FCC's auction of spectrum would generate $24.5 billion in auction revenues which would fully fund the $11.75 billion broadband network for first responders.

The CBO's analysis of S.911 reflects the sentiments of Senators Rockefeller, Hutchison, Schumer and others that this bill will help save lives, lower the national deficit and implement a final outstanding recommendation of the 9/11 Commission, without costing the American taxpayer.

Excerpt: Gramp, K., Willie, S., Pickford, M., Stocking, A., & Webre, P. (July 2011). COST ESTIMATE: S. 911 Public Safety Spectrum and Wireless Innovation Act. Congressional Budget Office.

S. 911: The Public Safety Spectrum and Wireless Innovation Act of 2011 would establish a new entity, the Public Safety Broadband Corporation, to build, operate, and maintain a broadband network for public safety agencies that would be available across the country on a specific spectrum band. The bill would grant a license to the corporation to use 22 MHz spectrum nationwide: the 10 MHz "D block" spectrum (discussed above) and 12 MHz that has been allocated for public safety purposes under current law. The license would have an initial term of 10 years and would be renewable for additional 10-year terms if the FCC determines that the corporation has met the requirements set out in S. 911.

The bill would appropriate $11.75 billion to the corporation from spectrum auction receipts to build a nationwide network of wireless broadband. The corporation also would be authorized to borrow funds from the public and incur other forms of indebtedness. It would be given temporary authority to borrow funds from the Treasury through the NTIA for amounts necessary to carry out its responsibilities; this borrowing authority would terminate once certain auctions have begun. CBO expects that the corporation would borrow amounts sufficient to allow the network to be developed and operated, independent of the timing of the auctions under the bill.

S. 911 also would authorize the corporation to assess and collect several different fees in amounts sufficient to cover, but not exceed, its annual operating expenses. Specifically, the corporation would be authorized to assess:

- *A subscription fee from each entity using the public safety network;*
- *Fees from commercial services that choose to lease the network's capacity on a secondary basis; and*
- *Fees from entities that access equipment or infrastructure built and maintained by the corporation.*

CBO estimates that establishing the corporation would increase direct spending by $12.5 billion over the 2012-2021 period. This amount includes amounts appropriated to the corporation by S. 911 for capital expenditures and net operating losses that CBO anticipates would be generated in the first few years of the corporation's operations.

CAPITAL EXPENDITURES TO BUILD OUT THE NETWORK

CBO estimates that the corporation would spend $11.5 billion over the 2012-2021 period to build a nationwide wireless broadband network.

Based on information from the FCC and industry experts, CBO estimates that the corporation would develop a network of about 45,000 sites to serve 95 percent of the Cost of Build Out population by 2018 at an average cost of about $170,000 per site. That estimate is higher than the costs typically incurred by private firms because of the added reliability and security needed for public safety systems and the cost of independent capabilities specified in the bill. CBO estimates that meeting the goal of nationwide coverage would require several thousand additional sites to be built in rural areas at roughly double that unit cost. Because S. 911 would provide funding for the additional sites, CBO estimates that most of those sites would be operational by 2021.

NET OPERATING INCOME

The corporation's annual cash flows from operations would depend on how quickly the network is built and used. Operating costs would be largely tied to the number of sites that are built and on the administrative costs of serving public safety users. CBO based its estimate of operating costs on historical trends for wireless firms as well as FCC and industry projections of the costs associated with sites that have been built or are leased from other companies. Income from customers would depend on the network's available capacity and market conditions. For this estimate, CBO assumes that the corporation would be able to sell virtually all of its available capacity by 2021 at prices that are consistent with industry trends for retail and wholesale transactions.

Based on that information, CBO estimates that the corporation's operating costs would exceed its income by about $1 billion over the 2012-2021 period. Operating losses are typical for new entrants in the wireless market because of the lag between start-up costs and income from retail and wholesale customers. CBO estimates that the corporation would experience annual losses ranging from about $200 million to $400 million a year in the first few years of operation but would start to generate sufficient income to offset those losses by the end of the 10-year period. CBO also expects that the *corporation's losses would be higher than for commercial firms because the towers located in areas with very low population densities may not generate enough income during this period to cover the added operating costs.*

STATE AND LOCAL GRANTS

S. 911 would appropriate $250 million from spectrum auction receipts for matching grants to assist state, local, and tribal governments in developing effective ways to use the public safety network created by the corporation. To implement the program, the Department of Commerce would be allowed to borrow that amount from the Treasury beginning on October 1, 2011. Once auction proceeds become available, they would be deposited into a State and Local Implementation Fund and would be credited as an offset to borrowed funds and cover other program expenses, subject to the $250 million limit.

RESEARCH AND DEVELOPMENT PROGRAMS

S. 911 would appropriate up to $1.5 billion from auction receipts for two research and development (R&D) programs related to communications technologies. Funding would be provided for each of the fiscal years 2012 through 2016 in the following amounts: $100 million a year would be allocated for a new research program coordinated by the National Institute of Standards and Technology (NIST) on systems for public safety users and $200 million a year for additional research conducted by NIST, the National Science Foundation, and the Defense Advanced Research Programs Agency.

Because of the time needed to conduct auctions and issue licenses to the winning bidders, CBO estimates that there would not be any funding available for the R&D programs until fiscal year 2014. As a result, we estimate that the funding available for those initiatives would total $900 million over 2012-2021period.

TRANSFER OF THE D BLOCK SPECTRUM

Current law directs the FCC to auction commercial licenses for 10 MHz of spectrum known as the "D block" and to deposit the proceeds in the Treasury. (The D block covers spectrum between the frequencies from 758 MHz to 763 MHz and between 788 MHz to 793 MHz.) Under current law, CBO estimates that such an auction will be held by the end of 2012 and will generate receipts of $2.75 billion over the 2012-2013 period.

S. 911 would reallocate the D block from commercial to public safety uses, at no cost to those entities. CBO estimates that forgoing the offsetting receipts from the auction of the D block would increase direct spending by $2.75 billion.

V. HOW WILL IT BE FUNDED

Excerpt: Gramp, K., Willie, S., Pickford, M., Stocking, A., & Webre, P. (July 2011). COST ESTIMATE: S. 911 Public Safety Spectrum and Wireless Innovation Act. Congressional Budget Office.

S. 911 would amend existing law regarding the FCC's authority to auction licenses to use the electromagnetic spectrum. It would extend the commission's auction authority, which is currently scheduled to expire at the end of fiscal year 2012, through 2021. The FCC would be directed to auction certain frequencies by January 31, 2014, including 95 megahertz (MHz) of spectrum that is currently used by the Department of Defense (DoD) and other agencies. Other provisions would establish a statutory framework for what are known as "incentive auctions," in which private firms (primarily television station owners) would voluntarily relinquish some or all of their existing spectrum rights in exchange for a payment from the FCC. That spectrum would then be available for new licensed or unlicensed services. To implement incentive auctions, the bill would:

- *Authorize the FCC to spend auction receipts to pay firms that voluntarily relinquish their licenses;*
- *Appropriate up to $1 billion from auction receipts to create an Incentive Relocation Fund administered by the National Technology Information Administration (NTIA). The fund would be used to pay television broadcasters who do not relinquish their licenses for costs the FCC would impose to change their channel assignment as part of the process of clearing spectrum for nonbroadcast services. The fund also would cover certain expenses incurred by cable operators and other distributors of television programming.*
- *Allow the FCC to spend auction receipts to compensate television broadcasters who do not relinquish their license for any modifications made by the FCC to the quality or scope of their coverage as a result of efforts to clear spectrum for nonbroadcast services; and*
- *Allow the FCC to make some television broadcast frequencies available for unlicensed use if the amount of spectrum awarded through competitive auctions is at least 84 MHz.*

CBO estimates that enacting those provisions would reduce direct spending by $24.5 billion over the 2012-2021 period. That estimate reflects the expected value of offsetting receipts (based on the outcomes of various scenarios regarding the quantity and quality of frequencies likely to be auctioned over this period), net of direct spending to compensate existing licensees affected by the auctions.

Establishes in the US Treasury the "State and Local Implementation Fund". The Treasury is authorized to deposit into or credited to the State and Local Implementation Fund (1) any amounts specified in section 401; and (2) any amounts borrowed by the Assistant Secretary. The Assistant Secretary is authorized to borrow from the general fund of the Treasury beginning on October 1, 2011, such sums as may be necessary, but not to exceed $250,000,000, to implement section 222. The Assistant Secretary is required to reimburse the general fund of the Treasury, without interest, for any amounts borrowed as funds are deposited into the State and Local Implementation Fund.

Summary: Sen Hutchison, K. B., & Sen Rockefeller, J. D. (2011). S. 911: The Public Safety Spectrum and Wireless Innovation Act of 2011. United States Senate, U.S. Senate Committee on Commerce, Science, and Transportation.

S. 911 establishes the "State and Local Implementation Gran Program" that is to be administered by the Assistant Secretary in consultation with the Corporation. The purpose of the grant program is to make grants to States to assist State, regional, tribal, and local jurisdictions to identify, plan, and implement the most efficient and effective way for such jurisdictions to utilize and integrate the infrastructure, equipment, and other architecture associated with the nationwide public safety interoperable broadband network to satisfy the wireless communications and data services needs of that jurisdiction, including with regards to coverage, siting, and other needs. The matching requirement for the grants is 80% of eligible costs but the Assistant Secretary can waive, in whole or in part, the requirements for good cause shown if the Assistant Secretary determines that such a waiver is in the public interest.

Six months after the establishment of the bylaws of the Corporation the Assistant Secretary, in consultation with the Corporation, shall establish requirements relating to the grant program, including (1) defining eligible cost; (2) determining the scope of eligible activities for grant funding; and (3) prioritizing grants for activities that ensure coverage in rural as well as urban areas. In carrying out the grant program, the Assistant Secretary shall require each State to certify in its application for grant funds that the State has designated a single officer or governmental body to serve as the coordinator of implementation of the grant funds.

VI. HOW WILL IT BE MANAGED

Alcatel-Lucent. (2010). Long Term Evolution (LTE) for Public Safety: Enabling Flexible Business Models. White Paper.

STATE AND LOCAL DEPLOYMENT OPTIONS

The following three deployment options each have positive and negative factors. For all options, it is important to understand the requirements, resources and risks.

- *CAPEX model – All equipment and software is purchased, and ongoing support is provided through in-house personnel.*

- *Managed model – All equipment and software is purchased, but the ongoing support is either wholly provided by another party, or the support is shared by another party and in-house personnel.*
- *Hosted model – Network access is provided by another party and leased to a public safety entity for a monthly fee.*

***In the CAPEX model**, the overall network is owned and managed by one or more public safety entities. These entities take full responsibility for purchasing all network elements and software, and they employ in-house personnel to build, manage, operate and maintain the network. Individual agencies may be able to remotely monitor network health.*

Mission-critical networks are built with complete geographic redundancy to eliminate any single point of failure. This approach increases costs for core network equipment, beyond what is usually required for commercial networks. Initial upfront costs can be offset — and ongoing OPEX costs can be reduced — through government grants and incentives, along with any reallocated monthly per-subscriber fees (which may currently be paid to commercial broadband wireless service providers). The extent of upfront costs depends on: the scale of deployment (local or regional), whether the core network is shared among multiple areas or entities and how deployment is scheduled (gradually over years or within a shorter time period). With the CAPEX model, the public safety entity must also employ skilled personnel for network design, operations, maintenance, security and technical support, as well as program and project management. For a small deployment, these expenditures might not be economically viable.

The state and local public safety entity has full control over the network. A dedicated network in the 700 MHz band provides operational benefits, along with potential savings on margins imposed by service providers. With the proper know-how in place, a self-managed network can also offer an "a-la-carte" selection of applications and services customized to user needs in the target area, which could be local, county or another public sector. On the other hand, smaller networks would not benefit from the economies of scale a commercial operator might be able to realize. For example, commercial operators could gain efficiencies by leveraging their existing commercial resources to manage — and possibly build — the public safety network.

The CAPEX model can be a good option for local and state public safety entities that deploy their own network as long as they have "critical size." Critical size is determined by comparing the total allocated costs with the cost of an equivalent outsourced or managed service.

*The **managed model** is a hybrid, combining elements of the CAPEX and hosted models. With the managed model, the public safety entity is responsible for ensuring that network elements are appropriately owned and deployed. But it contracts with another party to manage and/or operate the network. Leased lines connect the* *network to the Operations, Administration and Maintenance (OA&M) center. Individual agencies may be able to remotely monitor the health of the network.*

Similar to the CAPEX model, this model requires each public safety entity to purchase all the equipment and software and contract for the required deployment services. Depending on the network architecture, these costs can vary significantly. Though in this model, cost savings are possible by contracting management functions with another party. For the highest Quality of Service (QoS), management services should go beyond traditional network monitoring and provide a performance management platform that proactively monitors for predetermined thresholds, along with preventive maintenance to ensure all network elements are running at peak efficiency. In doing so, the network is managed proactively to maintain network availability while ensuring a high degree of service uptime.

The managed model offers flexibility in terms of the management functions contracted. For example, a public safety entity could have another party provide end-to-end operational support, using a service-centric approach. This approach provides operational support from the core through the network to the end user. Contracting one party to provide full operational support eliminates finger pointing and the need to address multivendor management requirements.

The managed model provides a degree of control to each public safety entity. Network elements are deployed at a site chosen (and often owned) by the public safety entity. Owning the assets allows each public safety entity to decide when to upgrade the network and implement its own security platform. By contracting with another party to provide management services, the public safety entity will have a predictable monthly fee with lower IT and administrative headcount. It will also require less investment in network management tools and training.

The ***hosted model*** *allows each public safety entity to use network assets that are owned and managed by another party. These assets are usually shared among several similar types of customers with similar needs, creating economies of scale for both capital and operational expenses. While core infrastructure is shared, Radio Access Networks (RANs) are usually owned — and may be unique to — each individual public safety entity. The shared core provides the benefits of the platform while reducing startup costs and ongoing operations costs.*

With a hosted model, the public safety entity pays a consistent, predictable periodic fee for network access. The fee is usually a function of some known factor, such as the number of end users, devices or usage. This model also eliminates the need to plan and allocate funding for network upgrades, maintenance contracts and ongoing training for operations. These expenses are all handled by the hosting provider, who is responsible for keeping the platform current, resolving all technical issues and ensuring the appropriate level of service.

A hosted model architecture, where a non-public safety entity is the host — thereby owning a portion of the core and handling OA&M activities. The hosted core may include all functions related to mobility control, bearer management, gateway selection and authentication, messaging center, device management center, subscriber databases and Quality of Service control. The public safety portion of the core consists primarily of gateways to provide external connectivity and IP addressing. Both fractional cores could be physically separate. This approach accommodates large implementations and can eventually serve multiple jurisdictions. Transport is split between public safety-owned backhaul — for example, within a given jurisdiction — and a third-party transport cloud that carries traffic (mainly signaling) toward the hosted core. Individual agencies may be able to remotely monitor the health of the network.

FEDERALLY CHARTERED INDEPENDENT NON-PROFIT CORPORATION

Summary: Sen Hutchison, K. B., & Sen Rockefeller, J. D. (2011). S. 911: The Public Safety Spectrum and Wireless Innovation Act of 2011. United States Senate, U.S. Senate Committee on Commerce, Science, and Transportation.

S. 911 assigns the license 20 MHz of spectrum to the independent Public Safety Broadband Corporation (PSBC). Term of license is 10 years. The Corporation can renew the license for 10 more years if the Corporation demonstrates that it met the duties and obligations set forth in the Act.

The Corporation will be incorporated in DC and will be subject to DC's Non-Profit Corporation Act (sec. 29–301.01 et seq., D.C. Official Code). The PSBC needs to have headquartered out of DC. Members of the initial BoD will need to incorporate the PSBC in DC. The Board will consist of:

- *Non Federal Officials – Secretary of Commerce will appoint:*
  - *At least 3 individuals to represent the interest of the states, localities, tribes, and territories. The appointment needs to ensure geographic and regional representation and ensure rural and urban representation.*
  - *At least 3 individuals to represent the interests of public safety. The appointees must be individuals who have served or are currently serving as public safety professionals.*
- *5 Other BoD comprised of experts in commercial cellular services, communications and network managers, financial managers, corporate leaders, and or additional state, local and public safety officials.*
- *Four Federal Officials*
  - *The Secretary of Commerce.*
  - *The Secretary of Homeland Security.*
  - *The Attorney General of the United States.*
  - *The Director of the Office of Management and Budget.*

Each non-Federal candidate for the Board must be able to meet at least one of the following criteria:

- *Expertise in public safety;*
- *Technical expertise regarding broadband communications, including public safety;*
- *Network expertise in building, deploying and operating commercial networks; and*
- *Financial expertise in funding and financing telecommunications networks.*

The Secretary must appoint at least one individual satisfies each of the criteria listed above to serve on the Board of Directors.

Board members may not accept consulting or advisory or other compensatory fee from the Corporation. Board members may not be associated with the Corporation or any affiliated company. Non-Federal Board members also can not be officers or employees of the US Government or the District of Columbia and they must be a citizen of the United States to be a Board of Officer.

Term of Office - *Federal members of the Board will serve as members of the Board for the life of life of the Corporation. Non-Federal members shall serve for 3 years. No non-Federal Board may serve more than 2 consecutive 3-year terms. Board serves until successor has taken office or the end of the calendar year in which the Board's term has expired, which ever is earlier. Term of the initial non-Federal Board members will be:*

- *4 members serve for 3 years;*
- *4 members serve for 2 years; and*
- *3 members serve for 1 year.*

Vacancies will be filled in the same manner as the original member was appointed.

Appointment of the Chair *- The Secretary of Commerce will select the Chair of the Board from among the non-Federal Board. The Chair will serve for 2 years term. The Chair may not serve more than two consecutive terms.*

Removal of non-Federal Board Members *- The Secretary of Commerce can remove the Chair or any other non-Federal Board member for good cause. Non-Federal Board members may also be removed by a majority vote for conduct that is detrimental to the Corporation and a request from the Secretary of Commerce to remove the Chair Board to be determined by the Board to be detrimental to the Corporation.*

Meetings – *The meetings will scheduled in accordance with the bylaws of the Corporation but the Board is required to meet at least once a year and at the call of the Chairperson. The meetings of the Board, including any committee of the Board, shall be open to the public. The Board may, by majority vote, close any such meeting* *only for the time necessary to preserve the confidentiality of commercial or financial information that is privileged or confidential, to discuss personnel matters, or to discuss legal matters affecting the Corporation, including pending or potential litigation. Eight members of the Board shall constitute a quorum, including at least 6 non-Federal members of the Board. Attendance at the meetings can be in person, via telephone or videoconference.*

Compensation *– Members of the Board serve with without pay. Board members will be allowed to per diem allowance for travel expenses at rates authorized for an employee of an agency under subchapter I of chapter 57 of title 5, United States Code.*

Corporation Staff – *The Board shall appoint the CEO and other officers and employees. The Board will set the terms and rates of compensation for the CEO and other officers and employees. The CEO may appoint employees as necessary. All employees and officers serve at the pleasure of the Board. To serve as and officer of the Corporation, you must be a US citizen. No political test or qualification can be used in selecting, appointing, promoting or other personnel actions with respect to officers, agents or employees of the Corporation. The Federal Board members shall jointly approve the compensation, including benefit plans and salary ranges, for officers and employees of the Board. No officer or employee of the Corporation may receive any salary or other compensation from any sources other than the Corporation for services rendered during the period of employment. Service by any officer on boards of directors of other organizations, on committees of such boards, and in similar activities for such organizations shall be subject to annual advance approval by the Board. No officer or employee of the Board or of the Corporation shall be considered to be an officer or employee of the United States Government or of the government of the District of Columbia.*

Advisory Committee *– The Board is required to establish a standing public safety advisory committee. The Board can establish additional ad hoc committees, panels or councils as the Board determines necessary.*

Non-profit and non-political requirements on the Corporation - *The Corporation will not issue any stocks. No part of the income or assets of the Corporation shall inure to the benefit of any director, officer, employee, or any other individual associated with the Corporation, except as salary or reasonable compensation for services. The Corporation may not contribute to or otherwise support any political party or candidate for elective public office. The Corporation shall not engage in lobbying activities (as defined in section 3(7) of the Lobbying Disclosure Act of 1995 (5 U.S.C. 1602(7))).*

POWERS AND AUTHORITY OF THE CORPORATION

To carry out its duties and responsibilities under the law, general powers include:

- *Adopt and use a corporate seal.*
- *Have succession until the Corporation is dissolved by an Act of Congress.*

- *Regulate the way the Corporation conducts it general business.*
- *Exercise all powers specifically granted by the provisions of this subtitle, and such incidental powers as shall be necessary.*
- *Hold hearings, sit and act at such times and places, take such testimony, and receive such evidence as the Corporation considers necessary to carry out its responsibilities and duties.*
- *Obtain grants and funds from and make contracts with individuals, private companies, organizations, institutions, and Federal, State, regional, and local agencies.*
- *Accept, hold, administer, and utilize gifts, donations, and bequests of property, both real and personal, for the purposes of aiding or facilitating the work of the Corporation.*
- *Issue notes or bonds.*
- *Incur indebtedness.*
- *Spend funds in a manner authorized by the Board, but only for purposes that will advance or enhance public safety communications consistent with the Act.*
- *Establish a reserve fund.*
- *Expend reserve accounts.*
- *Take such other actions as the Corporation (through its Board) may from time to time determine necessary, appropriate, or advisable to accomplish the purposes set forth in the section.*

Powers to deploy and operate a nationwide public safety interoperable broadband network include:

- *Holding the license for the 20 MHz of spectrum.*
- *Take all actions necessary to necessary to ensure the building, deployment, and operation of a nationwide public safety interoperable broadband network in consultation with Federal, State, tribal, and local public safety entities, the Director of NIST, the Commission, and the public safety advisory committee. At a minimum the Corporation will*
    - *ensure nationwide standards for use and access of the network;*
    - *issue open, transparent, and competitive requests for proposals (RFP) to private sector entities for the purposes of building, operating, and maintaining the network;*
    - *encourage that such the RFPs leverage, to the maximum extent economically desirable, existing commercial wireless infrastructure to speed deployment of the network;*
    - *manage and oversee the implementation and execution of contracts or agreements with non-Federal entities to build, operate, and maintain the network.*
- *The Corporation shall ensure the safety, security, and resiliency of the network, including requirements for protecting and monitoring the network to protect against cyberattack;*

- *The Corporation will promote competition in the equipment market, including devices for public safety communications, by requiring that equipment for use on the network be:*
    - *built to open, non-proprietary, commercially available standards;*
    - *capable of being used by any public safety entity and by multiple vendors across all public safety broadband networks operating in the 700 MHz band; and*
    - *backward-compatible with existing second and third generation commercial networks to the extent that such capabilities are necessary and technically and economically reasonable.*
- *The Corporation will promote integration of the network with public safety answering points or their equivalent.*
- *The Corporation shall require deployment phases with substantial rural coverage milestones as part of each phase of the construction and deployment of the network. To the maximum extent economically desirable, such proposals shall include partnerships with existing commercial mobile providers to utilize cost-effective opportunities to speed deployment in rural areas.*
- *The Corporation can obtain grants from and make contracts with individuals, private companies, and Federal, State, regional, and local agencies to deploy and operate a nationwide public safety interoperable broadband network.*
- *The Corporation can hire or accept voluntary services of consultants, experts, advisory boards, and panels to deploy and operate a nationwide public safety interoperable broadband network.*
- *The Corporation can receive payment for use of the network capacity licensed to the Corporation; and network infrastructure constructed, owned, or operated by the Corporation; and take such other actions as may be necessary to accomplish the purposes set forth in this subsection.*

Other duties and responsibilities of the Corporation include:

- ***Network Policy:** Establishing the network policies by developing the RFPs with appropriate timetables for construction, coverage areas, service levels, performance criteria, and other similar in the construction of such networks; the technical and operational requirements for the network; the practices, procedures, and standards for the management and operation of such network; the terms of service for the use of the network; the ongoing compliance review and monitoring of the management, operation, use and training of network operators and users.*
- ***Existing Infrastructure:** The Corporation has the authority to enter into agreements to utilize, to the maximum extent economically desirable, existing commercial or other communications infrastructure; and Federal, State, tribal, or local infrastructure.*
- ***Maintenance and Operation of the Network:** The Corporation shall ensure the maintenance, operation, and improvement of the nationwide public safety interoperable broadband network.*

- ***Roaming on Commercial Networks*** *- The Corporation shall negotiate and enter into, as it determines appropriate, roaming agreements with commercial network providers to allow the nationwide public safety interoperable broadband network to roam onto commercial networks and gain prioritization of public safety communications over such networks in times of an emergency.*
- ***Network Infrastructure and Device*** *- The Director of NIST, in consultation with the Corporation and the Commission, shall ensure the development of a list of certified devices and components meeting appropriate protocols and standards for public safety entities and commercial vendors to adhere to, if such entities or vendors seek to have access to, use of, or compatibility with the nationwide public safety interoperable broadband network.*
- ***Standards Setting*** *- The Director of NIST, in consultation with the Corporation, the Commission, and the public safety advisory committee, shall represent the interests of public safety users of the nationwide public safety interoperable broadband network before any proceeding, negotiation, or other matter in which a standards organization, standards body, standards development organization, or any other recognized standards-setting entity regarding the development of standards relating to interoperability.*
- ***Foreign Governments*** *- The Corporation shall not have the authority to negotiate or enter into any agreements with a foreign government on behalf of the United States.*
- ***U.S. Mail*** *- The Corporation may use the United States mails in the same manner and under the same conditions as the departments and agencies of the United States.*

CONSULTATION WITH STATE AND LOCAL GOVERNMENTS

In the development of RFPs and carrying out the duties and responsibilities established under the Act, the Corporation shall consult with regional, State, tribal, and local jurisdictions regarding the distribution and expenditure of any amounts required to carry out the policies established above, including: construction of an Evolved Packet Core and any Radio Access Network build out; placement of towers; coverage areas of the network, adequacy of hardening, security, reliability, and resiliency requirements; assignment of priority to local users; assignment of priority and selection of entities seeking access to or use of the nationwide public safety interoperable broadband network; and training needs of local users. The consultation shall occur between the Corporation and the single officer or governmental body designated by each State to certify in its application for grant funds.

> ***[NOTE: The Public Safety Alliance has requested that S. 911 be amended to require "coordination" with state and local government instead of "consultation".*** *The PSA believes that agency coordination across jurisdictions (local, tribal, state, and federal) and close oversight of construction, operation, and funding are essential to building out the broadband network, which is why the PSA supports language in S. 911 that establishes the governance structure of a new independent nonprofit Corporation. The PSA*

*strongly believes, however, that public safety must hold majority representation on the Board of Directors of the new Corporation. This framework must ensure there is a requirement for state and local coordination with the new Corporation but this coordination requirement must not impede the build out of the network. The governance of the new Corporation must be transparent and held accountable to build out the nationwide network and ensure interoperability. Chief Jeff Johnson, Answers to Questions for the Record for House Energy and Commerce Subcommittee on Communications and Technology Hearing titled "Creating an Interoperable Public Safety Network." (May 25, 2011)***]**

S. 911 authorizes the Corporation to collect fees for network use, lease of network capacity, and lease of network equipment and infrastructure.

- ***Network User Fee** – The Corporation is authorized to collect a user or subscription fee from each entity, including any public safety entity or secondary user, that seeks access to or use of the nationwide public safety interoperable broadband network.*
- ***Network Capacity Lease Fee** – The Corporation is authorized to collect a fee from any entity that seeks to enter into a covered leasing agreement. The secondary user may access to network capacity on a secondary basis for non-public safety services; and the spectrum allocated to such entity to be used for commercial transmissions along the dark fiber of the long-haul network of such entity.*
- ***Network Equipment and Infrastructure Lease Fee** – The Corporation is authorized to collect a fee from any entity that seeks access to or use of any equipment or infrastructure, including antennas or towers, constructed or otherwise owned by the Corporation.*
- ***Fee Amount** - The total amount of the fees assessed for each fiscal year shall be sufficient, and shall not exceed the amount necessary, to recoup the total expenses of the Corporation in carrying out its duties and responsibilities of the Corporation for the fiscal year involved.*
- ***Reinvestment of Funds** - The Corporation shall reinvest amounts received from the assessment of fees in the nationwide public safety interoperable broadband network by using such funds only for constructing, maintaining, or improving the network.*

S. 911 also requires the Comptroller General of the United States to conduct annual audits of the Corporation. The audit report is required to be submitted to appropriate committees of Congress; the President; and the Corporation.

The Corporation is required to submit and annual report to the appropriate committees of Congress. The report is required to include a comprehensive and detailed report of the operations, activities, financial condition, and accomplishments of the Corporation; and such recommendations or proposals for legislative or *administrative action as the Corporation deems appropriate. The directors, officers, employees, and agents of the Corporation shall be available to testify before the appropriate committees of the Congress with respect to the report; the report of any audit made by the Comptroller General; or any other matter that such committees may determine appropriate.*

S. 911 authorizes the Commission to adopt rules, if necessary in the public interest, to improve the ability of public safety networks to roam onto commercial networks and to gain priority access to commercial networks in an emergency if the public safety entity equipment is technically compatible with the commercial network; the commercial network is reasonably compensated; and such access does not preempt or otherwise terminate or degrade all existing voice conversations or data sessions.

S. 911 Prohibits the Corporation from offering commercial telecommunications services to directly to consumers. The section however does not prohibit the Corporation and a secondary user from entering into a covered leasing agreement. The Corporation is not limited from collecting lease fees related to network equipment and infrastructure.

VII. COST-BENEFIT ANALYSIS OF ALLOCATION

Excerpt: Ford, G. S., & Spiwak, L. J. (2011, March). Public Safety or Commercial Use? A Cost/Benefit Framework for the D Block. PHOENIX CENTER POLICY BULLETIN (26).

Preliminary analysis suggests that the 10 MHz D Block plausibly provides at least $3.4 billion more in social benefits if assigned to public safety rather than to commercial use. The lost auction revenue, we observe that the loss of auction revenues today is more than offset by the gain of higher auction revenues and lower public safety network deployment cost in the future. Thus, an auction of the D Block adds, rather than relieves, stress to the public budget.

Perhaps the most daunting, yet relevant, question regards the social benefits of "public safety." Such benefits are real but difficult to quantify and, absent immediate crisis, prone to be undervalued. If we faced another event like 9-11 or Hurricane Katrina, we believe the 20 MHz would be allocated to public safety immediately and the network fully funded in a week's time. Fortunately, we are not presently victims of such a crisis and, though the lack of crisis makes the spectrum allocation decision a more difficult one, this is a burden we welcome. For the moment, we choose to set aside the quantification of the benefits of an additional 10 MHz of spectrum for public safety, looking instead at the cost side of equation.

Spectrum is not homogeneous. Not only is the 700 MHz spectrum highly valuable because its technical properties are well-suited for mobile communications, including broadband Internet services, but for the public safety community the D Block has added value because it is contiguous to the PSB, which is already allocated to the public safety community. A contiguous block of 20 MHz of spectrum is substantially *more valuable than 20 MHz of nonadjacent spectrum. As noted above, a 10 MHz block of contiguous spectrum in the 700 MHz band is worth about $2 to $6 billion more than a non-contiguous block of the same size.*

While this value differential is estimated based on commercial use, much of this premium is based on the lower cost of deploying network for contiguous spectrum, which would likewise apply to public safety. Evidence suggests that the cost of the public safety network using 20 MHz of spectrum is probably about $10 billion. Andrew Seybold, a highly regarded wireless industry expert, suggests that expanding a 10 MHz public safety network to 20 MHz adds about 15% to 25% to network deployment costs. By this standard, the incremental cost of the additional 10 MHz is about $1.5 to $2.5 billion. Alternately, adding a non-contiguous block of 10 MHz of spectrum to the public safety network would cost about $5 to $7.5 billion in deployment costs. Assignment of the D Block to public safety, therefore, is likely to reduce the cost of the public safety network by around $4 billion in network deployment costs alone. Operational costs are likely to be lower as well, perhaps adding billions more to the savings. Moreover, the cost to deploy the 700 MHz band is much lower than other bands (some estimates are 70% lower than other bands). Thus, depending on what additional spectrum is provided to the public safety community if they do not receive the current 10 MHz block, the ultimate deployment costs could be substantially higher (though this differential may also apply to the commercial licensee). We leave a more sophisticated assessment of such costs to others, and assume here that the cost difference is $4 billion.

While we have not addressed the benefits of public safety's use of the additional 10 MHz of spectrum, which could be quite large, we can see that the contiguous spectrum premium of $4 billion is itself sufficient to offset the value of commercial assignment of an additional 10 MHz ($0.6 billion).

Even if the 10 MHz provided zero benefit in terms of enhanced public safety, then assignment of the D Block to public safety produces $3.4 billion in additional social value over and above the commercial value of the same block.

Notably, much of this value spread arises from the unique opportunity to create significant value by allocating a contiguous block of spectrum to public safety, and then doing so in the future for commercial use. This value is foregone by commercial allocation of the D Block today. While some may contest our estimates, it is necessary to account for the economic value arising from contiguous spectrum.

VIII. JOB CREATION (100,000 NEW JOBS)

Excerpt: Shapiro, Robert J. and Aparna Mathur. "The Contributions of Information and Communication Technologies To American Growth, Productivity, Jobs and Prosperity." September 2011. Telecommunications Industry Association. SONECOM.

The $10 billion proposal to fund the development and initial deployment of a nationwide wireless broadband data and communications network for public safety agencies would lead to the creation of an estimated 100,000 new jobs in Information and Communication Technologies (ICT) industries and, over time, produce indirect or spillover benefits of an estimated $4 billion to $8 billion per year.

Based on the current use of labor and capital by ICT companies and prevailing wages, nearly $8 billion of the initial funding would go to salaries, sufficient to produce some 74,000 new ICT jobs with average compensation of $107,229 per-worker. In addition, the remaining, nearly $3 billion in new capital investments would support some 20,000 additional jobs.

Analysts calculate that the new network and its technologies could increase the productivity of police and fire agencies by at last 1 percentage point per year, producing direct efficiency savings of nearly $2 billion per year. The indirect benefits from a nationwide public safety network could total another $2 billion to $6 billion per-year.

IX. WHY PUBLIC SAFETY NEEDS MORE THAN 10 MHZ

Excerpt: Rysavy, Peter. "Public Safety Spectrum." July 2011.

While commercial operators can design their networks for typical densities of mobile users, emergency situations can result in needing to support extremely high densities of public safety workers. For this reason alone, the public-safety network has to have as high a capacity as possible. The network must have at least 20 MHz of spectrum. Anything less could lead to catastrophic consequences due to applications performing unreliably or failing completely.

The consequence of insufficient spectrum is restricted capacity, which combined with high demand, causes network congestion. For applications, this means sluggish behavior or outright failures.

Consequences of such congestion are not just slower performance but also application failures. Most communications protocols implement timeouts on their operations, including Transmission Control Protocol (TCP) itself, the packet-transport protocol used in the Internet to provide reliable end-to-end delivery. With large delays or dropped packets, communications protocols attempt to deliver data reliably, but at some level of congestion, they can no longer cope properly, and applications will either indicate a failure, or worse yet, require an application or full-system restart.

Beyond needing 20 MHz just to satisfy bandwidth requirements, there are compelling reasons for providing Public Safety 20 MHz of contiguous spectrum.

- *LTE is spectrally more efficient operating in 20 MHz channels than 10 MHz channels. In other words, the network can deliver more bits per second using a 10 MHz radio channel (10 MHz down, 10 MHz up) than in two 5 MHz radio channels.*
- *Using non-contiguous radio channels will significantly increase the cost of the radio access network due to the need for additional radios and antennas.*
- *Adding spectrum later in a non-contiguous manner will result in devices in the field likely not being able to take advantage of the new spectrum.*

X. WHAT HAPPENS IF D BLOCK IS NOT ALLOCATED

Excerpt: Ford, G. S., & Spiwak, L. J. (May 2011). Re-Auction of the D Block: A Review of the Arguments. PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES.

Many proponents of a D Block re-auction focus exclusively on the potential auction revenues from the block. Others appear to believe the auction will somehow fund the entire (or at least a good chunk of the) public safety network. In these tough financial times, it is difficult to criticize anyone looking for revenues or cost savings. However, it is essential to consider the full financial effects of the allocation options, not simply those implications favoring one option or another.

First, the claimed $3 billion in revenue from a D Block re-auction is too rosy an expectation. Statistical analysis of historical auctions indicates that a 10 MHz block of spectrum in the 700 MHz band must be unencumbered to produce $3 billion in revenues. Yet, the FCC's National Broadband Plan envisions a number of significant encumbrances on any reauction of the D Block which have substantially reduced auction revenues in the past. (In 2008, the D Block failed to secure a minimum bid at auction of $1.3 billion due to onerous encumbrances, creating the stalemate among lawmakers and policymakers we are faced with today over this block of spectrum.)

Re-auction of the D Block will increase government spending on the public safety network and reduce future auction revenues by far more than the re-auction may generate in revenues.

Second, the re-auction of the D Block will under no circumstances come close to fully funding a public safety network. A nationwide public safety network is expected to cost about $10 to $13 billion. Even if a re-auction of the D Block did bring in $3 billion of revenues, it offsets only about one quarter of the public safety network's cost. The D Block re-auction offers no other mechanism by which to generate funds for the remaining network construction and operating costs.

Finally, we discuss the potential broader adverse market effects of a D Block re-auction. The evidence indicates that the public safety community needs a full 20 MHz of spectrum. If the D Block is assigned to commercial use, then an additional 10 MHz for public safety must be obtained from either future spectrum assignments or the *capacity-equivalent thereof obtained via burdensome public safety encumbrances on commercial spectrum. This alternate block of spectrum will not be contiguous to the Public Safety Broadband ("PSB") Block, which has the effect of increasing the deployment cost of the public safety network by an estimated $4 billion relative to the D Block assignment.*

A commercial assignment of the D Block also has the potential of frustrating the creation of contiguous blocks of spectrum for future auctions, thereby substantially reducing auction revenues. Moreover, filling the public safety spectrum shortage with public safety obligations on all commercial providers could substantially reduce future auction revenues.

Based on an econometric analysis of the more recent spectrum auctions in the United States, if the FCC auctioned the D Block on a truly unencumbered basis, then we could expect the auction to generate revenues in the range $1.3 to $3.3 billion. However, the re-auction of the D Block is not unencumbered. The Commission has made clear that it intends to impose costly requirements on any re-auction of the D Block.

While the agency hopes for a "voluntary" public-private partnership, it nevertheless hedges, advancing a set of rules by which the D Block will be auctioned. These rules include the following:

- *D Block licensee(s) must use a nationally standardized air interface [to] ensure that the D block will be technically capable of supporting roaming and priority access by public safety users of the neighboring public safety broadband block;*

- *D Block licensee(s) are required to provide such roaming and priority access to public safety users;*

- *D Block licensee(s) must develop and offer devices that operate both on the D Block and the neighboring public safety broadband block; and*

- *[D Block licensee(s)] should be subject to commercially reasonable build out requirements.*

A network suitable for public safety also requires both higher technical standards and a larger footprint than does a strictly commercial network. And, logically, with such increased requirements comes higher network deployment costs, and, in turn, with higher deployment costs comes a lower auction value for the spectrum.

Former FCC Chairman Reed Hundt, who was serving as the President of potential D Block bidder Frontline Communications, conceded "the costs necessary to reach only a few additional users would entail a vastly disproportionate additional cost." Likewise, Verizon testified that the build out requirements were too "costly" and Qualcomm testified that the build out requirements were "too onerous", going so far as to note *that these requirements were "far more expensive than any of the current [commercial] networks."*

The new D Block licensee would be required to take on cost-increasing mandates including: (1) the use of a Commission-selected air interface; (2) the mandate to develop and offer devices that operate both on the D Block and the PSB Block; and (3) the requirement to build out the network on the agency's timetable. All of these requirements could increase deployment costs, thereby reducing the auction value of the D Block.

Public safety obligations of the first auction attempt reduced the value of the spectrum by 86% and, as discussed above, the FCC's reauction plan embraces similar encumbrances.

A reauction of the D Block could produce less than $1 billion in revenue and is unlikely to exceed $2 billion in the best plausible scenario.

XI. CONCLUSION

Allocating the D Block to public safety for the build-out of a nationwide, interoperable and mission critical-grade public safety broadband network will fundamentally alter the way first, second and situational responders plan, respond and react to disasters of all proportions. For the first time in decades, it will put leading edge technology into the hands of those individuals who are called on every day to put their lives on the line for the safety and security of the American public.

This paradigm shift has not gone unnoticed in the minds of scholars, public safety professionals, legislators, corporations specializing in public safety communications products and services, who have all written prodigiously on this subject. This report is comprised of selected sections of these manuscripts. Our belief is that the passages will help highlight key points in order to give the reader a granular, and ultimately more comprehensive understanding of the issue at hand. In order to give context to the selected passages, each of the papers are reproduced in their entirety, which can be found in the appendix of this binder. A number of other supporting materials not highlighted in this packet which speak to the need for additional spectrum for the public safety community can also be found in the appendix.

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APPENDIX

The appendix can be downloaded at https://acrobat.com/#d=7J4x6MX-tDdaI3DxazSQYw

Appendix A – Studies

Appendix B – Letters of Support

Appendix C – Public Safety Spectrum Holdings

Appendix D – FCC Filings

Appendix E – Bill Language

Appendix F – Commentary and Policy Statements

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Appendix H – Public Safety Statistics

Appendix A – Studies

The Contributions of Information and Communication Technologies To American Growth, Productivity, Jobs and Prosperity

Robert J. Shapiro and Aparna Mathur

September 2011

SONECON

The Contributions of Information and Communication Technologies To American Growth, Productivity, Jobs and Prosperity[1]

Robert J. Shapiro and Aparna Mathur

I. Executive Summary

This study examines the role and impact of information and communications technologies ("ICT") in the American economy, and evaluates the likely effects of several current policy proposals and choices that involve ICT. This study includes both the reviews of the existing literature in this area as well as new analysis of the economic impact of ICT. Our critical findings include the following:

The Role of ICT in the American Economy

- In 2009, ICT firms contributed about $1 trillion to U.S. GDP, or 7.1 percent of GDP. This total includes nearly $600 billion in direct contributions from their own operations and more than $400 billion in indirect contributions through the benefits other sectors derived from the use of ICT.

- ICT companies accounted for 3,535,000 jobs in 2009. While total ICT employment declined since 2000, average compensation has risen sharply. In 2009, the compensation of full-time ICT employees averaged $107,229, 80.6 percent higher than the average for all full-time workers. From 1991 to 2009, average compensation in the ICT industry increased 162 percent, the fastest income gains of any U.S. industry.

- From 1991 to the present, ICT firms have contributed directly an average of $577 billion per-year in value-added to America's GDP. These direct contributions were equivalent to nearly one-third of the value-added provided by all manufacturing.

- According to an analysis by Federal Reserve economists, the use of ICT accounted for 28 percent of all U.S. productivity gains from 1995 to 2001, capital investments in those technologies explain another 34 percent of those gains, and changes in the organization of firms and worker training in response to ICT innovations accounted for another 10 percent of productivity gains.

- From 1991 to 2009, full-time ICT workers experienced larger wage and compensation gains than workers in any other sector, and the average compensation of ICT workers in 2009 was more than 80 percent higher than the average for all other private-sector workers.

[1] The authors gratefully acknowledge the research assistance of Jiwon Vellucci and Lisa Hamilton, and financial support for our research from the Technology Industry Association. The views and analyses are solely our own.

- ICT's direct contributions to GDP have increased nearly 25 percent since the 1990s, growing from 3.4 percent of GDP per-year in 1991-1993 to an average of 4.2 percent per-year over the years 2005-2009 – gains unmatched by any other industry.

The Impact of Policy Proposals that Rely on ICT Investments

The President's proposal to invest $10.7 billion in a nationwide public safety network

- The President's proposal to fund the development and initial deployment of a nationwide wireless broadband data and communications network for public safety agencies would lead to the creation of an estimated 100,000 new jobs in ICT industries and, over time, produce indirect or spillover benefits of an estimated $4 billion to $8 billion per year.

- Based on the current use of labor and capital by ICT companies and prevailing wages, nearly $8 billion of the initial funding would go to salaries, sufficient to produce some 74,000 new ICT jobs with average compensation of $107,229 per-worker. In addition, the remaining, nearly $3 billion in new capital investments would support some 20,000 additional jobs.

- Analysts calculate that the new network and its technologies could increase the productivity of police and fire agencies by at last 1 percentage point per year, producing direct efficiency savings of nearly $2 billion per year. The indirect benefits from a nationwide public safety network could total another $2 billion to $6 billion per-year.

Investments of $3.4 billion in a "Smart Electricity Grid" under the 2009 Recovery Act

- These investments should directly produce nearly 30,000 new jobs. If the funding becomes seed money and an ICT-based Smart Grid is developed and deployed, analysts estimate the net economic benefits could range from $48 billion to $76 billion per year.

- If the Smart Grid can reduce power outages by 20 percent, as predicted by the National Energy Technology Laboratory, it would save $20 billion per year. A Smart Grid also would virtually eliminate large-scale power blackout which now cost the economy $10 billion per-incident.

- Smart Grid monitoring of energy flows to large customers would generate benefits estimated at $10 billion per-year. Continuous, ICT-based monitoring also should reduce operational and maintenance costs by at least 10 percent, or another $2.5 billion per-year.

- The Smart Grid also should reduce transmission and delivery losses by at least 10 percent, generating $2.5 billion in annual benefits, and cutting the costs of transmission congestion by 10 percent, a reasonable target, should save another $2 billion per year.

- The Smart Grid also would allow utilities to eliminate or defer some large capital investments in centralized generating plants, substations and transmission and distribution lines, reducing their costs by an estimated $2 billion to $6 billion per-year.

Proposals to reduce the lower corporate tax burden

- Lowering the corporate tax burden by 10 percent would increase investments in ICT by nearly $71 billion over several years, which in turn should raise productivity and total business spending on wages, salaries and other compensation by nearly $450 billion.

- The additional ICT investments spurred by this lower corporate tax burden would produce indirect benefits or spillovers in other industries that would increase the value-added produced across the economy by nearly $450 billion.

- This reduction in the tax burden on businesses would generate an estimated $990 billion increase in all capital investments, with the largest increases occurring in manufacturing and utilities, mining and oil and gas exploration, finance and insurance, and real estate, rentals and leasing.

- Over several years, these increases in business investment and productivity would drive associated increases in workers' compensation, sufficient to cover wage gains averaging nearly $5,500 per-worker across the economy, or alternatively, some 6.8 million new jobs, or some combination of higher wages and additional jobs.

- The additional investments in ICT spurred by the reduction in the corporate tax burden would produce spillovers that would increase the value-added produced across the economy by $447.9 billion.

II. Introduction and Summary

For as long as organized economies have existed, human knowledge has been the basis for most economic value. From farmers millennia ago who first figured out the benefits of regularly watering and weeding their crops, to modern agribusiness applying advanced technologies to tend and harvest thousands of acres of genetically-modified foods, every economic advance has involved the use of new ideas. In recent times, the broad application of information and communication technologies (ICT) has accelerated this process. As a result, ICT industries have come to play a disproportionate role in the growth and continuing development of the U.S. economy. This study analyzes and assesses that role.

The ICT sector encompasses four sub-industries: computer and electronic products; publishing (including software); information and data processing services; and computer systems design and related services. Over the last generation, these distinctive ICT goods, services and systems have diffused across the American economy. This process of diffusion reflects the growing direct demand for the products of ICT companies, and as a result, the inflation-adjusted value-added created by ICT companies expanded from 3.4 percent of GDP in 1991 to 4.2 percent of GDP in 2009.[2] This means that ICT firms directly contributed about $600 billion to U.S. GDP in 2009. Over the same 18-year period, the average annual compensation of full-time ICT workers increased from just under $41,000 to more than $107,000, the fastest wage and

[2] See Table 2, below.

compensation gains of any sector. The average compensation of ICT workers is now more than 80 percent higher than the $59,400 average for all other private-sector American workers.[3]

ICT is broadly understood to be comprised of genuine “general purpose” or enabling technologies that can be adopted and adapted by every other industry. The data bear out this view: In the 1990s, investments in ICT by other industries grew 10 times faster than their investments in any other inputs. By the mid-to-late 1990s, economists began to seriously assess the effects of these investments Two early studies found that the use of ICT by other industries contributed one-sixth of average annual GDP growth in the years 1990-1995/6.[4] The estimates of ICT’s impact on U.S. growth in the later-1990s are even greater: Studies trace half or more of U.S. gains in productivity in those years to ICT.[5] In the last decade, economists have focused on the “spillovers” or “positive externalities” associated with the application of these ICT investments, from e-commerce to ICT-based management of supply chains.

This study is part of this long line of analyses assessing the direct and indirect economic benefits of ICT. Here, we use the 2009 Input-Output tables of the Bureau of Economic Analysis (BEA) to trace the flows of goods and services between ICT industries and all other industries, in order to estimate the value which each industry derived from its ICT investments. For example, we find that 3.1 percent of the total output of U.S. manufacturing in 2009 can be traced to ICT investments, as well as 4.3 percent of the output of the information sector, 4.0 percent of the output of management consultants, and 2.4 percent of the output of professional, scientific and technical services. Across industries, the benefits from ICT investments added over $400 billion to GDP in 2009, on top of nearly $600 billion in direct economic activity by ICT firms.

All told, therefore, the ICT sector was responsible, directly or indirectly, for a little more than $1 trillion in value-added in 2009, or 7.1 percent of U.S. GDP in that year.

Given the disproportionate economic impact of ICT industries, we also examine several policy proposals that could affect both the direct demand for ICT and the use of ICT by other industries. We focus on three initiatives – proposals to fund an ICT-based data and communication network for public safety agencies; funding approved in the 2009 stimulus Act to support the development of an ICT-enabled smart electricity grid; and a 10 percent reduction in the corporate tax burden. All three initiatives could provide significant economic benefits.

The two funding proposals will (smart electricity grid) or may (public safety network, not yet adopted) produce direct job creation in the ICT sector as well as large spillover effects in other industries. The President’s recent proposal to commit $10.7 billion to develop and deploy a nationwide wireless broadband data and communications network for public safety agencies should enable police, fire personnel and other first-responder agencies to improve the quality of their services and reduce operational costs. It also would lead to the creation of an estimated 100,000 new jobs in ICT industries alone and, over time, potential spillover benefits of some $4 billion to $8 billion per-year. Similarly, $3.4 billion allocated under the 2009 stimulus Act for investments in the digital-based modernization of the nation’s electricity grid, in order to create a

[3] See Table 3, below.
[4] Jorgenson and Stiroh (1999); Oliner and Sichel (2000).
[5] See footnotes 11, 12 and 13.

"Smart Grid," also should produce a stream of economic benefits. These expected benefits include a greater capacity to maintain the national electricity grid, detect and prevent outages and other problems throughout the grid, reduce both utility costs and energy consumption, and spur the deployment of more energy-efficient "smart buildings" and "smart appliances." The 2009 funding should directly produce nearly 30,000 new jobs directly. If this funding becomes the seed money for the full development of an ICT-based Smart Grid, the net economic benefits could range from $48 billion to $76 billion per-year.

Finally, a 10 percent reduction in the effective corporate tax rate would have large positive effects on ICT investment and business investment generally, assuming that the revenues costs would be offset by spending reductions or other revenue increases. A 10 percent reduction in the tax burden for all U.S. industries would produce an estimated $990 billion increase in business investment over several years, including nearly $71 billion in additional investments in ICT goods and services. After several years, those increases in ICT capital would produce an additional $448 billion in annual GDP. Based on how various industries have responded to increases in their ICT capital stock, these increases in ICT investment should produce significant gains for compensation and/or employment in every industry. If all of these benefits went to higher wages with no additional jobs, it would raise the average compensation of American workers after several years by $5,424, ranging from $836 per-worker in the accommodations and food service sector to $15,316 per-worker in the information industry.[6] Similarly, if all of the benefits of the additional ICT investments went to job creation, it would generate more than 6.8 million additional jobs after several years.

III. Innovation and Economic Growth and Productivity

Knowledge is the source of most economic value. When a company or country improves its underlying rates of growth and productivity, those improvements usually reflect the application of new ideas embodied in technological or organizational innovations. In the current period, many of those innovations involve ICT or organizational changes designed to enable firms to take advantage of their ICT investments.

The natural factors involved in economic activities – fuels and minerals, animal and plant life, land – all have been available for a very long time. Over time, however, innovators have developed and applied successive generations of new ideas about how best to use and combine those factors. The value of a microchip, fiber optic cable or supercomputer is countless times greater than the value of the minerals and other natural elements that comprise them, and that difference reflects the economic value of the many generations of ideas and innovations which now enable us to transform those elements into these technologies.

How well and how quickly a nation's enterprises develop, adopt and apply economic innovations, therefore, significantly influences that nation's overall growth, productivity and wage progress. Economists have established that innovation plays a larger role in economic progress than increases in capital investment or even improvements in the skills and education of workers. Beginning with the research of Nobel laureate Robert Solow in the 1950s, studies have established that the development and adoption of innovations is the single most powerful

[6] See Table 9, below.

determinant of a nation's underlying rate of economic growth. For example, Solow and others found that 30 percent to 40 percent of the economic gains achieved by the United States in the 20th century can be traced to economic innovation.[7] These innovations encompass not only new technologies, materials and production processes, but also new ways of financing, marketing and distributing goods and services, and new approaches for organizing a business and managing the workplace. By contrast, increases in the American economy's capital stock can explain only 10 percent to 15 percent of those gains, while another 20 percent can be traced to improvements in the education and skills of American workers.

Furthermore, the importance of innovations apparently has increased in recent times. One recent study used a version of Solow's growth accounting to examine the impact of innovation from 1973 to 1995, compared to 1996 to 2003.[8] The authors found that the impact of innovation on U.S. growth increased from 25 percent in the first period to 35 percent in the second.[9] This conclusion is consistent with recent work by researchers at the Federal Reserve Board of Governors, who found that since 1995, for the first time on record, U.S. businesses have invested as much in these idea-related intangibles[10] – about $1 trillion a year in the early years of this decade – as they do on plant, equipment and other traditional, tangible forms of investment.[11] The authors of this paper also found that U.S. business spending on long-lasting, knowledge capital grew faster than any other type of business or personal spending. Finally, the study traced more than four-fifths of the gains in U.S. productivity achieved in the latter-1990s to the development and use of new technologies and other innovations.

The Role of ICT Innovation

Innovation in recent years, perhaps more than in most periods, has been concentrated in a few areas, especially information and communications technologies. The Federal Reserve study of intangible investment found that the development of new ICT accounted for 28 percent of U.S. productivity gains from 1995 to 2001, capital investments in those technologies explained another 34 percent, and changes in the organization of firms and worker training in response to these innovations accounted for another 10 percent. These findings were the latest in a long line of analyses of the impact of ICT, reaching back now nearly two decades. In a 1999 study, for example, Harvard economist Dale Jorgenson and Kevin Stiroh from the Federal Reserve Bank of New York tracked the extraordinarily rapid adoption of computers by businesses and households in the 1990s, as the price of computers fell dramatically.[12] Throughout that decade, business investments in computers grew 28.3 percent per-year; household computer purchases increased even faster, by 37.3 percent per-year; and computer services to firms and households grew 20 percent per-year. These growth rates were 10 to 18 times the average annual growth for other inputs. By 1996, U.S. businesses spent nearly $180 billion annually on new computers, and consumers spent an additional $170 billion.

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[7] Solow (1956); Solow (1957); Denison (1962).
[8] Van Ark, , *et. al.* (2009).
[9] They divided up growth factors and found that the contribution of "multifactor productivity," largely a proxy for the development and application of innovations, increased from 25 to 35 percent.
[10] This broad category includes including investments in software programs and databases, scientific and non-scientific R&D, new-product development costs by service firms; advertising and market research to create brands; the development of new business models and corporate cultures; and expenditures on firm-specific training.
[11] Corrado, Hulten, and Sichel (2004)
[12] Jorgenson and Stiroh (1999).

This broad adoption of computers and their software enhanced the economic impact of the efficiencies and new capacities associated with their use. The Jorgenson-Stiroh study found that business use of computers added 0.26 percentage-points per-year to U.S. growth over the 1990-1996 period, while household purchases of computing equipment and services contributed an additional 0.13 percentage-points to growth, each year. Together, these two dynamics accounted for nearly one sixth of the average annual 2.4 percent growth in GDP in these years.[13]

Another well-known study by Stephen D. Oliner and Daniel E. Sichel measured ICT's contribution to growth of information and communications technologies over two periods: 1974 to 1990 and 1990 to 1995.[14] Over both periods, real growth averaged about 3 percent per-year; and the authors traced 0.25 percentage-points of that to computer hardware. They further found that software contributed 0.1 percentage-points to growth per-year in the first period and 0.25 percentage-points per-year in the second period, and that communications equipment contributed another 0.1 percentage point per-year over both periods. All told, ICT capital accounted for about 0.5 percentage points of U.S. annual growth over both periods, or again about one-sixth of our growth. Moreover, these ICT contributions to growth surged in the second half of the 1990s: The authors estimate that this contribution more than doubled to an average of 1.1 percentage-points per-year over the years 1996-1999 as the growth of the real stock of ICT capital accelerated. They also calculated that nearly half of the acceleration in labor productivity, from gains of 1.5 percent per-year in the first half of the 1990s to gains of 2.6 percent per-year in the second half of the decade, can be traced to rapid growth of ITC capital.

ICT's total contribution to U.S. growth is even greater than these studies suggest, however, because the studies do not take account of the spillover effects of ICT on growth in other industries. One characteristic of ICT capital which distinguishes it from traditional capital investment is the wide diffusion of ICT hardware and software across the economy and the broad range of their applications. Manufacturing companies, for example, operate computer-integrated systems that link together design, production, and management activities to produce more efficient use of resources. Information and communication technologies also enable firms to interact with other businesses faster and more efficiently, directly or through their supply chains. Some researchers evaluating the impact of ICT have focused on these network effects.[15] ICT-based networks, then, not only facilitate communication between firms; they also help streamline production processes and lower transaction costs. Therefore, another feature that distinguishes ICT capital from other traditional inputs is that ICT capital can generate considerable positive "externalities" or economic effects.

Network externalities, which occur when the efficiency or value of a product or service increases as the product or service is adopted by more users, is a signature feature of ICT.

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[13] GDP growth can also be expressed as the sum of the contributions of increases in capital services, consumers' durable services, labor inputs, and the TFP residual. The contributions of capital and consumers' durables can be decomposed into computer and non-computer components. Through the 1990s, computers were responsible for nearly 20 percent of the contribution of capital inputs to growth and 14 percent of the contribution of consumers' durables services. Taken together, these computer inputs contributed 0 .16 percentage points to the output growth for 1990-1996. These sources of growth are a direct result of substitution toward relatively cheap computers.

[14] Oliner and Sichel (2000).

[15] For example, Bresnahan (2001); Brynjolfsson and Hitt (2000); and Inoue (1998).

Economists further distinguish between direct and indirect network effects.[16] The direct version occurs from an increase in the number of users of an ICT product or service, as when growing numbers of PC owners increase the value of each owner's PC. The indirect network effect occurs from the development of applications, as when the growing number of users of Windows increases the usefulness of both PCs and Windows to each user, or more recently in the I-Phone and its many thousands of applications. The direct and indirect network effects of ICT, therefore, can have a significant impact on the diffusion and usage of that capital.

In addition to these network externalities associated with ICT, ICT can produce another type of externality, so-called knowledge spillovers or learning effects. The adoption of ICT typically produces or involves innovations in the production process and organizational changes.[17] As the noted Berkeley economist Paul Romer wrote a generation ago, the knowledge that enables a firm or industry to successfully adopt these advanced technologies tends to naturally spread or spill over to other firms and industries.[18] Therefore, in assessing the indirect economic benefits associated with ICT, we need to take account of the interdependence of firms in different industries and their inter-industry transactions.

A 2002 study measured these ICT spillovers using data for 42 industries from the national Input-Output tables over the period 1984 to 2000.[19] The authors found that industries with more transactions with ICT-intensive industries have larger ICT spillover effects. One striking finding is that the computerization of an industry's suppliers and customers reduces the industry's average costs, a clear example of a positive externality from ICT. Table 1, below, shows the average return received and average return generated by the 42 industries from their ICT capital stock and its spillovers. The first column shows the average returns to an industry from a one dollar increase in the ICT capital stock of other industries. Banking and security, wholesale trade, and business services derived the greatest returns from their transactions with ITC-intensive-industries; and among manufacturing industries, industrial machinery and equipment, and electronic and other electric equipment received the greatest benefits from these interactions. The common characteristic of the industries deriving the greatest benefits is that they are themselves intensive users of ICT capital. These findings suggest that the returns to an industry from these inter-industry transactions depend on an industry's own ICT capital.

The second column in the table shows the benefits to an industry of interacting with other industries that have ICT stocks, expressed as the returns that a one dollar increase in an industry's ICT capital stock generates *for other industries*. If a firm's suppliers have large ICT investments, the computerization of those suppliers will have positive spillovers for the firm, called "backward linkage." At the same time, the computerization of a firm's customer industries also produces spillovers for the firm, called "forward linkage." Backward and forward linkages from ICT investments reduce the average and variable costs for any industry, expressed as a return achieved by firms from interacting with its supplier and customer industries.

The results suggest that industries which receive large returns from their interactions – large spillover benefits -- also generate large returns from their own ICT for other industries.

[16] Katz and Shapiro (1985).
[17] Brynjolfsson and Hitt (2000).
[18] Romer (1986).
[19] Mun and Nadiri (2002).

The industry that generates the largest returns for other industries in this way is business services. For example, a $1 increase in the ICT investments by other industries generates an additional return – through lower costs -- of 4.8-cents for firms providing business services; and a $1 increase in the ICT investments by business services generates an additional return of 4.7-cents for other industries. The analysis also shows that some industries receive more benefits from interacting with ICT-intensive industries than their own ICT generates for other industries. For example, the bank and security industry receives four times the benefits from its interactions with other industries than its own ICT capital generates for other industries. In general, industries that receive greater returns than their ICT capital stocks generate for other industries are mainly service industries such as bank and security, wholesale trade, and communication.

Table 1: Average Returns Received and Generated From $1 Increase in ICT Capital Stock, By Industry, 1984-2000[20]

Industry	Average Return Received	Average Return Generated
Agriculture, forestry, and fishing	0.007	0.010
Mining	0.010	0.020
Construction	0.006	0.027
Lumber and wood products	0.001	0.004
Furniture and fixtures	0.001	0.002
Stone, clay, and glass products	0.002	0.003
Primary metal industries	0.003	0.008
Fabricated metal products	0.004	0.010
Industrial machinery and equipment	0.012	0.014
Electronic and other electric equipment	0.011	0.014
Transportation equipment	0.008	0.015
Instruments and related products	0.005	0.005
Miscellaneous manufacturing industries	0.001	0.002
Food and kindred products	0.006	0.015
Tobacco products	0.000	0.001
Textile mill products	0.002	0.003
Apparel and other textile products	0.001	0.002
Paper and allied products	0.003	0.007
Printing and publishing	0.007	0.008
Chemicals and allied products	0.009	0.013
Petroleum and coal products	0.003	0.010
Rubber , miscellaneous plastics products	0.002	0.008
Leather and leather products	0.000	0.000
Transportation	0.020	0.019
Communication	0.022	0.013
Electric, gas, and sanitary services	0.025	0.016

[20] *Ibid.*

Wholesale trade	0.069	0.027
Retail trade	0.031	0.028
Bank and security	0.080	0.022
Insurance	0.015	0.012
Real estate	0.032	0.028
Hotels and other lodging places	0.004	0.005
Personal services	0.001	0.003
Business services	0.048	0.047
Auto repair, services, and parking	0.003	0.010
Miscellaneous repair services	0.001	0.003
Motion pictures	0.002	0.003
Amusement and recreation services	0.002	0.004
Health services	0.008	0.013
Legal services	0.004	0.008
Educational services	0.001	0.003
Other services	0.014	0.024

Other research has focused on estimating the benefits of ICT for specific sectors or business lines. For example, a 2000 study analyzed the benefits of ICT for emergency response or 911 systems.[21] During the 1990s, many municipalities adopted "Enhanced 911" systems which used ICT to link automatic caller-identification to a database of address and location information, in an effort to shorten the time required for emergency responses. Using data from Enhanced 911 systems in counties in Pennsylvania from 1994 to 1996, the authors found that E-911 systems increased short-term survival rates for patients with cardiac diagnoses by about one percent. Similarly, the use of ICT enables hospitals to remotely monitor their intensive care units, feeding video, audio, and vital data to a single interface that allows doctors, nurses, and assistants to monitor many beds in multiple hospitals at once. By improving patient surveillance, two ICUs in Norfolk, VA, reduced deaths by 27 percent in the first year and cut their costs per-ICU case by 25 percent.[22] Other studies have documented a similar role for ICT in improving the affordability, safety, capability and efficiency of air transportation.[23]

In general, the ICT sector provides a wide range of benefits to different industries depending on how the technologies are applied and the characteristics of the adopting organization. With the broad adoption of ICT by retail businesses, for example, e-commerce transactions have grown six times faster than total retail sales, providing large externality benefits. This growth has also generated externality benefits for consumers: One recent survey found, for example, that consumers save between 10 percent and 40 percent by buying contact lenses over the Internet, compared to the prices charged by optometrists.[24] Online retail should continue to grow, in part because the longer people are online, the more likely they are to make more online purchases. While e-commerce still represents a modest share of retail sales, it

[21] Athey and Stern (2002).
[22] Mullaney (2006).
[23] Hansman (2005).
[24] Atkinson and McKay (2007).

accounts for a sizeable share of the total transactions in certain areas, with, for example, more than 20 percent of airline and other travel reservations occurring online.

IV. The Contributions of the ICT sector to GDP, Value-Added, Jobs and Compensation

The ICT sector – computer and electronic products, software and other publishing, information and data processing services, and computer systems design and services – has averaged double-digit growth for the past decade. From 1987 to 2008, the sector grew every year.[25] The recession years of 2001 and 2009 were the only times that ICT's value-added declined, driven by contractions in software and computer and electronics products. Table 2 shows the ICT sector's direct contribution to economic growth, employment, and incomes.[26]

Table 2: Contribution of ICT to U.S. GDP, Value-Added, Employment and Compensation, 1991-2009

Year	Value Added By ICT ($ millions)	Value Added as A Percent of GDP	Total Compensation By ICT ($ millions)	ICT Employment, Full-Time Equivalents	Average Compensation, Full-Time ICT Worker
1991	$203,829	3.4%	$172,258	4,207,000	$40,946
1992	$215,949	3.4%	$177,104	4,076,000	$43,450
1993	$227,404	3.4%	$185,636	4,081,000	$45,488
1994	$253,404	3.6%	$198,533	4,183,000	$47,462
1995	$275,859	3.7%	$208,887	4,242,000	$49,243
1995	$303,962	3.9%	$217,225	4,303,000	$50,482
1997	$343,181	4.1%	$234,466	4,415,000	$53,107
1998	$372,043	4.2%	$279,707	4,124,000	$67,824
1999	$405,625	4.3%	$321,562	4,238,000	$75,876
2000	$409,867	4.1%	$378,022	4,534,000	$83,375
2001	$380,771	3.7%	$359,948	4,430,000	$81,252
2002	$422,572	4.0%	$321,700	3,923,000	$82,004
2003	$438,412	3.9%	$315,852	3,674,000	$85,970
2004	$496,244	4.2%	$329,010	3,628,000	$90,686
2005	$537,385	4.3%	$348,134	3,685,000	$94,473
2006	$560,332	4.2%	$370,093	3,779,000	$97,934
2007	$580,183	4.1%	$389,004	3,764,000	$103,349
2008	$607,128	4.2%	$395,959	3,782,000	$104,696
2009	$599,797	4.2%	$379,056	3,535,000	$107,229

[25] Harris, *et al.* (2011).
[26] Bureau of Economic Analysis. Industry Economic Accounts: Gross-Domestic-Product-(GDP)-by-Industry Data. The compensation and jobs data before 1997 use the SIC classification of industries, while post-1997 uses NAICS data. Data on Full-time Equivalent workers are available only by SIC codes, and therefore the SIC-based series from 1991-1997 may not be perfectly comparable to the NAICs-based series from 1998 to 2009.

As Table 2 shows, ICT's contribution to GDP has risen nearly 25 percent since the 1990s, increasing from 3.4 percent of GDP in 1991-1993 to an average of 4.2 percent over the years 2005-2009. No other industry matches those gains. Over this period, ICT firms directly contributed an average of $577 billion per-year in value-added to GDP. Thus, ICT's direct contribution was equal to nearly one-third of the contribution of all manufacturing at 11.2 percent of GDP. From 2005 to 2009, GDP grew by about $4.2 trillion, from $9,951.5 billion to $14,119 billion; and ICT gains directly accounted for 4.0 percent to 4.5 percent of that growth.

ICT companies also accounted for 4.1 million to 4.5 million full-time jobs in the 1990s. ICT employment has declined gradually since 2001, but the average compensation of its workers has increased sharply. From 1991 to 2000, this average compensation more than doubled from $40,946 in 1991 to $83,375 in 2000. From 2000 to 2009, this average compensation rose another 29 percent from $83,375 in 2000 to $107,229 in 2009, even as average incomes for all Americans declined. From 1991 to 2009, average ICT compensation rose 162 percent, the fastest gains of any sector. As a result, the gap between the average compensation of ICT and other private-sector workers widened sharply, from 29.5 percent in 1991 to 80.6 percent in 2009. (Table 3, below) Counting only wages and salaries, the average weekly earnings of ICT employees in 2010 were $938.89 or nearly 50 percent higher than all private-sector employees.[27]

Table 3. Average Compensation, ICT versus All Other Private-Sector Workers, 1991-2009

Year	Average Compensation, Full-Time ICT Worker	Average Compensation, Full-Time Non-ICT Private-Sector Worker	Difference: Compensation Advantage of ICT Workers
1991	$40,946	$31,613	29.5%
1992	$43,450	$33,372	30.2%
1993	$45,488	$34,222	32.9%
1994	$47,462	$34,978	35.7%
1995	$49,243	$35,711	37.9%
1995	$50,482	$36,682	37.6%
1997	$53,107	$38,094	39.4%
1998	$67,824	$40,168	68.9%
1999	$75,876	$41,693	82.0%
2000	$83,375	$44,063	89.2%
2001	$81,252	$45,508	78.5%
2002	$82,004	$47,009	74.4%
2003	$85,970	$49,217	74.7%
2004	$90,686	$50,952	78.0%
2005	$94,473	$52,681	79.3%
2006	$97,934	$54,742	78.9%
2007	$103,349	$56,805	81.9%
2008	$104,696	$58,437	79.2%
2009	$107,229	$59,381	80.6%

[27] Bureau of Labor Statistics, ftp://ftp.bls.gov/pub/suppl/empsit.ceseeb2.txt.

We also can estimate the contribution of ICT investments to the output of other industries. To do so, we use BEA input-output tables.[28] BEA provides two types of these tables to measure linkages between industries. The first is called the Make table, with rows that show the value of each good or commodity produced by each industry and columns that distribute the output of each good or commodity across industries.[29] For example, the 2009 Make table shows that the "Farms" industry contributed 99.8 percent of total "Farms" commodities. The second table is the Use table, which shows the value of each commodity or good used in producing the output of each industry. Each column in the Use table sums to an industry's total output, while each row shows the value of each good or commodity that goes towards producing that output. For example, the 2009 Use table shows that the "Farms" industry used 12.3 percent of Farm industry commodities and less than 1 percent of Machinery industry commodities to produce total output of $299.1 billion.

To estimate the value each industry derives from ICT investments, we created an "Adjusted Make Table" that shows the share of each commodity's total output contributed by all other industries. Technically, we divide each element of the Make Table by its column total, which is the industry's total output of a commodity, and each element in the row shows the output of that commodity being produced by the industry. Therefore, the Adjusted Make Table shows the share of the total value of the commodity produced by each industry. Next, we multiply these values by those in the Use table. This gives us an industry-by-industry matrix in which each element shows the contribution of each industry to the total output of all other industries. From this matrix, we can isolate the spillovers or contributions of ICT industries to other industries.[30]

Table 4, below, shows, for example, that the output by information and services industries as well as several manufacturing industries depend particularly on ICT investments. ICT investments account for more than 4.3 percent of the total output of the information sector, more than 3.1 percent of the output of all manufacturing, and nearly 4.0 percent of the output of business management services. Moreover, this analysis also can measure spillovers from ICT by analyzing the flow of goods between the ICT industries and all other industries. We find that the ICT industries contributed $528.2 billion in value to other industries in 2009, or 3.74 percent of the total U.S. GDP of $14.1 trillion in that year. The public sector accounts for $128.6 billion of that total. Considering only the private sector, spillovers from ICT were responsible for $401.3 billion of the value produced by non-ICT industries. Moreover, this estimate is conservative, because it captures direct spillovers but not indirect ones that, for example, reduce costs in other industries.[31]

[28] Bureau of Economic Analysis. Industry Economic Accounts: Input-Output Accounts Data, http://www.bea.gov/industry/io_annual.htm.

[29] There are 65 industry and commodity groups. Each column corresponds to a specific commodity group and the column total is the total output of that commodity. Each row corresponds to a specific industry and shows the output of each commodity produced by that industry. Note that the industry and commodity groupings are titled the same.

[30] Note we show the ICT industries, such as computer and electronics product, publishing industries, and so on.

[31] Mun and Nadiri (2002).

Table 4: Spillover Effects of the ICT Sector On All Industries, 2009[32]

Industry	Use of ICT ($ millions)	Output* ($ millions)	ICT Share of Total Output
Agriculture, Forestry, Fishing	$847	$340,726	0.25%
Mining, Oil, Gas Exploration	$1,797	$349,233	0.51%
Utilities	$1,733	$392,461	0.44%
Construction	$13,809	$1,091,005	1.27%
Manufacturing	$141,115	$4,522,357	3.12%
Wholesale Trade	$10,591	$1,018,943	1.04%
Retail Trade	$14,363	$1,193,407	1.20$
Transportation and Warehousing	$3,605	$712,451	0.51%
Information	$51,429	$1,191,925	4.31%
Finance & Insurance	$43,049	$2,264,742	1.90%
Real Estate, Rental & Leasing	$8,340	$2,619,605	0.32%
Profess'al, Scientific, Tech. Services	$35,716	$1,514,926	2.36%
Management of Companies	$14,965	$378,177	3.96%
Administrative, Support, Waste Mgt	$15,362	$621,861	2.47%
Education	$5,879	$240,194	2.45%
Health Care & Social Assistance	$19,020	$1,705,157	1.12%
Arts, Entertainment & Recreation	$1,989	$209,568	0.95%
Accommodation & Food Services	$8,572	$718,869	1.19%
Other Services	$9,166	$559,502	1.64%
Total or Average	**$401,347**	**$21,645,109**	**1.93%**
Government	$126,811	$3,159,049	4.01%

Based on this analysis, we can measure ICT's total contribution to U.S. GDP and growth. As Table 4, above, shows, the industries deriving the greatest benefits from ICT are manufacturing, information, finance and insurance, and professional, scientific and technical services. Across the economy, these indirect effects from ICT investments added nearly $401.4 billion to U.S. GDP in 2009, on top of the $599.8 billion in value-added contributed directly by ICT companies in 2009. All told, therefore, the ICT industry contributed $1,001.1 billion to U.S. GDP in 2009, or 7.1 percent of total GDP. In addition, this analysis allows us to estimate the value derived by government from its use of ICT, which as noted came to $126.8 billion in 2009.

V. The Impact of Policy on Levels on ICT Investment and Innovation

The powerful impact of ICT on the performance of other industries increases the importance of policies that can affect their use of ICT. Here, we examine three such initiatives currently discussed in policy circles and analyze the ICT-related benefits generated in each case: 1) The range of economic benefits expected from proposed funding for an ICT-based national wireless public safety network; 2) the potential economic benefits from the proposed funding for an ICT-based reconfiguration of the nation's electricity grid into a "Smart Grid;" and 3) the impact of a 10 percent reduction in corporate taxes on ICT investments by various industries, and their impact on wage and employment gains.

[32] Total exceeds GDP, because outputs from one industry are inputs for other industries. Also, the contributions of ICT to each sub-industry in the manufacturing sector are presented in the Appendix (Table A-1).

The National Public Safety Network

Since taking office, the Obama administration has proposed a number of initiatives involving the intensive use of ICT to help address social and economic issues. One prominent example is the proposal in the President's current, FY 2011 budget for $10.7 billion to support the development and deployment of a nationwide wireless broadband network dedicated to public safety. The funds would go to create a wireless communications network for emergency service agencies across the country, including police, firefighters and emergency medical service personnel, to help them prevent or respond more efficiently and effectively to incidents that endanger people or property.

The proposed program should generate a range of economic benefits. To begin, the direct funding should create nearly 100,000 new jobs: A White House assessment and a separate study by Cisco (2009) concurred that the program and its funding would generate employment for network planners; laborers for laying and installing cable; technicians to build and install network devices, wireless access points, video surveillance cameras, gunshot detectors, and environmental sensors; and trainers for installation.[33] As the network is established, it would create more jobs for network administrators and managers, technical support staff, network analysts, project managers, and IT analysts. Based on the current use of labor and capital by ICT companies and prevailing wages, nearly $8 billion of the initial funding would go to salaries, sufficient to create about 74,000 new ICT jobs. In addition, the nearly $3 billion in new capital investments should support perhaps 20,000 additional jobs.

While a majority of the ICT investments would occur from public-sector agencies, and there are no analyses of the employment effects of ICT investments specifically by the public sector, we assume here that the new public-sector ICT investments would be allocated to capital and labor in the same proportions as in the ICT sector itself. With a capital-labor ratio of 0.32, approximately 25 percent of the total value of the capital and labor employed should go for capital investments. Therefore, about 75 percent of the total $10.7 billion invested in the public safety networks would be used for new ICT-related employment, or nearly $8 billion. At an average compensation per-worker of $107,229, those funds would produce the nearly 74,000 new jobs. If the investments in the public safety network are more capital intensive than we assume here, the employment gains could be less.

A wireless broadband network of public safety agencies also would generate substantial direct savings for law enforcement and other emergency personnel, and equally substantial indirect savings from the lives saved and property preserved. We cannot know precisely how great these savings would be. However, if the use of the new network and its technologies increases the productivity of police and fire agencies by 1 percentage point per-year – less than comparable innovations increased private-sector productivity – the direct efficiency savings would be nearly $2 billion per-year. In addition, economic analysts at the Phoenix Center estimate that the indirect benefits from a full-fledged public safety network could come to another $2 billion to $6 billion per-year.[34] In short, therefore, the proposal would create nearly

[33]The White House, Office of the Press Secretary (2011).; Cisco (2009).
[34] Ford and Spiwak (2011).

100,000 jobs; and over time, the network itself should generate savings or benefits of some $4 billion to $8 billion per-year.

The network's main purpose is to support the daily operations of police, fire fighters and other public safety agencies – for example, by providing real-time video surveillance of critical areas and crime and fire scenes, so police and firefighters can monitor and deploy the appropriate personnel, hour-to-hour. In addition, the ICT-based network would provide wireless data and communication networks for officers in the field to consult databases, building plans and schematics, and public and private surveillance systems. Further, first-responders on their way to fires, hostage situations, and other incidents will be able to review real-time video from the incident scenes, as well as public and private databases, to better plan and coordinate their responses. The President's proposal also includes other provisions that could further expand its economic benefits.[35] For example, other public agencies could be permitted to use the network. The plan also would encourage police and firefighting agencies to enter into partnerships with appropriate commercial operators, so each side could leverage the experience and assets of the other. Finally, the network's value also could rise sharply when major terrorism and natural disasters strike. In fact, the original impetus for the proposal came from the 9/11 Commission's criticism of the lack of inter-operable communications systems among the diverse first-responders at the World Trade Center and the resulting vulnerabilities for homeland security.[36]

The proposal to allocate nearly $11 billion to create a wireless local, regional and national data and communications network for public safety officials and agencies represents an acute public policy application of ICT that should generate large economic benefits. The initial appropriation should generate nearly 100,000 jobs; once in place, the system should produce an estimated $2 billion per-year in efficiency savings by police and fire departments, as well as another $2 billion to $6 billion per-year benefits from additional lives and property preserved from the application of ICT to the daily operations of public safety officers. And these benefits could be much greater if they are applied, as they almost certainly would be, to instances of major terrorism or large natural disasters.

Investments in a Smart Grid

Another current example of ICT-related funding by the federal government that will produce significant economic benefits is the provision in the American Recovery and Reinvestment Act of 2009 allocating $3.4 billion for investments in a "Smart Grid," the largest energy-grid modernization effort on record. A Smart Grid is an ICT-based network that delivers electricity to businesses and consumers using two-way digital data and communications systems, often linked directly to systems and appliances in offices, factories and homes. To achieve this, the Smart Grid overlays the existing electrical grid with a range of information and communications technologies, including extensive deployment of smart meters. As with the federal support for a wireless broadband public safety data and communications network, the Smart Grid would generate significant direct and indirect savings and economic benefits.

[35] Testimony of Paul Steinberg (2011)
[36] Moore (2010).

The most direct benefit from the appropriation is the jobs it has created: Based on ICT industry's allocation of expenditures between labor and capital investments, and average salaries in the sector, the provision has directly generated about 24,000 jobs, plus perhaps another 5,000 jobs associated with the program's capital purchases. Moreover, this represents an initial investment in the long-term creation of an ICT-based Smart Grid, over some 20 years, that will probably be funded by both the private utility industry and government. The creation of a nationwide Smart Grid will entail hundreds of thousands of additional jobs, including smart-meter manufacturing workers; engineering technicians, electricians and equipment installers, IT system designers and cyber security specialists, data entry clerks and database administrators, and business and power system analysts.[37] The greatest economic benefits, however, will follow from the actual use of the Smart Grid. For example, in a recent analysis, the Electric Power Research Institute (2010) identified additional new capacities possible with a Smart Grid.[38] They include reconfigurations so utilities can prevent "fault currents" from exceeding damaging levels, wide-area monitoring of the condition of the bulk power system in real time, real-time determination of the capacity to carry load for each element in the grid, and advanced metering systems for real time management of power demand by customers based on adjusted pricing.

Another often-cited benefit of an ICT-based Smart Grid is fewer power outages. If the Smart Grid can reduce those outages by 20 percent, as predicted by the National Energy Technology Laboratory,[39] it would save $20 billion per-year from some $100 billion in current annual costs from such outages as estimated by the Electric Power Research Institute (EPRI).[40] Industry experts have enumerated additional applications of a Smart Grid that also would generate significant savings or economic benefits,[41] including automating the operations of the core grid, collecting the data required to reduce the cost and increase the effectiveness of maintenance programs, smart metering to shift power use by businesses and households from high-use times of the day and month to lower-use days and times, and the eventual development and operations of "smart buildings" that automatically optimize their use of electricity.

Some of these applications are possible today. For example, Oberlin College conducted a competition a half-decade ago in which it challenged its students to conserve and shift their electricity consumption.[42] On average, dormitories were able to cut their electricity use by 32 percent; but two dormitories that received real-time feedback on their energy use and costs, through smart metering within a wireless data communication network tied to the electricity grid, reduced their electricity consumption by 56 percent. A Smart Grid also could support homeowners and businesses that want to produce their own energy, using small-scale generation from photovoltaics, solar thermal energy, and oil and natural gas-fired generators. The ICT-based grid could not only accommodate the use of such "microgeneration" and provide outside energy when needed; it also could transfer excess energy from microgenerators to other customers and credit the small producer. Similarly, with the deployment of a Smart Grid, drivers

[37] KEMA (2009).
[38] EPRI (2010).
[39] National Energy Technology Laboratory (2010).
[40] EPRI (2001)
[41] Feisst, Schlesinger and Frye (2008).
[42] Dormitory Energy Competition at Oberlin College (2005).

of hybrids or all-electric cars could create and store electricity in their automobiles and then sell it back to the grid whenever they chose to do so.

Beyond the 29,000 jobs created directly by the appropriation and potential $20 billion in annual benefits or savings from reducing power outages, the National Energy Technology Laboratory (2010), has identified other potential economic benefits of a Smart Grid.[43] For example, the ICT components of a Smart Grid would monitor the energy flows to large customers and reduce the incidence of poor power quality, generating benefits estimated at $10 billion per-year. Raising the stakes on quality control, the Smart Grid also could virtually eliminate the danger from large-scale blackouts, which cost the economy some $10 billion each.

Furthermore, by improving the efficiency of the energy infrastructure, from generation to consumer, and of local and national electricity markets, the Smart Grid will reduce electricity consumption and drive down prices, relative to the continued reliance on less efficient energy infrastructure. Recent experiments suggest that these savings could cut current electricity bills by 10 percent to 15 percent: In 2010, American households and businesses spent $370.5 billion for electricity, suggesting economic benefits from this source of $37 billion to $55 billion per-year.[44] The ICT-enabled monitoring of the power grid also should reduce transmission and delivery losses (T&D) by at least 10 percent, producing another $2.5 billion in annual benefits;[45] and cutting the costs of transmission congestion costs by 10 percent, a reasonable target, would save another $2 billion per-year. The system's continuous ICT-based monitoring also should reduce operations and maintenance costs by at least 10 percent, generating another $4 billion in annual savings. These efficiency gains should not reduce overall employment: While some of the savings in operations and maintenance may cost jobs, the efficiency gains generate new demand for other and services, leading to more employment to produce, distribute and sell them. Finally, the deployment of a Smart Grid would allow utilities to eliminate or defer a share of the planned, large capital investments – in centralized generating plants, substations and transmission and distribution lines – reducing costs by an average of roughly $2 billion to $6 billion per-year.[46]

All told, these enumerated benefits from the application of ICT to the nation's electricity grid come to some $70 billion to $90 billion per-year. This estimate is reasonably close to an analysis by the Electric Power Research Institute working with the Department of Energy: Their study projects total Smart Grid costs of $340 billion to $480 billion over 20 years, and economic benefits of $1.3 trillion to $2 trillion over the same period.[47] That suggests benefits that would average $65 billion to $100 billion per-year, and exceed costs by roughly 3-to-1 to 5-to-1. That would mean net benefits averaging $48 billion to $76 billion per-year. With regard to jobs, a report by the energy consultancy KEMA (2008) has forecast that building and operating a Smart Grid would create thousands of jobs across the country, including smart meter manufacturing workers; engineering technicians, electricians and equipment installers, IT system designers and cyber security specialists, data entry clerks and database administrators, and business and power

[43] NETL (2010).
[44] Energy Information Administration (2011).
[45] Business Roundtable Report (2007).
[46] Kintner-Meyer, Schnieder and Pratt (2007).
[47] EPRI, (2011).

system analysts.[48] To be sure, these benefits will be accrued over many years. Smart Grid activity in the United States is focused today on "advanced metering," a precursor to a genuine Smart Grid. Duke Energy is the only utility that has filed plans with regulators for elements of a Smart Grid, although others have filed plans that involve advanced metering. These activities, however, were spurred in part by the 2009 funding, which may be seen years from now as the seed money for an ICT-based transformation of our energy infrastructure.

Reducing the Corporate Tax Burden

The tax treatments of corporate investments, their financing and their returns affect the cost of capital for businesses and thus actual investment levels, including the investments in ICT that drive the direct and spillover benefits documented earlier in this study. Many economists have studied the impact of the corporate tax burden and its top tax rate on investment, here and in other nations. This research shows, first, that capital investment responds to both the marginal corporate tax rate and the "effective" tax rate or tax burden, which takes into account deductions and credits for particular investments and expenditures. It is also often noted that over the last decade, the United States has maintained a relatively high marginal tax rate and tax burden on corporate profits, while most European countries have reduced their corporate taxes.[49] This research suggests that our high corporate tax rates and tax burdens may contribute to our relatively low domestic investment rates.

The high U.S. corporate tax burden and rates may particularly affect investment by ICT industries, because the value of corporate tax preferences critical to investment is less for the ICT sector than for many other industries. In addition, as noted by the Joint Committee on Taxation (JCT), the ICT industry has not received new tax benefits since at least 1986.[50] By contrast, in 2004 alone, Congress provided new tax preferences for railroads, film and TV production, and biodiesel blender makers; and the 2009 stimulus included new tax expenditures for a range of clean energy producers and consumers.

Unsurprisingly, there has been considerable research and debate recently about the economic impact of reducing the corporate tax burden and marginal tax rate. We leave that debate to others. Instead, we focus on how a 10 percent reduction in the corporate tax burden or effective rate would affect investments by ICT companies and ICT investments by other industries, because those investments produce disproportionately large benefits for GDP, productivity and wages. As we will see, such a 10 percent tax reduction would increase investments in ICT by nearly $71 billion over several years, which in turn would raise productivity and total spending on compensation by nearly $450 billion. Over several years, those investment and productivity gains would drive higher levels for compensation, sufficient to cover wage increases averaging $5,424 per-worker across the economy, or some 6.8 million new jobs, or some combination of higher wages and additional jobs.

[48] KEMA (2009).
[49] A recent study from the American Enterprise Institute, for example, found that among all OECD nations, the United States has the second highest effective corporate tax rate and combined national and local marginal corporate tax rate (Japan is number one in both cases)Hassett and Mathur (2011).
[50] Joint Committee on Taxation (2011).

To calculate these effects, we begin by estimating how much investment would increase in response to a reduction in its tax burden, or in economic terms, "the elasticity of investment with respect to effective corporate tax rates." A recent review of the international tax literature found that this average elasticity is 0.6: A one percent reduction in the corporate tax burden is followed on average by a 0.6 percent increase in investment.[51] Other studies have found larger responses, as high as 3.3 percent,[52] but here we adopt the more conservative value.

Applying this value, we estimate how much each industry would expand its investments, in ICT and overall, over three-to-five years, if Congress reduced the corporate tax burden by 10 percent. (Table 5, below) Over several years, American businesses would increase their ICT capital stock by some $71 billion, relative to what we would expect under the present corporate tax. The largest increases in ICT investments would occur in the information industry; manufacturing; professional, scientific and technical services; and transportation and warehousing. American businesses would increase their overall capital investments by $990 billion, with the largest increases occurring in manufacturing and utilities, mining and oil and gas exploration, finance and insurance, and real estate, rentals and leasing.

Table 5: Impact of a 10 Percent Reduction in Corporate Tax Burden On ICT Investment and Total Capital Investment, by Industry ($ millions)

Industry	ICT Capital Stock (millions)	Total Capital Stock (millions)	Increase in ICT Capital Stock (millions)	Increase in Total Capital Stock (millions)
Ag., Forestry, Fishing	$2,397	$492,462	$144	$29,548
Mining, Oil, Gas Exploration	$13,751	$1,269,032	$825	$76,142
Utilities	$23,575	$1,823,966	$1,415	$109,438
Construction	$28,462	$283,702	$1,708	$17,022
Manufacturing	$150,873	$2,309,681	$9,052	$138,581
Wholesale Trade	$61,282	$502,948	$3,677	$30,177
Retail Trade	$29,057	$1,036,955	$1,743	$62,217
Transportation & Warehousing	$109,863	$1,105,476	$6,592	$66,329
Information	$270,001	$1,162,888	$16,200	$69,773
Finance & Insurance	$114,331	$1,278,624	$6,860	$76,717
Real Estate, Rental, Leasing	$55,510	$1,320,507	$3,331	$79,230
Profess'al, Scientific & Tech. Services	$153,348	$371,962	$9,201	$22,318
Mgt of Companies	$59,743	$479,134	$3,585	$28,748
Admin., Support & Waste Mgt.	$32,639	$226,256	$1,958	$13,575
Education	$9,418	$429,122	$565	$25,747
Health Care, Social Assist.	$43,835	$1,187,396	$2,630	$71,244
Arts, Entertain., Recreation	$4,250	$226,104	$255	$13,566
Accommodation, Food Services	$8,587	$524,951	$515	$31,497
Other Services	$8,908	$464,058	$534	$27,843
Total	**$1,179,830**	**$16,495,224**	**$70,790**	**$989,712**

Next, we look at how these increases in ICT investments would affect each industry's wages and employment. For this analysis, we use BEA data on compensation and ICT

[51] Gordon and Hines (2002).
[52] De Mooij and Ederveen (2003).

investment for 1998 to 2007, and calculate how much compensation rises when an industry increases its ICT investments – the "elasticity of compensation to ICT investment." This analysis of total compensation covers both increases in wages and increases in the numbers of workers earning them. We cannot know how much of the gains from ICT investments would go to wages and how much to additional jobs, although we would expect that more would go to higher wages then additional jobs, because ICT investment is associated closely with gains in productivity that lead to higher wages. Table 6, below, shows the increases in total compensation spending, by industry, that should follow from the higher ICT investments expected from a 10 percent reduction in corporate tax burdens.[53]

The analysis shows that these increases in ICT investments would lead to increases in compensation spending ranging from 3 percent (accommodations and food services; utilities; management of companies and enterprises; and mining, oil and gas exploration) to 16 percent (transportation and warehousing; information; and real estate, rentals and leasing). Compensation spending would increase by $35.5 billion in manufacturing, by $39 billion in health care and social assistance, by over $40 billion in the information sector, and by nearly $79 billion in finance and insurance. All told, the increases in ICT capital investments would raise private-sector compensation spending by nearly $450 billion or by an average of 7 percent.

Table 6. Impact of Increased ICT Capital on Total Compensation, By Industry, Over Time ($ billions)

Industry	ICT Capital After Tax Cut	Current Industry Compensation Spending	Post-tax Compensation Spending	Increase in Compensation Spending
Ag., Forestry, Fishing	$2.54	$43.77	$46.86	$3.10
Mining, Oil, Gas Exploration	$14.58	$64.77	$66.80	$2.03
Utilities	$24.99	$67.04	$69.01	$1.97
Construction	$30.17	$378.35	$395.94	$17.60
Manufacturing	$159.93	$858.65	$893.15	$34.51
Wholesale Trade	$64.96	$410.86	$452.46	$41.60
Retail Trade	$30.80	$480.42	$515.81	$35.39
Transportation & Warehousing	$116.46	$245.93	$284.60	$38.66
Information	$286.20	$248.36	$288.75	$40.39
Finance & Insurance	$121.19	$568.12	$646.80	$78.68
Real Estate, Rental, Leasing	$58.84	$102.47	$118.97	$15.51
Prof'al, Scientific, Tech. Services	$162.55	$669.14	$696.35	$27.21
Mgt of Companies	$63.33	$212.83	$219.45	$6.62
Admin. Support & Waste Mgt.	$34.60	$286.52	$305.67	$19.15
Education	$9.98	$135.62	$146.29	$10.67
Health Care, Social Assist.	$46.47	$855.87	$894.91	$39.05
Arts, Entertainment, Recreation	$4.51	$322.86	$337.66	$14.79
Accommodation, Food Services	$9.10	$242.64	$250.10	$7.46
Other Services	$9.44	$234,747	$247.26	$12.51
Total	**$1,250.62**	**$6,428.95**	**$6,876.84**	**$447.89**

[53] These estimates are based on the elasticity of an industry's ICT investments to the reduction in its effective tax rate, and the elasticity of an industry's compensation costs to increases in its stock of ICT.

Since we cannot know how this additional compensation spending would be divided between higher wages and additional jobs, we provide the two upper bounds: The increase in per-worker wages or compensation if all of the additional resources went to that use with no increase in the number of workers; and the increase in jobs if all of those resources went to job creation with no increase in wages. (Table 7, below) The reality would fall somewhere in-between. For example, the additional investment in ICT by manufacturing firms would lead to some combination of wage increases of up to $2,993 per-worker and job gains of up to 463,347 slots, a midpoint of about $1,500 in higher wages per-worker and about 232,000 additional jobs in manufacturing. Similarly, the construction industry would see some combination of wage increases of up to $2,957 per-worker and job gains of up to 276,768 positions. Across the economy, the rule would be, the greater the gains in wages, the smaller the increase in jobs (and vice versa).

Table 7. Impact of Increased ICT Capital on Wages and Employment, By Industry

Industry	Average Compensation Per-Worker, 2009	Post-Tax-Cut Increase in Compensation Per Worker, Upper Bound	Total Employment, 2009	Post-Tax-Cut Increase In Employment, Upper Bound
Ag., Forestry, Fishing	$41,366	$2,926	1,058,000	74,843
Mining, Oil, Gas Exploration	$102,648	$3,220	631,000	19,796
Utilities	$120,795	$3,549	555,000	16,306
Construction	$63,578	$2,957	5,951,000	276,768
Manufacturing	$74,477	$2,993	11,529,000	463,347
Wholesale Trade	$75,888	$7,684	5,414,000	548,223
Retail Trade	$37,807	$2,785	12,707,000	936,057
Transportation & Warehousing	$61,376	$9,649	4,007,000	629,936
Information	$94,182	$15,316	2,637,000	428,830
Finance & Insurance	$102,051	$14,133	5,567,000	770,963
Real Estate, Rental, Leasing	$54,824	$8,831	1,869,000	301,061
Prof'al, Scientific, Tech. Services	$93,221	$3,791	7,178,000	291,925
Mgt of Companies	$118,437	$3,681	1,797,000	55,855
Admin. Support & Waste Mgt.	$43,158	$2,884	6,639,000	443,607
Education	$48,315	$3,801	2,807,000	220,804
Health Care, Social Assist.	$58,373	$2,663	14,662,000	668,892
Arts, Entertainment, Recreation	$200,661	$9,195	1,609,000	73,728
Accommodation, Food Services	$27,162	$836	8,933,000	274,784
Other Services	$40,600	$2,164	5,782,000	308,148
Average or Total	**$76,785**	**$5,424**	**101,332,000**	**6,803,873**

If all of the additional resources for compensation spending went into higher wages with no additional jobs, the higher ICT investments would raise the wages of an average U.S. worker by $5,424 over several years, ranging from a high of $15,316 per-worker in the information industry and $14,133 in finance and insurance, to a low of $836 per-worker in the accommodations and food service sector and $2,164 in other services. Alternatively, if all of the new ICT-driven spending for compensation went into job creation with no increase in wages, it would mean an additional 6.8 million new jobs over several years. The largest job gains would occur in retail trade (936,057 positions), finance and insurance (770,963 jobs), health care and social assistance (668,892 jobs), and transportation and warehousing (629,936 positions).

Finally, the increases in compensation correspond economically to the increase in value-added or GDP. Therefore, the additional investments in ICT spurred by the reduction in the corporate tax burden would produce spillovers that would increase the value-added produced across the economy by $447.9 billion.[54]

VI. Conclusion

Information and communications technologies have played a unique role in the development and success of the American economy over the last two decades. ICT industries have grown more rapidly than any other economic sector, and the average compensation of ICT industry workers now runs more than 80 percent more than the average for all other U.S. industries. Moreover, ICT has been on the cutting edge of economic innovation. These innovations have diffused across nearly every other industry, increasing efficiency and driving additional innovations in the way other industries operate and the goods and services they produce.

This study has measured these various effects. We found that in 2009, ICT itself was responsible for some $600 billion in value-added, or 4.2 percent of GDP. We further found that the ICT investments by other industries were responsible for an additional $400 billion in value-added produced by those industries. In short, ICT generates unusually large and extensive "spillover benefits" for other industries and their workers. All told, ICT industries in 2009 were responsible, directly or indirectly, for the production of about $1 trillion in goods and services, or 7.1 percent of GDP in that year. Given ICT's disproportionate impact on U.S. growth, public policies that promote investments in ICT also would produce disproportionate benefits for the economy.

These economic benefits also are apparent in our analysis of the impact of three ICT related public policies. A proposed $10.7 billion public investment in an ICT-based wireless data and communications network for police and other public safety agencies would lead to the creation of nearly 100,000 new jobs in ICT industries alone and, over time, spillover benefits of some $4 billion to $8 billion per-year. The $3.4 billion stimulus funding for an ICT-based wireless data and communications network for a "Smart Grid" should directly produce nearly 30,000 new jobs and, if this funding becomes seed money for the full development of an ICT-based Smart Grid, the net benefits will range from $48 billion to $76 billion per-year. Finally, a 10 percent reduction in corporate tax burdens would spur nearly $71 billion in additional investments in ICT goods and services by other industries. And after several years, those increases in ICT capital would produce an additional $448 billion in annual GDP and significant increases in compensation and/or employment in every industry. If all of these benefits went to higher wages with no additional jobs, it would over time raise the average compensation of American workers by $5,424; and if all of the benefits of the additional ICT investments went to job creation, it would over time generate more than 6.8 million additional jobs.

[54] This is derived from Table 6, the differences between total current compensation and total compensation after the tax change and additional ICT investments.

The critical role of ICT in the current growth and development of the U.S. economy is also central to establishing and maintaining a comparative advantage for American companies and workers in the global economy. ICT advances and their adoption by industries across the U.S. economy help drive innovation in every sector. With scores of developing nations now able to operate standard technologies and business methods at less cost than in the United States, the American capacity to apply ICT to develop and adapt new innovations for every phase of the economic process has become critical to U.S. competitiveness in a global economy.

Appendix

Table A-1. Contribution of ICT to the Output on Industries, By Industry, 2009

Industry	Contribution of ICT (millions)	ICT Contribution to Industry Output
Farms	$731	0.24%
Forestry, fishing, and related activities	$117	0.28%
Oil and gas extraction	$595	0.32%
Mining, except oil and gas	$540	0.71%
Support activities for mining	$662	0.75%
Utilities	$1,733	0.44%
Construction	$13,809	1.27%
Wood products	$1,174	1.48%
Nonmetallic mineral products	$1,573	1.70%
Primary metals	$3,598	2.00%
Fabricated metal products	$6,983	2.30%
Machinery	$6,683	2.55%
Computer and electronic products	$55,310	15.66%
Electrical equipment, appliances, and components	$3,348	3.23%
Motor vehicles, bodies and trailers, and parts	$10,713	3.07%
Other transportation equipment	$26,258	10.52%
Furniture and related products	$1,276	2.09%
Miscellaneous manufacturing	$2,848	1.93%
Food and beverage and tobacco products	$4,746	0.62%
Textile mills and textile product mills	$567	1.24%
Apparel and leather and allied products	$99	0.55%
Paper products	$2,439	1.54%
Printing and related support activities	$2,270	2.53%
Petroleum and coal products	$523	0.11%
Chemical products	$7,643	1.24%
Plastics and rubber products	$3,064	1.80%
Wholesale trade	$10,591	1.04%
Retail trade	$14,363	1.20%
Air transportation	$214	0.16%
Rail transportation	$1,069	1.69%
Water transportation	$90	0.26%
Truck transportation	$1,332	0.56%
Transit and ground passenger transportation	$116	0.36%
Pipeline transportation	$127	0.66%
Other transportation and support activities	$281	0.21%
Warehousing and storage	$374	0.65%
Publishing industries (includes software)	$20,166	6.28%

Motion picture and sound recording industries	$2,275	2.18%
Broadcasting (except internet) and telecom.	$20,360	3.25%
Other information services	$8,627	6.14%
Federal Reserve banks, credit intermediation	$18,268	1.78%
Securities, commodity contracts, and investments	$21,048	4.76%
Insurance carriers and related activities	$3,213	0.48%
Funds, trusts, and other financial vehicles	$520	0.42%
Real estate	$3,665	0.16%
Rental, leasing services, lessors of intangible assets	$4,676	1.54%
Legal services	$4,731	1.68%
Computer systems design and related services	$8,261	3.44%
Misc. professional, scientific, technical services	$22,724	2.29%
Management of companies and enterprises	$14,965	3.96%
Administrative and support services	$14,243	2.61%
Waste management and remediation services	$1,119	1.47%
Educational services	$5,879	2.45%
Ambulatory health care services	$9,335	1.17%
Hospitals and nursing and residential care facilities	$8,215	1.07%
Social assistance	$1,469	1.03%
Performing arts, spectator sports, museums	$1,091	0.91%
Amusements, gambling, and recreation industries	$898	1.00%
Accommodation	$2,711	1.40%
Food services and drinking places	$5,862	1.12%
Other services, except government	$9,166	1.64%
Contribution to total GDP, Private Sector	**$401,344**	**1.99% (average)**
Federal general government	$88,295	8.81%
Federal government enterprises	$951	1.04%
State and local general government	$33,062	1.82%
State and local government enterprises	$4,503	1.81%
Contribution to GDP, Public and Private Sectors	**$528,158**	**2.07% (average)**
Total GDP	**$14,119,040**	**3.74%**

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East Bay Regional Communications System Authority (EBRCSA)

Project Cornerstone Network LTE Testing

Network Test Report

September 12, 2011

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Executive Summary

The public safety community is about to embark on the most important upgrade to its mission-critical communications systems ever. Today, police, sheriff, fire, and EMS personnel only have access to voice communications on dedicated public safety spectrum. However, since the Federal Government allocated this spectrum for public safety use over the course of many years, it is not contiguous in nature but available on six different portions of the wireless spectrum.

The voice channels on each of these portions of the spectrum allocated to public safety communications voice are not sufficient to provide communications for all of the agencies and, therefore, over the years, some agencies make use of one portion of the spectrum while other agencies are assigned channels on another portion of the spectrum. This has resulted in a lack of interoperability between agencies, even within the same jurisdiction. It is not unusual for the police department in a city to be on a different portion of the spectrum than the fire and EMS departments. The result of this is that when these agencies are working side-by-side on an incident they cannot directly communicate with each other.

In addition, since these channels are suitable for voice communications only, the public safety community has little or no access to data services, pictures, or video. In order to partially solve some of these problems, some departments have entered into service agreements with commercial wireless operators for wireless phone, messaging, and broadband services. However, during major incidents these commercial networks are jammed with news media and citizens trying to contact their offices or loved ones. At the time this capability is needed most by the first responder community, it becomes unavailable due to commercial network overload.

The lack of interoperability that has been an issue for public safety nationwide for more than three decades was brought to the nation's attention during the terrorist attacks on 9/11 and again during Katrina. A number of different agencies all responded to provide services and were unable to coordinate with each other due to a lack of interoperable voice communications along with the lack of data and video communications. Since these incidents, many agencies have upgraded their voice communications systems and banded together to form regional and even statewide voice communications systems. However, because of the nature of their spectrum allocations they have not been able to address the issue of providing broadband communications services to those in the field.

Recently, Congress and the FCC allocated additional spectrum for public safety in what is known as the 700-MHz band. This band was occupied by TV stations above channel 53 that were relocated lower in the TV spectrum. The resulting band was divided into blocks. Public safety received two blocks of this spectrum: one for additional voice channels and one for a nationwide, fully interoperable broadband system that will add data, picture, and video capabilities for first responders. AT&T, Verizon, and others were then permitted to bid on other blocks within this band. The block adjacent to the public safety allocation known as the D Block was supposed to have been sold at auction with the condition that the winner would work with public safety to build out a nationwide private/public partnership system that would result in a shared network for both the private network operator and for public safety.

For a number of reasons, no bids were received for this spectrum, thus it was not auctioned. Today it sits idle. The public safety community quickly rallied and joined forces in order to convince both the FCC and Congress that the D Block should be reallocated to public safety so the amount of broadband spectrum available meets the needs of the public safety community on a daily basis. During the past two years, public safety has gained a lot of traction for this reallocation of the D Block but has also faced some stiff opposition from those who would like to see it re-auctioned for commercial purposes. Most of the discussions about who should gain access to the D Block have to do with how much broadband spectrum public safety really needs on a daily basis for local incidents. There have been many studies (all theoretical in nature) about the capacity of the existing public safety spectrum but until now there have been no real-world tests to validate whether the Public Safety Spectrum Trust (PSST) spectrum is really sufficient for public safety's daily requirements.

While this debate continues, the FCC issued waivers to 21 jurisdictions allowing them to start building their portion of the network. The San Francisco Bay Area applied for and received one of the waivers. The East Bay Regional Communications System Authority in partnership with the Bay Area Urban Area Security Initiative (UASI) developed Project Cornerstone as a proof of concept for the larger LTE network planned for the Bay Area. For the first time, we were able to conduct real-world testing of the first demonstration system of public safety broadband. The methodology and the test results are presented in the following report.

The conclusion reached by Andrew Seybold, Inc. as a result of this in-depth testing is that the presently allocated 10 MHz of spectrum (5 MHz by 5 MHz) for public safety's exclusive use is not sufficient to meet its needs on a daily basis. One of the prime advantages to implementing a nationwide broadband network is to enable first responders in the field to have access to video for the first time. Think of this as giving sight to the blind. For the first time, those responding to incidents will be able to see video from a fixed camera near the incident. For the first time, those in the command center in charge of an incident will be able to view, in real time, video sent back from the scene. The SWAT commander will be able to see exactly what his team's sharpshooters can see using their rifle scopes, and during a bomb incident, live video of the bomb can be made available to bomb experts anywhere in the world, one of whom might recognize it and be able to guide those at the scene as to the best way to disarm it and render it harmless.

In order to accomplish all of this and more, including having access to information regarding an incident, the history of the perpetrator, or perhaps still pictures of a suspect wanted for a crime, public safety needs sufficient bandwidth for this nationwide broadband system and as our test results conclusively show, the 10 MHz of spectrum presently allocated to public safety does not provide sufficient bandwidth for incidents that occur in cities and counties on a daily basis. Therefore, the 700-MHz spectrum known as the D Block needs to be reallocated to public safety to ensure it has the bandwidth it needs.

Andrew M. Seybold	Robert O'Hara
CEO and Principal Consultant	Partner
Andrew Seybold, Inc.	Andrew Seybold, Inc.

Introduction

Andrew Seybold, Inc. (ASI) was contracted by the East Bay Regional Communications System Authority (EBRCSA) to undertake a series of network capacity tests for the first 700-MHz system in the United States to deploy LTE. This network operates in 10 MHz (5 MHz by 5 MHz) of spectrum licensed to the Public Safety Spectrum Trust (PSST) and under a waiver granted to EBRCSA by the FCC.

EBRCSA, in turn, will be integrated with the planned nationwide fully interoperable broadband network dedicated to public safety and providing, for the first time, a nationwide public safety network based on commercial standards that will enable the first responder community to move equipment and manpower anywhere in the nation and be able to communicate with all of the other agencies involved in a major incident. The lack of interoperability for public safety agencies has created problems during major incidents for more than thirty years but was brought to the attention of the public during the Oklahoma City bombing, the 9/11 tragedy, and major hurricanes such as Katrina.

The reason for the engagement of ASI to perform capacity tests on this system was many fold: First, it is important for network planning purposes to understand both the capacity and the limitations of the network. Next, there are ongoing discussions about the amount of spectrum, and therefore the amount of capacity the public safety community needs on a daily basis. The public safety community and its supporters believe that 10 MHz of broadband spectrum is not sufficient for the types of broadband services that will be required on a daily basis, especially in major metropolitan areas. There are also those who believe that the D Block, the additional 10 MHz of spectrum being requested, should instead be auctioned for use by a commercial network operator.

Up to this point, all of the capacity models that have been run by those involved with the public safety community have indicated that 10 MHz of spectrum is not sufficient for normal daily data and video requirements while those who are in favor of auctioning the D Block have presented their own capacity models that are designed to support their own position. These tests conducted on the Cornerstone system are the first real-world tests conducted on a live system, and simulating a variety of incidents that are commonplace and handled, on a daily basis, by police, fire and EMS agencies either acting alone or in combination with the other agencies.

ASI has been involved in these discussions and Andrew M. Seybold has filed numerous comments with the FCC based on our own computer-generated capacity studies. We found what we believe to be a major discrepancy in the way capacity was measured in the case of those who are proponents of the D Block auction. The capacity calculations used by these companies and the FCC were based on capacity models developed by the 3GPP and were based on a grid of 19 cells sites, each with 3 sectors, for a total of 57 cell sectors. Interference was assumed to be equal across all of these cell sectors and the capacity measurements were based on spreading a user base across all of the sectors. While this capacity modeling method may in fact work for commercial network deployments, it is not germane when running capacity studies for a public safety broadband system.

The public safety community—police, fire, and EMS—responds to multiple incidents per day within their own jurisdictions that involve multiple public safety responders. These incidents, for the most part, are confined to a small geographic area that will usually be provided coverage by only one or at the most two cell sectors of the LTE broadband network. Therefore, the most important measure of capacity for a public safety broadband system needs to be focused on the capacity within a single cell sector rather than over a broader area. The testing methodology developed by ASI was based on self-contained incidents confined to a small geographic area and modeled based on real-world incidents that the public safety community responds to every day.

As an incident grows in complexity the number of first responders on the scene increases rapidly and the amount of video and data resources needed to manage the incident will increase exponentially. Incidents can grow in size and complexity quickly. During the early stages, while there is an incident commander on the scene, the demands that will be placed on the broadband network will continue to expand. If the incident needs to be managed for a longer period of time, additional resources such as command-and-control vehicles and incident management personnel will be put into place. At this point, it will be possible to manage the demand for voice, data, and video services, but in the early stages of an incident, those who are responding are occupied with sizing up the incident, deploying personnel, ensuring that the general public is out of harm’s way, and coordinating resources that are either on the scene or responding to it.

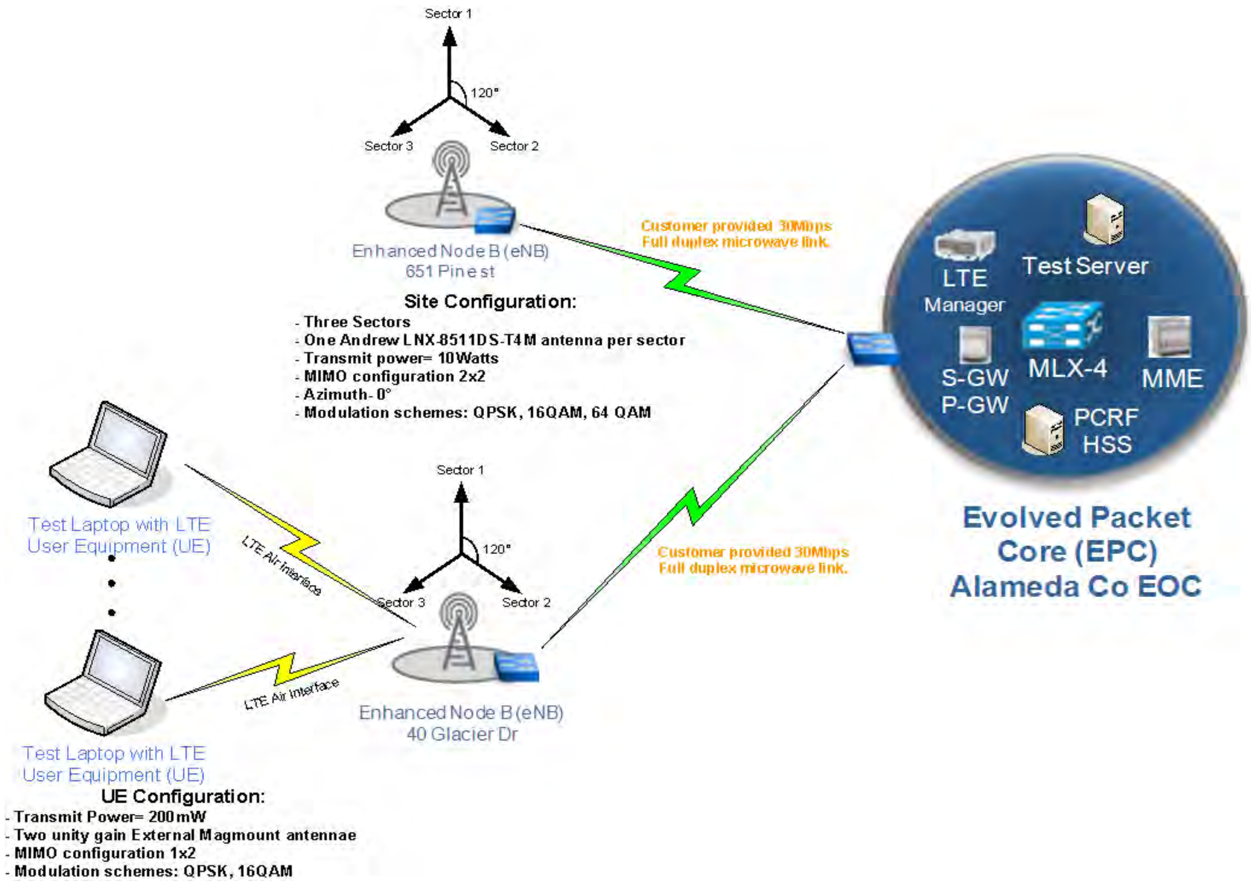
As an incident builds, so too will the demand placed on the LTE broadband network, and since the vast majority of these incidents will occur within a small geographic area, the coverage of that area will, in most cases, be provided by a single cell sector or two overlapping cell sectors. Further, it is important to understand that a blocked call or lack of available bandwidth during the incident as it grows in size and complexity is not an option for public safety. Therefore, the total amount of bandwidth available within a single cell sector is of paramount importance when designing the public safety broadband network and the amount of capacity available within each cell sector is directly proportional to the amount of bandwidth available within the cell sector. It is imperative that there be enough bandwidth available to handle the increased demand in service on a daily basis.

Based on our testing and the resources public safety agencies have identified as required for these types of incidents, ASI has concluded that 10 MHz of broadband spectrum (5 MHz X 5 MHz) is not sufficient to meet the needs of the public safety community on a daily basis in metropolitan and suburban areas of the United States.

The Network Under Test

The LTE network under test is located in Alameda County, California. The Evolved Packet Core (EPC) that is used to manage the network, identify units on the network, and for all command-and-control functions is located in the Alameda County Emergency Operations Center (EOC). The EPC is connected to the two cell sites via County Microwave with a total per cell site capacity of 30 Mbits per second. For the purposes of these tests, the test server was co-located at the Core in order to ensure that there were no network bottlenecks between the test server and the network under test.

This is a diagram of the Alameda County test network:



Each of the two active cell sites is divided into three sectors, which is the standard cell site configuration for all commercial cellular networks. For the purposes of these tests, all were conducted within the coverage of a single cell sector for each of the two sites and it was verified that there was no network traffic on the other two sectors. The total backhaul of 30 Mbits per second provided by the County Microwave system was available for the single sector under test.

The field devices we used were Panasonic Toughbook computers of the same variety that are in daily use within the public safety community, and the LTE field devices were standard LTE USB modems that were connected to the Toughbooks with USB cables. These USB modems were connected to two unity gain antennas mounted on the roofs of the test vehicles, providing the best case connectivity between the user device and the network (units with internal antennas such as handheld LTE devices when available will have degraded coverage and capabilities).

Additional network details may be found in Appendix A. The network was functional and fully operational and drive tests were conducted both by Motorola and Anritsu prior to beginning the testing. Stationary tests were conducted at multiple locations, run multiple times for verification, and the results are presented later in this report.

The Test Procedures

The test methodology developed by ASI for these capacity tests are based on real-world scenarios. That is, typical incidents that require public safety response on a daily basis. The incidents were created by ASI with the assistance of public safety officials from various police, fire, and EMS departments across the nation. They are based first on the amount of manpower and the number of units needed to respond to each of the various types of incidents and then the stated requirements in terms of video and data traffic public safety officials believe would be required for each incident. The incidents were developed using the Incident Command Structure (ICS), which is almost universally used by all public safety agencies.

The resulting scenarios included:

1. Bank robbery with potential hostage situation
   a. First responders on the scene: police
   b. Additional police response
   c. Fire and EMS staged near the scene
   d. SWAT team deployment
   e. Perimeter units to seal off the incident area
2. Multi-story building fire
   a. First responders on the scene: fire
   b. Additional fire units and EMS responding
   c. Police response for street and crowd control
3. Multi-vehicle accident, multiple injuries and extensive damage to vehicles
   a. First responders on the scene: police
   b. Fire and EMS response
   c. Additional police for traffic control
   d. Tow trucks (secondary responders)

The tests were designed around each of these incidents and the number of personnel from each agency was vetted by several departments across the country. The data and video requirements for each incident were calculated to provide uplink video to the dispatch center from the first unit on scene. This would then be retransmitted down to additional incoming resources including the ranking officer who responds to take command of the scene.

A video was recorded in the test area, streaming at a resolution and data rate comparable to those used in police patrol cars. Streaming software and measurement software were loaded onto both the server computer and each of the client computers. Scripts were written to calculate actual throughput, accuracy of reception, and other factors. Video files were created for both uplink (from the scene) and downlink (to the scene and responding units) and were varied in capacity requirements based on the resolution of the video required by public safety.

Prior to and during the stationary tests, both Motorola and Anritsu personnel conducted drive tests of the cell sector coverage area to verify coverage of the cell sector in use during the tests. During the actual tests, Anritsu America personnel equipped with state-of-the-art network monitoring equipment were monitoring and recording the amount of both the uplink and downlink traffic being generated during the tests.

More details of the testing methodology and the testing software used are provided in Appendix B.

The Actual Tests

The main objective of the tests was to measure network capacity in both the uplink and downlink directions from the scene of an incident and at various distances from the center of the cell sector under test. Four locations were chosen for each cell sector under test:

1. Near the cell center (highest possible data rates) location was 0.5 miles from the cell center
2. Mid-coverage (lower average data rates) location was 1.5 miles from cell center
3. Edge of cell (lowest average data rates) location was 3.8 miles from the cell center
4. A final location at the very edge of the cell coverage, in this case 4.2 miles from the cell center
5. The terrain varied for the two cell sectors under test
    a. One cell sector was located within the City of Martinez in a semi-dense building environment, but most of the buildings while multi-story were not more than six to eight floors tall
    b. The second location was more suburban in nature on the edge of Martinez with sparse housing, large trees, and in one case in the parking lot of a large shopping center.

It should be noted that LTE broadband networks are designed to provide three different data speeds down to the devices and two different data rates from the devices up to the network. Basically, those closest to the cell site will have the fastest data speeds to and from the network, those located in the middle of the cell sector coverage will have the next fastest data speed down from the network and, depending upon their location, either of the two up-to-the-network data speeds. Those toward the edge of the cell sector will have access to the slowest outbound data speed and the slower of the two up-to-the-network data speeds.

Devices and Configurations

The devices used for field testing were USB LTE modems built and designed specifically to provide service within the public safety licensed spectrum. In most cases, during the actual tests these modems were connected via USB cables to the Panasonic Toughbooks and external unity gain antennas on magnetic mounts were placed on the roof and/or back deck of the test vehicles. Two antennas were connected to each modem.

Seven Panasonic Toughbooks with Windows XP were used for all of the testing

For several of the tests, the USB modems made use of external antennas but were located within the vehicle rather than roof-mounted. This provided us with a sample of lower performance devices as well as the optimum performance of the modems using external antennas.

One of the test modems

For the most part, the modems performed well. There were several times during the tests when the modems stopped working due to glitches within the modem and the tests were stopped and restarted multiple times to verify all of the results. However, as can be seen from the data in Appendices C and D, a few of the tests are reported using only a single test session. The test Toughbooks were placed in two or three vehicles and the vehicles were placed within 50 to 300 feet of each other, simulating a number of devices within a confined location.

One of the test vehicles – note the antennas on the roof

The actual testing started with a single video or data stream from the vehicle up to the server at the Alameda County EOC, followed by a simulation of a retransmission of the video down to the scene. During each test, the number of video and/or data streams to and from the scene was increased. At the same time, Anritsu was monitoring the LTE channel in both directions and was recording the percentage of the capacity in use during each phase of the testing. This gave us a visual indication of the percentage of capacity that was being used during each phase of the testing. In addition, the other criteria measured included the quality of the video in both directions and any packet loss experienced during the up and down loading of the data files. Appendix C shows the test results as recorded for both data and video up and downloading as well as the capacity usage as measured by Anritsu during the tests. The tests were run multiple times except as noted above and the overall results are recapped in the next section of this report and in a detailed listing of the tests included in Appendices C and D.

The test results reported were collected over several multi-day test cycles, recorded on the server (uplink) and on each of the seven Panasonic Toughbooks used for testing (downlink). Anritsu's data was captured in real time. Some of this data is included in the next section and some is included in Appendix E as well. ASI is confident that these test results reflect real-world scenarios and that the results are based on best case network performance with no known chokepoints between the mobile devices and the test server located within the core of the network.

Test Results

We first measured the total capacity of the cell site by sending data from it to the mobile units (downlink or download). We measured sending data to a single mobile unit and to several mobile units at the same time. Note that when we used multiple mobile units they were all located in the same cell sector. These tests were made under what should be considered “ideal” conditions: We were the only users of the network during the tests; there was no other traffic.

As described in Appendix B, we tested at three different locations. The locations were selected to represent “best case” (near the cell tower), “typical case” (a midpoint in the cell coverage area), and “worst case” (at the cell edge) network coverage and performance. We sent random data to and from the mobile units using the same network protocols that streaming video cameras use. From these tests we arrived at the following measurements of the network’s total available bandwidth for a single sector:

Test Site	Downlink Bandwidth	Uplink Bandwidth
Glacier Street (near cell)	16 to 19 Mbits / sec	6 to 7 Mbits / sec
Sunvalley Mall (mid cell)	11 to 15 Mbits / sec	2 Mbits / sec
John Muir House (cell edge)	6 to 8 Mbits / sec	0.2 to 0.3 Mbits / sec

These measurements were made streaming data to and from a single or at most a handful of mobile units. As more mobile units are present in the cell sector, more network bandwidth will be devoted to packet management and other network traffic.

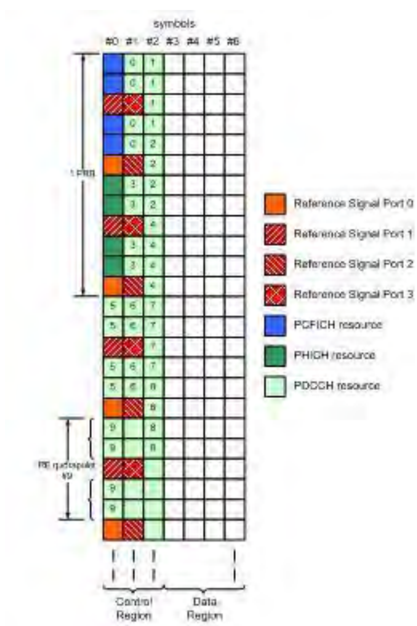
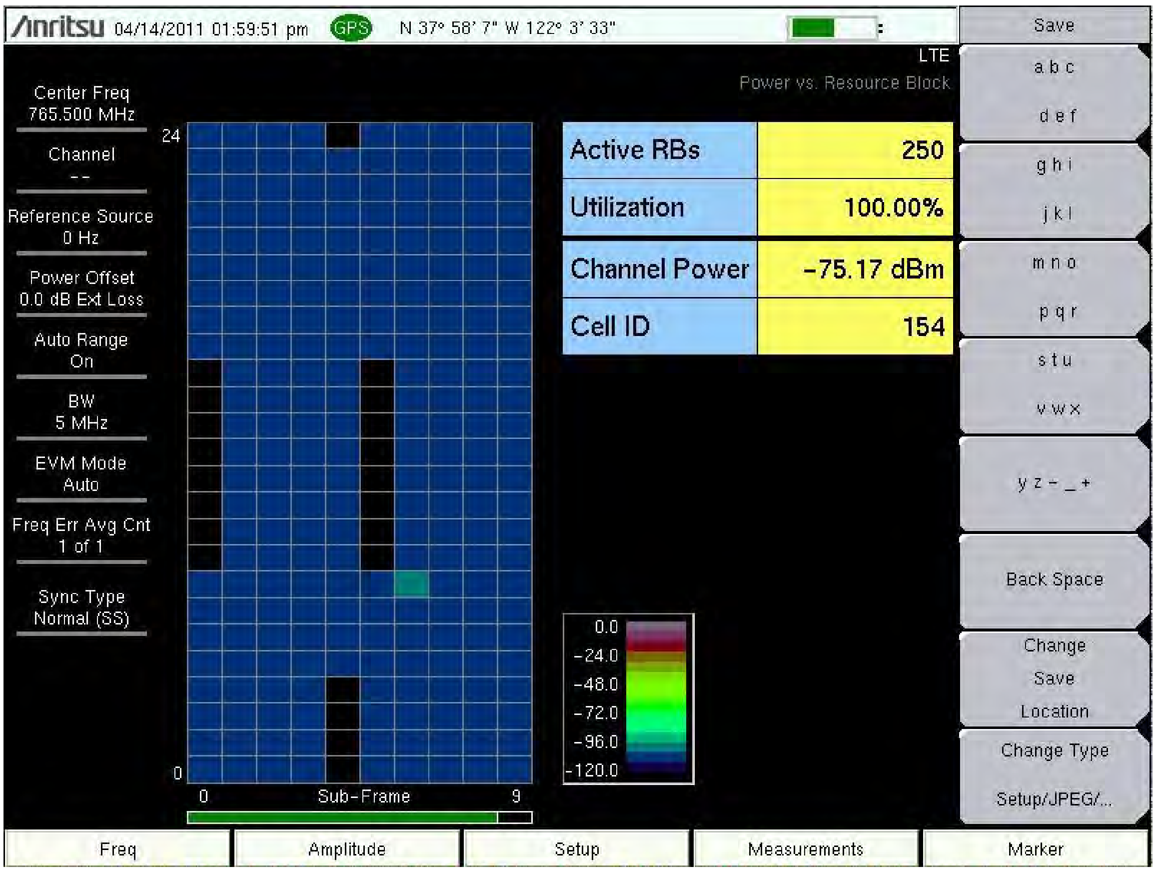


Diagram of LTE Resource Blocks

LTE assigns resource blocks to each user within a cell sector; in a 5 MHz by 5 MHz network the total number of resource blocks available is 520. Some of these blocks are reserved for signaling data (16 blocks) and network-to-device communications and are therefore not available for data communications.

The LTE carrier is made up of resource blocks. Some are reserved for signaling, but most of them are for data. Each user is assigned a number of resource blocks depending upon their priority on the system. The more data they are sending, the more resource blocks are required during their transmission. When sending a streaming video, the system allocates as many resource blocks as it can to that user.



Resource blocks in use during the network testing, courtesy of Anritsu America

Resource blocks that are not in use during these video transmissions are the signaling channel resource blocks that are used for the network and device to communicate with each other. In this particular case, 100% of the available resource blocks are being occupied with data. The signal level being reported is very good.

Besides streaming random data to and from the mobile units, we also streamed actual video using an MPEG4 codec. We recorded a VGA quality (640 x 480 pixels at about 15 frames per second) video while driving around the streets of Martinez near the test locations. This quality is typical of video cameras currently installed in police cars. The captured video enabled us to consistently stream a video with a known data rate of 1.91 Mbits per second.

At each of the test locations we simultaneously streamed videos to and from multiple mobile units while recording the received videos. Below is an image from the test video:

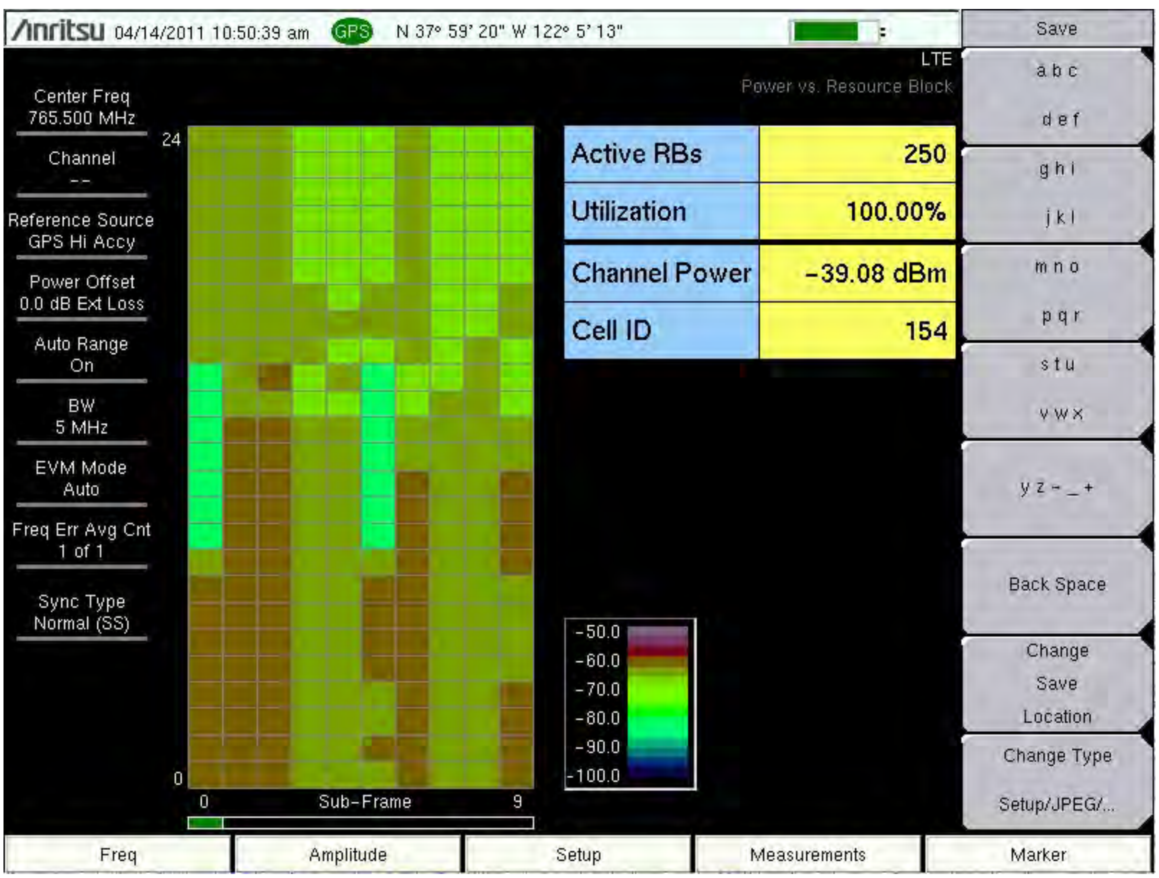
It became very obvious when there was insufficient bandwidth for a video to display, as the image quickly froze and broke up as shown below:

Actual video playbacks will be available in the PowerPoint presentation that will accompany this report and at www.andrewseybold.com.

The table below shows the number of simultaneous videos we were able to successfully stream to or from the cell site. Note that at the John Muir House location, which is at the edge of cell coverage, we were unable to stream a single video from the mobile unit to the cell site. This confirms the data measurements presented above, as we only measured an uplink bandwidth of 0.2 to 0.3 Mbits per second at that location, which is clearly below the 1.91 Mbits per second needed for the test video to successfully stream.

Test Site	Downlink Video Streams	Uplink Video Streams
Glacier Street (near cell)	5	3
Sunvalley Mall (mid cell)	3	2
John Muir House (cell edge)	2	0

More information on the data test results can be found in Appendix C. More information on the video test results can be found in Appendix D. We interpret the above numbers in the next section.



Anritsu Network Monitor showing very strong signal strength and 100% network utilization

What the Test Results Mean

Perhaps the best way to interpret the test results is to walk through two scenarios where first responders are reacting to an incident. We are not describing these incidents as they happen today, but as we project they will occur in the future when public safety LTE networks are widely deployed. The obvious change from today will be a significant increase in the use of live video feeds as a real-time information gathering tool for the first responders. The two scenarios are:

- "Barricaded Hostage": a gunman holds one or more hostages in a building
- "Suspected Bomb": a suspicious package turns out to be a bomb and must be deactivated

In each of these scenarios there will be a variety of data traffic both up to and down from the LTE network. Not every source will be active at all times. Data traffic will be transmitted from devices such as these in the field:

- Sniper scope (3.1 Mbits per second)
- Police car dashboard camera (1.9 Mbits per second)
- Helicopter-mounted camera (3.1 Mbits per second, typically via microwave link, not LTE network)
- Video feed from bomb / hazardous situation robot (3.1 Mbits per second)
- Additional handheld video feed (1.9 Mbits per second)
- Uploaded data from EMS response units (EKGs, scans, etc. at 0.1 Mbits per second)

Typically, all video feeds from the field are transmitted to the central dispatch center where the dispatcher relays one or more selected feeds to the police incident commander, the SWAT commander, and the fire chief. Therefore, in addition to the above traffic, the following data traffic will be transmitted down to devices in the field from the LTE network:

- Video feeds from any of the sources listed above, in either high resolution or converted down to a lower resolution
- Video feeds from existing wired street or highway cameras
- Video feeds from third-party cameras such as news helicopters
- Downloads of building plans, utility network plans, photographs, or other data

Beyond the above traffic related to the incident, there will be ongoing data traffic (both up and down) related to normal police activity in the same cell sector. An example of this would be a license check arising from a traffic stop.

What is important to this report is the estimated data traffic at the peak of the incident. Of course, in real life such incidents unfold over time. We are interested in projecting whether the LTE network can handle the maximum data load each scenario will generate.

Barricaded Hostage

A gunman holds one or more hostages in a building for a period of hours. The police respond with the following mobile units:

- 2 snipers
- 1 helicopter
- 1 police incident commander
- 1 SWAT commander
- 1 police car camera
- 2 police vehicles receiving video feed

At the peak of the incident, we have the following data being uploaded to the LTE network:

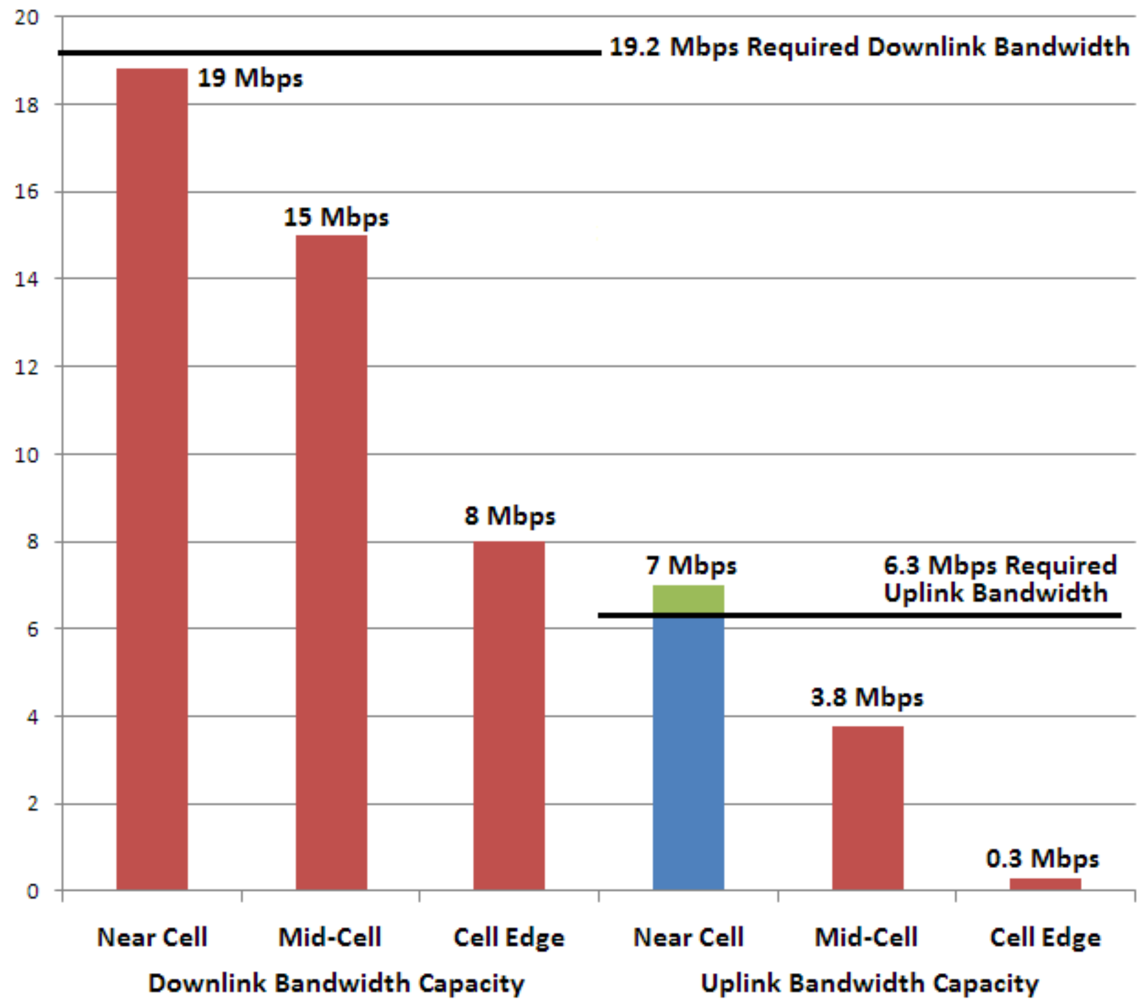
- Sniper 1 high-resolution streaming video: 3.1Mbits per second
- Sniper 2 low-resolution streaming video: 1.2 Mbits per second
- Police car camera streaming video: 1.9 Mbits per second
- “Background” ongoing police activity: 0.1 Mbits per second

This gives us a 6.3 Mbits per second uplink data stream to the LTE network and over the backhaul to the command center. We assume that the command center relays the sniper streams (one at high resolution and one at low resolution) and the helicopter stream to both the police and SWAT commanders, and the police car video stream to each of two close-in police vehicles. This means the following data are downloaded over the LTE network:

- Sniper 1 high-resolution streaming video to police commander: 3.1Mbits per second
- Sniper 1 high-resolution streaming video to SWAT commander: 3.1Mbits per second
- Sniper 2 low-resolution streaming video to police commander: 1.2Mbits per second
- Sniper 2 low-resolution streaming video to SWAT commander: 1.2Mbits per second
- Police car low-resolution streaming video to police vehicle1: 1.9Mbits per second
- Police car low-resolution streaming video to police vehicle2: 1.9Mbits per second
- Helicopter high-resolution streaming video to police commander: 3.1 Mbits per second
- Helicopter high-resolution streaming video to SWAT commander: 3.1 Mbits per second
- Download of floor plans: 0.5 Mbits per second
- “Background” ongoing police activity: 0.1 Mbits per second

This gives us a 19.2 Mbits per second downlink data stream from the command center over the backhaul and down the LTE network. The total backhaul load imposed by these streaming video feeds is 25.5 Mbits per second. Note that the downloads of floor plans or other data requests are probably only a few megabytes each and would only last 10 or 20 seconds.

The following diagram illustrates both the projected bandwidth required for the incident and the bandwidth that is available on a 10 MHz (5 MHz by 5 MHz) system. Where the available bandwidth is inadequate it is highlighted in red (below the line indicating required bandwidth):



Barricaded hostage scenario bandwidth as measured and required

It should be obvious that this scenario exceeds the capabilities of the network we tested in almost every situation.

Suspected Bomb

A suspicious package turns out to be a bomb and must be deactivated. The bomb squad uses a remote-controlled robot to open the package and deactivate the explosive device. Civilian cellular telephone service is turned off in the area to foil remote activation. The police respond with the following mobile units:

- 1 helicopter
- 1 police incident commander
- 1 bomb squad commander
- 1 bomb squad remote control camera
- 1 police car camera
- 1 police vehicle receiving video feed

At the peak of the incident, we have the following data being uploaded to the LTE network:

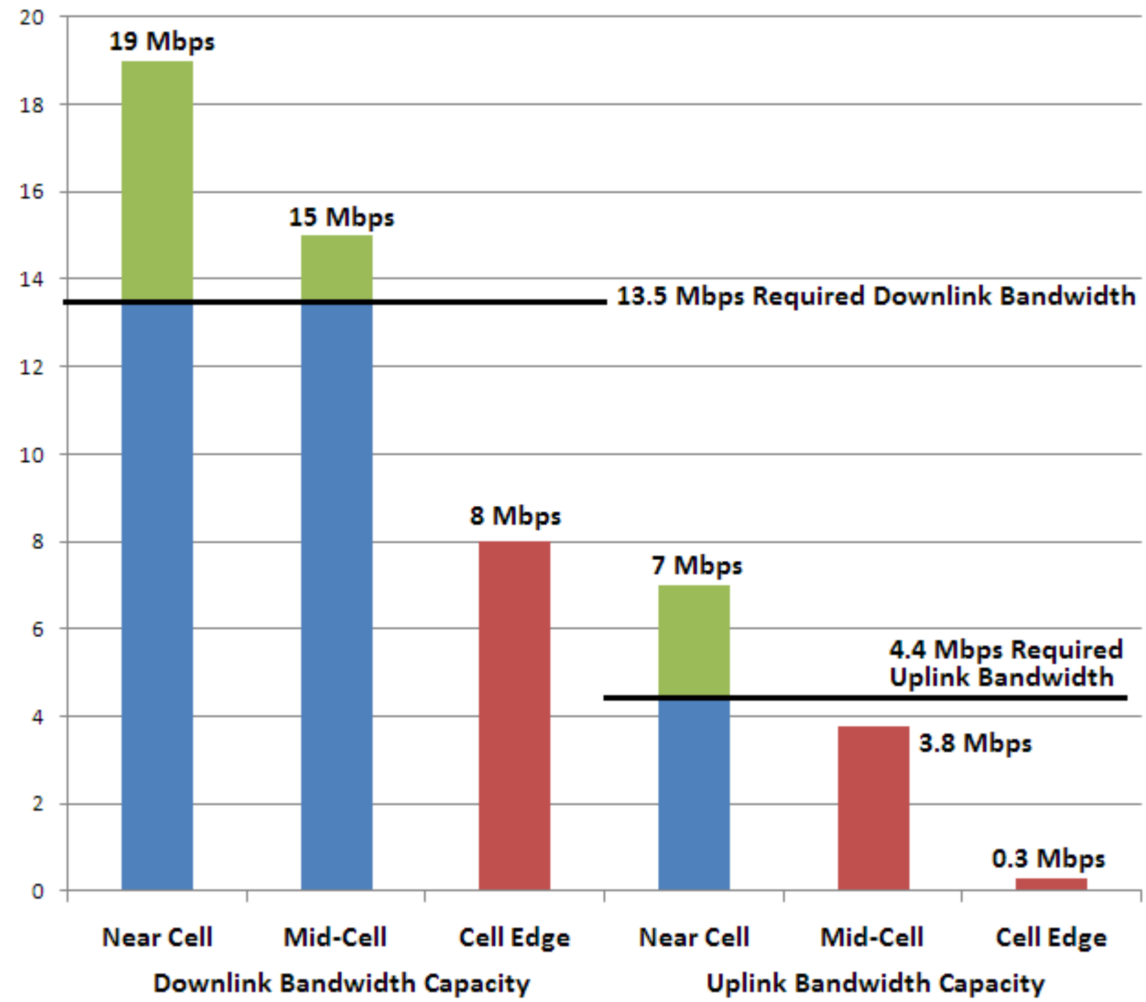
- Bomb squad remote control high-resolution streaming video: 3.1 Mbits per second
- Police car low-resolution streaming video: 1.2 Mbits per second
- “Background” ongoing police activity: 0.1 Mbits per second

This gives us a 4.4 Mbits per second uplink data stream to the LTE network and over the backhaul to the command center. We assume that the command center relays the helicopter stream, bomb squad remote control camera stream, and police vehicle stream to the bomb squad commander; the helicopter and squad car stream to the police commander; and the helicopter stream to a close-in police vehicle. This means the following data are downloaded over the LTE network:

- Helicopter high-resolution streaming video to police commander: 3.1 Mbits per second
- Helicopter high-resolution streaming video to bomb squad commander: 3.1 Mbits per second
- Bomb remote control camera high-resolution streaming video to bomb squad commander: 3.1 Mbits per second
- Police vehicle low-resolution streaming video: to police commander: 1.2 Mbits per second
- Police vehicle low-resolution streaming video: to bomb squad commander: 1.2 Mbits per second
- Helicopter high-resolution streaming video to police vehicle: 1.2 Mbits per second
- Download of utility plans of the neighborhood: 0.5 Mbits per second
- “Background” ongoing police activity: 0.1 Mbits per second

This gives us a 13.5 Mbits per second downlink data stream from the command center over the backhaul and down the LTE network. The total backhaul load imposed by these streaming video feeds is 17.9 Mbits per second. Note that the downloads of utility plans or other data requests are probably only a few megabytes each and would only last 10 or 20 seconds.

The following diagram illustrates both the projected bandwidth required for the incident and the bandwidth that is available on a 10 MHz (5 MHz by 5 MHz) system. Again, where the available bandwidth is inadequate it is highlighted in red (below the line indicating required bandwidth):



Suspected bomb scenario bandwidth as measured and required

It is clear that the test network can only support this scenario if it occurs very close to the cell site.

Public Safety Video and Data Requirements

The above scenarios do not account for any other types of applications that may be used or needed during these incidents but they clearly show that even under these conditions the 10 MHz of spectrum allocated to public safety is not sufficient to provide the video and data services that will be required during these types of incidents. These incidents are not events that happen once in a while within a given jurisdiction, these and other incidents that require multiple-unit response and the use of video and data for extended periods of time occur on a daily basis.

Note that the above scenarios do not include any voice service over LTE. If and when mission-critical voice does become available over LTE it will put additional stress on the broadband network, especially in confined areas, which is the case for most incidents. If we had added the bandwidth required for 30 push-to-talk devices into our testing scenarios, the amount of available bandwidth for video and data services would be reduced by 15-20% (based on current estimates within the LTE technology community). Thus the public safety network needs to have enough spectrum available to be able to provide the types of video and data services required as well as to be able to add mission-critical voice services if they become available.

Public demand for broadband services has grown more than 75% each year for the past three years, yet if you had asked prior to commercial broadband being available what the demand for wireless broadband services would be, the answer, three years ago, would not have anticipated this huge rate of growth due to the advancement of smartphones and tablets as well as the proliferation of applications. This same growth curve will apply to the public safety community as well. Until the network is built and placed into operation we can only identify the most obvious of applications and services. However, once the network is online, just as in the commercial world, public safety will find additional uses and applications for the broadband network that will not only drive up daily demand and usage but also drive up the amount of bandwidth that will be consumed during these types of incidents. Therefore, to limit the public safety community to 10 MHz of broadband spectrum will not meet its needs on a daily basis nor will it allow for new and innovative applications that can be used to better serve the pubic and protect the lives of first responders as well.

What Public Safety Can Count On in 10 MHz of Spectrum

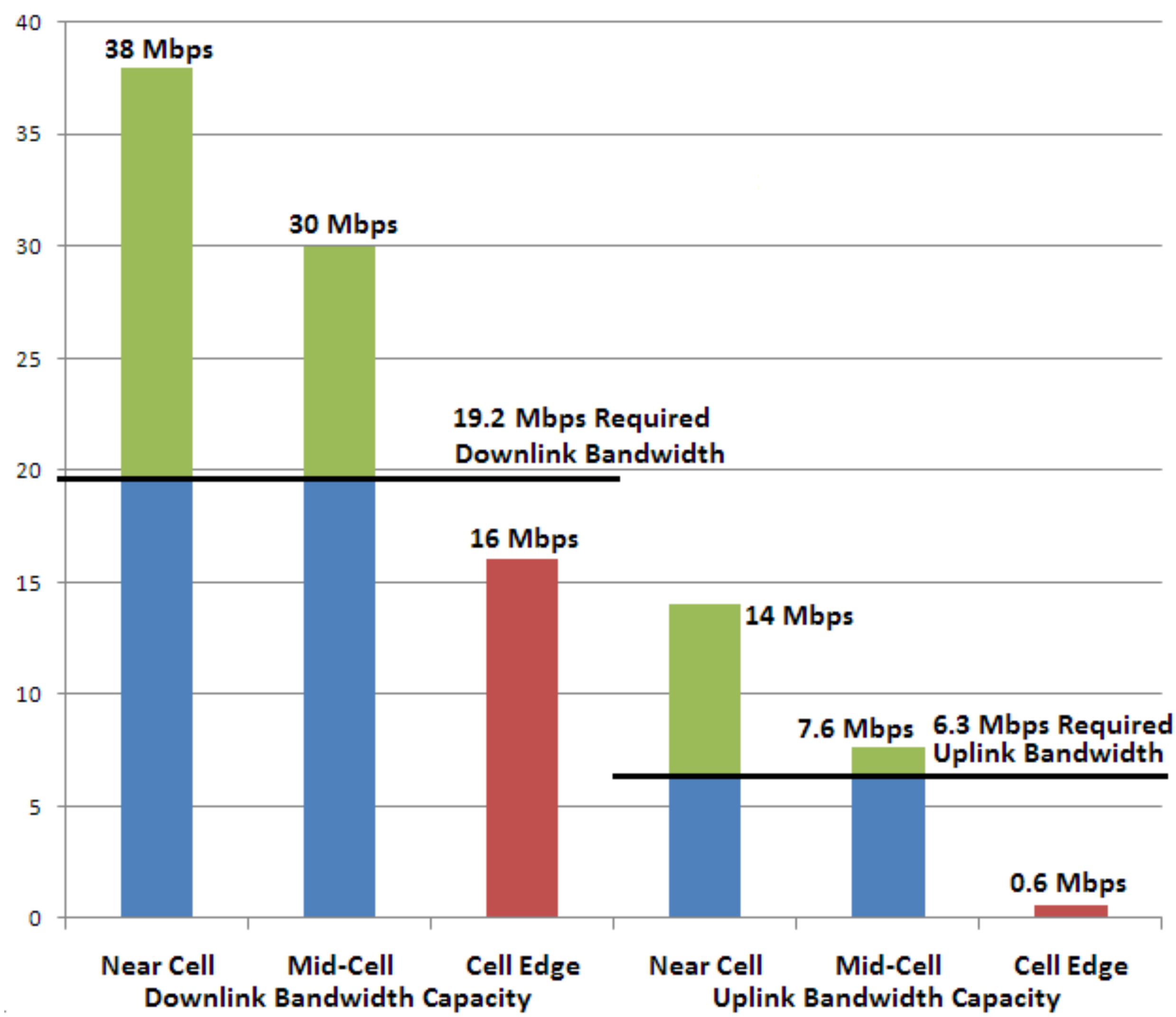
As described above, the tests were conducted with the minimum expected response to an incident. As incidents escalate, response levels will increase and the demand for data and video services will increase as well. As can be seen by the test results, additional demand would create network overload in every condition and at every location within a cell sector.

During a major incident, once an incident command center has been established it will be possible to interactively manage the demand for data and video, but the demand will outstrip the network's ability to meet that demand. Well before an incident command post is established at the scene, the demand for data services will be such that the network will quickly reach saturation and become non-functional. As we observed, when the network is overloaded, the impact of the overload was not only to block the subsequent video or data stream but also to cause the videos or data streams that had been usable to become unusable.

Public safety will be able to rely on a 10-MHz network during the initial phase of the incident and perhaps again once a command structure has been established. However, during the most critical portion of the response as more first responders arrive on the scene and when the agency's command center is in an information gathering mode, the system will reach saturation and not be able to provide the critical data needed to contain the incident. Incidents can and do grow rapidly in size and complexity, and it is crucial to those in the field as well as those within the command structure to have real-time video and data services available to them during the entire incident, not only at the beginning.

How Much Spectrum Is Required?

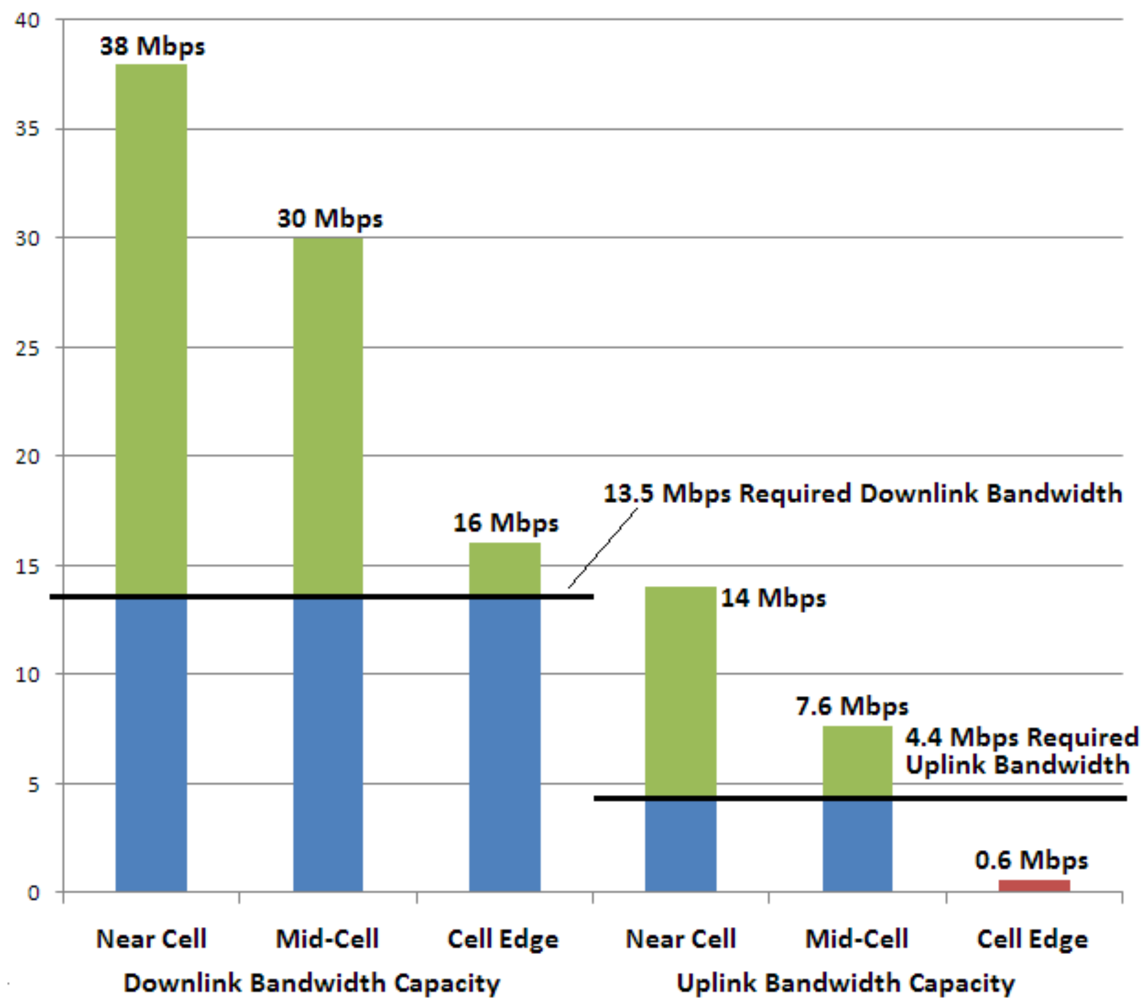
As described above, the tests demonstrate that 10 MHz of spectrum is inadequate to support the needs of the public safety community. The obvious question then is if 10 MHz is too little, how much is enough? While we do not have a 20-MHz network to test, we can project its performance. The following diagram illustrates how 20 MHz of contiguous spectrum would perform in the barricaded hostage scenario. Again, where the available bandwidth is inadequate it is highlighted in red (below the line indicating required bandwidth):



Barricaded hostage scenario bandwidth as projected and required

The projected 20 MHz (10 MHz by 10 MHz) network has sufficient capacity for this demanding scenario in all locations except at the very edge of the cell sector coverage. Edge of cell communications is an issue with both commercial and public safety networks. It will be critical for the network to be designed to minimize the edge of cell situations within a given coverage area. This can be accomplished with overlapping cell coverage but at the same time care must be taken to minimize the interference between overlapping cells. After the initial network completion it will be necessary to drive test the network to ensure that sufficient bandwidth is available, especially within major metro areas. Ensuring that there is sufficient bandwidth could add to the overall cost of this network.

The following diagram illustrates how 20 MHz of contiguous spectrum would perform in the suspected bomb scenario:



Suspected bomb scenario bandwidth as projected and required

The 20 MHz (10 MHz by 10 MHz) network has sufficient capacity for this demanding scenario in all locations except at the very edge of the cell sector coverage, and that for uplink only. Again, system design will be critical to ensure that edge of cell situations are minimized whenever possible.

Conclusions

We believe that the tests conducted using the Cornerstone network provide the first real-world results for a 10-MHz public safety broadband system. After vetting the incidents chosen prior to the testing and vetting the results of the testing with seasoned first responders and commanders, it is clear to us that 10 MHz of spectrum will not meet the daily incident requirements of the public safety community.

Some detractors might try to point out that some broadband is better than none. However, this is not the case since at the most crucial times network overload can and does result in the entire system not being available for use. During the recent earthquake on the east coast, the commercial networks were fully operational but they were overloaded. The result was not only that those who wanted to make a call or send video were denied access to the network, but many who had network connectivity lost that connectivity—a situation that is intolerable for public safety.

The public safety voice networks are built to meet harsh standards, and the broadband network must be designed and built to those same mission-critical standards. Not having enough capacity available for the network is not an acceptable option. Neither is expecting the commercial operators to provide priority access to the first responder community. Again, during the east coast earthquake not only were the networks overloaded, the signaling channel used by devices to communicate their requests for service was overloaded. In that circumstance, even if priority had been granted to public safety, the devices would not have been able to communicate that priority status with the network and would not have had access to the network.

Public safety needs a dedicated, nationwide broadband network. The network must be robust and it must have sufficient bandwidth available within a single cell sector. Our findings clearly show that 10 MHz of spectrum and the bandwidth it provides does not meet these criteria. More spectrum is needed and it must be contiguous to the existing public safety broadband spectrum, not in some other portion of the spectrum and not allocated after the public safety broadband network is in operation. To add spectrum that is not adjacent to the existing broadband spectrum would more than double the cost of the network and would increase the cost of the devices used on the network.

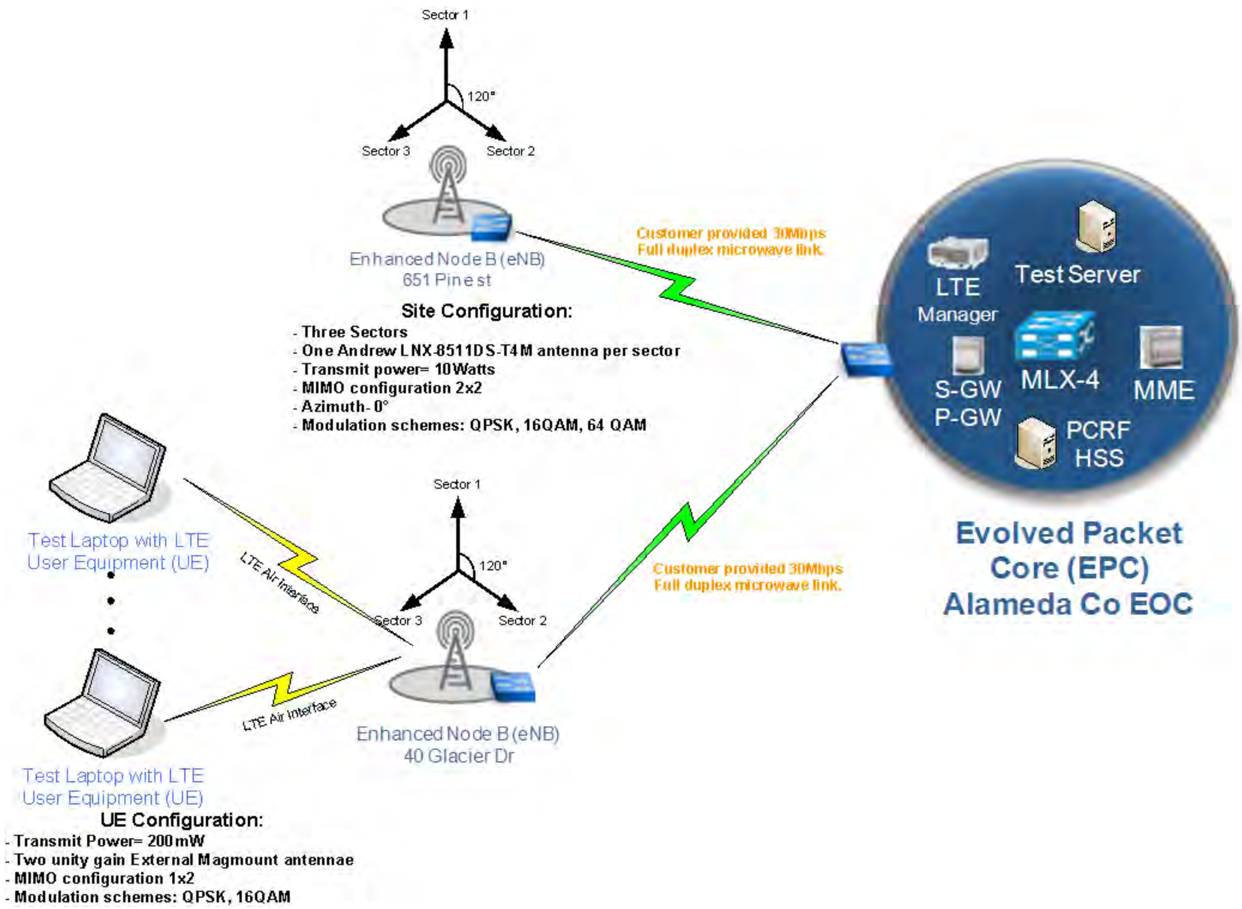
Based on these real-world tests, we strongly recommend that public safety be provided with at least 20 MHz of contiguous spectrum (10 MHz by 10 MHz). The only way to accomplish this is to reallocate the 700-MHz D Block to public safety and this should be done prior to the build-out of the waiver recipients' portion of the nationwide network. The cost to build out 10 MHz of spectrum and 20 MHz of spectrum is identical at the time of construction. Later, the addition of this spectrum would add to the cost of the network and require device redesign, adding to the cost of the user equipment. The entire premise of providing public safety with broadband spectrum using a commercial technology is to provide public safety personnel with capabilities they do not have presently at a lower cost than its existing voice communications equipment.

The public safety nationwide interoperable broadband network based on 10 MHz of spectrum that is currently available will not meet the needs of the public safety community. Rather it will, on a daily basis, end up congested at incident locations and fail to provide the public safety community with the bandwidth that is needed for data, pictures, and video. Most emergency incidents are confined to a small geographic area and, as noted above, our testing results conclude that the current bandwidth assigned to public safety is not sufficient even for incidents that occur on a daily basis.

If, in the future, mission-critical voice is added to this network, it will further degrade the amount of available bandwidth. The demand for voice, data, and video all within the same cell sector will swamp the network's capacity and even with Quality of Service and priority status enabled, the public safety community will not have enough bandwidth to provide the mission-critical level of service required. Public safety cannot afford to rely on a network that will not provide the amount of bandwidth it needs when it needs it. We therefore recommend that the additional 10 MHz of bandwidth that is adjacent to the public safety spectrum be reallocated to public safety in a timely manner.

Appendix A: Network Details

The network under test was configured in this manner:



Motorola, the network system supplier, stated that the network was configured with a 30-Mbps backhaul bandwidth:

- Not limited to eNodeB sector or user device
- Available on a first come, first served basis
- Full 30 Mbps can be assigned to a single user device

The bottom line is that the backhaul did not create a network chokepoint. Also, note that none of the tests transmitted data over the Internet.

The cell site power output and effective radiated power are as follows:

- Full power output of the system is 80 Watts (2 x 40 Watts max) and the corresponding ERP (with conservative estimates on line losses) is 56.9dBm

- FCC Experimental License limits to 59.4 Watts max ERP. To abide by this limitation, the power on the eNb has been turned down to 10 Watts total, which corresponds to about 59.4 Watts ERP.

To explain further:

Tx Power = 10W = 40 dBm
Antenna Gain = 14 dBi
Cable + Connectors Loss = 4 dB*
EIRP = 40 + 14 – 4 = 50 dBm
ERP = EIRP – 2.1dB = 47.9 dBm

This is almost right at the FCC Experimental License ERP limit of 59.4W = 10*log10(59.4x1000) = 47.7dBm.

At the Glacier Street site, pictured below, the LTE antennas (circled) are co-located on a tower hosting public cellular antennas as well as microwave antennas:

LTE Antenna location at the Glacier Street site

In downtown Martinez at 651 Pine Street the LTE antennas are located on top of the tallest building in the area:

LTE Antennas at 651 Pine Street

The network core and our test server were located at the Contra County Emergency Operations Center:

Microwave dishes at EOC network core and test server location

Appendix B: Testing Methodology

Test Locations

We tested at three different sites in the Martinez, California area. The Glacier Street site was adjacent to the LTE base station at the center of the cell sector; our test location was 0.1 miles from the base station. This gave us the best possible signal strength, and thus the maximum data throughput over the air. In other words, this was the “best case” network performance.

Below is a photograph of the Glacier Street site, showing the location of the cell tower and the test site:

The Sunvalley Mall is located in the center of the cell sector at the midpoint of the base station's coverage map, 2.23 miles from the tower. We characterize this site as giving us "typical" network performance.

Below is a photograph showing the cell tower in the upper left corner and the Sunvalley Mall test site in the lower right corner:

The final site is at the John Muir House National Monument, 2.35 miles from the tower. Even though this location is only slightly farther from the tower than the Sunvalley Mall site, intervening hills place it at the edge of the base station's coverage area. Therefore this site gives us a measure of "worst case" performance.

Below is a photograph showing the cell tower at the right and the test location at the left. The area in the center contains hills that block line of sight between the tower and the test location:

Test Procedures and Tools

At each site we streamed data from the network core to the client computers ("download" tests) and streamed data from the client computers to the core ("upload" tests). We also streamed test videos in each direction. For both data and video we streamed to a single client and simultaneously to multiple clients. Likewise, we performed upload tests to the server from both single and multiple clients.

We used seven client computers during the tests. Each was a Panasonic Toughbook CF-30 with a 1.6-GHZ Intel Core 2 Duo CPU and 2 GB of memory running Microsoft Windows XP with Service Pack 3. Attached to the client computers was a pre-production external USB LTE modem. At the network core we installed a server computer that was powered by a 2.66-GHZ Intel Core i5 processor and 4 GB of memory, running Windows 7 Professional 32-bit. Since the server was located at the network core, we never relied on an Internet connection for any of the data traffic.

Several different software packages were used to conduct the tests:

VLC media player, available at videolan.org, was used to stream and display the test videos. VLC is a free and open source cross-platform multimedia player and framework that plays most multimedia files as well as DVD, audio CD, VCD, and various streaming protocols.

Wireshark, available at wireshark.org, was used to measure the data traffic generated by streaming the test videos. Wireshark is the world's foremost network protocol analyzer. It captures and allows interactive browsing of traffic running on a computer network. It is the *de facto* (and often *de jure*) standard across many industries and educational institutions.

Iperf, available at sourceforge.net/projects/iperf, was used to stream and measure data traffic. Iperf was developed by NLANR/DAST as a modern alternative for measuring maximum TCP and UDP bandwidth performance. Iperf allows the tuning of various parameters and UDP characteristics and reports bandwidth, delay jitter, and datagram loss.

We ran two types of tests: data streaming and video streaming.

In the data streaming tests we used Iperf to stream random data via UDP, sending 1470-byte data packets. As explained above, UDP is the carrier protocol for streaming video, so streaming UDP packets is a valid stand-in for streaming video. As well as performing the streaming, Iperf generated comprehensive logs that enabled us to accurately characterize the end-to-end network performance.

We used a webcam to record a video while driving through Martinez, California. The video was recorded on one of the Panasonic Toughbooks with VGA resolution (640 by 480 pixels). Because of the limited processing power of the Toughbook, the recorded video was captured at about 15 to 20 frames per second and exhibited the occasional dropped frame on playback. Streaming the test video on a computer with a 2.3-GHz Intel Core i5 processor produces an outbound bit rate of 1.91 Mbits per second.

In the video streaming tests we used VLC to stream a test video to a particular client computer using the Real-time Transport Protocol (RTP), which defines a standardized packet format for delivering audio and video over IP networks. RTP is used extensively in communication and entertainment systems that involve streaming media and it is designed for end-to-end, real-time transfer of streaming data. The protocol provides facility for jitter compensation and detection of out of sequence arrival in data that are common during transmissions on an IP network. RTP is regarded as the primary standard for audio/video transport in IP networks.

Real-time multimedia streaming applications require timely delivery of information and can tolerate some packet loss to achieve this goal. Thus the majority of the RTP implementations are built on the User Datagram Protocol (UDP) rather than on the Transmission Control Protocol (TCP), commonly used for email, file transfer, and web browsing. However, too many lost packets result in dropped video frames, lost pixels, and image freezing.

Appendix C: Data Test Results

The following tables present the raw data from the field tests. The columns display the following information:

Mbits/sec	is the rate at which data was received by the target computer (client computer on downloads, server computer on uploads) measured in megabytes (not megabits) per second of data delivered.
Jitter	is the average of the deviation from the network mean packet latency across the network, measured in milliseconds.
Lost Data	is the percentage of sent data that was not received by the target computer.
Antenna	indicates whether the field computer's LTE modem is connected to an external antenna or is relying on an antenna internal to the modem. During the tests we found the modems with external antennas to perform significantly better than those with internal antennas.
Test	summarizes the particular test for which the results are displayed. If the test mentions more than one client, it means that data was being sent to or received from multiple computers at the same time.

Glacier Street (near cell) Downlink Tests

The first test set below demonstrates the maximum capacity of the network at the "best case" location. We streamed data to a mobile unit at a rate of 50 Mbits per second, well above the network capacity. As expected, only a fraction of the packets were received. We repeated the test twice more at a lower rate of 20 Mbits per second, for an average capacity of slightly less than 16 Mbits per second.

The next two test sets demonstrate that at 10 Mbits per second the network is highly reliable with very few lost packets, and at 5 Mbits per second no packets are lost.

Following that, the next two tests show the limits of the network: Streaming to three mobile units at 5 Mbits per second shows that more than 25% of the data packets are lost. The final test shows that performance will vary, as we were able to stream data to four mobile clients at 5 Mbits per second with negligible packet loss.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
15.40	2.77	69%	External	Download at 50 Mbits/sec to 1 client
14.60	1.78	3%	External	Download at 20 Mbits/sec to 1 client
17.00	1.86	15%	External	Download at 20 Mbits/sec to 1 client
15.67	1.82	9%	External	Average Mbits/sec
9.97	1.39	0%	External	Download at 10 Mbits/sec to 1 client
9.83	2.32	2%	External	Download at 10 Mbits/sec to 1 client
9.90	1.85	1%	External	Average Mbits/sec
5.00	2.03	0%	External	Download at 5 Mbits/sec to 1 client
4.99	1.99	0%	Internal	Download at 5 Mbits/sec to 2 clients
4.99	3.96	0%	External	
9.98				Total Mbits/sec
3.56	9.73	28%	External	Download at 5 Mbits/sec to 3 clients
4.49	1.61	10%	External	
4.82	3.90	4%	Internal	
12.87				Total Mbits/sec
7.73	2.37	23%	External	Download at 10 Mbits/sec to 2 clients
7.12	2.43	29%	Internal	
14.85				Total Mbits/sec
4.82	5.34	2%	Internal	Download at 5 Mbits/sec to 4 clients
4.69	3.68	2%	External	
4.74	3.79	1%	External	
4.74	2.13	1%	Internal	
18.99				Total Mbits/sec

Eleven attempts were made to simultaneously download data at 5 Mbits/sec to four clients. Unfortunately, only one of these tests completed (and as noted above, with almost no dropped packets). During the other ten tries one or more of the modems dropped the network connection.

Glacier Street (near cell) Uplink Tests

In the first test set below we streamed data to from a mobile unit at a rate of 100 Mbits per second, well above the network capacity. As expected, only a fraction of the packets were received. The average capacity of the network was somewhat less than 6 Mbits per second.

The second test set shows that at an upload rate of 5 Mbits per second the network is highly reliable with no lost packets.

The next two test sets demonstrate the difference between a modem with an internal antenna and one connected to an external antennal. The mobile units with external antennas were able to stream data to the server at a higher data rate, with fewer lost packets.

The final two tests show the limits of the network: Streaming from multiple mobile units at 5 Mbits per second each resulted in significant packet loss.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
6.25	8.52	90%	External	Upload at 100 Mbits/sec from 1 client
5.44	3.68	92%	External	Upload at 100 Mbits/sec from 1 client
5.85	6.10	91%	External	Average Mbits/sec
5.00	4.31	0%	External	Upload at 5 Mbits/sec from 1 client
4.99	3.72	0%	External	Upload at 5 Mbits/sec from 1 client
5.00	4.01	0%	External	Average Mbits/sec
5.75	3.57	42%	External	Upload at 10 Mbits/sec from 1 client
5.70	5.92	43%	External	Upload at 10 Mbits/sec from 1 client
5.49	3.82	8%	External	Upload at 10 Mbits/sec from 1 client
5.65	4.44	31%	External	Average Mbits/sec
2.20	6.07	78%	Internal	Upload at 10 Mbits/sec from 1 client
4.40	7.62	56%	Internal	Upload at 10 Mbits/sec from 1 client
4.21	5.16	58%	Internal	Upload at 10 Mbits/sec from 1 client
4.35	3.37	27%	Internal	Upload at 10 Mbits/sec from 1 client
3.79	5.55	55%	Internal	Average Mbits/sec
2.98	9.02	40%	External	Upload at 5 Mbits/sec from 2 clients
3.57	4.17	29%	External	
6.55				Total Mbits/sec
2.12	11.13	57%	External	Upload at 5 Mbits/sec from 3 clients
2.52	5.54	49%	External	
2.44	4.67	51%	External	
7.08				Total Mbits/sec

As with the download tests reported above, we were unable to upload data from more than three clients simultaneously since none of these tests completed. One or more of the modems dropped the network connection.

Glacier Street (near cell) Simultaneous Downlink / Uplink Tests

These tests confirm what we observed in the separate download and upload tests above. Since the downlink and uplink operate on different frequencies, they are independent of each other, and that is what we measured. Also, these tests show the lower performance of the modems with internal antennas.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
5.00	1.60	0%	External	Download at 5 Mbits/sec to 2 clients, upload at 5 Mbits/sec from 2 clients
4.97	2.98	1%	External	
9.97				Total Download Mbits/sec
1.00	5.95	0%	Internal	
2.87	8.04	42%	Internal	
3.87				Total upload Mbits/sec
4.99	3.21	0%	External	Download at 5 Mbits/sec to 3 clients, upload at 5 Mbits/sec from 2 clients
4.97	2.98	1%	External	
4.99	3.15	0%	External	
14.95				Total Download Mbits/sec
1.00	8.86	0%	Internal	
1.94	5.53	61%	Internal	
2.94				Total upload Mbits/sec

Beyond these tests, five attempts were made to simultaneously download data to four clients while uploading from two others. Unfortunately, none of these tests completed. One or more of the modems dropped the network connection.

Sunvalley Mall (mid cell) Downlink Tests

The first test set below demonstrates the maximum capacity of the network at the "typical case" location. We streamed data to a mobile unit at data rates ranging from 20 Mbits per second, well above the network capacity, down to 10 Mbits per second. The average capacity measured was slightly less than 11 Mbits per second. Note that at a streaming rate of 10 Mbits per second, only 1% of the data packets were lost.

The next two test sets demonstrate the difference between a modem with an internal antenna and one connected to an external antennal. The mobile units with external antennas were able to receive data from the server at a higher data rate, with fewer lost packets.

The final two test sets demonstrate that at 5 Mbits per second the network is highly reliable and able to stream to three clients simultaneously with few if any lost packets.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
11.10	2.23	44%	External	Download at 20 Mbits/sec to 1 client
11.10	2.20	26%	External	Download at 15 Mbits/sec to 1 client
9.76	2.03	35%	External	Download at 15 Mbits/sec to 1 client
11.10	2.30	21%	External	Download at 14 Mbits/sec to 1 client
12.50	5.04	4%	External	Download at 13 Mbits/sec to 1 client
11.30	1.57	6%	External	Download at 12 Mbits/sec to 1 client
9.89	0.70	1%	External	Download at 10 Mbits/sec to 1 client
10.96				Average Mbits/sec
4.60	4.29	7%	Internal	Download at 5 Mbits/sec to 1 client
4.96	4.88	1%	External	Download at 5 Mbits/sec to 2 clients
2.45	5.16	51%	Internal	
7.41				Total download Mbits/sec
4.97	2.50	1%	External	Download at 5 Mbits/sec to 2 clients
4.98	0.55	0%	External	
9.95				Total download Mbits/sec
4.97	4.44	1%	External	Download at 5 Mbits/sec to 3 clients
4.97	4.62	1%	External	
4.98	0.83	0%	External	
14.92				Total download Mbits/sec

Two attempts were made to simultaneously download data at 5 Mbits/sec to four clients. Unfortunately, none of these tests completed. One or more of the modems dropped the network connection.

Sunvalley Mall (mid cell) Uplink Tests

In these tests we streamed data from one and then two mobile units at a rate of 5 Mbits per second, which turned out to be well above the network capacity. Thus only a fraction of the packets were received. The measured capacity of the network was slightly more than 2 Mbits per second.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
0.85	27.76	83%	External	Upload at 5 Mbits/sec from 1 client
0.75	36.15	85%	External	Upload at 5 Mbits/sec from 2 clients
1.36	8.22	72%	External	
2.11				Total upload Mbits/sec

Three additional attempts were made to stream data to the host, but the modems disconnected before the tests could be completed.

Sunvalley Mall (mid cell) Simultaneous Downlink / Uplink Tests

These tests confirm what we observed in the separate download and upload tests above. We were able to stream from the server to the mobile units at a total rate of almost 10 Mbits per second while simultaneously uploading at 1 Mbit per second.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
4.98	5.18	5%	External	Download at 5 Mbits/sec to 2 clients, upload at 5 Mbits/sec from 1 client
4.98	0.00	2%	External	
9.96				Total download Mbits/sec
1.02	21.11	79%	External	Total upload Mbits/sec

John Muir House (cell edge) Download Tests

Because this location is at the edge of the LTE cell coverage, the modems with internal antennas were unable to make a connection to the network, thus we were unable to run all of the planned tests.

The first two test sets below demonstrate the maximum capacity of the network at the “worst case” location. We streamed data to a mobile unit at data rates ranging from 15 Mbits per second, well above the network capacity, down to 10 Mbits per second. The average capacity measured was slightly less than 11 Mbits per second. Note that at a streaming rate of 5 Mbits per second, only 4% of the data packets were lost.

The last two test sets demonstrate that the network cannot support streaming to more than one mobile client at 5 Mbits per second without suffering significant data packet loss.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
6.08	3.19	59%	External	Download at 15 Mbits/sec to 1 client
6.05	3.21	49%	External	Download at 12 Mbits/sec to 1 client
5.99	3.53	40%	External	Download at 10 Mbits/sec to 1 client
6.04				Average Mbits/sec
4.88	3.59	4%	External	Download at 5 Mbits/sec to 1 client
3.26	6.79	35%	External	Download at 5 Mbits/sec to 2 clients
4.32	0.58	14%	External	
7.58				Total download Mbits/sec
2.13	4.22	57%	External	Download at 5 Mbits/sec to 3 clients
2.84	7.66	43%	External	
3.14	3.44	37%	External	
8.11				Total download Mbits/sec

Two attempts were made to simultaneously download data at 5 Mbits/sec to four clients. Unfortunately, none of these tests completed. One or more of the modems dropped the network connection.

John Muir House (cell edge) Upload Tests

In these tests we streamed data from a mobile unit at a rate of 10 and then 5 Mbits per second, which turned out to be well above the network capacity, thus only a fraction of the packets were received. The measured capacity of the network was slightly more than 0.2 Mbits per second.

Mbits/sec	Jitter (ms)	Lost Data	Antenna	Test
0.19	67.35	98%	External	Upload at 10 Mbits/sec from 1 client
0.19	70.20	96%	External	Upload at 5 Mbits/sec from 1 client
0.27	47.86	95%	External	Upload at 5 Mbits/sec from 1 client
0.22				Average Mbits/sec

Appendix D: Video Test Results

The following tables present the raw data from the field tests. The columns display the following information:

Mbits/sec	is the rate at which data was received by the target computer (client computer on downloads, server computer on uploads) measured in megabytes (not megabits) per second of data delivered.
Jitter	is the average of the deviation from the network mean packet latency across the network measured in milliseconds.
Lost Data	is the percentage of sent data that was not received by the target computer.
Antenna	indicates whether the field computer's LTE modem is connected to an external antenna or is relying on an antenna internal to the modem. During the tests we found the modems with external antennas to perform significantly better than those with internal antennas.
Test	summarizes the particular test for which the results are displayed. If the test mentions more than one client, it means that data was being sent to or received from multiple computers at the same time.

Note that some of the tests do not have the data rates recorded due to a software failure on the mobile units.

Downlink Tests

In these tests we streamed our test video to one or more mobile units. We recorded the received video image and later checked it for quality. When the received video is labeled "good quality" it means a reasonable image is displayed, although some dropped frames are noticeable.

Location	Mbits/sec	Lost Data	Antenna	Test
Glacier Street	1.86	3%	External	Stream to client – good quality
	5.73			Stream to 3 clients – good quality
	7.64			Stream to 4 clients – good quality
	9.55			Stream to 5 clients – good quality
				Stream to 6 clients – modems disconnect
Sunvalley Mall	5.73			Stream to 3 clients – good quality
				Stream to 4 clients – modems disconnect
John Muir House	1.76	8%	External	Stream to client – good quality
John Muir House	1.60	16%	External	Stream to 2 clients – good quality
	1.42	26%	External	
	3.02		External	Total Mbits/sec
John Muir House	1.71	10%	External	Stream to 3 clients – good quality
	1.28	33%	External	
	1.81	5%	External	
	4.80			Total Mbits/sec
John Muir House				Stream to 4 clients – modems disconnect

Uplink Tests

In these tests we streamed our test video from one or more mobile units to the server. We recorded the received video image and later checked it for quality. When the received video is labeled "good quality" it means a reasonable image is displayed, although some dropped frames are noticeable.

Location	Mbits/sec	Lost Data	Antenna	Test
Glacier Street	1.67	13%	External	Stream from client – good quality
Sunvalley Mall	0.93	51%	External	Stream from client – image breakup
	3.82			Stream from 2 clients – good quality
				Stream from 3 clients – image breakup

Several attempts were made to stream more than one video simultaneously to the server at the Glacier Street test location, but none were successful. We were unable to successfully stream any videos from the mobile units to the server at the "worst case" John Muir House test site. The available network bandwidth was inadequate.

Appendix E: Anritsu Test Data

The following are images taken off the screen of the Anritsu LTE broadband test sets used during the tests. Each of these represents a snapshot in time and each includes a total of 520 Resource Blocks, 16 of which are used for signaling between the network and the device, leaving a total of 504 resource blocks allocated for data transfer.

The downlink and uplink each contain the same number of resource blocks; these screen shots are for the downlink only. The color of the resource block indicates the signal strength of the received signal. The lower numbers (i.e., closer to -0) indicate a stronger signal. As the signal weakens the numbers will move lower, i.e., -50, -89, etc. See the color grid within each screen shot to indicate the signal strength for each resource block. Black indicates that that resource block is empty and therefore available.

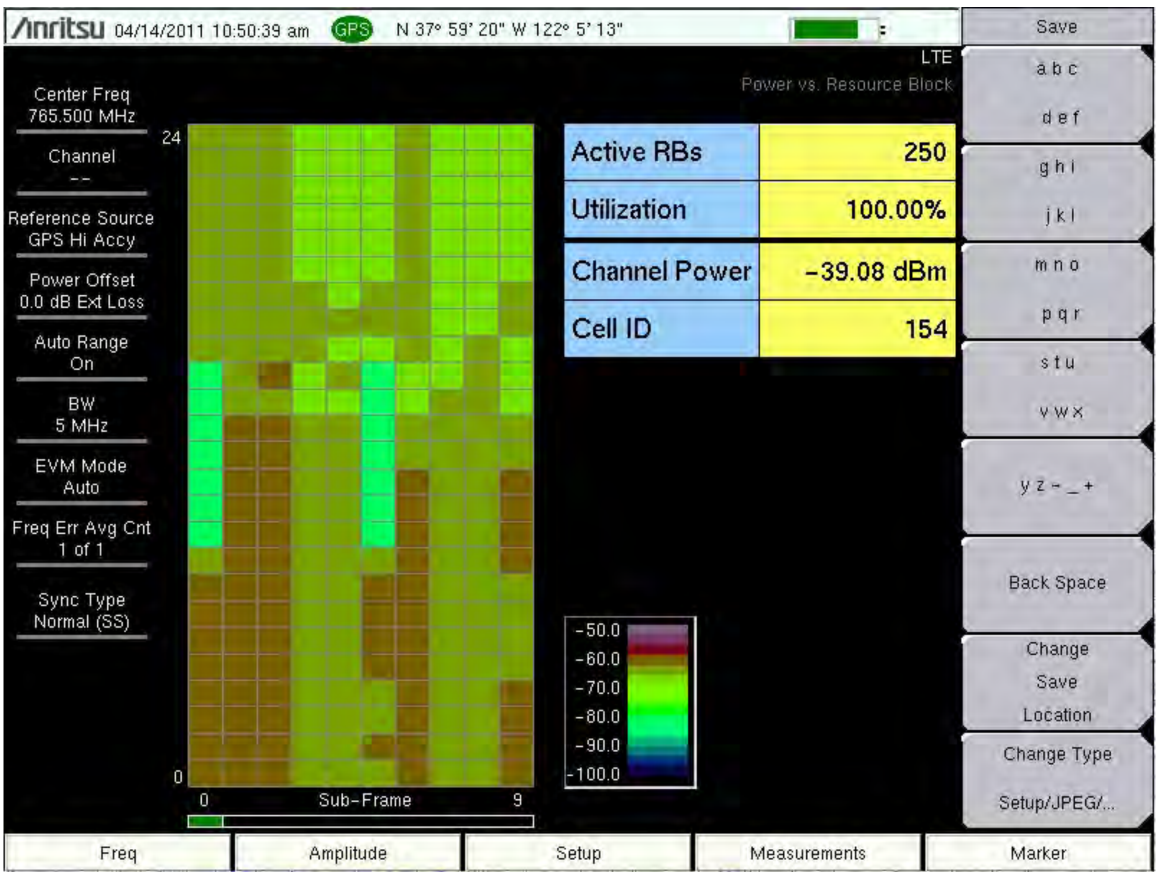


Diagram 1: Closest to the cell center, very strong signal, network is operating at 100% of its capacity

Notice in this diagram that the 16 signaling channel resource blocks as well as a few others in this frame are not in use.

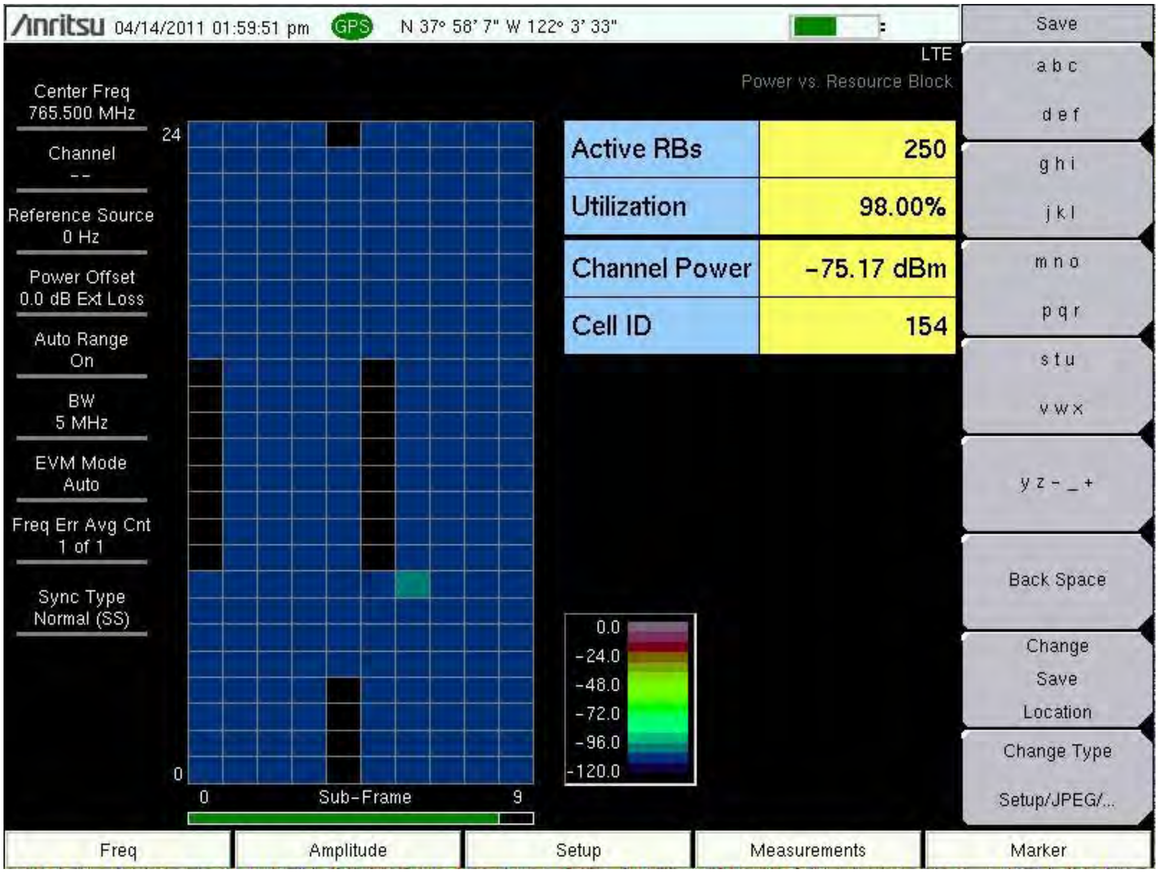


Diagram 2: Middle of cell coverage, signal level weaker, 98% network utilization

In the next diagram, notice that signal strength is much weaker and unevenly distributed within the resource block.

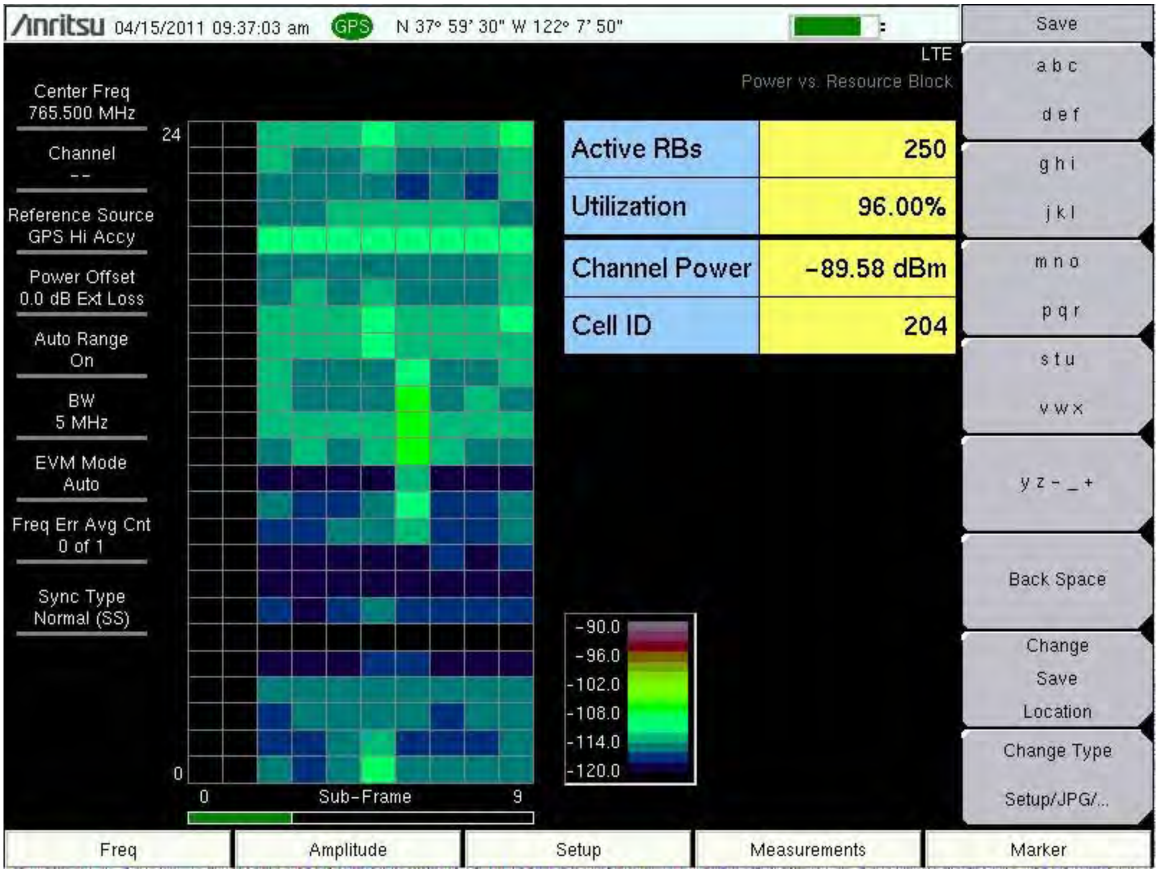


Diagram 3: Edge of cell, 96% system utilization

Appendix F: Test Logs

In this section we list a sample Iperf report from each of the three test sites.

Glacier Street (near cell)

This log documents the server sending data to a single client at the rate of 20 megabits per second:

```
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 8.00 KByte (default)
------------------------------------------------------------
[1908] local 10.170.2.224 port 5001 connected with 10.171.96.6 port 51051
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 0.0- 1.0 sec 1.15 MBytes 9.68 Mbits/sec 1.740 ms 1313429363/ 846 (1.6e+008%)
[1908] 1.0- 2.0 sec 1.17 MBytes 9.85 Mbits/sec 0.920 ms  3/ 841 (0.36%)
[1908] 2.0- 3.0 sec 1.19 MBytes 9.96 Mbits/sec 1.689 ms  11/ 858 (1.3%)
[1908] 3.0- 4.0 sec 1.16 MBytes 9.76 Mbits/sec 1.826 ms  13/ 843 (1.5%)
[1908] 4.0- 5.0 sec 1.16 MBytes 9.73 Mbits/sec 2.240 ms  19/ 846 (2.2%)
[1908] 5.0- 6.0 sec 1.19 MBytes 9.97 Mbits/sec 1.699 ms  15/ 863 (1.7%)
[1908] 6.0- 7.0 sec 1.19 MBytes 9.95 Mbits/sec 1.616 ms  5/ 851 (0.59%)
[1908] 7.0- 8.0 sec 1.18 MBytes 9.87 Mbits/sec 1.801 ms  2/ 841 (0.24%)
[1908] 8.0- 9.0 sec 1.19 MBytes 9.98 Mbits/sec 1.082 ms  9/ 858 (1%)
[1908] 9.0-10.0 sec 1.16 MBytes 9.73 Mbits/sec 1.552 ms  23/ 850 (2.7%)
[1908] 10.0-11.0 sec 1.18 MBytes 9.91 Mbits/sec 1.395 ms  2/ 845 (0.24%)
[1908] 11.0-12.0 sec 1.14 MBytes 9.57 Mbits/sec 1.914 ms  34/ 848 (4%)
[1908] 12.0-13.0 sec 1.18 MBytes 9.94 Mbits/sec 0.747 ms  6/ 851 (0.71%)
[1908] 13.0-14.0 sec 1.16 MBytes 9.76 Mbits/sec 0.918 ms  20/ 850 (2.4%)
[1908] 14.0-15.0 sec 1.17 MBytes 9.85 Mbits/sec 2.511 ms  15/ 853 (1.8%)
[1908] 15.0-16.0 sec 1.19 MBytes 9.95 Mbits/sec 1.104 ms  11/ 857 (1.3%)
[1908] 16.0-17.0 sec 1.15 MBytes 9.67 Mbits/sec 2.070 ms  19/ 841 (2.3%)
[1908] 17.0-18.0 sec 1.17 MBytes 9.80 Mbits/sec 1.721 ms  25/ 858 (2.9%)
[1908] 18.0-19.0 sec 1.19 MBytes 9.98 Mbits/sec 1.818 ms  1/ 850 (0.12%)
[1908] 19.0-20.0 sec 1.16 MBytes 9.77 Mbits/sec 1.708 ms  19/ 850 (2.2%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 20.0-21.0 sec 1.18 MBytes 9.90 Mbits/sec 2.894 ms  2/ 844 (0.24%)
[1908] 21.0-22.0 sec 1.18 MBytes 9.89 Mbits/sec 1.631 ms  17/ 858 (2%)
[1908] 22.0-23.0 sec 1.16 MBytes 9.76 Mbits/sec 1.943 ms  12/ 842 (1.4%)
[1908] 23.0-24.0 sec 1.18 MBytes 9.93 Mbits/sec 1.828 ms  6/ 850 (0.71%)
[1908] 24.0-25.0 sec 1.17 MBytes 9.81 Mbits/sec 0.764 ms  17/ 851 (2%)
[1908] 25.0-26.0 sec 1.19 MBytes 9.98 Mbits/sec 1.861 ms  8/ 857 (0.93%)
[1908] 26.0-27.0 sec 1.16 MBytes 9.73 Mbits/sec 1.721 ms  16/ 843 (1.9%)
[1908] 27.0-28.0 sec 1.17 MBytes 9.82 Mbits/sec 1.550 ms  24/ 859 (2.8%)
[1908] 28.0-29.0 sec 1.17 MBytes 9.85 Mbits/sec 1.964 ms  4/ 842 (0.48%)
[1908] 29.0-30.0 sec 1.17 MBytes 9.85 Mbits/sec 1.992 ms  12/ 850 (1.4%)
[1908] 30.0-31.0 sec 1.16 MBytes 9.71 Mbits/sec 1.840 ms  25/ 851 (2.9%)
[1908] 31.0-32.0 sec 1.20 MBytes 10.0 Mbits/sec 1.758 ms  4/ 857 (0.47%)
[1908] 32.0-33.0 sec 1.16 MBytes 9.70 Mbits/sec 1.639 ms  27/ 852 (3.2%)
[1908] 33.0-34.0 sec 1.18 MBytes 9.89 Mbits/sec 2.303 ms  11/ 852 (1.3%)
[1908] 34.0-35.0 sec 1.17 MBytes 9.85 Mbits/sec 0.480 ms  10/ 848 (1.2%)
[1908] 35.0-36.0 sec 1.12 MBytes 9.37 Mbits/sec 2.190 ms  38/ 835 (4.6%)
[1908] 36.0-37.0 sec 1.21 MBytes 10.1 Mbits/sec 0.746 ms  2/ 865 (0.23%)
[1908] 37.0-38.0 sec 1.06 MBytes 8.87 Mbits/sec 1.159 ms  11/ 765 (1.4%)
[1908] 38.0-39.0 sec 1.27 MBytes 10.6 Mbits/sec 0.842 ms  27/ 931 (2.9%)
[1908] 39.0-40.0 sec 1.19 MBytes 10.0 Mbits/sec 2.164 ms  8/ 859 (0.93%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 40.0-41.0 sec 1.19 MBytes 10.0 Mbits/sec 1.674 ms  5/ 855 (0.58%)
[1908] 41.0-42.0 sec 1.04 MBytes 8.75 Mbits/sec 2.121 ms  15/ 759 (2%)
[1908] 42.0-43.0 sec 1.30 MBytes 10.9 Mbits/sec 1.849 ms  15/ 940 (1.6%)
[1908] 43.0-44.0 sec 1.17 MBytes 9.78 Mbits/sec 1.658 ms  12/ 844 (1.4%)
[1908] 44.0-45.0 sec 1.16 MBytes 9.73 Mbits/sec 0.780 ms  23/ 850 (2.7%)
[1908] 45.0-46.0 sec 1.17 MBytes 9.84 Mbits/sec 1.998 ms  13/ 850 (1.5%)
[1908] 46.0-47.0 sec 1.18 MBytes 9.87 Mbits/sec 1.709 ms  20/ 859 (2.3%)
[1908] 47.0-48.0 sec 1.18 MBytes 9.90 Mbits/sec 1.903 ms  0/ 842 (0%)
[1908] 48.0-49.0 sec 1.18 MBytes 9.93 Mbits/sec 1.780 ms  14/ 858 (1.6%)
[1908] 49.0-50.0 sec 1.16 MBytes 9.69 Mbits/sec 1.668 ms  19/ 843 (2.3%)
[1908] 50.0-51.0 sec 1.17 MBytes 9.85 Mbits/sec 1.832 ms  12/ 850 (1.4%)
[1908] 51.0-52.0 sec 1.17 MBytes 9.78 Mbits/sec 1.773 ms  26/ 858 (3%)
[1908] 52.0-53.0 sec 1.15 MBytes 9.62 Mbits/sec 1.670 ms  25/ 843 (3%)
[1908] 53.0-54.0 sec 1.20 MBytes 10.1 Mbits/sec 2.312 ms  9/ 868 (1%)
[1908] 54.0-55.0 sec 1.16 MBytes 9.71 Mbits/sec 1.863 ms  21/ 847 (2.5%)
[1908] 55.0-56.0 sec 1.15 MBytes 9.61 Mbits/sec 2.370 ms  36/ 853 (4.2%)
[1908] 56.0-57.0 sec 1.18 MBytes 9.88 Mbits/sec 1.775 ms  16/ 856 (1.9%)
```

```
[1908] 57.0-58.0 sec 1.17 MBytes 9.78 Mbits/sec 1.681 ms  10/ 842 (1.2%)
[1908] 58.0-59.0 sec 1.12 MBytes 9.41 Mbits/sec 1.228 ms  50/ 850 (5.9%)
[1908] 59.0-60.0 sec 1.18 MBytes 9.91 Mbits/sec 1.521 ms  14/ 857 (1.6%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 60.0-61.0 sec 1.18 MBytes 9.90 Mbits/sec 0.990 ms  11/ 853 (1.3%)
[1908] 61.0-62.0 sec 1.17 MBytes 9.81 Mbits/sec 1.677 ms  16/ 850 (1.9%)
[1908] 62.0-63.0 sec 1.16 MBytes 9.77 Mbits/sec 0.924 ms  19/ 850 (2.2%)
[1908] 63.0-64.0 sec 1.12 MBytes 9.41 Mbits/sec 1.609 ms  48/ 848 (5.7%)
[1908] 64.0-65.0 sec 1.19 MBytes 10.0 Mbits/sec 1.780 ms  0/ 852 (0%)
[1908] 65.0-66.0 sec 1.19 MBytes 9.97 Mbits/sec 1.976 ms  0/ 848 (0%)
[1908] 66.0-67.0 sec 1.18 MBytes 9.94 Mbits/sec 1.556 ms  0/ 845 (0%)
[1908] 67.0-68.0 sec 1.17 MBytes 9.82 Mbits/sec 1.807 ms  15/ 850 (1.8%)
[1908] 68.0-69.0 sec 1.19 MBytes 10.0 Mbits/sec 1.377 ms  9/ 859 (1%)
[1908] 69.0-70.0 sec 1.18 MBytes 9.89 Mbits/sec 1.884 ms  7/ 848 (0.83%)
[1908] 70.0-71.0 sec 1.19 MBytes 10.0 Mbits/sec 1.634 ms  2/ 852 (0.23%)
[1908] 71.0-72.0 sec 1.18 MBytes 9.90 Mbits/sec 1.798 ms  0/ 842 (0%)
[1908] 72.0-73.0 sec 1.17 MBytes 9.81 Mbits/sec 0.653 ms  17/ 851 (2%)
[1908] 73.0-74.0 sec 1.18 MBytes 9.88 Mbits/sec 1.820 ms  17/ 857 (2%)
[1908] 74.0-75.0 sec 1.18 MBytes 9.91 Mbits/sec 1.106 ms  6/ 849 (0.71%)
[1908] 75.0-76.0 sec 1.18 MBytes 9.94 Mbits/sec 1.844 ms  6/ 851 (0.71%)
[1908] 76.0-77.0 sec 1.18 MBytes 9.93 Mbits/sec 1.717 ms  7/ 851 (0.82%)
[1908] 77.0-78.0 sec 1.18 MBytes 9.93 Mbits/sec 1.734 ms  7/ 851 (0.82%)
[1908] 78.0-79.0 sec 1.18 MBytes 9.91 Mbits/sec 1.805 ms  0/ 843 (0%)
[1908] 79.0-80.0 sec 1.08 MBytes 9.06 Mbits/sec 1.792 ms  87/ 857 (10%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 80.0-81.0 sec 1.12 MBytes 9.36 Mbits/sec 0.770 ms  55/ 851 (6.5%)
[1908] 81.0-82.0 sec 1.18 MBytes 9.91 Mbits/sec 1.886 ms  6/ 849 (0.71%)
[1908] 82.0-83.0 sec 1.19 MBytes 9.98 Mbits/sec 1.619 ms  1/ 850 (0.12%)
[1908] 83.0-84.0 sec 1.19 MBytes 10.0 Mbits/sec 1.746 ms  0/ 851 (0%)
[1908] 84.0-85.0 sec 1.15 MBytes 9.65 Mbits/sec 1.770 ms  30/ 851 (3.5%)
[1908] 85.0-86.0 sec 1.05 MBytes 8.81 Mbits/sec 0.858 ms  9/ 758 (1.2%)
[1908] 86.0-87.0 sec 1.28 MBytes 10.7 Mbits/sec 1.020 ms  31/ 942 (3.3%)
[1908] 87.0-88.0 sec 1.19 MBytes 9.95 Mbits/sec 2.225 ms  0/ 846 (0%)
[1908] 88.0-89.0 sec 1.15 MBytes 9.61 Mbits/sec 0.514 ms  31/ 848 (3.7%)
[1908] 89.0-90.0 sec 1.19 MBytes 9.98 Mbits/sec 2.083 ms  6/ 855 (0.7%)
[1908] 90.0-91.0 sec 1.17 MBytes 9.84 Mbits/sec 1.815 ms  15/ 852 (1.8%)
[1908] 91.0-92.0 sec 1.16 MBytes 9.74 Mbits/sec 2.205 ms  0/ 828 (0%)
[1908] 92.0-93.0 sec 1.21 MBytes 10.1 Mbits/sec 2.642 ms  7/ 867 (0.81%)
[1908] 93.0-94.0 sec 1.19 MBytes 9.98 Mbits/sec 1.521 ms  7/ 856 (0.82%)
[1908] 94.0-95.0 sec 1.19 MBytes 9.95 Mbits/sec 1.771 ms  5/ 851 (0.59%)
[1908] 95.0-96.0 sec 1.15 MBytes 9.61 Mbits/sec 1.711 ms  32/ 849 (3.8%)
[1908] 96.0-97.0 sec 1.16 MBytes 9.71 Mbits/sec 1.688 ms  27/ 853 (3.2%)
[1908] 97.0-98.0 sec 1.17 MBytes 9.84 Mbits/sec 1.632 ms  5/ 842 (0.59%)
[1908] 98.0-99.0 sec 1.18 MBytes 9.90 Mbits/sec 1.709 ms  16/ 858 (1.9%)
[1908] 0.0-100.0 sec  117 MBytes 9.83 Mbits/sec 2.323 ms 1485/85031 (1.7%)
```

Sunvalley Mall (mid cell)

This log documents the server sending data to a single client at the rate of 20 megabits per second:

```
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 8.00 KByte (default)
------------------------------------------------------------
[1908] local 10.170.2.207 port 5001 connected with 10.171.96.6 port 51726
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 0.0- 1.0 sec 1.17 MBytes 9.80 Mbits/sec 0.849 ms 1547322235/ 897 (1.7e+008%)
[1908] 1.0- 2.0 sec 1.29 MBytes 10.8 Mbits/sec 1.077 ms 782/ 1699 (46%)
[1908] 2.0- 3.0 sec 1.47 MBytes 12.4 Mbits/sec 1.683 ms 535/ 1586 (34%)
[1908] 3.0- 4.0 sec 1.63 MBytes 13.7 Mbits/sec 2.016 ms 637/ 1802 (35%)
[1908] 4.0- 5.0 sec 1.27 MBytes 10.7 Mbits/sec 1.802 ms 806/ 1715 (47%)
[1908] 5.0- 6.0 sec 1.30 MBytes 10.9 Mbits/sec 1.718 ms 765/ 1692 (45%)
[1908] 6.0- 7.0 sec 1.39 MBytes 11.6 Mbits/sec 1.748 ms 710/ 1698 (42%)
[1908] 7.0- 8.0 sec 1.52 MBytes 12.7 Mbits/sec 0.963 ms 635/ 1718 (37%)
[1908] 8.0- 9.0 sec 1.56 MBytes 13.1 Mbits/sec 1.473 ms 565/ 1681 (34%)
[1908] 9.0-10.0 sec 1.54 MBytes 12.9 Mbits/sec 1.879 ms 621/ 1722 (36%)
[1908] 10.0-11.0 sec 1.29 MBytes 10.8 Mbits/sec 1.765 ms 734/ 1655 (44%)
[1908] 11.0-12.0 sec 1.28 MBytes 10.8 Mbits/sec 1.491 ms 806/ 1721 (47%)
[1908] 12.0-13.0 sec 1.30 MBytes 10.9 Mbits/sec 1.776 ms 756/ 1680 (45%)
[1908] 13.0-14.0 sec 1.30 MBytes 10.9 Mbits/sec 1.558 ms 793/ 1720 (46%)
[1908] 14.0-15.0 sec 1.27 MBytes 10.6 Mbits/sec 1.953 ms 775/ 1679 (46%)
[1908] 15.0-16.0 sec 1.26 MBytes 10.5 Mbits/sec 2.138 ms 827/ 1723 (48%)
[1908] 16.0-17.0 sec 1.30 MBytes 10.9 Mbits/sec 1.190 ms 758/ 1688 (45%)
[1908] 17.0-18.0 sec 1.27 MBytes 10.7 Mbits/sec 1.258 ms 794/ 1702 (47%)
[1908] 18.0-19.0 sec 1.21 MBytes 10.2 Mbits/sec 0.629 ms 827/ 1693 (49%)
[1908] 19.0-20.0 sec 1.24 MBytes 10.4 Mbits/sec 2.483 ms 740/ 1624 (46%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
```

```
[1908] 20.0-21.0 sec 1.26 MBytes 10.6 Mbits/sec 2.101 ms 872/ 1772 (49%)
[1908] 21.0-22.0 sec 1.28 MBytes 10.8 Mbits/sec 1.155 ms 804/ 1720 (47%)
[1908] 22.0-23.0 sec 1.29 MBytes 10.8 Mbits/sec 1.444 ms 784/ 1702 (46%)
[1908] 23.0-24.0 sec 1.25 MBytes 10.5 Mbits/sec 1.344 ms 801/ 1694 (47%)
[1908] 24.0-25.0 sec 1.30 MBytes 10.9 Mbits/sec 1.655 ms 764/ 1692 (45%)
[1908] 25.0-26.0 sec 1.31 MBytes 10.9 Mbits/sec 2.123 ms 767/ 1698 (45%)
[1908] 26.0-27.0 sec 1.28 MBytes 10.8 Mbits/sec 2.047 ms 786/ 1701 (46%)
[1908] 27.0-28.0 sec 1.22 MBytes 10.2 Mbits/sec 1.304 ms 840/ 1711 (49%)
[1908] 28.0-29.0 sec 1.32 MBytes 11.1 Mbits/sec 0.350 ms 766/ 1709 (45%)
[1908] 29.0-30.0 sec 1.28 MBytes 10.7 Mbits/sec 1.372 ms 776/ 1690 (46%)
[1908] 30.0-31.0 sec 1.28 MBytes 10.7 Mbits/sec 1.277 ms 788/ 1699 (46%)
[1908] 31.0-32.0 sec 1.27 MBytes 10.7 Mbits/sec 1.283 ms 807/ 1714 (47%)
[1908] 32.0-33.0 sec 1.30 MBytes 10.9 Mbits/sec 1.257 ms 765/ 1689 (45%)
[1908] 33.0-34.0 sec 1.26 MBytes 10.5 Mbits/sec 1.657 ms 805/ 1702 (47%)
[1908] 34.0-35.0 sec 1.29 MBytes 10.8 Mbits/sec 1.390 ms 780/ 1702 (46%)
[1908] 35.0-36.0 sec 1.30 MBytes 10.9 Mbits/sec 1.432 ms 775/ 1699 (46%)
[1908] 36.0-37.0 sec 1.17 MBytes 9.80 Mbits/sec 2.081 ms 709/ 1542 (46%)
[1908] 37.0-38.0 sec 1.40 MBytes 11.7 Mbits/sec 1.287 ms 862/ 1858 (46%)
[1908] 38.0-39.0 sec 1.30 MBytes 10.9 Mbits/sec 1.336 ms 771/ 1699 (45%)
[1908] 39.0-40.0 sec 1.33 MBytes 11.2 Mbits/sec 1.323 ms 765/ 1715 (45%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 40.0-41.0 sec 1.31 MBytes 11.0 Mbits/sec 1.195 ms 753/ 1688 (45%)
[1908] 41.0-42.0 sec 1.34 MBytes 11.2 Mbits/sec 1.437 ms 761/ 1714 (44%)
[1908] 42.0-43.0 sec 1.29 MBytes 10.9 Mbits/sec 2.117 ms 778/ 1701 (46%)
[1908] 43.0-44.0 sec 1.25 MBytes 10.5 Mbits/sec 1.408 ms 798/ 1690 (47%)
[1908] 44.0-45.0 sec 1.31 MBytes 11.0 Mbits/sec 1.361 ms 773/ 1709 (45%)
[1908] 45.0-46.0 sec 1.35 MBytes 11.3 Mbits/sec 2.029 ms 743/ 1703 (44%)
[1908] 46.0-47.0 sec 1.33 MBytes 11.1 Mbits/sec 1.426 ms 739/ 1685 (44%)
[1908] 47.0-48.0 sec 1.35 MBytes 11.3 Mbits/sec 2.176 ms 756/ 1716 (44%)
[1908] 48.0-49.0 sec 1.32 MBytes 11.1 Mbits/sec 1.217 ms 746/ 1686 (44%)
[1908] 49.0-50.0 sec 1.31 MBytes 11.0 Mbits/sec 1.209 ms 775/ 1713 (45%)
[1908] 50.0-51.0 sec 1.31 MBytes 11.0 Mbits/sec 1.973 ms 765/ 1703 (45%)
[1908] 51.0-52.0 sec 1.32 MBytes 11.1 Mbits/sec 1.542 ms 740/ 1685 (44%)
[1908] 52.0-53.0 sec 1.32 MBytes 11.1 Mbits/sec 0.117 ms 773/ 1715 (45%)
[1908] 53.0-54.0 sec 1.33 MBytes 11.2 Mbits/sec 1.326 ms 749/ 1699 (44%)
[1908] 54.0-55.0 sec 1.28 MBytes 10.7 Mbits/sec 1.002 ms 777/ 1689 (46%)
[1908] 55.0-56.0 sec 1.33 MBytes 11.2 Mbits/sec 1.267 ms 760/ 1710 (44%)
[1908] 56.0-57.0 sec 1.29 MBytes 10.9 Mbits/sec 2.294 ms 748/ 1671 (45%)
[1908] 57.0-58.0 sec 1.23 MBytes 10.3 Mbits/sec 1.127 ms 855/ 1732 (49%)
[1908] 58.0-59.0 sec 1.24 MBytes 10.4 Mbits/sec 1.547 ms 806/ 1688 (48%)
[1908] 59.0-60.0 sec 1.28 MBytes 10.7 Mbits/sec 1.049 ms 801/ 1712 (47%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 60.0-61.0 sec 1.29 MBytes 10.8 Mbits/sec 1.310 ms 788/ 1706 (46%)
[1908] 61.0-62.0 sec 1.33 MBytes 11.1 Mbits/sec 1.218 ms 740/ 1687 (44%)
[1908] 62.0-63.0 sec 1.33 MBytes 11.1 Mbits/sec 0.289 ms 767/ 1713 (45%)
[1908] 63.0-64.0 sec 1.32 MBytes 11.1 Mbits/sec 1.457 ms 751/ 1692 (44%)
[1908] 64.0-65.0 sec 1.38 MBytes 11.6 Mbits/sec 0.825 ms 721/ 1704 (42%)
[1908] 65.0-66.0 sec 1.55 MBytes 13.0 Mbits/sec 0.931 ms 595/ 1704 (35%)
[1908] 66.0-67.0 sec 1.55 MBytes 13.0 Mbits/sec 0.898 ms 588/ 1695 (35%)
[1908] 67.0-68.0 sec 1.35 MBytes 11.3 Mbits/sec 1.775 ms 612/ 1572 (39%)
[1908] 68.0-69.0 sec 1.45 MBytes 12.1 Mbits/sec 1.026 ms 804/ 1835 (44%)
[1908] 69.0-70.0 sec 1.39 MBytes 11.7 Mbits/sec 1.826 ms 690/ 1685 (41%)
[1908] 70.0-71.0 sec 1.33 MBytes 11.2 Mbits/sec 1.199 ms 756/ 1707 (44%)
[1908] 71.0-72.0 sec 1.31 MBytes 11.0 Mbits/sec 1.229 ms 766/ 1701 (45%)
[1908] 72.0-73.0 sec 1.36 MBytes 11.4 Mbits/sec 1.003 ms 726/ 1695 (43%)
[1908] 73.0-74.0 sec 1.26 MBytes 10.6 Mbits/sec 1.056 ms 817/ 1717 (48%)
[1908] 74.0-75.0 sec 1.33 MBytes 11.2 Mbits/sec 1.146 ms 748/ 1700 (44%)
[1908] 75.0-76.0 sec 1.32 MBytes 11.1 Mbits/sec 1.294 ms 755/ 1697 (44%)
[1908] 76.0-77.0 sec 1.31 MBytes 11.0 Mbits/sec 1.711 ms 755/ 1693 (45%)
[1908] 77.0-78.0 sec 1.33 MBytes 11.1 Mbits/sec 0.581 ms 764/ 1711 (45%)
[1908] 78.0-79.0 sec 1.29 MBytes 10.9 Mbits/sec 2.153 ms 781/ 1704 (46%)
[1908] 79.0-80.0 sec 1.31 MBytes 11.0 Mbits/sec 1.263 ms 764/ 1698 (45%)
[ ID] Interval     Transfer    Bandwidth     Jitter   Lost/Total Datagrams
[1908] 80.0-81.0 sec 1.26 MBytes 10.5 Mbits/sec 2.077 ms 787/ 1684 (47%)
[1908] 81.0-82.0 sec 1.29 MBytes 10.8 Mbits/sec 1.429 ms 800/ 1720 (47%)
[1908] 82.0-83.0 sec 1.34 MBytes 11.2 Mbits/sec 0.952 ms 746/ 1699 (44%)
[1908] 83.0-84.0 sec 1.29 MBytes 10.8 Mbits/sec 0.612 ms 778/ 1697 (46%)
[1908] 84.0-85.0 sec 1.28 MBytes 10.8 Mbits/sec 1.303 ms 777/ 1692 (46%)
[1908] 85.0-86.0 sec 1.29 MBytes 10.9 Mbits/sec 1.314 ms 777/ 1700 (46%)
[1908] 86.0-87.0 sec 1.28 MBytes 10.8 Mbits/sec 1.179 ms 787/ 1703 (46%)
[1908] 87.0-88.0 sec 1.33 MBytes 11.2 Mbits/sec 1.825 ms 756/ 1706 (44%)
[1908] 88.0-89.0 sec 1.29 MBytes 10.8 Mbits/sec 1.857 ms 748/ 1670 (45%)
[1908] 89.0-90.0 sec 1.30 MBytes 10.9 Mbits/sec 1.547 ms 799/ 1724 (46%)
[1908] 90.0-91.0 sec 1.30 MBytes 10.9 Mbits/sec 1.155 ms 786/ 1711 (46%)
[1908] 91.0-92.0 sec 1.34 MBytes 11.2 Mbits/sec 1.221 ms 748/ 1701 (44%)
[1908] 92.0-93.0 sec 1.30 MBytes 10.9 Mbits/sec 1.401 ms 762/ 1688 (45%)
[1908] 93.0-94.0 sec 1.27 MBytes 10.7 Mbits/sec 1.296 ms 795/ 1704 (47%)
[1908] 94.0-95.0 sec 1.31 MBytes 10.9 Mbits/sec 1.209 ms 768/ 1699 (45%)
[1908] 95.0-96.0 sec 1.20 MBytes 10.0 Mbits/sec 2.489 ms 841/ 1695 (50%)
[1908] 96.0-97.0 sec 1.19 MBytes 9.97 Mbits/sec 1.256 ms 860/ 1708 (50%)
[1908] 97.0-98.0 sec 1.34 MBytes 11.2 Mbits/sec 1.271 ms 754/ 1709 (44%)
```

```
[1908] 98.0-99.0 sec 1.35 MBytes 11.3 Mbits/sec 1.804 ms 723/ 1687 (43%)
[1908] 99.0-100.0 sec 1.35 MBytes 11.3 Mbits/sec 1.279 ms 740/ 1704 (43%)
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 0.0-100.5 sec  132 MBytes 11.1 Mbits/sec 2.228 ms 75636/170043 (44%)
```

John Muir House (cell edge)

This log documents the server sending data to a single client at the rate of 15 megabits per second:

```
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 8.00 KByte (default)
------------------------------------------------------------
[1908] local 10.170.2.217 port 5001 connected with 10.171.96.6 port 62928
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 0.0- 1.0 sec  659 KBytes 5.40 Mbits/sec 2.824 ms 1313429522/ 641 (2e+008%)
[1908] 1.0- 2.0 sec  689 KBytes 5.64 Mbits/sec 3.884 ms 795/ 1275 (62%)
[1908] 2.0- 3.0 sec  678 KBytes 5.55 Mbits/sec 4.422 ms 804/ 1276 (63%)
[1908] 3.0- 4.0 sec  614 KBytes 5.03 Mbits/sec 1.804 ms 703/ 1131 (62%)
[1908] 4.0- 5.0 sec  670 KBytes 5.49 Mbits/sec 2.681 ms 849/ 1316 (65%)
[1908] 5.0- 6.0 sec  797 KBytes 6.53 Mbits/sec 3.970 ms 822/ 1377 (60%)
[1908] 6.0- 7.0 sec  711 KBytes 5.82 Mbits/sec 3.302 ms 781/ 1276 (61%)
[1908] 7.0- 8.0 sec  708 KBytes 5.80 Mbits/sec 3.503 ms 742/ 1235 (60%)
[1908] 8.0- 9.0 sec  820 KBytes 6.71 Mbits/sec 2.970 ms 746/ 1317 (57%)
[1908] 9.0-10.0 sec  781 KBytes 6.40 Mbits/sec 3.810 ms 732/ 1276 (57%)
[1908] 10.0-11.0 sec  758 KBytes 6.21 Mbits/sec 3.236 ms 745/ 1273 (59%)
[1908] 11.0-12.0 sec  670 KBytes 5.49 Mbits/sec 2.835 ms 671/ 1138 (59%)
[1908] 12.0-13.0 sec  769 KBytes 6.30 Mbits/sec 2.869 ms 787/ 1323 (59%)
[1908] 13.0-14.0 sec  811 KBytes 6.64 Mbits/sec 4.073 ms 762/ 1327 (57%)
[1908] 14.0-15.0 sec  744 KBytes 6.09 Mbits/sec 2.071 ms 798/ 1316 (61%)
[1908] 15.0-16.0 sec  742 KBytes 6.08 Mbits/sec 3.361 ms 722/ 1239 (58%)
[1908] 16.0-17.0 sec  778 KBytes 6.37 Mbits/sec 2.705 ms 771/ 1313 (59%)
[1908] 17.0-18.0 sec  706 KBytes 5.79 Mbits/sec 2.398 ms 745/ 1237 (60%)
[1908] 18.0-19.0 sec  755 KBytes 6.19 Mbits/sec 3.400 ms 786/ 1312 (60%)
[1908] 19.0-20.0 sec  761 KBytes 6.23 Mbits/sec 3.696 ms 747/ 1277 (58%)
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 20.0-21.0 sec  639 KBytes 5.23 Mbits/sec 2.544 ms 746/ 1191 (63%)
[1908] 21.0-22.0 sec  782 KBytes 6.41 Mbits/sec 3.652 ms 816/ 1361 (60%)
[1908] 22.0-23.0 sec  777 KBytes 6.36 Mbits/sec 2.506 ms 734/ 1275 (58%)
[1908] 23.0-24.0 sec  780 KBytes 6.39 Mbits/sec 3.338 ms 734/ 1277 (57%)
[1908] 24.0-25.0 sec  709 KBytes 5.81 Mbits/sec 3.416 ms 780/ 1274 (61%)
[1908] 25.0-26.0 sec  739 KBytes 6.06 Mbits/sec 2.579 ms 761/ 1276 (60%)
[1908] 26.0-27.0 sec  775 KBytes 6.35 Mbits/sec 2.690 ms 732/ 1272 (58%)
[1908] 27.0-28.0 sec  736 KBytes 6.03 Mbits/sec 4.687 ms 764/ 1277 (60%)
[1908] 28.0-29.0 sec  699 KBytes 5.73 Mbits/sec 3.907 ms 772/ 1259 (61%)
[1908] 29.0-30.0 sec  617 KBytes 5.06 Mbits/sec 2.906 ms 722/ 1152 (63%)
[1908] 30.0-31.0 sec  815 KBytes 6.68 Mbits/sec 3.041 ms 851/ 1419 (60%)
[1908] 31.0-32.0 sec  719 KBytes 5.89 Mbits/sec 2.697 ms 773/ 1274 (61%)
[1908] 32.0-33.0 sec  725 KBytes 5.94 Mbits/sec 3.704 ms 768/ 1273 (60%)
[1908] 33.0-34.0 sec  645 KBytes 5.28 Mbits/sec 3.915 ms 691/ 1140 (61%)
[1908] 34.0-35.0 sec  738 KBytes 6.04 Mbits/sec 3.445 ms 816/ 1330 (61%)
[1908] 35.0-36.0 sec  769 KBytes 6.30 Mbits/sec 3.691 ms 821/ 1357 (61%)
[1908] 36.0-37.0 sec  755 KBytes 6.19 Mbits/sec 2.926 ms 753/ 1279 (59%)
[1908] 37.0-38.0 sec  653 KBytes 5.35 Mbits/sec 3.600 ms 781/ 1236 (63%)
[1908] 38.0-39.0 sec  790 KBytes 6.47 Mbits/sec 3.151 ms 761/ 1311 (58%)
[1908] 39.0-40.0 sec  797 KBytes 6.53 Mbits/sec 3.896 ms 722/ 1277 (57%)
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 40.0-41.0 sec  663 KBytes 5.43 Mbits/sec 2.196 ms 730/ 1192 (61%)
[1908] 41.0-42.0 sec  718 KBytes 5.88 Mbits/sec 1.910 ms 821/ 1321 (62%)
[1908] 42.0-43.0 sec  568 KBytes 4.66 Mbits/sec 1.789 ms 861/ 1257 (68%)
[1908] 43.0-44.0 sec  718 KBytes 5.88 Mbits/sec 4.188 ms 793/ 1293 (61%)
[1908] 44.0-45.0 sec  767 KBytes 6.28 Mbits/sec 5.151 ms 780/ 1314 (59%)
[1908] 45.0-46.0 sec  726 KBytes 5.95 Mbits/sec 3.054 ms 764/ 1270 (60%)
[1908] 46.0-47.0 sec  680 KBytes 5.57 Mbits/sec 2.438 ms 799/ 1273 (63%)
[1908] 47.0-48.0 sec  734 KBytes 6.01 Mbits/sec 2.577 ms 734/ 1245 (59%)
[1908] 48.0-49.0 sec  699 KBytes 5.73 Mbits/sec 4.033 ms 740/ 1227 (60%)
[1908] 49.0-50.0 sec  759 KBytes 6.22 Mbits/sec 2.169 ms 695/ 1224 (57%)
[1908] 50.0-51.0 sec  837 KBytes 6.86 Mbits/sec 2.250 ms 828/ 1411 (59%)
[1908] 51.0-52.0 sec  660 KBytes 5.41 Mbits/sec 2.745 ms 681/ 1141 (60%)
[1908] 52.0-53.0 sec  838 KBytes 6.87 Mbits/sec 2.629 ms 824/ 1408 (59%)
[1908] 53.0-54.0 sec  724 KBytes 5.93 Mbits/sec 1.911 ms 740/ 1244 (59%)
[1908] 54.0-55.0 sec  738 KBytes 6.04 Mbits/sec 2.482 ms 795/ 1309 (61%)
[1908] 55.0-56.0 sec  775 KBytes 6.35 Mbits/sec 3.381 ms 702/ 1242 (57%)
[1908] 56.0-57.0 sec  817 KBytes 6.69 Mbits/sec 3.044 ms 744/ 1313 (57%)
[1908] 57.0-58.0 sec  721 KBytes 5.90 Mbits/sec 2.446 ms 736/ 1238 (59%)
[1908] 58.0-59.0 sec  775 KBytes 6.35 Mbits/sec 1.565 ms 687/ 1227 (56%)
[1908] 59.0-60.0 sec  673 KBytes 5.52 Mbits/sec 3.071 ms 753/ 1222 (62%)
```

```
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 60.0-61.0 sec  732 KBytes 6.00 Mbits/sec 2.747 ms 816/ 1326 (62%)
[1908] 61.0-62.0 sec  722 KBytes 5.92 Mbits/sec 3.865 ms 723/ 1226 (59%)
[1908] 62.0-63.0 sec  746 KBytes 6.12 Mbits/sec 1.895 ms 799/ 1319 (61%)
[1908] 63.0-64.0 sec  731 KBytes 5.99 Mbits/sec 3.163 ms 864/ 1373 (63%)
[1908] 64.0-65.0 sec  772 KBytes 6.33 Mbits/sec 1.967 ms 645/ 1183 (55%)
[1908] 65.0-66.0 sec  804 KBytes 6.59 Mbits/sec 3.280 ms 806/ 1366 (59%)
[1908] 66.0-67.0 sec  758 KBytes 6.21 Mbits/sec 2.383 ms 747/ 1275 (59%)
[1908] 67.0-68.0 sec  840 KBytes 6.88 Mbits/sec 3.723 ms 611/ 1196 (51%)
[1908] 68.0-69.0 sec  775 KBytes 6.35 Mbits/sec 2.352 ms 728/ 1268 (57%)
[1908] 69.0-70.0 sec  811 KBytes 6.64 Mbits/sec 2.755 ms 657/ 1222 (54%)
[1908] 70.0-71.0 sec  935 KBytes 7.66 Mbits/sec 2.667 ms 766/ 1417 (54%)
[1908] 71.0-72.0 sec  827 KBytes 6.77 Mbits/sec 2.501 ms 659/ 1235 (53%)
[1908] 72.0-73.0 sec  838 KBytes 6.87 Mbits/sec 2.934 ms 733/ 1317 (56%)
[1908] 73.0-74.0 sec  797 KBytes 6.53 Mbits/sec 3.487 ms 719/ 1274 (56%)
[1908] 74.0-75.0 sec  719 KBytes 5.89 Mbits/sec 3.314 ms 774/ 1275 (61%)
[1908] 75.0-76.0 sec  685 KBytes 5.61 Mbits/sec 1.155 ms 755/ 1232 (61%)
[1908] 76.0-77.0 sec  701 KBytes 5.74 Mbits/sec 1.657 ms 828/ 1316 (63%)
[1908] 77.0-78.0 sec  782 KBytes 6.41 Mbits/sec 3.438 ms 735/ 1280 (57%)
[1908] 78.0-79.0 sec  757 KBytes 6.20 Mbits/sec 3.932 ms 745/ 1272 (59%)
[1908] 79.0-80.0 sec  589 KBytes 4.82 Mbits/sec 2.623 ms 728/ 1138 (64%)
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 80.0-81.0 sec  800 KBytes 6.55 Mbits/sec 3.499 ms 856/ 1413 (61%)
[1908] 81.0-82.0 sec  685 KBytes 5.61 Mbits/sec 2.536 ms 802/ 1279 (63%)
[1908] 82.0-83.0 sec  742 KBytes 6.08 Mbits/sec 3.178 ms 757/ 1274 (59%)
[1908] 83.0-84.0 sec  738 KBytes 6.04 Mbits/sec 3.019 ms 762/ 1276 (60%)
[1908] 84.0-85.0 sec  693 KBytes 5.68 Mbits/sec 1.791 ms 706/ 1189 (59%)
[1908] 85.0-86.0 sec  815 KBytes 6.68 Mbits/sec 3.448 ms 795/ 1363 (58%)
[1908] 86.0-87.0 sec  703 KBytes 5.76 Mbits/sec 3.035 ms 784/ 1274 (62%)
[1908] 87.0-88.0 sec  693 KBytes 5.68 Mbits/sec 3.725 ms 656/ 1139 (58%)
[1908] 88.0-89.0 sec  887 KBytes 7.27 Mbits/sec 3.433 ms 793/ 1411 (56%)
[1908] 89.0-90.0 sec  755 KBytes 6.19 Mbits/sec 3.604 ms 751/ 1277 (59%)
[1908] 90.0-91.0 sec  699 KBytes 5.73 Mbits/sec 2.895 ms 790/ 1277 (62%)
[1908] 91.0-92.0 sec  739 KBytes 6.06 Mbits/sec 2.864 ms 759/ 1274 (60%)
[1908] 92.0-93.0 sec  713 KBytes 5.84 Mbits/sec 3.650 ms 777/ 1274 (61%)
[1908] 93.0-94.0 sec  703 KBytes 5.76 Mbits/sec 3.870 ms 747/ 1237 (60%)
[1908] 94.0-95.0 sec  790 KBytes 6.47 Mbits/sec 3.490 ms 765/ 1315 (58%)
[1908] 95.0-96.0 sec  739 KBytes 6.06 Mbits/sec 3.727 ms 723/ 1238 (58%)
[1908] 96.0-97.0 sec  724 KBytes 5.93 Mbits/sec 2.933 ms 724/ 1228 (59%)
[1908] 97.0-98.0 sec  748 KBytes 6.13 Mbits/sec 4.365 ms 840/ 1361 (62%)
[1908] 98.0-99.0 sec  880 KBytes 7.21 Mbits/sec 3.940 ms 661/ 1274 (52%)
[1908] 99.0-100.0 sec  721 KBytes 5.90 Mbits/sec 3.243 ms 777/ 1279 (61%)
[ ID] Interval     Transfer    Bandwidth     Jitter  Lost/Total Datagrams
[1908] 0.0-100.5 sec 72.8 MBytes 6.08 Mbits/sec 3.189 ms 75602/127553 (59%)
```

Wireshark Download Log

This log documents the server streaming the video to a client. In two minutes of elapsed time, more than 20,000 packets will be transmitted. The first six, representing a little more than 1/100th of a second, are shown here:

```
No.    Time     Source         Destination       Protocol Length Info
   1 0.000000  10.171.96.6       10.170.2.218       UDP    1370   Source port: 58055 Destination port:
avt-profile-1

Frame 1: 1370 bytes on wire (10960 bits), 1370 bytes captured (10960 bits)
Ethernet II, Src: 11:22:33:44:55:66 (11:22:33:44:55:66), Dst: 02:50:f2:00:01:81
(02:50:f2:00:01:81)
Internet Protocol Version 4, Src: 10.171.96.6 (10.171.96.6), Dst: 10.170.2.218 (10.170.2.218)
User Datagram Protocol, Src Port: 58055 (58055), Dst Port: avt-profile-1 (5004)
Data (1328 bytes)

No.    Time     Source         Destination       Protocol Length Info
   2 0.002860  10.171.96.6       10.170.2.218       UDP    1370   Source port: 58055 Destination port:
avt-profile-1

Frame 2: 1370 bytes on wire (10960 bits), 1370 bytes captured (10960 bits)
Ethernet II, Src: 11:22:33:44:55:66 (11:22:33:44:55:66), Dst: 02:50:f2:00:01:81
(02:50:f2:00:01:81)
Internet Protocol Version 4, Src: 10.171.96.6 (10.171.96.6), Dst: 10.170.2.218 (10.170.2.218)
User Datagram Protocol, Src Port: 58055 (58055), Dst Port: avt-profile-1 (5004)
Data (1328 bytes)

No.    Time     Source         Destination       Protocol Length Info
   3 0.005993  10.171.96.6       10.170.2.218       UDP    1370   Source port: 58055 Destination port:
avt-profile-1
```

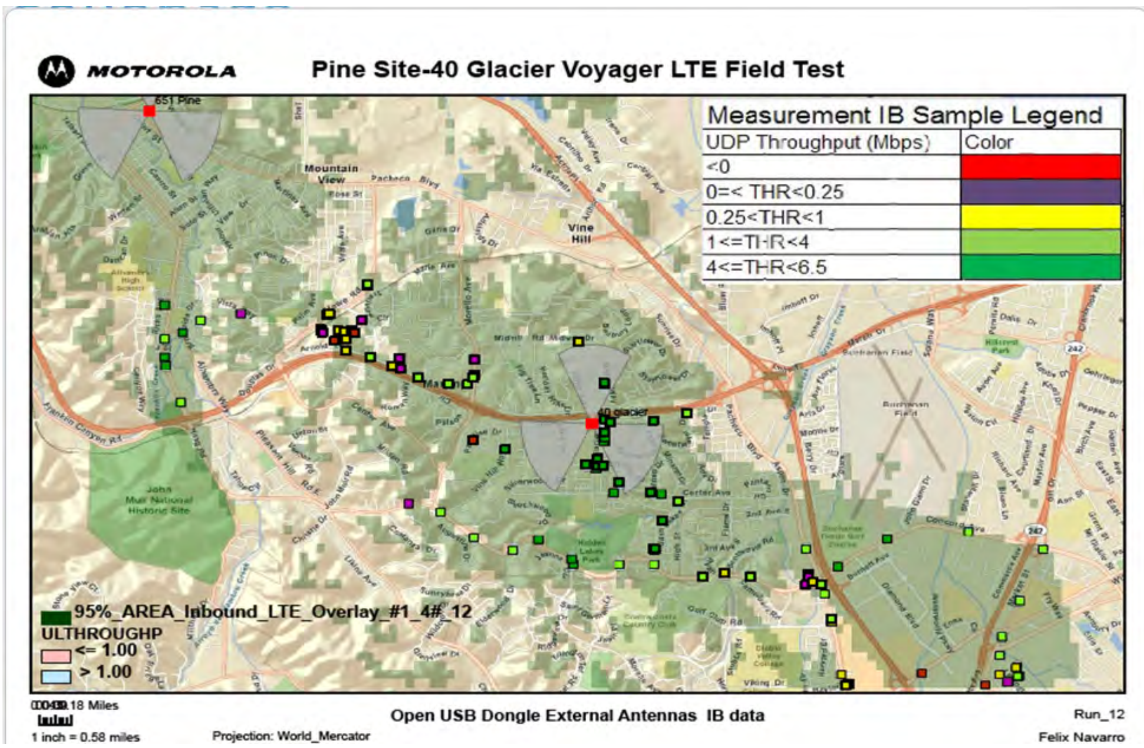
```
Frame 3: 1370 bytes on wire (10960 bits), 1370 bytes captured (10960 bits)
Ethernet II, Src: 11:22:33:44:55:66 (11:22:33:44:55:66), Dst: 02:50:f2:00:01:81
(02:50:f2:00:01:81)
Internet Protocol Version 4, Src: 10.171.96.6 (10.171.96.6), Dst: 10.170.2.218 (10.170.2.218)
User Datagram Protocol, Src Port: 58055 (58055), Dst Port: avt-profile-1 (5004)
Data (1328 bytes)

No.    Time     Source         Destination       Protocol Length Info
   4 0.008890  10.171.96.6      10.170.2.218      UDP    1370  Source port: 58055 Destination port:
avt-profile-1

Frame 4: 1370 bytes on wire (10960 bits), 1370 bytes captured (10960 bits)
Ethernet II, Src: 11:22:33:44:55:66 (11:22:33:44:55:66), Dst: 02:50:f2:00:01:81
(02:50:f2:00:01:81)
Internet Protocol Version 4, Src: 10.171.96.6 (10.171.96.6), Dst: 10.170.2.218 (10.170.2.218)
User Datagram Protocol, Src Port: 58055 (58055), Dst Port: avt-profile-1 (5004)
Data (1328 bytes)

No.    Time     Source         Destination       Protocol Length Info
   5 0.010870  10.171.96.6      10.170.2.218      UDP    1370  Source port: 58055 Destination port:
avt-profile-1

Frame 5: 1370 bytes on wire (10960 bits), 1370 bytes captured (10960 bits)
Ethernet II, Src: 11:22:33:44:55:66 (11:22:33:44:55:66), Dst: 02:50:f2:00:01:81
(02:50:f2:00:01:81)
Internet Protocol Version 4, Src: 10.171.96.6 (10.171.96.6), Dst: 10.170.2.218 (10.170.2.218)
User Datagram Protocol, Src Port: 58055 (58055), Dst Port: avt-profile-1 (5004)
Data (1328 bytes)

No.    Time     Source         Destination       Protocol Length Info
   6 0.013887  10.171.96.6      10.170.2.218      UDP    1370  Source port: 58055 Destination port:
avt-profile-1

Frame 6: 1370 bytes on wire (10960 bits), 1370 bytes captured (10960 bits)
Ethernet II, Src: 11:22:33:44:55:66 (11:22:33:44:55:66), Dst: 02:50:f2:00:01:81
(02:50:f2:00:01:81)
Internet Protocol Version 4, Src: 10.171.96.6 (10.171.96.6), Dst: 10.170.2.218 (10.170.2.218)
User Datagram Protocol, Src Port: 58055 (58055), Dst Port: avt-profile-1 (5004)
Data (1328 bytes)
```

Appendix G: Acknowledgements

The following companies and organizations provided support and/or equipment for these tests and we are grateful for their contribution:

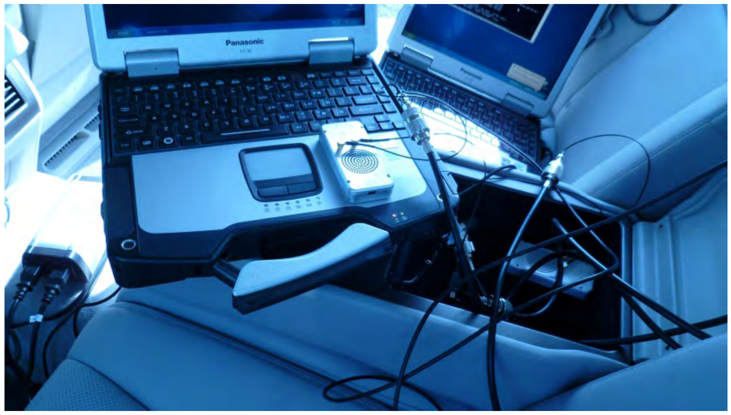
Motorola Solutions

Motorola, which provided the system under test, was gracious in the time and personnel it provided before, during, and after the tests. In addition, its initial drive tests of the network enabled us to determine the best test locations within the cell sector.



Panasonic

Panasonic loaned us seven Toughbook computers (model CF 30) in order to provide a consistent set of test devices. Each of these notebooks was running the same version of Windows XP. These notebooks are the same as those used by many public safety agencies in the United States and around the world.

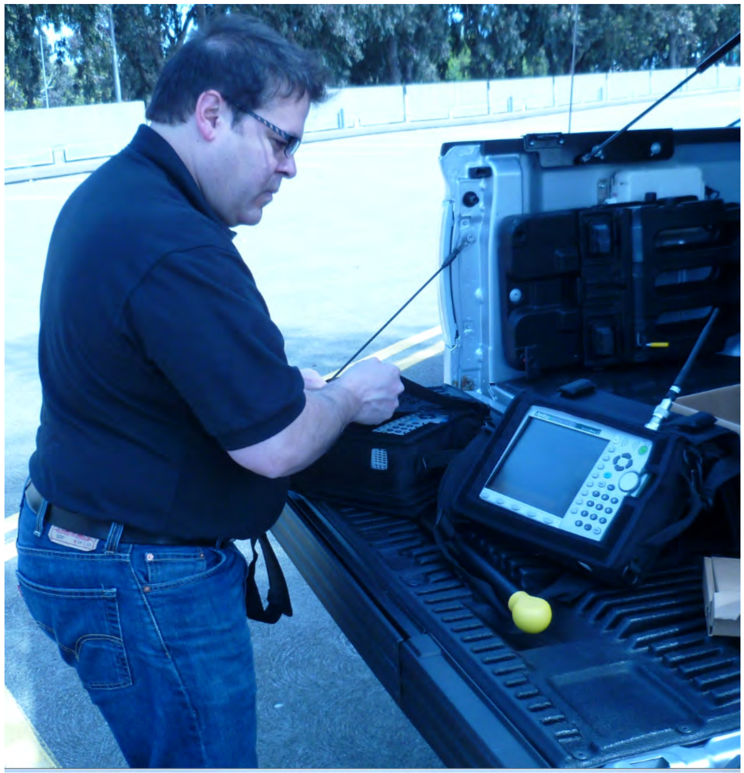


Two Toughbooks during the testing.

Toughbook displaying the test video.

Anritsu America

Anritsu America provided personnel, test equipment, and the latest version of its test software. Anritsu also verified our findings during the entire test period.



Anritsu America performing network measurements

The Anritsu America test equipment

ANDREWSEYBOLD

Andrew Seybold, Inc., 315 Meigs Road, A-267, Santa Barbara, CA 93109

805-898-2460 voice, 805-898-2466 fax, www.andrewseybold.com

An Analysis of State of Arizona and Broadband Services

Senator: Jon Kyl

State Statistics: (from http://www.broadbandmap.gov/summarize/state/arizona)

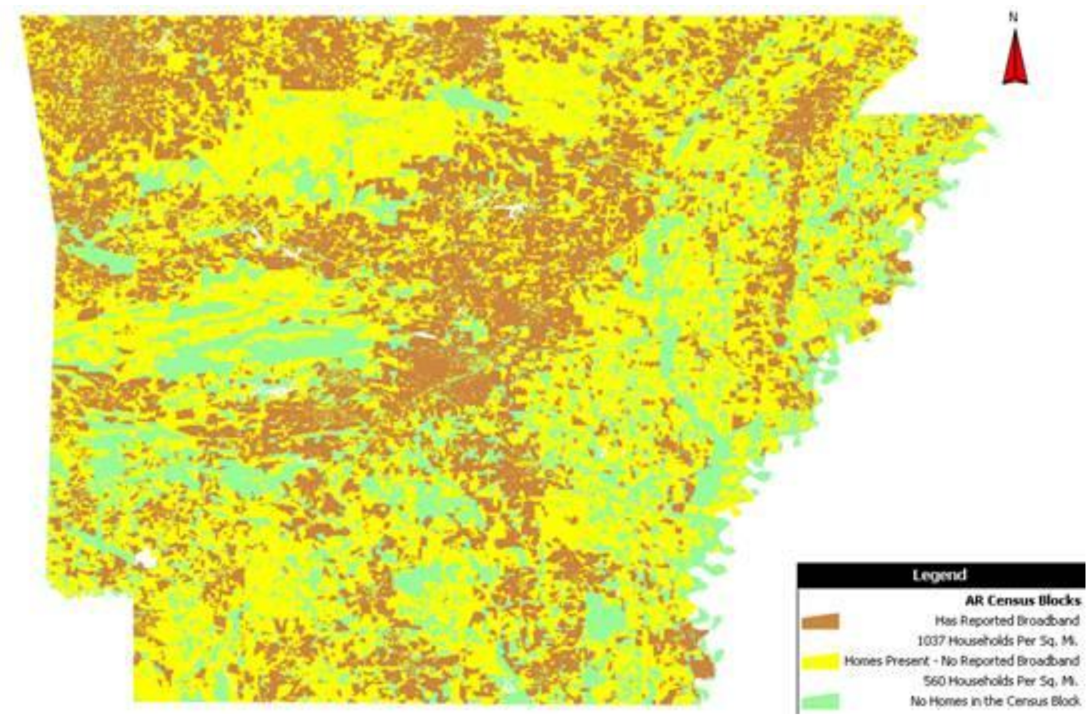
As of June 2010

Geography:

Total area (sq miles)	44,825
Population	11,478,141
Households	4,495,475

Age	Area (%)	Nationwide
under 5	6.8%	7.2%
5 - 19	20.2%	20.7%
20 - 34	19.6%	19.9%
35 - 59	33.7%	33.6%
60+	19.6%	18.7%

Map of Arizona Broadband Deployment



Number of Wireline Providers	Percent Population	Nationwide
0	3.1%	5.8%
1	10.1%	15.3%
2	63.1%	47.7%

Number of Wireline Providers	Percent Population	Nationwide
3	23.4%	21.5%
4	0.4%	7.8%
5	0.0%	1.2%
6	0.0%	0.4%
7	0.0%	0.3%
8+	0.0%	0.1%

Number of Wireless Providers	Percent Population	Nationwide
0	0.5%	1.5%
1	3.5%	5.8%
2	7.1%	10.6%
3	12.2%	15.2%
4	30.7%	27.6%
5	24.1%	18.3%
6	14.3%	11.6%
7	3.8%	4.3%
8+	3.9%	5.0%
DSL	92.6%	86.6%
Fiber	5.4%	14.5%

Number of Wireline Providers	Percent Population	Nationwide
Cable	90.0%	82.2%

Speed	Percent Population	Nationwide
Unreported	0.0%	0.6%
Download > 0.768 Mbps, Upload > 0.2 Mbps	98.2%	98.3%
Download > 3 Mbps, Upload > 0.768 Mbps	96.8%	95.5%

Proposed Private/Public Partnership for Broadband Deployment

Results in Near 100% 9opulation Coverage and Higher Data Speeds

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), enters into a public/private partnerships with interested parties to build-out the 700-MHz Public Safety broadband network in the state.
2) The private companies involved could include private telecommunications companies, local power utilities, health care and educational organizations.
3) The private companies would help fund the cost of the network build out in rural areas with the balance of the funds coming from the federal funding as proposed in several of the bills now before congress.
4) The private companies would also contribute existing telecommunications and power line towers, back-haul, and right-of-way access.
5) The network would then be available, on a secondary basis as follows:
    a. Power companies would use the network to meet their SmartGrid needs
        i. They could then resell broadband services to their rural customers for Internet access
    b. Telecommunications companies would also be able to make use of and resell wireless broadband services to their customers.
    c. Health Care and educations organizations would be able to make use of the network for their own use at favorable broadband rates.
6) The on-going cost of operating the network would be funded by a combination of the private and public safety entities that would make use of the network.

This type of private/public partnership would provide the state with almost 100% of the population with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties.

It should be noted that during a major disaster or incident that required Public Safety pre-emption of the broadband network this pre-emption would only occur within the immediate are of the disaster while other areas of the state would remain unaffected and therefore broadband services would be available.

This type of program will provide the state with broadband services to its rural population at affordable prices, AND will provide broadband services in these areas faster than any plan that has, so far, been presented by the federal or state Government.

Andrew M. Seybold

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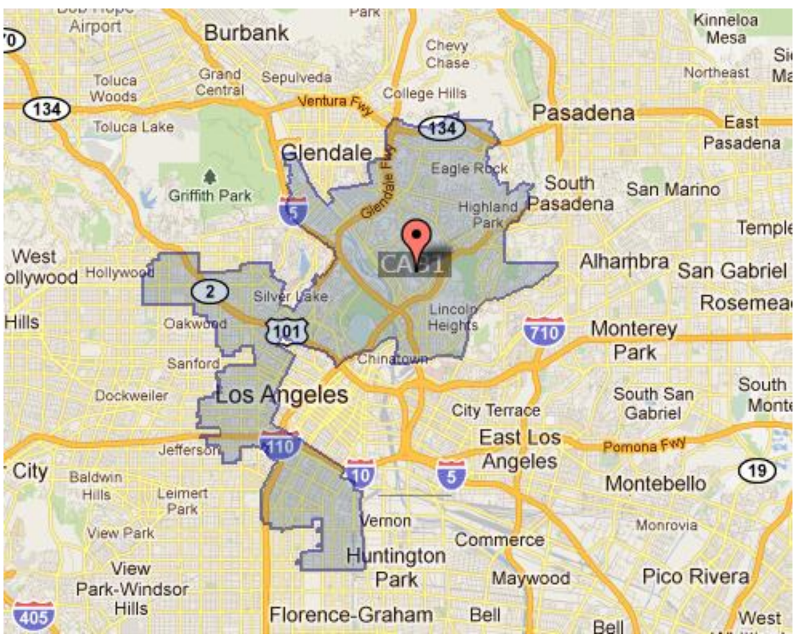
An Analysis of State of California's 31st Congressional District and Broadband Services

Representative: Xavier Becerra

State Statistics: (from http://www.broadbandmap.gov/summarize/state/california/congressional-districts/31 **)**

As of June 2010



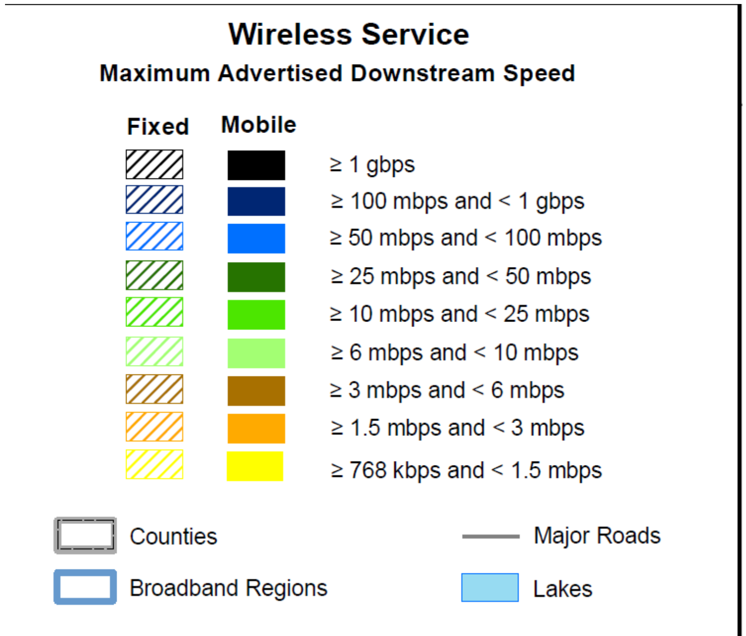
California's 31st congressional district is a congressional district in the U.S. state of California based in Los Angeles County. It is currently the only congressional district entirely based within the city of Los Angeles and includes the heavily Hispanic/Latino portions of inner-city Los Angeles, including Hollywood.

Geography:

Total area (sq miles)	40
Population	687,443

Households	215,800

Age	**Area (%)**	**Nationwide**
under 5	7.9%	7.2%
5 - 19	23.9%	20.7%
20 - 34	22.0%	19.9%
35 - 59	33.0%	33.6%
60+	13.3%	18.7%



Number of Wireline Providers	Percent Population	Nationwide
0	0.1%	5.8%
1	9.9%	15.3%
2	55.4%	47.7%
3	34.1%	21.5%
4	0.5%	7.8%
5	0.0%	1.2%
6	0.0%	0.4%
7	0.0%	0.3%
8+	0.0%	0.1%

Number of Wireless Providers	Percent Population	Nationwide
0	0.0%	1.5%
1	0.0%	5.8%
2	0.0%	10.6%
3	0.0%	15.2%
4	6.6%	27.6%
5	93.5%	18.3%
6	0.0%	11.6%
7	0.0%	4.3%
8+	0.0%	5.0%

Technology	Percent Population	Nationwide
DSL	92.8%	86.6%
Fiber	0.1%	14.5%
Cable	95.7%	82.2%
Wireless	100.0%	96.9%
Other	0.0%	1.5%

Speed	Percent Population	Nationwide

Speed	Percent Population	Nationwide
Unreported	0.0%	0.6%
Download > 0.768 Mbps, Upload > 0.2 Mbps	100.0%	98.3%
Download > 3 Mbps, Upload > 0.768 Mbps	99.8%	95.5%

Proposed Private/Public Partnership for Broadband Deployment

Results in Near 100% Population Coverage and Higher Data Speeds

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), enters into a public/private partnerships with interested parties to build-out the 700-MHz Public Safety broadband network in the state.
2) The private companies involved could include private telecommunications companies, local power utilities, health care and educational organizations.
3) The private companies would help fund the cost of the network build out in rural areas with the balance of the funds coming from the federal funding as proposed in several of the bills now before congress.
4) The private companies would also contribute existing telecommunications and power line towers, back-haul, and right-of-way access.
5) The network would then be available, on a secondary basis as follows:
    a. Power companies would use the network to meet their SmartGrid needs
        i. They could then resell broadband services to their rural customers for Internet access
    b. Telecommunications companies would also be able to make use of and resell wireless broadband services to their customers.
    c. Health Care and educations organizations would be able to make use of the network for their own use at favorable broadband rates.
6) The on-going cost of operating the network would be funded by a combination of the private and public safety entities that would make use of the network.

This type of private/public partnership would provide the state with almost 100% of the population with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties.
It should be noted that during a major disaster or incident that required Public Safety pre-emption of the broadband network this pre-emption would only occur within the immediate are of the disaster while other areas of the state would remain unaffected and therefore broadband services would be available.

This type of program will provide the state with broadband services to its rural population at affordable prices, AND will provide broadband services in these areas faster than any plan that has, so far, been presented by the federal or state Government.

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An Analysis of State of Kentucky and Broadband Services

Senator: Mitch McConnell

State Statistics:

Total Population: 4,314,113 (2009 Est)

Broadband usage in Kentucky (NTIA 2007 statistics):

Total Households:	1,749,000	
Total with Internet access:	960,000	54.86%
Total with dial-up access:	253,000	14.44%
Total with broadband access:	700,000	40.02%
Total with anywhere access:	1,166,000	66.67%

According to the ITU Report (for all of United States)

Internet users in 2010	239,893,600	77.3%
Broadband users	85,287,100	

Conclusions:
In Kentucky, 253,000 households have only slow-speed dial-up access available.
In Kentucky, 1,049,000 households have no access to broadband services.

Broadband for Kentucky:

The recent stimulus funds made available by NTIA and IUS did not materially increase the broadband penetration rate in Kentucky.

What is needed in order to provide broadband access to most of the citizens of Kentucky are private/public partnerships. Commercial wired and wireless operators do not build facilities where the population per square mile is low. There is no return on investment for these companies to cover these rural areas in any state.

Coverage of most of the population of Kentucky *CAN* be provided if there are public/private partnerships.

IF the 700-MHz D Block is reallocated to Public Safety *THEN* there will be sufficient spectrum to enable private/public partnerships in the rural areas of Kentucky and broadband services can be made available.

A Workable Business Model:

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), or the State of Kentucky, enters into a public/private partnerships with interested parties to build out the 700-MHz Public Safety broadband network in the district.
2) The private companies involved could include private telecommunications companies, local power utilities, health care and educational organizations.
3) The private companies would help fund the cost of the network build-out with the balance of the funds coming from Federal funding as proposed in Senate Bill 911 which was passed by committee 24/4 (a bipartisan vote) and which is now ready to be introduced in the full Senate.
4) The private companies would also contribute right-of-ways, existing telecommunications and power line towers, backhaul, and right-of-way access, thus making the build-out of this shared wireless broadband system more attractive and feasible for both the private and public entities.
5) The network would then be available, on a secondary basis as follows
    a. Power companies would use the network to meet their SmartGrid needs.
        i. They could then resell broadband services to their rural customers for Internet access.
    b. Telecommunications companies would also be able to make use of and resell wireless broadband services to their customers.
    c. Health care and educational organizations would be able to make use of the network for their own use at favorable broadband rates.
6) The ongoing cost of operating the network would be funded by a combination of the private and Public Safety entities that would make use of the network.

One set of potential private partners is listed below. Many of these companies are non-profit coops, and are members of the National Rural Telecommunications Cooperative. Many of them are power companies and the NRTC, on behalf of its members, has expressed an interest in working with Public Safety in the type of public/private partnerships described above:

Big Rivers Electric Corporation
Blue Grass Energy Cooperative Corporation
Clark Energy Cooperative, Inc.
Cumberland Valley Electric
East Kentucky Power Cooperative
Farmers Rural Electric Cooperative
Fleming Mason Energy
Foothills Rural Telephone Cooperative Corporation
Fox Creek R.E.C.C.
Gearheart Communications / dba Inter Mountain Cable, Inc.
Grayson Rural Electric Cooperative Corp
Green River Electric Corporation
Harrison County R.E.C.C.
Henderson Union RECC
Hickman-Fulton Counties Rural Electric Cooperative Corporation
Inter-County Energy Cooperative
Jackson Energy Cooperative
Jackson Purchase Energy
Kenergy
Kentucky Association of Electric Cooperatives
Licking Valley Rural Electric Cooperative Corporation
Logan Telephone Cooperative
Meade County Rural Electric Cooperative

Mountain Rural Telephone Cooperative Corporation
Nolin Rural Electric Cooperative Corporation
Owen Electric Cooperative, Inc.
Pennyrile Rural Electric Cooperative Corporation
Peoples Rural Telephone Cooperative
Salt River Electric Cooperative Corporation
Shelby Rural Electric Cooperative Corporation
South Central Rural Telephone Co.
South Kentucky Rural Electric Cooperative Corporation
SouthEast Telephone, Inc.
Taylor County Rural Electric Cooperative Corporation
Three Oaks Marketing and Development
Warren Rural Electric Cooperative Corporation
West Kentucky RECC
West Kentucky and Tennessee Telecommunications Cooperative

This type of private/public partnership would provide almost 100% of the population of Kentucky with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available today. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties.

This type of program will provide the State of Kentucky and other states with broadband services to their rural populations at affordable prices *AND* will provide broadband services in these areas faster than any plan that has, so far, been presented by the Federal or State Governments.

Andrew M. Seybold
CEO and Principal Consultant

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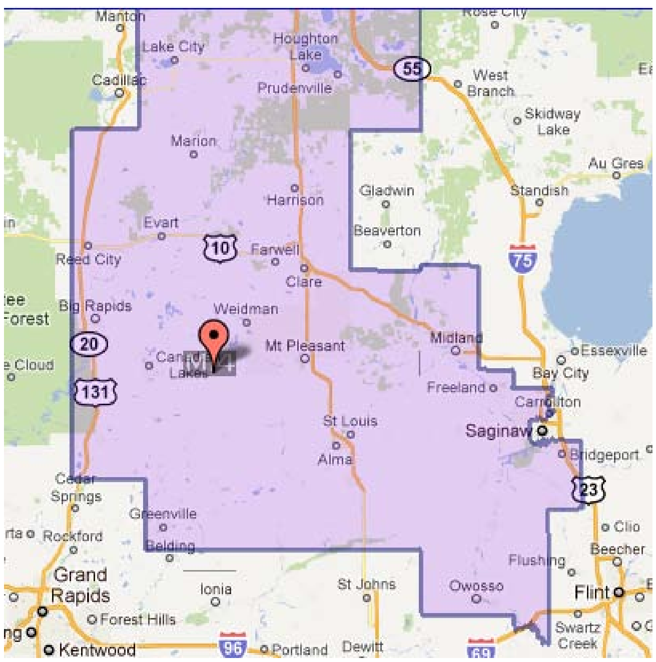
An Analysis of State of Michigan 4th Congressional District and Broadband Services

Representative: David Camp

State Statistics: (from http://www.broadbandmap.gov/summarize/state/michigan/congressional-districts/04)

As of June 2010



Michigan's 4th congressional district is a United States Congressional district that currently includes portions of Northern and Central Michigan, consisting of all of Clare, Grand Traverse, Gratiot, Isabella, Kalkaska, Leelanau, Mecosta, Midland, Missaukee, Montcalm, Osceola, and Roscommon counties and the northern portion of Shiawassee and most of the western portion of Saginaw counties.

Geography:

Total area (sq miles)	8,150
Population	685,815
Households	262,695

Age	Area (%)	Nationwide
under 5	6.8%	7.2%
5 - 19	18.9%	20.7%
20 - 34	20.5%	19.9%
35 - 59	32.9%	33.6%
60+	20.9%	18.7%

NOTE: Connect Michigan does not have Broadband penetration maps by County available yet.

Number of Wireline Providers	Percent Population	Nationwide
0	16.5%	5.8%
1	18.1%	15.3%
2	31.9%	47.7%
3	24.6%	21.5%
4	8.0%	7.8%
5	0.8%	1.2%
6	0.0%	0.4%
7	0.0%	0.3%

Number of Wireline Providers	Percent Population	Nationwide
8+	0.0%	0.1%

Number of Wireless Providers	Percent Population	Nationwide
0	0.0%	1.5%
1	5.1%	5.8%
2	16.4%	10.6%
3	18.3%	15.2%
4	25.5%	27.6%
5	13.0%	18.3%
6	20.2%	11.6%
7	1.6%	4.3%
8+	0.0%	5.0%

Technology	Percent Population	Nationwide
DSL	75.0%	86.6%
Fiber	7.0%	14.5%
Cable	68.8%	82.2%

Number of Wireline Providers	Percent Population	Nationwide
Wireless	98.3%	96.9%
Other	0.0%	1.5%

Speed	Percent Population	Nationwide
Unreported	0.0%	0.6%
Download > 0.768 Mbps, Upload > 0.2 Mbps	99.3%	98.3%
Download > 3 Mbps, Upload > 0.768 Mbps	99.1%	95.5%

Proposed Private/Public Partnership for Broadband Deployment

Results in Near 100% Population Coverage and Higher Data Speeds

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), enters into a public/private partnerships with interested parties to build-out the 700-MHz Public Safety broadband network in the state.
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An Analysis of State of Ohio and Broadband Services

Senator: Rob Portman

State Statistics: (from http://www.broadbandmap.gov/summarize/state/ohio)

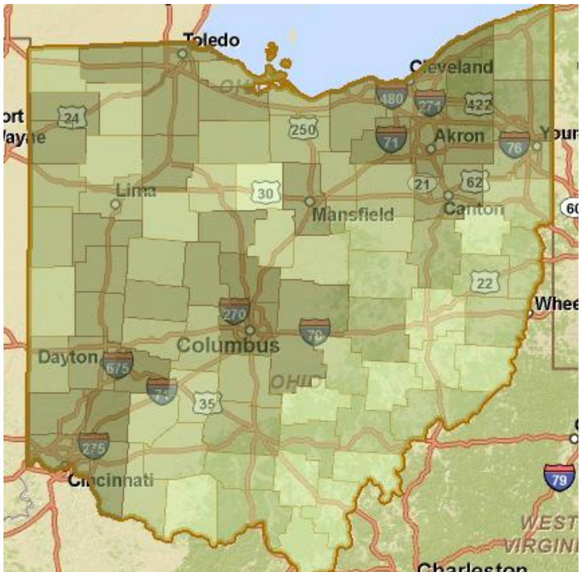
As of June 2010

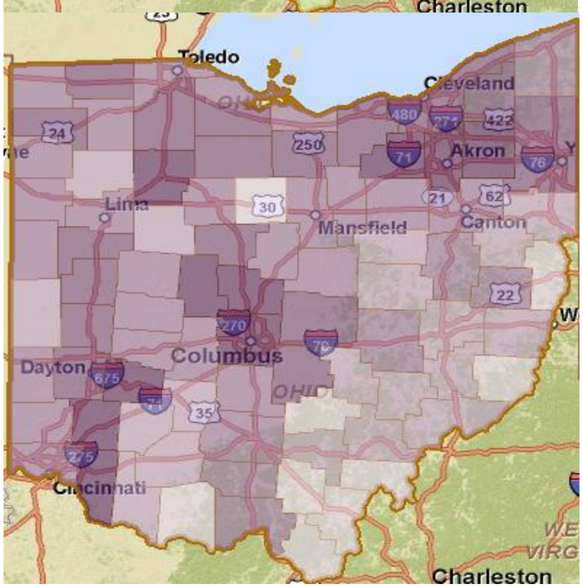
Geography:

Total area (sq miles)	44,825
Population	11,478,141
Households	4,495,475

Age	**Area (%)**	**Nationwide**
under 5	6.8%	7.2%
5 - 19	20.2%	20.7%
20 - 34	19.6%	19.9%
35 - 59	33.7%	33.6%
60+	19.6%	18.7%

Broadband Adoption in Ohio





Map One above: Total Broadband adoption in the state

Map Two above: Total Internet adoption in the State

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0	3.1%	5.8%
1	10.1%	15.3%
2	63.1%	47.7%
3	23.4%	21.5%
4	0.4%	7.8%
5	0.0%	1.2%
6	0.0%	0.4%
7	0.0%	0.3%
8+	0.0%	0.1%

Number of Wireless Providers	Percent Population	Nationwide
0	0.5%	1.5%
1	3.5%	5.8%
2	7.1%	10.6%
3	12.2%	15.2%
4	30.7%	27.6%

Number of Wireline Providers	Percent Population	Nationwide
5	24.1%	18.3%
6	14.3%	11.6%
7	3.8%	4.3%
8+	3.9%	5.0%

Technology	Percent Population	Nationwide
DSL	92.6%	86.6%
Fiber	5.4%	14.5%
Cable	90.0%	82.2%
Wireless	98.1%	96.9%
Other	0.0%	1.5%

Speed

Speed	Percent Population	Nationwide
Unreported	0.0%	0.6%
Download > 0.768 Mbps, Upload > 0.2 Mbps	99.4%	98.3%
Download > 3 Mbps, Upload > 0.768 Mbps	99.3%	95.5%

Proposed Private/Public Partnership for Broadband Deployment

Results in Near 100% 9opulation Coverage and Higher Data Speeds

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An Analysis of State of Pennsylvania and Broadband Services

Senator: Pat Toomey

State Statistics: (from http://www.broadbandmap.gov/summarize/state/pennsylvania)

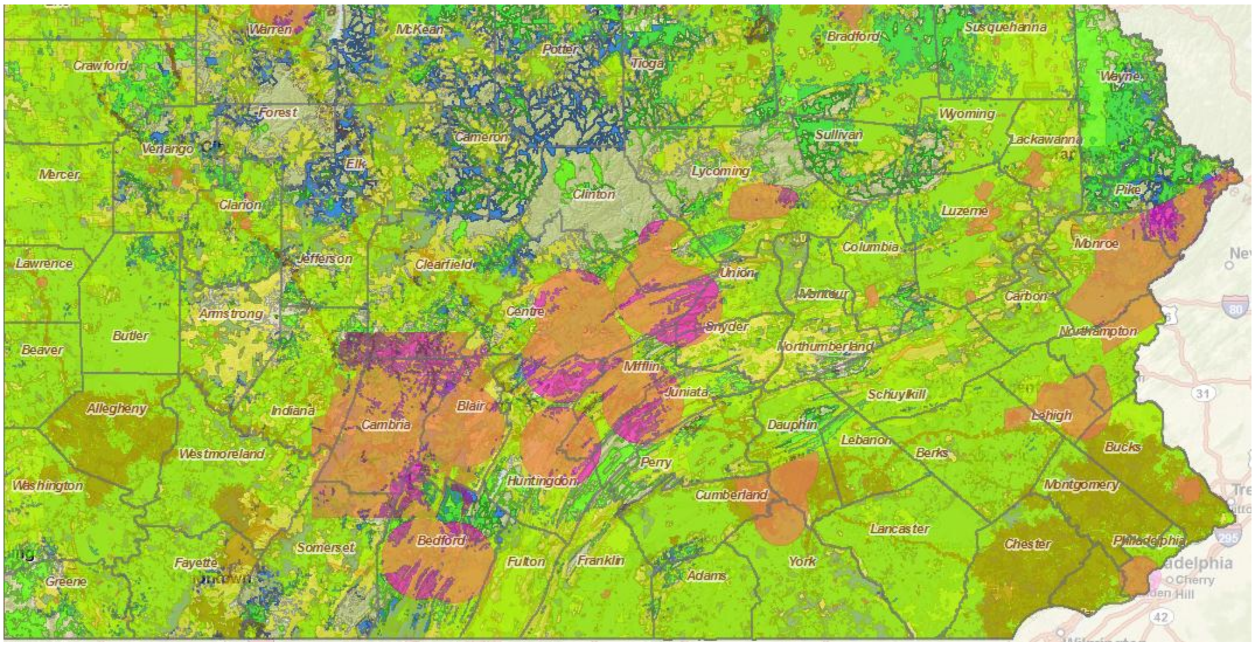
As of June 2010

Geography:

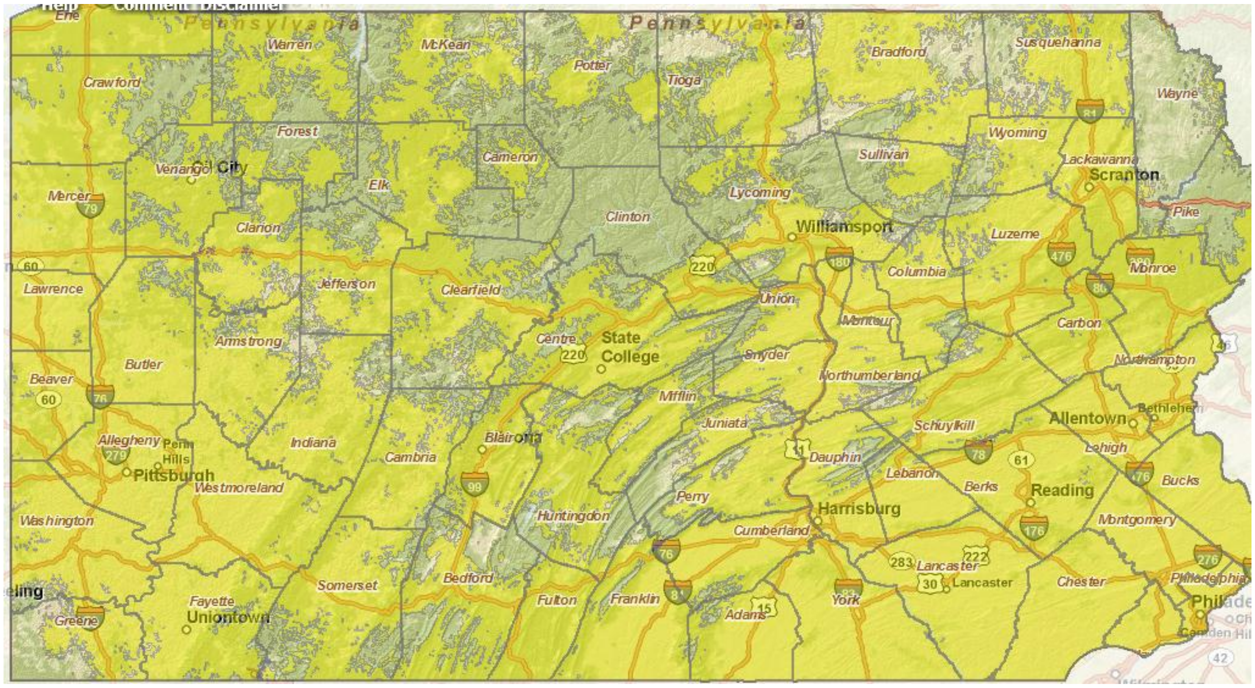
Total area (sq miles)		46,054
Population		12,435,962
Households		4,831,324
Age	**Area (%)**	**Nationwide**
[under 5]()	6.6%	7.2%
[5 - 19]()	19.1%	20.7%

20 - 34	19.0%	19.9%
35 - 59	33.9%	33.6%
60+	21.5%	18.7%

State of Pennsylvania: All types of broadband coverage shown



Map of the State of Pennsylvania with depicting just mobile wireless services



Pennsylvania
Erie
Warren
McKean
Potter
Tioga
Bradford
Susquehanna
Wayne
Crawford
Forest
Cameron
Sullivan
Wyoming
Lackawanna
Scranton
Venango
Oil City
Mercer
Elk
Lycoming
Clinton
Williamsport
Pike
Clarion
Luzerne
Lawrence
Jefferson
Clearfield
Union
Columbia
Monroe
Montour
Carbon
Centre
State College
Snyder
Armstrong
Butler
Northumberland
Northampton
Beaver
Mifflin
Juniata
Schuylkill
Allentown
Bethlehem
Allegheny
Penn Hills
Pittsburgh
Indiana
Cambria
Blairsville
Dauphin
Lehigh
Westmoreland
Lebanon
Berks
Reading
Bucks
Washington
Huntingdon
Perry
Harrisburg
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Somerset
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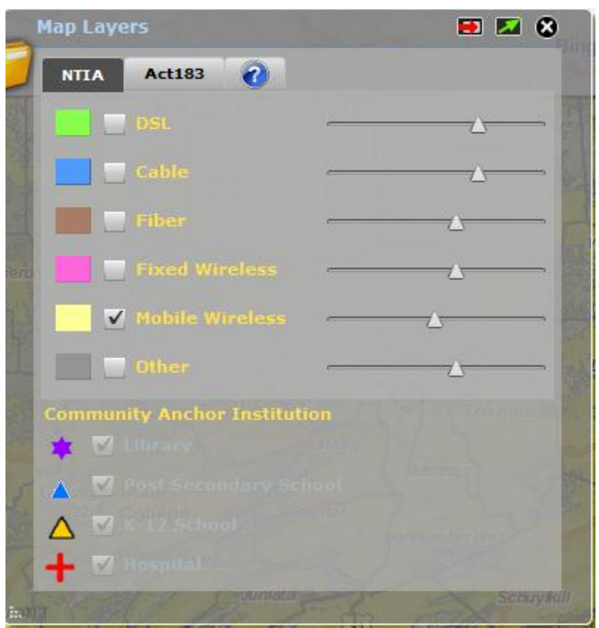
Chester
Philadelphia
Fayette
Uniontown
Greene
Fulton
Franklin
Adams
York



Map Layers
NTIA
Act183
DSL
Cable
Fiber
Fixed Wireless
Mobile Wireless
Other
Community Anchor Institution
Library
Post Secondary School
K-12 School
Hospital

Number of Wireline Providers	Percent Population	Nationwide
0	2.7%	5.8%
1	14.9%	15.3%
2	41.3%	47.7%
3	36.8%	21.5%
4	4.0%	7.8%
5	0.2%	1.2%
6	0.0%	0.4%
7	0.0%	0.3%
8+	0.0%	0.1%

Number of Wireless Providers	Percent Population	Nationwide
0	1.3%	1.5%
1	12.1%	5.8%
2	7.1%	10.6%
3	12.7%	15.2%
4	13.3%	27.6%
5	25.6%	18.3%
6	20.8%	11.6%

Number of Wireline Providers	Percent Population	Nationwide
7	7.1%	4.3%
8+	0.0%	5.0%

Technology	Percent Population	Nationwide
DSL	82.7%	86.6%
Fiber	29.7%	14.5%
Cable	90.3%	82.2%
Wireless	97.1%	96.9%
Other	0.0%	1.5%

Speed	Percent Population	Nationwide
Unreported	0.0%	0.6%
Download > 0.768 Mbps, Upload > 0.2 Mbps	99.6%	98.3%
Download > 3 Mbps, Upload > 0.768 Mbps	99.4%	95.5%

Proposed Private/Public Partnership for Broadband Deployment

Results in Near 100% 9opulation Coverage and Higher Data Speeds

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), enters into a public/private partnerships with interested parties to build-out the 700-MHz Public Safety broadband network in the state.
2) The private companies involved could include private telecommunications companies, local power utilities, health care and educational organizations.
3) The private companies would help fund the cost of the network build out in rural areas with the balance of the funds coming from the federal funding as proposed in several of the bills now before congress.
4) The private companies would also contribute existing telecommunications and power line towers, back-haul, and right-of-way access.
5) The network would then be available, on a secondary basis as follows:
    a. Power companies would use the network to meet their SmartGrid needs
        i. They could then resell broadband services to their rural customers for Internet access
    b. Telecommunications companies would also be able to make use of and resell wireless broadband services to their customers.
    c. Health Care and educations organizations would be able to make use of the network for their own use at favorable broadband rates.
6) The on-going cost of operating the network would be funded by a combination of the private and public safety entities that would make use of the network.

This type of private/public partnership would provide the state with almost 100% of the population with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties.
It should be noted that during a major disaster or incident that required Public Safety pre-emption of the broadband network this pre-emption would only occur within the immediate are of the disaster while other areas of the state would remain unaffected and therefore broadband services would be available.

This type of program will provide the state with broadband services to its rural population at affordable prices, AND will provide broadband services in these areas faster than any plan that has, so far, been presented by the federal or state Government.

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An Analysis of State of South Carolina's 6th Congressional District and Broadband Services

Representative: James Clyburn

State Statistics: (from http://www.broadbandmap.gov/summarize/state/california/congressional-districts/31 **)**

As of June 2010

The **6th Congressional District of South Carolina** is a congressional district in central South Carolina. It includes all of Bamberg, Clarendon, Colleton, Marion and Williamsburg counties and parts of Berkeley, Calhoun, Charleston, Dorchester, Florence, Georgetown, Lee, Orangeburg, Richland and Sumter counties.

Geography:

Total area (sq miles)	40
Population	687,443
Households	215,800

Age	Area (%)	Nationwide
under 5	7.9%	7.2%
5 - 19	23.9%	20.7%

20 - 34	22.0%	19.9%
35 - 59	33.0%	33.6%
60+	13.3%	18.7%

Number of Wireline Providers	Percent Population	Nationwide
0	12.3%	5.8%
1	29.7%	15.3%
2	54.5%	47.7%
3	3.4%	21.5%
4	0.2%	7.8%
5	0.0%	1.2%
6	0.0%	0.4%
7	0.0%	0.3%
8+	0.0%	0.1%

Number of Wireless Providers	Percent Population	Nationwide
0	0.4%	1.5%
1	20.5%	5.8%
2	23.1%	10.6%
3	33.1%	15.2%

Number of Wireline Providers	Percent Population	Nationwide
4	22.9%	27.6%
5	0.0%	18.3%
6	0.0%	11.6%
7	0.0%	4.3%
8+	0.0%	5.0%

Technology	Percent Population	Nationwide
DSL	82.3%	86.6%
Fiber	0.5%	14.5%
Cable	63.6%	82.2%
Wireless	97.4%	96.9%
Other	0.0%	1.5%

Speed	Percent Population	Nationwide
Unreported	0.0%	0.6%
Download > 0.768 Mbps, Upload > 0.2 Mbps	99.0%	98.3%
Download > 3 Mbps, Upload > 0.768 Mbps	98.6%	95.5%

Proposed Private/Public Partnership for Broadband Deployment

Results in Near 100% Population Coverage and Higher Data Speeds

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), enters into a public/private partnerships with interested parties to build-out the 700-MHz Public Safety broadband network in the state.
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3) The private companies would help fund the cost of the network build out in rural areas with the balance of the funds coming from the federal funding as proposed in several of the bills now before congress.
4) The private companies would also contribute existing telecommunications and power line towers, back-haul, and right-of-way access.
5) The network would then be available, on a secondary basis as follows:
    a. Power companies would use the network to meet their SmartGrid needs
        i. They could then resell broadband services to their rural customers for Internet access
    b. Telecommunications companies would also be able to make use of and resell wireless broadband services to their customers.
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6) The on-going cost of operating the network would be funded by a combination of the private and public safety entities that would make use of the network.

This type of private/public partnership would provide the state with almost 100% of the population with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties.
It should be noted that during a major disaster or incident that required Public Safety pre-emption of the broadband network this pre-emption would only occur within the immediate are of the disaster while other areas of the state would remain unaffected and therefore broadband services would be available.

This type of program will provide the state with broadband services to its rural population at affordable prices, AND will provide broadband services in these areas faster than any plan that has, so far, been presented by the federal or state Government.

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An Analysis of State of Utah and Broadband Services

Senator: Orin Hatch

State Statistics: (from Hatch.senate.gov)

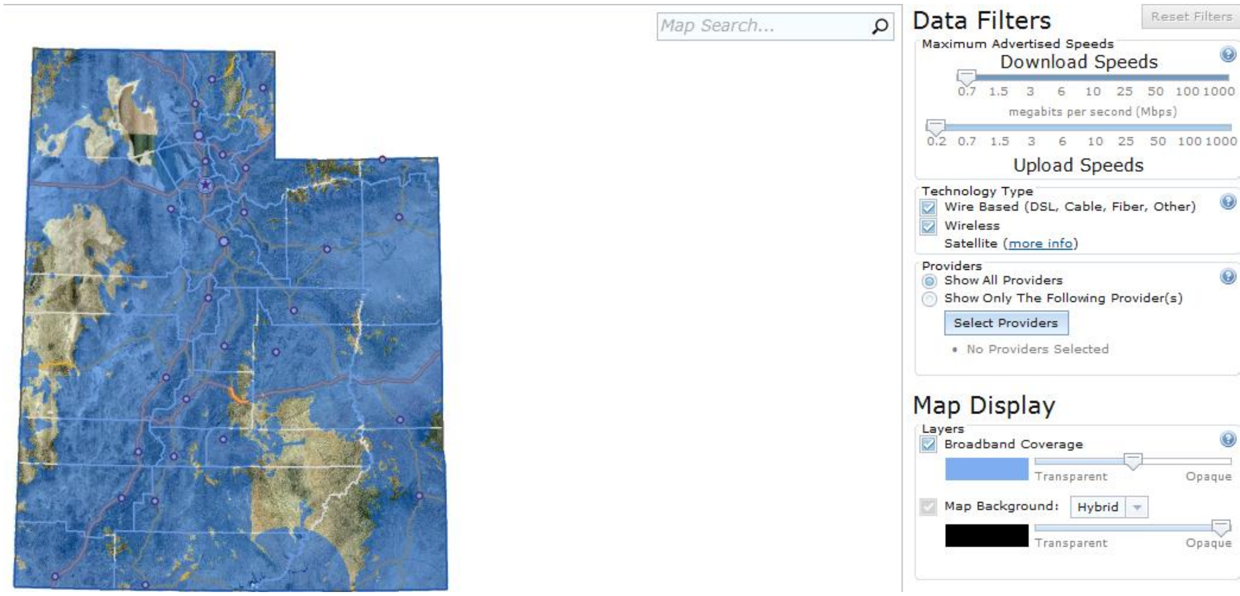
2000 Census Information

Race	UTAH	USA avg.
White persons	92.7%	79.6%
Black persons	1.4%	12.9%
American Indian and Alaska Native persons	1.4%	1.0%
Asian persons	2.1%	4.6%
Native Hawaiian and Other Pacific Islander	0.8%	0.2%
Persons reporting two or more races	1.7%	1.7%
Persons of Hispanic or Latino origin	12.3%	15.8%
White persons not Hispanic	81.2%	65.1%
Foreign born persons	7.1%	11.1%

Geography

Geography QuickFacts	Utah	USA
Land area, (2000) (square miles)	82,143.65	3,537,438.44
Persons per square mile	27.2	79.6

Current map of broadband availability:



The recent stimulus funds made available by NITA and IUS did not materially increase the broadband penetration rate in Utah. Private providers will not build either wired or wireless broadband infrastructure in rural areas with low density populations. They simply cannot afford to do so. What is needed in order to provide broadband access to most of the citizens of Utah are private/public partnerships.

Coverage of most of the population of Utah CAN be provided if there are public/private partnerships.

IF the 700 MHz D block is re-allocated to public safety THEN there will be sufficient spectrum to permit private/public partnerships in the rural areas of Kentucky and broadband services can be made available.

A Workable Business Model:

One business model that has been proposed for other states where the rural population does not have access to broadband services is as follows:

1) The Public Safety Governance organization (the license holder), and/or the State of Utah, enters into a public/private partnerships with interested parties to build out the 700-MHz Public Safety broadband network in the district.
2) The private companies involved could include private telecommunications companies, local power utilities, health care and educational organizations.
3) The private companies would help fund the cost of the network build-out with the balance of the funds coming from Federal funding as proposed in Senate Bill 911 which was passed by committee 24/4 (a bipartisan vote), and which is now ready to be introduced in the full Senate.
4) The private companies would also contribute right-of-ways, existing telecommunications and power line towers, backhaul, and right-of-way access, thus making the build-out of this shared wireless broadband system more attractive and feasible for both the private and public entities.

5) The network would then be available, on a secondary basis as follows:
    a. Power companies would use the network to meet their SmartGrid needs.
        i. They could then resell broadband services to their rural customers for Internet access.
    b. Telecommunications companies would also be able to make use of and resell wireless broadband services to their customers.
    c. Health care and educational organizations would be able to make use of the network for their own use at favorable broadband rates.
6) The ongoing cost of operating the network would be funded by a combination of the private and Public Safety entities that would make use of the network.

One set of potential private partners is listed below, many of these companies are non-profit coops, and are members of the National Rural Telecommunications Cooperative (NRTC) .Many of them are power companies and the NRTC, on behalf of its members has expressed an interest in working with public safety in the type of public/private partnerships described above:

Utah Telcos
Beehive Telephone, St. George
Central Utah Telephone, Fairview
Emery Telephone, Orangeville
South Central Utah Telephone, Escalante
Uintah Basin Telecommunications Association, Roosevelt

Utah Electrics
Dixie Escalante Rural Electric Association (REA), Beryl
Garkane Energy Coop, Loa
Moon Lake Electric Association (EA), Roosevelt
Utah REA, South Jordan

This type of private/public partnership would provide almost 100% of the population of the State of Utah with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available today. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties. It should be noted that with broadband technology, built in a cellular network configuration only the area directly affected by the disaster would have limited or not access to broadband services, all other areas of the statewide system would remain available to secondary usage.

This type of program will provide the State of Utah and other states with broadband services to their rural populations at affordable prices *AND* will provide broadband services in these areas faster than any plan that has, so far, been presented by the Federal or State Governments.

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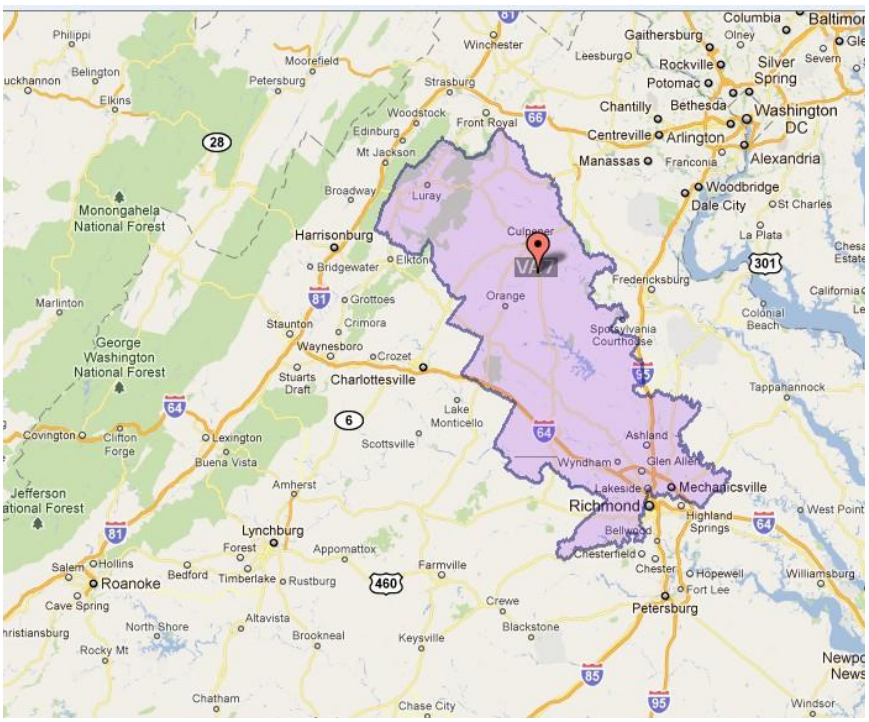
An Analysis of Virginia's 7th Congressional District

Representative: Majority Leader Eric Cantor

7th District of Virginia: Jurisdictions

Part of: Henrico, Richmond city, Chesterfield, Caroline, and Spotsylvania All of: Hanover, Goochland, Louisa, Madison, Orange, Culpeper, Rappahannock, and Page

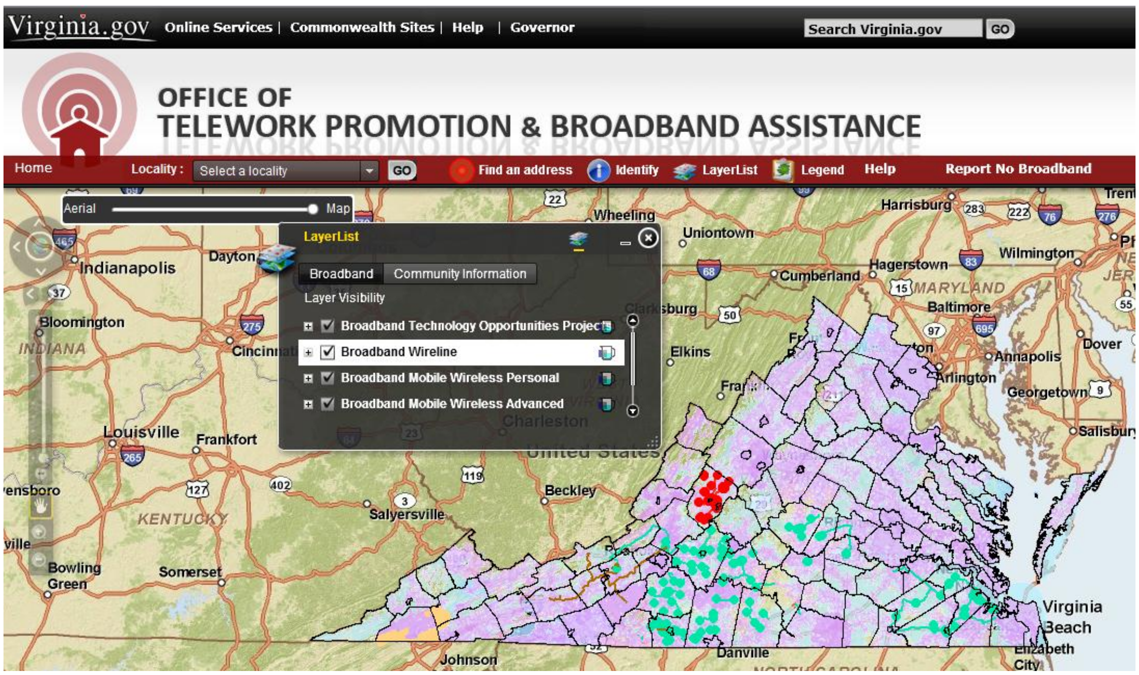


Population (2000)	643,499
Median income	[$](#)50,990
Ethnicity	79.1% White, 16.2% Black, 2.3% Asian, 2.0% Hispanic, 0.3% Native American, 0.2% other
Cook PVI	R+9

While no specific information appears to be available for the 7th District in Virginia, the statistics for broadband in rural Virginia are as follows:

Total State Population:	7,078,515
Urban Population:	5,169,955
Rural Population:	1,908,560
Percent of the State population with high speed access:	78.8 percent

The Governor's office for the State of Virginia has issued a series of maps depicting in which portions of the state broadband services are available. This first map shows that a significant portion of the State is already covered by broadband, however it should be noted that is map includes Broadband Wire line services (usually DSL or Cable with data speeds of between 1 and 3 Mbps, as well as two forms of mobile broadband coverage. The maps below show the State's broadband status for both what is called Broadband Mobile Wireless Personal and Broadband Mobile Wireless Advanced.



As can be seen from these two maps the State of Virginia and including the 7th district has wireless broadband coverage at the lower data rate (Broadband Wireless Personal) but when reviewing the map for Mobile Wireless Advanced services, (4G or LTE services) the State remains basically uncovered.

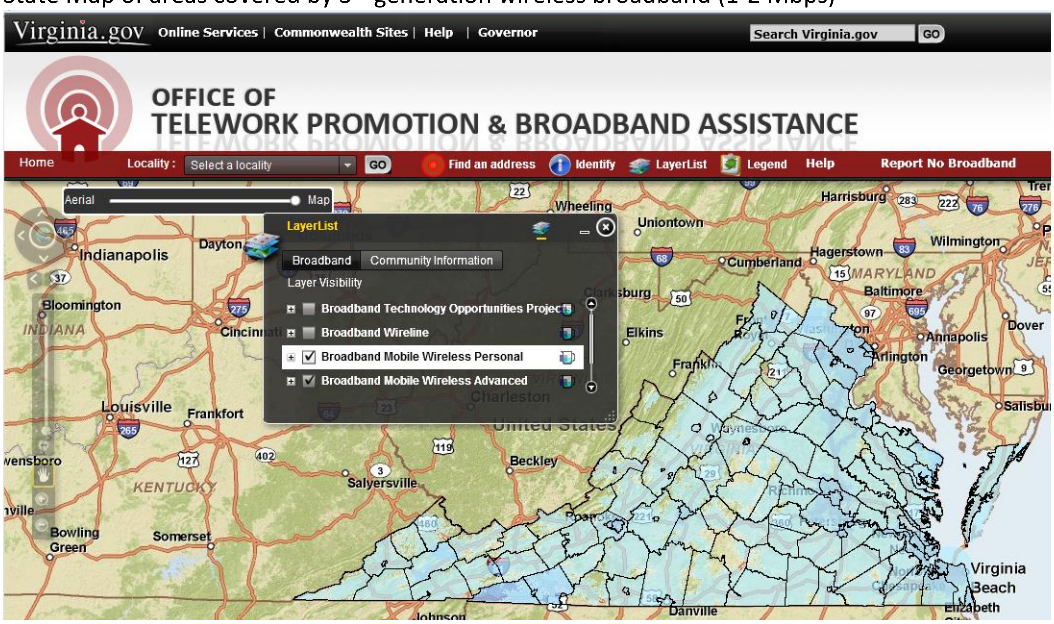
The expansion of 4G or LTE high-speed broadband wireless services will be slow to materialize because of the large investment required by the commercial network operators. However, if the D block is re-allocated to public safety, in many rural areas of Virginia, including those within the 7th Congressional District, Public Safety will be able to team up with many potential private companies to jointly build out 4G broadband wireless.

These public/private partnerships would provide much faster deployment of 4th generation broadband wireless services in all of Virginia but especially in the rural areas. The public safety community (local jurisdictions) would enter into these partnerships which would permit the private companies to contribute funding, and existing cell sites and power lines as well as back-haul, and would result in a rapid build out of the entire State. In this manner the State of Virginia and including the 7th Congressional district would achieve near 100% broadband coverage within the next few years.

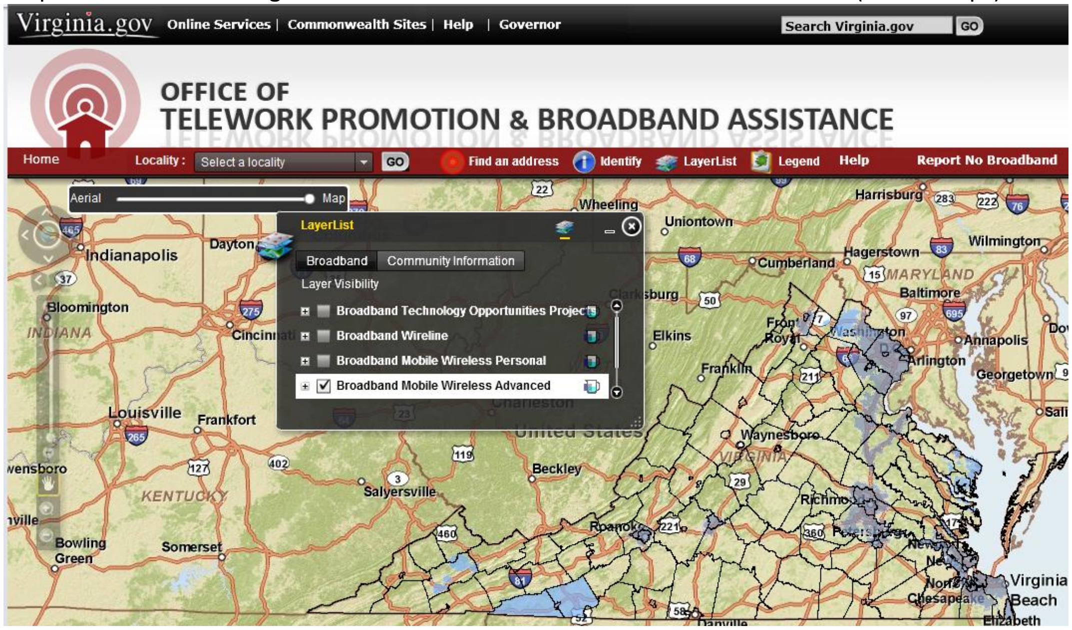
The business model could look something like this:

1) The Public Safety Governance organization (the license holder), or the State of Virginia, enters into a public/private partnership with interested parties to build out the 700 MHz Public Safety broadband network in district.
2) The private companies involved could include private telecommunications companies, local power utilities, health care and educational organizations.
3) The private companies would help fund the cost of the network build out with the balance of the funds coming from the Federal funding as proposed in several of the bills now before congress.
4) The private companies would also contribute rights of way, existing telecommunications and power line towers, back-haul, and right of way access.
5) The network would then be available, on a secondary basis as follows:
    a. Power companies would use the network to meet their SmartGrid needs
        i. They could then resell broadband services to their rural customers for Internet access
    b. Telecommunications companies would also be able to make use of and resale wireless broadband services to their customers.
    c. Health Care and educations organizations would be able to make use of the network for their own use at favorable broadband rates.
6) The on-going cost of operating the network would be funding by a combination of the private and public safety entities that would make use of the network.

State Map of areas covered by 3rd generation wireless broadband (1-2 Mbps)



Map of the State showing current 4th Generation Wireless Broadband Services (12-15 Mbps)



This type of private/public partnership would provide the 7th District of Virginia with almost 100% of the population with access to broadband services for their businesses, homes, schools, and other locations where broadband services are currently not available today. Public Safety would have full use of the network during major disasters but at all other times the network would be shared by all of the contributing parties.

During times of a major emergency only those secondary customers within the affected area would be have reduced access or no access to the wireless broadband network. Those outside of the affected area would still have full access the wireless broadband network on a secondary basis.

Conclusion:

These types of public/private partnerships, on a local level, are good for public safety, good for the private companies who will be working with the public safety community to build and operate this network and will provide faster broadband in the rural areas of the State, including the 7th Congressional district to those living in these rural areas.

As far as I know there is nothing planned with in the State or the 7th District which will provide broadband services to not only the first responder community but to private companies as well as the residents of the area in such a timely and affordable manner.

Andrew M. Seybold

P E R S P E C T I V E S

PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES

Re-Auction of the D Block: A Review of the Arguments

George S. Ford and Lawrence J. Spiwak*

May 24, 2011

Introduction

Last March, we released a POLICY BULLETIN entitled: *Public Safety or Commercial Use? A Cost/Benefit Framework for the D Block,*[1] in which we proposed a framework to assess the relative benefits of having the government either assign the D Block to public safety or re-auction the spectrum for commercial use. Each approach has its costs and its benefits. Our analysis indicated that the 10 MHz D Block provides $3.4 billion more in social benefits if assigned to public safety rather than to commercial use, even accounting for the expected auction revenues from that block. That is, the financial benefits of public safety assignment exceed any lost auction revenue from the D Block.

Notwithstanding, some policymakers remain committed to a re-auction attempt of the D Block for commercial use. Many proponents of a D Block re-auction focus exclusively on the potential auction revenues from the block.[2] Others appear to believe the auction will somehow fund the entire (or at least a good chunk of the) public safety network.[3] In these tough financial times, it is difficult to criticize anyone looking for revenues or cost savings.[4] However, it is essential to consider the full financial effects of the allocation options, not simply those implications favoring one option or another.

In this PERSPECTIVE, we present a more holistic view of the financial implications of a D Block re-auction. First, we present evidence suggesting that the claimed $3 billion in revenue from a D Block re-auction is too rosy an expectation.[5] Statistical analysis of historical auctions indicates that a 10 MHz block of spectrum in the 700 MHz band must be *unencumbered* to produce $3 billion in revenues.[6] Yet, the FCC's *National Broadband Plan* envisions a number of significant encumbrances on any re-auction of the D Block which have substantially reduced auction revenues in the past.[7] (In 2008, the D Block failed to secure a minimum bid at auction of $1.3 billion due to onerous encumbrances, creating the stalemate among lawmakers and policymakers we are faced with today over this block of spectrum.)

> ***... re-auction of the D Block will increase government spending on the public safety network and reduce future auction revenues by far more than the re-auction may generate in revenues.***

Second, the re-auction of the D Block will under no circumstances come close to fully funding a public safety network. A nationwide public safety network is expected to cost about $10 to $13 billion. Even if a re-auction of the D Block did bring in $3 billion of revenues, it offsets only about one quarter of the public safety network's cost. The D Block re-auction offers no other mechanism by which to generate funds for the remaining network construction and operating costs. To date, the only formal proposal put forth to fund the public safety network with auction revenue is a voluntary incentive auction for television broadcast spectrum.[8]

Finally, we discuss the potential broader adverse market effects of a D Block re-auction. The evidence indicates that the public safety community needs a full 20 MHz of spectrum.[9] If the D Block is assigned to commercial use, then an additional 10 MHz for public safety must be obtained from either future spectrum assignments or the capacity-equivalent thereof obtained via burdensome public safety encumbrances on commercial spectrum.[10] This alternate block of spectrum will not be contiguous to the Public Safety Broadband ("PSB") Block, which has the effect of increasing the deployment cost of the public safety network by an estimated $4 billion relative to the D Block assignment.[11]

… a 10 MHz block of spectrum in the 700 MHz band must be unencumbered to produce $3 billion in revenues. Yet, the FCC's National Broadband Plan envisions a number of significant encumbrances on any re-auction of the D Block …

A commercial assignment of the D Block also has the potential of frustrating the creation of contiguous blocks of spectrum for future auctions, thereby substantially reducing auction revenues. Moreover, filling the public safety spectrum shortage with public safety obligations on all commercial providers could substantially reduce future auction revenues.

In all, a plausible case can be made that the re-auction of the D Block will increase government spending on the public safety network and reduce future auction revenues by far more than the re-auction may generate in revenues. Even under the favorable scenarios (e.g., $3 billion in revenues), the re-auction of the D Block does not appear to pass a cost-benefit test.

Revenues from the D Block are Likely to be Relatively Small

The D Block and the PSB Block are two contiguous 10 MHz blocks in the 700 MHz band. In 2008, the Commission attempted to auction the D Block to create a mandated public-private partnership for a public safety network. Since the D Block is contiguous to the 10 MHz PSB Block, the agency hoped that the partnership would permit some commercial use of the PSB Block and provide additional capacity for public safety professionals on the D Block when needed. As we all know, the effort was an unmitigated failure, effectively leaving fallow both blocks—a condition that persists today.[12]

Despite the D Block bust, the *National Broadband Plan* proposes to try again. Recognizing the past failure, the Commission hopes to "overcome past challenges by encouraging, though not requiring, incentive-based partnerships to ensure success."[13] In other words, the Commission intends to assign the D Block to commercial use, leaving the public safety community to make its way with its 10 MHz PSB Block, an amount that appears to be insufficient for a modern, interoperable public safety network.[14]

Some favor the agency's plan; others oppose it. Support for the re-auction of the D Block is based largely on its potential to generate auction revenue, which will be used to support unprecedented levels of federal deficit spending.[15] By government estimates, the D Block would generate about $3 billion in auction revenues.[16]

Based on an econometric analysis of the more recent spectrum auctions in the United States, if the FCC auctioned the D Block on a truly unencumbered basis, then we could expect the auction to generate revenues in the range $1.3 to $3.3 billion.[17] However, the re-auction of the D Block is not unencumbered. The Commission has made clear that it intends to impose costly requirements on any re-auction of the D Block.

While the agency hopes for a "voluntary"[18] public-private partnership, it nevertheless hedges, advancing a set of rules by which the D Block will be auctioned. These rules include the following:

- D Block licensee(s) must use a nationally standardized air interface [to] ensure that the D block will be technically capable of supporting roaming and priority access by public safety users of the neighboring public safety broadband block;
- D Block licensee(s) are required to provide such roaming and priority access to public safety users;
- D Block licensee(s) must develop and offer devices that operate both on the D Block and the neighboring public safety broadband block; and
- [D Block licensee(s)] should be subject to commercially reasonable buildout requirements.[19]

Clearly, the *National Broadband Plan*'s proposal for re-auctioning the D Block includes a number of meaningful value-reducing encumbrances.[20]

As what is past can easily become prologue, it is sensible to look for guidance at the effects of similar requirements from the original failed auction. Fortunately, we have available a detailed report on the first failed auction from the agency's own Inspector General ("IG"), who conducted a careful and detailed investigation into the reasons underlying the failure of the first D Block auction. This report contains numerous interviews with many of the major industry players, and presents a devastating critique of the public-private partnership approach to the public safety network.[21] Many of the findings in the IG's Report remain relevant to the *National Broadband Plan*'s re-auction proposal, as we discuss below.

Roaming and Priority Access

Perhaps the biggest conflict for any public safety public/private partnership comes over the crucial and highly contentious issue of roaming and priority access. Under both the FCC's old and new proposed paradigm, the D Block licensee is "*required* to provide roaming and [] priority access" for public safety use.[22]

... the re-auction of the D Block will under no circumstances come close to fully funding a public safety network.

In the case of the original D Block auction, the IG found such access requirements to be a major impediment to the successful implementation of the D Block paradigm. Indeed, as the IG pointed out, public safety's mandatory prioritization meant that commercial users on the D Block would have been "subject to the very kinds of service interruptions—during periods of peak preemption—deemed unacceptable to public safety."[23] One industry executive described the plan as "ruthless preemption" that would lead to "a very costly network with diminished commercial value."[24]

Moreover, given the requirement to enter into roaming and access agreements, the parties are obligated to set compensation to the private operator for use of its spectrum. A likely approach is for the FCC to impose on commercial providers a mandatory obligation similar to that imposed in the agency's recent *Data Roaming Order*, where parties must reach "commercially reasonable" roaming agreements with public safety entities or deal with the Commission as arbiter.[25]

... filling the public safety spectrum shortage with public safety obligations on all commercial providers could substantially reduce future auction revenues.

The problem with such a paradigm, particularly in regards to public safety entities, is that the Commission has very little credibility with Wall Street as a neutral arbiter of disputes. Indeed, in the case of the original D Block auction, the IG found that private firms expressed a legitimate "fear that the FCC would have a tendency to support the perceived needs [of public safety… and, as such, the] assurance that the FCC would monitor the negotiations, require good faith, and be the final arbiter of disputes was small comfort" to any prospective bidder.[26] Obviously, such risk will continue reduce the value of the D Block at any re-auction.

Increased Cost of Deployment

A network suitable for public safety also requires both higher technical standards and a larger footprint than does a strictly commercial network. And, logically, with such increased requirements comes higher network deployment costs, and, in turn, with higher deployment costs comes a lower auction value for the spectrum.[27] Former FCC Chairman Reed Hundt, who was serving as the President of potential D Block bidder Frontline Communications, conceded "the costs necessary to reach only a few additional users would entail a vastly disproportionate additional cost."[28] Likewise, Verizon testified that the buildout requirements were too "costly"[29] and Qualcomm testified that the buildout requirements were "too onerous", going so far as to note that these requirements were "far more expensive than any of the current [commercial] networks."[30]

The *National Broadband Plan's* re-auction proposal does not fully alleviate these cost concerns. The new D Block licensee would be required to take on cost-increasing mandates including: (1) the use of a Commission-selected air interface; (2) the mandate to develop and offer devices that operate both on the D Block and the PSB Block; and (3) the requirement to buildout the network on the agency's timetable.[31] All of these requirements could increase deployment costs, thereby reducing the auction value of the D Block.

The Value of the Encumbered D Block

According the FCC's Inspector General, public safety encumbrances on quasi-commercial spectrum create "many layers of uncertainty and risk," and these problems "were responsible for potential bidders' decisions not to bid" on the public/private partnership promoted by the agency.[32] The *National Broadband Plan*'s proposal likewise creates "many layers of uncertainty and risk," and it is reasonable to expect a significant diminution in the value of the block to private-sector bidders, reducing auction revenues.

Public safety obligations of the first auction attempt reduced the value of the spectrum by 86%[33] and, as discussed above, the FCC's re-auction plan embraces similar encumbrances. Moreover, in light of recent Commission actions in the *Harbinger Order,*[34] and the pending merger of AT&T and T-Mobile, we believe there will be few established bidders for the D Block, either as a result of carrier choice or, more likely, by government mandated exclusion.[35] Fewer bidders typically implies less revenue.

As we concluded in our earlier paper, a re-auction of the D Block could produce less than $1 billion in revenue and is unlikely to exceed $2 billion in the best plausible scenario.[36] (We note, however, such predictions are necessarily speculative.)

Revenues from a New D Block Auction Will Not Fully Fund a Public Safety Network

As noted above, one alleged benefit of re-auctioning the D Block is the creation of revenues to help fund the public safety network. It appears that some policymakers believe these revenues will be sufficient to fully fund the public safety network. Nothing could be further from the truth.

The cost of constructing a public safety network is estimated to be about $10 to $13 billion.[37] In light of the numerous encumbrances, it is unlikely that the D Block will generate auction revenues anywhere near the claimed $3 billion. A more reasonable estimate is revenue in the $1 billion to $2 billion range. So, under the best of conditions, therefore, the re-auction offsets about one one-third of the costs. A more plausible case is one-tenth of the cost.

Plainly, a D Block re-auction will not pay for the public safety network. Indeed, it will cover only a small share of the costs under the best of conditions, and, as explained in the next section, may actually increase the cost of the network.

Broader Adverse Market Effects of a D Block Re-Auction

As noted above, evidence indicates that public safety needs 20 MHz of spectrum to construct a modern, interoperable LTE public safety network.[38] Re-auctioning the D Block, however, leaves the public safety community with only 10 MHz of spectrum (the PSB Block). If 20 MHz is indeed required for a fully-functioning public safety network, then, as we explained in POLICY BULLETIN NO. 26, there are two solutions to resolve this shortfall, neither of which favor the re-auction of the D Block.

One option is to give additional spectrum, say 10 MHz, to the public safety community in the future. This block, however, will not be contiguous to the PSB Block. As a consequence, the efficiencies of contiguous spectrum are lost. Adding a non-contiguous 10 MHz block to the PSB Block increases deployment costs for the public safety network by about $4 billion.[39]

Now, rather than reducing the public cost of the public safety network by an amount equal to auction revenues (as re-auction proponents hope), the re-auction plan increases the cost of the network by more than any offered estimate of auction revenues. The re-auction places a heavier burden on government finances than does a reassignment of the block to public safety. In essence, it could be argued that the re-auction proposal is founded on the logic that $3 billion in revenues (at best) is sufficient to justify $4 billion in additional network deployment costs (which must be funded by the government).

... the re-auction of the D Block will increase government spending on the public safety network and reduce future auction revenues by far more than the re-auction generates in revenues.

A second approach is to burden all commercial providers with public safety obligations. Indeed, this approach is already being contemplated by the Commission. In the *National Broadband Plan's* re-auction plan, the Commission intends to impose a requirement that "commercial mobile radio service providers … give public safety users the ability to roam on commercial networks in 700 MHz and potentially other bands."[40] Unlike in the earlier attempt to auction the D Block, the Commission now proposes to extend the "priority access on commercial networks" to *"all networks using the 700 MHz band and potentially other networks as well."*[41]

Thus, under the agency's purportedly new and improved plan, the value-killing obligations that sank the first D Block auction apply not just to the D Block but to *all* spectrum licenses, sabotaging the commercial value of spectrum and increasing compliance costs for firms. As such, the expectation should be that the D Block re-auction curbs future auction revenues, including the contemplated voluntary incentive auction to reclaim unused broadcast spectrum. The plan also reduces the value of spectrum auctioned in the past, though we do not expect the Commission to issue refunds (though perhaps they should).[42]

The voluntary spectrum incentive auctions proposed for broadcast spectrum could break the stalemate on this vitally important issue regarding robust … broadband communications for America's first responders.

Depending on the rules, which the agency suggests may be expansive, the lost auction revenues could accrue on virtually all spectrum auctioned in future periods. Adding these lost revenues to the attenuation in commercial value of previously auctioned spectrum would easily swamp the $1 to $2 billion in auction revenues expected from the D Block. If true, the re-auction option appears exceedingly short sighted.

Conclusion

Resistance to the assignment of the D Block to the public safety community—thereby providing these vital public servants the resources to build a modern mobile communications network—rests largely on the hope of significant revenues generated from the re-auction of the D Block for commercial uses. However, a re-auction of the D Block offers far less revenue potential than the government predicts. Given the FCC's proposed encumbrances, and other likely auction rules imposed by an aggressively regulatory agency, the auction revenues from the block are more likely to be about $1 billion—about one-third of the number bandied about by auction proponents.

Yet, regardless of whether or not revenues are $1 billion or $3 billion, the auction revenues do not come close to fully funding the public safety network, as some appear to believe it will, and the re-auction plan offers no other source of revenue for funding the network. The government is on the hook for funding the vast majority of the costs of the public safety network. As noted above, to date, the only credible proposal that could provide sufficient spectrum to alleviate the looming spectrum exhaust and provide significant auction revenue sufficient to cover the cost of building a public safely network and have money left over for deficit reduction is the notion of voluntary incentive auctions to repurpose unused broadcast spectrum.[43]

If the 10 MHz PSB Block falls short of satisfying public safety's spectrum requirements, as studies indicate it will, then the re-auction of the D Block actually increases the taxpayer's share of network deployment costs by far more than anyone's expectation of auction revenues. Also, the re-auction will cut substantially future auction revenues if the Commission imposes public safety encumbrances on all 700 MHz spectrum and other spectrum as well to cover the spectrum shortfall for public safety.

In all, the notion that the re-auction of the D Block is a net positive for the government's budget is exceedingly weak. A more likely consequence is that the re-auction increases deficit spending by adding costs to the public network and reducing future auction revenues.

If Congress is truly serious about raising money through commercial spectrum auctions, then it should encourage federal regulators in their efforts to find more spectrum, including the repurposing of television broadcast spectrum to more valued uses. The voluntary spectrum incentive auctions proposed for broadcast spectrum could break the stalemate on this vitally important issue regarding robust, reliable and resilient broadband communications for America's first responders.

NOTES:

* **Dr. George Ford** ***is Chief Economist of the Phoenix Center for Advanced Legal and Economic Public Policy Studies; Lawrence J. Spiwak is President of the Phoenix Center for Advanced Legal & Economic Public Policy Studies. The views expressed in this*** **PERSPECTIVE** ***do not represent the views of the Phoenix Center, its Adjunct Follows, or any if its individual Editorial Advisory Board Members.***

1 G.S. Ford and L.J. Spiwak, *Public Safety or Commercial Use? A Cost/Benefit Framework for the D Block*, PHOENIX CENTER POLICY BULLETIN NO. 26 (March 2011) (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB26Final.pdf).

2 *See, e.g.*, S. Jerome, *Senate Dems Rally Behind Public Safety Bill*, THE HILL (May 15, 2011) (available at: http://thehill.com/blogs/hillicon-valley/technology/161287-senate-dems-rally-behind-public-safety-bill); D. Hatch, *Walden on Collision Course with Dems Over Spectrum*, NATIONAL JOURNAL (February 10, 2011) (available at: http://techdailydose.nationaljournal.com/2011/02/walden-on-collision-course-wit.php); PRESS RELEASE, *Upton, Walden Respond to President's Broadband Proposals* (February 10, 2011) (available at: http://republicans.energycommerce.house.gov/News/PRArticle.aspx?NewsID=8205).

3 S. Jerome, *Blackburn Supporting D Block Auction*. THE HILL (January 24, 2011) (available at: http://thehill.com/blogs/hillicon-valley/technology/139657-blackburn-to-support-d-block-auction). Notably, the original idea for a public-private partnership to buildout a public safety network was considered an option at the time due when there was no public funding to support a nationwide, dedicated public safety broadband network.

4 *See, e.g.*, S. Jerome, *House GOP Fears Big Taxpayer Tab For Public Safety Network*, THE HILL (May 23, 2011) (available at: http://thehill.com/blogs/hillicon-valley/technology/162649-house-gop-unflinching-on-cost-fears-for-public-safety-network); D. Hatch, *Walden on Collision Course with Dems over Spectrum*, NATIONAL JOURNAL, *supra* n. 2 ("... if the D-block is not auctioned, a significant revenue-generating opportunity would be lost. You open a three billion dollar wound in a rather bleeding budget"); S. Jerome, *Upton, Walden Question President's Wireless, Public Safety Proposals*, THE HILL (February 10, 2011)(available at: http://thehill.com/blogs/hillicon-valley/technology/143321-upton-walden-question-presidents-wireless-public-safety-proposals).

5 *Id*. *See also* http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access.

6 *Cost/Benefit Framework for the D Block*, *supra* n. 1 at p. 7; G.S. Ford, T.M. Koutsky and L.J. Spiwak, *Using Auction Results to Forecast the Impact of Wireless Carterfone Regulation on Wireless Networks*, PHOENIX CENTER POLICY BULLETIN NO. 20 (Second Edition) (May 2008) (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB20Final2ndEdition.pdf).

7 CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter the *National Broadband Plan*) at p. 315-6, Recommendation 5.8.2.

8 *See, e.g.*, "Public Safety Spectrum and Wireless Innovation Act" recently introduced by Commerce Committee Chairman Senator Jay Rockefeller (D-WV), which would also give public safety the entire 20 MHz of the D Block and PSB and cover the costs of the network via voluntary incentive auctions to free up unused broadcast spectrum. (http://commerce.senate.gov/public/?a=Files.Serve&File_id=6321ae2e-fc48-412a-8eaf-15c848bc7047. This plan has received wide bi-partisan support, although the FCC was reportedly opposed to it. *See* S. Jerome, *Rockefeller: FCC was "Not Happy" with his Public Safety Communications Plan*, THE HILL (February 6, 2011) (available at: http://thehill.com/blogs/hillicon-valley/technology/142345-sen-rockefeller-fcc-was-nothappy-with-his-public-safety-plan).

9 A. Seybold, *Comments on the FCC White Paper: Federal Communications Commission Omnibus Broadband Initiative A Broadband Network Cost Model: A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America's First Responders*, Working Paper (April 26, 2010), p. 5 (10 MHz is insufficient for public safety) (available at: http://andrewseybold.com/wp-content/uploads/2010/04/Comments-FCCWP-Final-April-27-2010.pdf); A. Seybold, *Public Safety Broadband* (March 4, 2010) ("10 MHz of spectrum is not enough for either the public safety community or a commercial operator to handle all of the data traffic in the top 50-75 urban areas") (available at: http://andrewseybold.com/1338-public-safety-broadband); Rysavy Research, *The Spectrum Imperative: Mobile Broadband Spectrum and its Impacts for U.S. Consumers and the Economy – An Engineering Analysis* (March 16, 2011) (available at: http://www.mobilefuture.org/page/-/rysavy-

NOTES CONTINUED:

spectrum-effects-301611.pdf) at p. 6 (demonstrating that LTE networks require a minimum of 20 MHz of spectrum). As the FCC has mandated that public safety networks must use LTE, it follows that public safety needs the full 20 MHz of spectrum. *See In the Matter of Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; Amendment of Part 90 of the Commission's Rules,* __ FCC Rcd __, FCC 11-6, THIRD REPORT AND ORDER AND FOURTH FURTHER NOTICE OF PROPOSED RULEMAKING (rel. January 26, 2011).

10 Today public safety's mission-critical voice communications are limited by nature because of a maze of different spectrum bands allocated to public safety at different times over the years and it has taken herculean efforts to create interoperability in particular spectrum bands, such as the 800 MHz band, in certain regions of the country, such as the Gulf Coast. This is the primary reason why interoperability remains elusive for first responders across the nation.

11 *Cost/Benefit Framework for the D Block*, *supra* n. 1 at p. 11.

12 OFFICE OF INSPECTOR GENERAL, *Official Report: D Block Investigation* (April 25, 2008) (hereinafter "*IG Report*") (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-281791A1.pdf). Some limited waivers have been granted for public safety officials to use the PSB Block.

13 *National Broadband Plan*, *supra* n. 7, at p. 315.

14 *Supra* n. 9. It should be noted that the Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) ("DRA") directs the agency to auction the D Block.

15 *Supra* n. 5.

16 *Id.*

17 *Cost/Benefit Framework for the D Block, supra* n. 1 at p. 7; *Using Auction Results*, *supra* n. 6; G.S. Ford, *Valuing the AWS-3 Spectrum: A Response to Comments*, PHOENIX CENTER PERSPECTIVE NO. 08-02 (July 21, 2008) (available at: http://www.phoenix-center.org/perspectives/Perspective08-01Final.pdf); G.S. Ford, *Calculating the Value of Unencumbered AWS-III Spectrum*, PHOENIX CENTER PERSPECTIVE NO. 08-01 (June 25, 2008) (available at: http://www.phoenix-center.org/perspectives/Perspective08-02Final.pdf).

18 *National Broadband Plan*, *supra* n. 7 at Recommendation 5.8.2.

19 *Id.*

20 If the buildout schedule for the re-auctioned D Block is commensurate with other commercial auctions, then there should be no devaluation based solely on the buildout schedule.

21 *IG Report, supra* n. 12.

22 *National Broadband Plan, supra* n. 7 at p. 315.

23 *IG Report*, *supra* n. 12 at p. 24.

24 *Id.* at p. 20.

25 *In the Matter of Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services,* FCC 11-52, SECOND REPORT AND ORDER, __ FCC Rcd __ (rel. April 7, 2011) at ¶¶ 74-87.

26 Indeed, in the case of the first D Block auction, the IG found that public safety officials "freely acknowledged that emergency responders could not be subject to the kind of interruption and loss of service experienced by the typical cell phone user [… and that a] system impervious to such interruptions would be much more expensive to build." *IG Report, supra* n. 12 at p. 23. *See also* G.S. Ford and L.J. Spiwak, *The Broadband Credibility Gap*, PHOENIX CENTER POLICY PAPER NO. 40 (June 2010) (available at: http://www.phoenix-center.org/pcpp/PCPP40Final.pdf), *and republished in* 19 COMMLAW CONSPECTUS 75 (2010) (illustrating the effects of a lack of credibility by regulators).

27 *IG Report, id.* at p. 24.

28 *Id.* at p. 24.

NOTES CONTINUED:

29 *Id.* at p. 20.

30 *Id.* at p. 21.

31 *National Broadband Plan*, *supra n*. 7 at Recommendation 5.8.2.

32 *IG Report*, *supra* n. 12 at p. 26.

33 *Cost/Benefit Framework for the D Block, supra* n. 1.

34 *SkyTerra Comm., Inc. & Harbinger Capital Partners Funds, Applications for Consent to Transfer of Control, Memorandum* OPINION AND ORDER AND DECLARATORY RULING, 25 FCC Rcd 3059 (2010); *see also Cost/Benefit Framework for the D Block, supra* n. 1 at pp. 7-9; T.R. Beard, G.S. Ford, L.J. Spiwak, and M. Stern, *A Policy Framework for Spectrum Allocation in Mobile Communications*, 63 FEDERAL COMMUNICATIONS LAW JOURNAL 639, 651-52 (2011) (available at http://www.law.indiana.edu/fclj/pubs/v63/no3/Vol.63-3_2011-May_Art.-03_Beard.pdf).

35 *Cost/Benefit Framework for the D Block, supra* n. 1; Beard, Ford *et al. id.*

36 *Cost/Benefit Framework for the D Block, id.* at p. 9.

37 *Id*. at p. 11; R. Arbogast and D. Kaut, *Senators Push for Public Safety Build, Wireless Broadband Spectrum Bill*, STIFEL NICOLAUS TMT REGULATORY (May 18, 2011) ("the public-safety network could be built for $11-13 billion").

38 *Supra* n. 9.

39 *Cost/Benefit Framework for the D Block, supra* n. 1 at p. 11.

40 *National Broadband Plan, supra* n. 7 at p. 316 (Emphasis supplied).

41 *Id.* at p. 316.

42 *In the Matter of Preserving the Open Internet, Broadband Industry Practices,* FCC 10-201, REPORT AND ORDER, __ FCC Rcd __ (rel. December 23, 2010) at ¶ 133 (according to the FCC, it has the authority to "change the license terms 'if in the judgment of the Commission such action will promote the public interest, convenience, and necessity' … even if the affected licenses were awarded at auction.")

43 *See supra* n. 9.

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PUBLIC SAFETY OR COMMERCIAL USE? A COST/BENEFIT FRAMEWORK FOR THE D BLOCK

Abstract: The issue of whether the government should assign the D Block of spectrum to public safety or auction the spectrum for commercial use requires an assessment of the relative benefits and costs of these two alternatives. We propose such a framework, and preliminary analysis suggests that the 10 MHz D Block plausibly provides at least $3.4 billion more in social benefits if assigned to public safety rather than to commercial use. Much of this difference is attributable to the unique opportunity to create a contiguous 20 MHz block of spectrum, and to the fact that this opportunity exists only for the public safety community. As for the lost auction revenue, we observe that the loss of auction revenues today is more than offset by the gain of higher auction revenues and lower public safety network deployment cost in the future. Thus, an auction of the D Block adds, rather than relieves, stress to the public budget. Finally, we estimate that if policymakers choose not to give public safety the D Block and instead opt to require service obligations on other 700 MHz spectrum that would permit the encroachment of public safety users during episodes of resource scarcity, then such encumbrances could materially diminish the auction value of any newly allocated 700 MHz spectrum by as much as 86%.

I. Introduction

As part of the reallocation of the spectrum made available by the digital television ("DTV") transition, the Federal Communications Commission boldly attempted to create, and fund, a nationwide interoperable public safety network. To make a very complicated story simple, as part of the DTV transition, Congress set aside approximately 10 MHz of the new spectrum for public safety use (commonly referred to as the "Public Safety Broadband" allocation or "PSB"). When the FCC set up its auctions for the DTV spectrum, it placed the PSB next to a contiguous 10 MHz of spectrum (the D Block) that was to be auctioned, so the theory went, to create a public/private partnership that could be used for both commercial and public safety purposes utilizing both the D Block and the PSB.[1] However, due to the public service obligations imposed on the D Block auction and the questionable logic of the scheme, the auction effort failed, an outcome of little surprise to anyone.[2] Today, three years after the failed auction, the debate about what should be done next about the D Block is fully engaged.[3]

Given the observed failure of the "public/private partnership" approach, the rapid rise in public safety capacity demands, and the unique benefits of combining the PSB and the D Block, the public safety community has requested that the Federal government forgo the auction of the D Block and directly assign it to public safety. This allocation would thus provide for a full 20 MHz of contiguous prime spectrum that could be used to construct a modern, interoperable nationwide public safety communications network.[4] The FCC to date has rejected this request, planning instead to auction the D Block on an unencumbered basis for commercial use (subject to technical capability for public safety broadband use),[5] although the agency has granted some waivers to begin operations in the PSB.[6] In the FCC's view, any shortfall in capacity on the

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1 *In the Matter of Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems; Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services; Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission's Rules Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010 Declaratory Ruling on Reporting Requirement under Commission's Part 1 Anti-Collusion Rule,* FCC 07-132, SECOND REPORT AND ORDER, __ FCC Rcd ___ (rel. Aug. 10, 2007) at ¶¶ 325-36.

2 *See, e.g.,* Art Brodsky, *Public Safety Doomed "D Block" Auction To Failure*, Public Knowledge Blog (March 26, 2008) (available at: http://www.publicknowledge.org/node/1479); Mathew Lasar, *700 MHz D Block Autopsy: Public Safety Net Concept Was Doomed,* ARS TECHNICA (April 27, 2008) (available at: http://arstechnica.com/old/content/2008/04/700mhz-d-block-autopsy-public-safety-net-concept-was-doomed.ars).

3 Auction 73 was closed on March 18, 2008 (http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=73).

4 *See, e.g.,* Public Safety Alliance, *"What's at Stake"*, available at: http://www.psafirst.org/what-is-at-stake.

5 CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter the *National Broadband Plan*) at 86.

6 *See In Re Service Rules for the 698-746, 747-762 and 777-792 MHz Bands,* WT Docket No. 06-150; *Implementing a Nationwide Broadband, Interoperable Public Safety Network in the 700 MHz Band,* PS Docket No. 06-229; *Amendment of*

(Footnote Continued….)

public safety network can be resolved by roaming agreements with commercial carriers.[7] And, of course, an auction brings with it the potential to enrich the Treasury with much needed revenues.[8]

Interestingly, the White House has rejected the FCC's proposal and has sided with the public safety community, explicitly calling for the reallocation of the full 20 MHz of contiguous spectrum to build a modern, interoperable nationwide public safety network.[9] Such a position is consistent with the "Public Safety Spectrum and Wireless Innovation Act" recently introduced by Commerce Committee Chairman Senator Jay Rockefeller (D-WV), which would also give public safety the entire 20 MHz of the D Block and PSB.[10] This plan has received wide bi-partisan support,[11] although the FCC was reportedly opposed to it.[12] Other policymakers from both political parties, however, have views more aligned with those of the Commission,

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Part 90 of the Commission's Rules, WP Docket No. 07-100; *Third Report and Order* and *Fourth Further Notice of Proposed Rulemaking,* FCC 11-6, ___ FCC RCD __ (rel. January 26, 2011) at ¶ 4.

7 *A Broadband Network Cost Model: A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America's First Responders,* OBI TECHNICAL PAPER NO. 2 (May 2010) at 1 (available at: http://download.broadband.gov/plan/fcc-omnibus-broadband-initiative-(obi)-technical-paper-broadband-network-cost-model-basis-for-public-funding-essential-to-bringing-nationwide-interoperable-communications-to-americas-first-responders.pdf) (hereinafter "*Broadband Network Cost Model*"); *see also* Jon Peha, *The Public Safety Nationwide Interoperable Broadband Network: A New Model for Capacity, Performance and Cost,* FCC White Paper (June 2010) at 18 ("The network is based on the availability of 10 megahertz of spectrum dedicated to public safety use by Congress, which provides public safety with substantially more spectrum per user than major commercial networks, providing them with the required capacity and performance for critical communications needs. Roaming and priority access will provide additional capacity on up to 70 megahertz or more of spectrum")(available at: http://fcc.gov/pshs/docs/releases/DOC-298799A1.pdf).

8 *See, e.g.,* Oral Testimony of Coleman Bazelon, The Brattle Group, U.S. House of Representatives, Committee on Energy and Commerce Subcommittee on Communications, Technology, and the Internet (June 17, 2010).

9 White House Press Release, *President Obama Details Plan to Win the Future through Expanded Wireless Access* (February 10, 2011) (available at: http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access).

10 Available at: http://commerce.senate.gov/public/?a=Files.Serve&File_id=6321ae2e-fc48-412a-8eaf-15c848bc7047. To alleviate the "spectrum crunch", Senator Rockefeller is also including the bold idea of "incentive auctions" to try to coax broadcasters to free up additional spectrum. According to a study by CEA and CTIA, such incentive auctions can be expected to generate over $30 billion in new revenue, some of which can be used to fund the new public safety network. *See, Broadcast Spectrum Incentive Auctions,* White Paper prepared by CTIA: The Wireless Association and CEA: Consumer Electronics Association (February 15, 2011).

11 http://www.house.gov/apps/list/hearing/ny03_king/dblockreallocation.html.

12 Sara Jerome, *Rockefeller: FCC was "Not Happy" with his Public Safety Communications Plan,* THE HILL (February 6, 2011) (available at: http://thehill.com/blogs/hillicon-valley/technology/142345-sen-rockefeller-fcc-was-not-happy-with-his-public-safety-plan).

and are calling for the prompt auction of the D Block for commercial purposes.[13] This intra-governmental quibbling proceeds unabated as the public safety community waits to build a modern communications network.

Resolution to the D Block issue is a complex problem. Here, we present an economically-valid framework—heretofore absent from the debate—within which we can evaluate the cost and benefits of the relevant alternatives. While we cannot claim to answer every question relevant to the allocation decision and some of our estimates are necessarily speculative (e.g., what is the social value of public safety?), our analysis suggests that the assignment of the D Block to public safety is advised, with a net benefit of $3.4 billion dollars even when we pointedly ignore the benefits of the additional spectrum for the provision of public safety. The cost-benefit calculus depends largely on the benefits arising from the technical and economic advantages of contiguous spectrum and the relatively small impacts of a temporary, incremental increase of 10 MHz of spectrum on market outcomes. While more research on this topic is warranted, we hope future contributions will adhere to an explicit, rational framework for analysis.

II. A Decision Framework

A sensible decision framework begins by recognizing there are costs and benefits to all actions. If alternatives are mutually exclusive, as is the assignment of a *particular* 10 MHz block of spectrum, then assignment to one party excludes assignment to any other. In other words, assignment has an opportunity cost, and the proper accounting of such costs and their offsetting benefits is critical to rational decision making. The goal of public policy is to maximize economic well-being by choosing the option with the highest net value to the people of the United States.

A review of the D Block debate suggests the following characterization. Today, there is 10 MHz of spectrum that can be allocated either for public safety or for commercial purposes.[14] This D Block is contiguous to the 10 MHz PSB block already dedicated to public safety, permitting a unique opportunity for a public safety network of 20 MHz using contiguous

[13] *See, e.g.*, Sara Jerome, *Blackburn Supporting D Block Auction,* THE HILL (January 24, 2011); Sara Jerome, *GOP Torn Between Homeland Security, Fiscal Restraint in Public Safety Fight,* THE HILL (January 26, 2011) (available at: http://thehill.com/blogs/hillicon-valley/technology/140475-gop-torn-between-homeland-security-fiscal-restraint-in-public-safety-fight); Rep. Henry Waxman, *Emergency System Needs Upgrade,* ROLL CALL (July 8, 2010)(available at: http://www.rollcall.com/features/Technology_Telecommunications/tandt/-48166-1.html).

[14] We ignore other alternatives not part of the present debate.

spectrum.[15] In the relatively near future, according to the FCC and the Obama Administration, there will be much more spectrum available. The Federal government is in the process of adding an additional 500 MHz of spectrum for commercial use, with 300 MHz of that spectrum intended to be online by 2015.[16] The need for additional spectrum for the commercial sector has been established, and the evidence indicates that public safety's current and expected needs exceed 10 MHz.[17] Thus, we assume there will be another 10 MHz that must be allocated to whichever party does not receive the current allocation. However, this new spectrum will not be contiguous to the PSB, and the D Block will not be contiguous to this new spectrum. Additionally, this future 10 MHz block allocation is assumed to be part of a contiguous block, an option likely to become available as the government reassigns 500 MHz of spectrum to commercial uses. The issue, therefore, is about the timing of benefits and costs, with one type accruing now and the other later.

Given this specification, there are two relevant options to consider in a cost-benefit tradeoff. In the first option, the D Block spectrum, which is contiguous to the PSB 10 MHz already assigned to public safety, is allocated to the public safety community, which precludes its auction now to the commercial sector. This choice permits the benefits and costs derived from public safety's use of the spectrum to accrue now, while postponing the benefits and costs from commercial use of this additional 10 MHz of spectrum into the future. That is, allocating the

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15 *See, e.g.*, Public Safety Alliance, *House of Cards: FCC's Capacity White Paper Built on Assumptions and Conjecture* (July 2, 2010) at 3 ("Since the D-Block spectrum is adjacent to the public safety broadband allocation, it is uniquely positioned to provide the needed additional capacity throughput for a public safety agency's entire coverage area including the cell edge where throughput decreases significantly. Any alternative spectrum offered in other bands will be less efficient. Additional components would be required which would increase the cost and reduce performance of broadband devices. Non-adjacent spectrum blocks of the same size as the D Block will not provide as much throughput capacity, since greater efficiency is achieved through spectrum aggregation.").

16 *National Broadband Plan* at XII ("Make 500 megahertz of spectrum newly available for broadband within 10 years, of which 300 megahertz should be made available for mobile use within five years."); Remarks by Lawrence H. Summers, *Technical Opportunities, Job Creation and Economic Growth* (June 28, 2010) (available at: http://www.whitehouse.gov/administration/eop/nec/speeches/technological-opportunities-job-creation-economic-growth); *Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband*, Department of Commerce (October 2010)(available at: http://www.ntia.doc.gov/reports/2010/TenYearPlan_11152010.pdf).

17 Bill Schrier, Chief Technology Officer, City of Seattle, *Public Safety, Government, Wireless and Spectrum*, National League of Cities (May 27, 2010) (""[M]ost urban areas will rapidly outgrow the capacity of the 10 MHz allocated by the FCC for the public safety networks."); Andrew Seybold, *Response to Roberson and Associates, LLC White Paper entitled "Technical Analysis of the Proposed 700 MHz D-Block Auction, dated August 23, 2010, contracted for by T-Mobile USA, Inc.",* (September 10, 2010) at 5 (available at: http://andrewseybold.com/wp-content/uploads/2010/09/ResponseT-MobileWP09-10-10FNL.pdf) ("Data usage has grown on commercial networks in the order of 5000% in only the past three years. Demand will follow the same curve as the commercial broadband sector as new applications and devices become available for Public Safety…").

contiguous D Block to public safety only *postpones* the allocation of an additional 10 MHz for commercial purposes (which the "new" block comes from the 500 MHz of spectrum promised by the FCC and the Obama Administration). In the second option, the D Block is auctioned for commercial purposes now, precluding its assignment for public safety purposes. In this case, the incremental benefits and costs from commercial use accrue now, but the benefits and costs of public safety's use are postponed. Framed in this way, the relevant issue is not whether the 10 MHz is used for public safety or used for commercial use, but rather *when* and *which* 10 MHz is put to use in both, and how the size and timing of benefits compare between these two alternatives.

More formally, let B_s^t represent the incremental benefits and C_s^t the incremental cost of an additional 10 MHz of spectrum assigned to sector s at time t, where s has values P for public safety and A for commercial application, and where t is 0 for the present and 1 for the future. The incremental net value of public safety assignment of the D Block today is $V_P^0 = B_P^0 - C_P^0$ today, and $V_P^1 = B_P^1 - C_P^1$ in the future. In the same way, we have net benefit V_A^0 if the 10 MHz is auctioned for commercial purposes today, and V_A^1 given future allocation. Applying the constraint that each party receives a 10 MHz block, then the best policy decision is simply to take the highest value of the two sums $V_P^0 + V_A^1$ (i.e., public safety now, auction later) and $V_A^0 + V_P^1$ (i.e., auction now, public safety later).[18] The D Block spectrum should be given to public safety if $V_P^0 + V_A^1 > V_A^0 + V_P^1$, or equivalently, $V_P^0 - V_P^1 > V_A^0 - V_A^1$. Notably, all the costs and benefits that enter into these valuations are incremental to the status quo. That is, costs and benefits are measured only for the additional 10 MHz allocation.[19]

Armed with this simple but useful framework, we can provide some meaningful commentary on this important issue and interpret some of the available evidence in a pertinent manner. In what follows, we evaluate some of the evidence and issues using the cost-benefit framework, and we believe this exercise is highly informative.

III. Assigning the D Block to Commercial Use

The total economic benefits of commercial use include profits and consumer surplus, where these benefits are only those added by the addition of 10 MHz of spectrum. As for profits, assuming there are a few relatively homogeneous bidders, the profits from the added spectrum

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[18] We ignore the possibility of either party getting both allocations.

[19] The upper 10 MHz of the D Block is already allocated to public safety and a network will be built to use that spectrum. Those costs are not incremental to the D Block.

will be largely dissipated at auction.[20] Based on an econometric analysis of the more recent spectrum auctions in the U.S., if the FCC auctioned the D Block on a truly unencumbered basis, then we could expect the auction to generate revenues in the range \$1.3 to \$3.3 billion.[21] There are, however, many reasons to expect this range of potential revenues is too high, including the Commission's recent track record of trading off auction revenues for other goals.

First, as seen in the earlier attempt to auction the D Block, public service obligations levied on the commercial license holder substantially reduce the value of spectrum. Only one bid was received in that auction (\$472 million) and it was well below the minimum bid established by the Commission (\$1.3 billion). The public safety encumbrances, therefore, imposed costs of about \$0.8 to \$2.8 billion, as reflected in the low bid value.[22] Given the lack of any service rules for the re-auction of the D Block, it is unclear what public safety encumbrances will be placed on the spectrum. The *National Broadband Plan* proposes that the commercial use be "technically compatible with the public safety broadband services," so some constraints will be placed on a commercial winner.[23] If there is an auction, and in light of the current debate, then we suspect there will be significant political pressure to impose public safety obligations on the D Block.[24] Thus, the expected auction revenues should be reduced to account for some types of public service obligations. If these obligations are even half as burdensome as those in the original auction, then the reduction in auction revenue would still be a sizeable 40%.

Second, the Commission has imposed certain obligations on spectrum blocks set for auction. For example, the Commission imposed stringent open platform obligations in the C Block auction of the 700 MHz spectrum, with disastrous results. Indeed, the conditions placed on the C block reduced auction revenues by a whopping 32%, with little to no perceptible benefit.[25]

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20 G.S. Ford, T.M. Koutsky and L.J. Spiwak, *Using Auction Results to Forecast the Impact of Wireless Carterfone Regulation on Wireless Networks*, PHOENIX CENTER POLICY BULLETIN NO. 20 (Second Edition) (May 2008) (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB20Final2ndEdition.pdf).

21 Estimated from the regression analysis and data presented in *Using Auction Results, id.* The difference between the lower and upper estimates is based on the REA and Auction 73 premium.

22 Assuming an unencumbered auction revenue range of \$1.3 to \$3.3 billion.

23 *National Broadband Plan*, *supra* n. 5, p. 76.

24 *See*, *e.g.*, *Whitepaper: Technical Analysis of the Proposed 700 MHz D-Block Action*, Prepared for T-Mobile by Roberson and Associates, Inc. (August 23, 2010) (available at: http://fjallfoss.fcc.gov/ecfs/comment/view?id=6015952735), arguing that the D Block can effectively be shared under a public safety obligation. We provide no comment on the legitimacy of the analysis, but simply note that its relevance presumes the FCC will impose a public safety obligation on the D Block and that such obligations reduce expected auction revenues.

25 *Using Auction Results, supra* n. 20.

Although the Commission did not go as far when it promulgated its recent *Open Internet Order*, the Commission did impose some obligations on wireless network operators and, equally important, threatened to extend the full C Block conditions to other commercial licensees if circumstances warrant.[26] Accordingly, it is not unreasonable to expect that the Commission could extend obligations to the D Block, including C Block-type obligations, and, as such, we expect the auction revenues for the D Block to be lower than a naïve model would predict.

Third, given the Commission's recent *Harbinger* decision[27] and concerns expressed in its *14th CRMS Report* about industry concentration[28], it is also not unreasonable to assume that the Commission may exclude some bidders from the auction.[29] A reduction in the number of bidders, particularly if these potential bidders are large firms, is likely to reduce the expected auction revenue (ceteris paribus).[30]

Finally, the economic health of the country has deteriorated since the bidding in Auction 73. Thus, the D Block auction should not be expected to produce as much revenue as the earlier auctions. Coleman Bazelon estimates that the economic crisis will reduce the expected value of spectrum by approximately 20%.[31]

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26 *In re Preserving the Open Internet, Broadband Industry Practices,* FCC 10-201, REPORT AND ORDER, ___ FCC Rcd ___ (rel. December 23, 2010) at ¶135 (hereinafter "*Open Internet Order*").

27 *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services,* FOURTEENTH REPORT, FCC 10-81, __ FCC Rcd __ (rel. May 20, 2010) (hereinafter "*Fourteenth CMRS Report*").

28 *In the Matter of SkyTerra Communications, Inc. and Harbinger Capital Partners Funds, Applications for Consent to Transfer of Control,* MEMORANDUM OPINION AND ORDER AND DECLARATORY RULING, DA 10-535 (rel. March 26, 2010) (hereinafter the *Harbinger Order*). For a full discussion of *Harbinger Order*, *see* George S. Ford and Lawrence J. Spiwak, *The Broadband Credibility Gap,* PHOENIX CENTER POLICY PAPER NO. 40 (June 2010) (available at: http://www.phoenix-center.org/pcpp/PCPP40Final.pdf), *and forthcoming in* 19 COMMLAW CONSPECTUS (2011).

29 *C.f.,* Public Knowledge, "Spectrum Reform" ("The best method for ensuring that the spectrum is not simply bought by incumbent broadband providers is by limiting their eligibility to bid — either through a flat prohibition or spectrum caps.")(available at: http://www.publicknowledge.org/issues/spectrum-reform); Gregory Rose and Mark Lloyd, *The Failure of FCC Spectrum Auctions,* Center for American Progress (May 2006).

30 Auction theory indicates that a reduction in the number of bidders will reduce auction prices in an ascending, second-price auction. *See, e.g.,* L. Phlips, THE ECONOMICS OF IMPERFECT INFORMATION (1988), Ch. 4. Accordingly, a cynical interpretation of the debate might be that the D Block presents an opportunity for some industry participants to buy spectrum at reduced prices due to the likelihood the present Commission will exclude some bidders, and in doing so establish precedent for such exclusions in future auctions.

31 C. Bazelon, *The Need for Additional Spectrum for Wireless Broadband: The Economic Benefits and Costs of Reallocations*, The Brattle Group (October 2009) (available at: http://www.brattle.com/_documents/uploadlibrary/upload809.pdf).

Given these four factors, we expect the auction revenue from the D Block to be considerably less than the estimated range based on prior auctions ($1.3 to 3.3 billion). An auction of the D Block, depending on the rules, could produce less than $1 billion in revenue, and we suspect this low revenue amount is plausible given the current regulatory climate. We suspect auction revenue is unlikely to exceed $2 billion in the best *plausible* scenario but, again, such predictions are necessarily speculative.

Factors Reducing Auction Value of the D Block

1. Public Safety Obligations
2. Other Obligations, such as Open Internet/Platform Obligations
3. Excluded Bidders
4. Economic Crisis

As for consumer surplus additions, this relatively small addition of spectrum to the commercial sector (currently licensed 572 MHz by the Commission's count) is unlikely to be a game changer.[32] The consumer surplus gains from commercial assignment are limited to what little competitive effects may arise from the added spectrum. To evaluate this issue, we adopt a common, widely-used model of price formation familiar from previous analyses in telecommunications. Assuming Cournot Competition in Quantities, unit elasticity of demand, and a Hirschman-Herfindahl Index ("HHI") of 2500, we estimate the addition of 10 MHz of spectrum will reduce prices by about 0.6%.[33] Given a total market size of $160 billion, consumer

[32] *OBI Technical Paper No. 6*, p. 15 ("547 MHz, in total, is currently licensed under flexible use rules, which allows for mobile broadband and voice services").

[33] Price is defined as $P = cN/(N - 1)$, where c is marginal cost and N is the number of firms, taken to be the numbers-equivalent of the HHI (=1/HHI). Based on recent estimates, we assume an HHI of 2,500 producing an N of 4. *See 14th CMRS Report*, *supra* n. 27, at 51 (2,848) and Table 41 (2,200). Assuming 547 MHz of spectrum available, the addition of 10 MHz of spectrum is treated as the equivalent of adding 0.07 firms, resulting in a price cut of 0.6%. *See, e.g.*, J. Sutton, *Sunk Costs and Market Structure* (1995), Ch. 3; J.B. Duvall and G.S. Ford, *Changing Industry Structure: The Economics of Entry and Price Competition*, PHOENIX CENTER POLICY PAPER NO. 10 (April 2001) (available at: http://www.phoenix-center.org/pcpp/PCPP10Final.pdf) *and reprinted in* 7 TELECOMMUNICATIONS & SPACE LAW JOURNAL 11 (2001).

surplus gains (net of transfers) from this price cut are then about $600 million, annually.[34] While other models of price formation would yield different results, the Cournot approach used here is familiar, plausible, and implementable using relatively little information.

Another piece of the valuation puzzle arises from the fact that the future 10 MHz of spectrum could be part of a contiguous block. Turning again to the econometric analysis of previous auctions, the auction revenue from a contiguous 10 MHz block is expected to bring a premium of $2 to $6 billion (other things constant).[35] We assume that a 10 MHz block auctioned to commercial use in the future will be contiguous and will have an auction premium of $4 billion (the mid-point of the range).

Turning to the question of value, we can use this analysis to get a rough approximation of $V_A^0 - V_A^1$. Assuming the auction revenues are $2 billion, consumer surplus gains are $0.6 billion annually, the contiguous block premium is $4 billion, and the difference between time 0 and 1 is five years, the value difference from delay of the auction of 10 MHz is about $0.6 billion (= 2B + 2.6B - 4B).[36]

IV. Assigning the D Block to Public Safety

Perhaps the most daunting, yet relevant, question regards the social benefits of "public safety." Such benefits are real but difficult to quantify and, absent immediate crisis, prone to be undervalued. If we faced another event like 9-11 or Hurricane Katrina, we believe the 20 MHz would be allocated to public safety immediately and the network fully funded in a week's time. Fortunately, we are not presently victims of such a crisis and, though the lack of crisis makes the spectrum allocation decision a more difficult one, this is a burden we welcome. For the moment, we choose to set aside the quantification of the benefits of an additional 10 MHz of spectrum for public safety, looking instead at the cost side of equation.

Spectrum is not homogeneous. Not only is the 700 MHz spectrum highly valuable because its technical properties are well-suited for mobile communications, including broadband

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34 The change in consumer surplus under unitary elasticity is market size in terms of expenditures (about $160 billion in 2010) multiplied by the natural log of the ratio of the new price to the old price. For expenditure data, see *Wireless Industry Indices: Mid-Year 2010 Results*, CTIA (November 2010) (available at: http://files.ctia.org/pdf/CTIA__Survey_Midyear_2010_Graphics.pdf).

35 *Using Auction Results, supra* n. 20.

36 We assume a discount rate of 4.4%. The discount rate is the government recommended discount rate for social projects evaluated over a twenty-year window. *See* OMB Circular No. A-94, APPENDIX C (Revised December 2009) (http://www.whitehouse.gov/OMB/circulars/a094/a94_appx-c.html).

Internet services, but for the public safety community the D Block has added value because it is contiguous to the PSB, which is already allocated to the public safety community. A contiguous block of 20 MHz of spectrum is substantially more valuable than 20 MHz of non-adjacent spectrum. As noted above, a 10 MHz block of contiguous spectrum in the 700 MHz band is worth about $2 to $6 billion more than a non-contiguous block of the same size.

While this value differential is estimated based on commercial use, much of this premium is based on the lower cost of deploying network for contiguous spectrum, which would likewise apply to public safety. Evidence suggests that the cost of the public safety network using 20 MHz of spectrum is probably about $10 billion.[37] Andrew Seybold, a highly regarded wireless industry expert, suggests that expanding a 10 MHz public safety network to 20 MHz adds about 15% to 25% to network deployment costs.[38] By this standard, the incremental cost of the additional 10 MHz is about $1.5 to $2.5 billion.[39] Alternately, adding a non-contiguous block of 10 MHz of spectrum to the public safety network would cost about $5 to $7.5 billion in deployment costs.[40] Assignment of the D Block to public safety, therefore, is likely to reduce the cost of the public safety network by around $4 billion in network deployment costs alone. Operational costs are likely to be lower as well, perhaps adding billions more to the savings.

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[37] White House, *supra* n. 9 (assigning $7 billion in construction costs); *Broadband Network Cost Model*, *supra* n. 7 ($6.3 billion for a 10 MHz network).

[38] A. Seybold, *Comments on the FCC White Paper: Federal Communications Commission Omnibus Broadband Initiative A Broadband Network Cost Model: A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America's First Responders*, Working Paper (April 26, 2010), p. 15 (available at: http://andrewseybold.com/wp-content/uploads/2010/04/Comments-FCCWP-Final-April-27-2010.pdf). The FCC study, *Broadband Network Cost Model*, *supra* n. 7, claims an additional 10 MHz of spectrum would substantially *increase* the cost of the public safety network, but we find the extreme assumptions of that analysis to be unreasonable and in violation of economic logic. Seybold, *supra* n. 38 also rejects the agency's argument ("The Commission seems to believe that there are only two choices for building out the public safety broadband network. The first choice is its option to essentially combine it with the commercial networks except for some of the radio equipment. The second is to provide a totally separate and standalone network. The FCC does not take into account that between these two extremes is a number of options that can and should be explored.").

[39] Expanding commercial networks is also costly. There is little reason to suspect that the cost of a commercial expansion to additional 10 MHz will be much different than for the public safety community. For example, it was announced that Verizon is expected to spend $4 billion in equipment alone to deploy LTE, which is about $180 million per MHz of 700 MHz spectrum. For 10 MHz, the cost would be about $1.8 billion. *Verizon Wireless Awards Alcatel-Lucent Contract Expected to be Worth US $4 Billion for Ongoing 3G Network Expansion and LTE Build out*, Alcatel-Lucent Press Release (Nov. 4, 2010) (available at: http://www.alcatel-lucent.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0vM0Y_QjzKLd4x3tXDUL8h2VAQAURh_Yw!!?LMSG_CABINET=Docs_and_Resource_Ctr&LMSG_CONTENT_FILE=News_Releases_2010/News_Article_002258.xml).

[40] Seybold, *supra* n. 38 at p. 15.

Moreover, the cost to deploy the 700 MHz band is much lower than other bands (some estimates are 70% lower than other bands). Thus, depending on what additional spectrum is provided to the public safety community if they do not receive the current 10 MHz block, the ultimate deployment costs could be substantially higher (though this differential may also apply to the commercial licensee). We leave a more sophisticated assessment of such costs to others, and assume here that the cost difference is $4 billion.

While we have not addressed the benefits of public safety's use of the additional 10 MHz of spectrum, which could be quite large, we can see that the contiguous spectrum premium of $4 billion is itself sufficient to offset the value of commercial assignment of an additional 10 MHz ($0.6 billion). Let Z be the marginal benefits from enhanced public safety created by the combination of the D Block for public safety use. From our cost-benefit framework, the relevant decision criterion for assignment to public safety is

$$V_P^0 - V_P^1 > V_A^0 - V_A^1, \tag{1}$$

approximated here to be

$$Z + \$4 \text{ billion} > \$0.6 \text{ billion}, \tag{2}$$

which plainly holds, even without sizing Z (where $Z > 0$ and potentially is very large). Even if the 10 MHz provided zero benefit in terms of enhanced public safety, then assignment of the D Block to public safety produces $3.4 billion in additional social value over and above the commercial value of the same block. (Of course, this is a result of the constraints we imposed on the problem, i.e., 10MHz of spectrum would be provided to public safety one way or another.) We have also ignored the value of spectrum currently used for narrowband purposes by public safety that may be repurposed for commercial use as a result of migrating existing public safety capacity demands to the D Block and PSB.[41]

Notably, much of this value spread arises from the unique opportunity to create significant value by allocating a contiguous block of spectrum to public safety, and then doing so in the future for commercial use. This value is foregone by commercial allocation of the D Block today. While some may contest our estimates, it is necessary to account for the economic value arising from contiguous spectrum.

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[41] For example, Section 205(3) of the Rockefeller Bill, *supra* n. 10, requires the Commission to conduct a report within five years of enactment that examines, among other things, to determine whether there is an "opportunity for return of any spectrum to the Commission for auction to commercial providers to provide revenue to the Treasury of the United States."

V. An Alternative: Public Safety Encumbrances on Commercial Networks

Thus far in this analysis, we have assumed that if the D Block is used for commercial services, then an additional, non-contiguous 10 MHz block will be assigned for public safety use in the future. A realistic alternative to this grant of additional spectrum for public safety is simply to impose encumbrances on other 700 MHz spectrum that permit the encroachment of public safety users during episodes of resource scarcity. Unfortunately, however, it was exactly this approach that produced such miserable results in the first D Block auction. There are many complex issues that must be resolved with any sort of sharing scheme of this type, and such resolutions can be very costly. As revealed in Auction 73, public safety encumbrances substantially reduce the value of spectrum. Auctions revenues from an unencumbered D Block would have been about $3.3 billion, whereas the only bid for the encumbered block was a paltry $472 million—a mere 14% of its revenue potential.

Consider, for the moment, that incentive auctions for broadcast spectrum, which have been proposed in the Rockefeller bill, permit the recovery and repurposing of 120 MHz of quality spectrum. One study estimates that the auction revenues from this spectrum would be $35 billion, with a net value of $33 billion after relocation of existing licensees.[42] Our earlier research suggests that these predicted auction revenues are plausible.[43] Applying public safety obligations on this spectrum, however, would materially diminish its value. From the failed D Block, we might conclude that public safety obligations would reduce the auction value of the 120 MHz of spectrum to as little as $5 billion (= 35 × 0.14), a loss in revenues of $30 billion or 86% of its potential. This calculation likely represents the upper boundary of lost auction revenues since it presumes the encumbrances apply equally to all 120 MHz. Alternately, at the other extreme, using the size of the D Block in proportion, the reduction in auction revenues would be more to the tune of $2.5 billion, which is still a sizeable amount and probably more than the sale price of the D Block in a present day auction.[44] Notably, both numbers are underestimates of the total value loss since they measure only the loss in private value from the spectrum. We have ignored in these calculations the higher cost and diminished value to the public safety community (and those they serve) due to the reduced functionality inherent to a sharing of networks purposed mainly for commercial use. The fact of the matter is that no

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42 *See supra* n. 10.

43 We estimate a 10 MHz block could yield $3.3 billion in auction revenue. A total of 120 MHz of spectrum, in turn, would render about $40 billion. We note there are factors that could raise or lower auction revenues in the future such as encumbrances, market conditions, the number of bidders, and so forth.

44 A 10 MHz block is 8.3% of a 120 MHz block. Assuming $35 billion in unencumbered auction revenues, each 10 MHz would bring $2.9 billion (on average). Applying the 14% factor from Auction 73, an encumbered D Block would yield only $408 million in auction revenue, cutting auction revenues by about $2.5 billion.

government agency can guarantee public safety quality access to commercial spectrum on an as-needed basis.

In all, we believe the use of encumbrances will be more costly than the assignment of an additional 10 MHz in the future (as we have modeled the issue above). So that our estimates are conservative, we do not incorporate the costs of this alternative in our calculations. Any proposal adopting this option for supplying spectrum resources to the public safety network should provide a careful study of the loss of auction revenues and the dollar value of the reduced functionality and higher costs of such a network.

VI. Conclusion

The assignment of the D Block spectrum to public safety or commercial use requires an assessment of the relative benefits and costs of these two alternatives. We propose an economically sensible cost-benefit framework in the POLICY BULLETIN. An assessment of the Commission's record and other evidence within this framework suggests that D Block assignment to public safety has a higher value, producing no less than $3.4 billion more in social benefits than commercial use. Much of this difference is attributable to the unique opportunity to create a contiguous 20 MHz block of spectrum, and the fact that this opportunity exists only for the public safety community. We recognize that this issue is complex and our analysis is preliminary. That said, our work includes many of the "big ticket items", such as potential auction revenues. However, the calculations ignore any incremental benefits to society from the use of the additional 10 MHz block by the public safety community. As these gains are likely to be large, the economics seems to lean strongly in the direction of an assignment of the license to public safety. We suggest more research on this topic, but encourage future contributions to adhere to an explicit, rational framework for analysis.

At the forefront of the debate over the D Block is the potential for auction revenue. If the D Block is assigned to public safety, then the auction revenues from the 10 MHz block are forgone. The argument has been made that auctioning the spectrum will provide revenues to help fund the public safety network and perhaps aid in deficit reduction. We argue that this argument is invalid; we observe that the loss of auction revenues today are more than offset by the gain of higher auction revenues in the future and lower public network deployment costs . Thus, the auction adds, rather than relieves, stress to the public budget. Moreover, the Rockefeller bill, which allocates the D Block to public safety, also permits the use of incentives auctions to recover high-quality broadcast television spectrum that can then be re-purposed for mobile services. According to some, this spectrum is expected to generate just over $35 billion in auction revenues, the sum of which could be used for funding the public safety network and deficit reduction. Thus, while the D Block may offer a unique opportunity for the public safety network, it is not exceptional in its ability to generate auction revenues for the federal coffer.

The allocation of spectrum resources is an inherently complex issue. In the case of the D Block, complicating the choice is the fact that while the economic benefits of public safety are exceedingly difficult to quantify, the social goal of ensuring the safety of all Americans is nonetheless at stake. Fortunately, even if we value this security benefit at zero, our analysis shows that allocation to public safety is still preferred even on purely economic grounds. In our view, based on the analysis presented above, and absent evidence to the contrary, we believe the D Block should be combined in a contiguous 20 MHz block for use by the public safety community.

Public Safety Spectrum

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About Rysavy Research

Rysavy Research LLC is a consulting firm that has specialized in wireless technology since 1993. Projects have included reports on the evolution of wireless technology, test reports, spectrum analysis for broadband services, evaluation of wireless technology capabilities, strategic consultations, system design, articles, courses and webcasts, and network performance measurement.

Peter Rysavy, president of Rysavy Research, specializes in the capabilities and evolution of wireless technology. He has written more than a hundred and twenty articles, reports and white papers, and has taught forty public wireless courses and webcasts. He has also performed technical evaluations of many wireless technologies including municipal/mesh Wi-Fi networks, Wi-Fi hotspot networks, mobile browser technologies, cellular-data networks, and wireless e-mail systems.

From 1988 to 1993, Peter Rysavy was vice-president of engineering and technology at LapLink where projects included LapLink, LapLink Wireless, and connectivity solutions for a wide variety of mobile platforms. Prior to that, he spent seven years at Fluke Corporation where he worked on touch screen and data acquisition products.

Peter Rysavy is also the executive director of the Portable Computer and Communications Association (PCCA, http://www.pcca.org), a group that evaluates wireless technologies, investigates mobile communications architectures and promotes wireless-data interoperability. Peter Rysavy graduated with BSEE and MSEE degrees from Stanford University in 1979. More information is available at http://www.rysavy.com.

Notice

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Introduction

Through advances in technology, mass adoption, and global innovation, today's wireless networks offer tremendous voice and data capabilities. Voice coverage is reliable and ubiquitous, while data services, now commonly called mobile broadband, provide throughput rates to users of millions of bits per seconds, orders of magnitude higher than just a decade ago. New generations of wireless technology, such as Long Term Evolution (LTE), have just started to be deployed, and will deliver even greater data capabilities. LTE is the perfect choice for public safety applications. This paper will explain why 20 MHz of contiguous spectrum is essential for this technology.

This paper also discusses the emergence of LTE as a global standard, the bandwidth requirements of different applications, the relationship between spectrum and capacity, the crucial need for at least 20 MHz for public safety, and the challenges of alternate approaches that seek to share spectrum between Public Safety and commercial operators.

LTE as a Global Standard

LTE is the technology likely to see the broadest deployment of any new wireless technology over the next decade. Nearly all major cellular operators have committed to adopting LTE. The result will be huge economies of scale leading to cost-efficient services and devices. LTE not only provides high data throughput, but packets traverse the network with low delay, and traffic flow can be controlled to provide high levels of quality-of-service for applications such as video and voice over Internet Protocols (VoIP). First Responders have wisely endorsed LTE for their 700 MHz broadband networks.

Spectrum and Capacity

The amount of capacity in wireless networks depends on a variety of factors, but in general, mobile-broadband networks have significantly lower capacity than fixed-broadband networks. Capacity can be calculated by assessing the spectral efficiency of different wireless technologies, a value that is represented in bits per second per Hertz of spectrum (bps/Hz). While new technologies such as LTE are spectrally more efficient than prior technologies, all wireless technologies are reaching what is called the Shannon bound, a law that dictates the maximum spectral efficiency that a technology can achieve relative to noise.

By knowing the radio channel size and the spectral efficiency of the wireless technology, one can estimate the aggregate capacity of a cell site. LTE in its initial deployments has a spectral efficiency value for the downlink of about 1.5 bps/Hz per sector. For the uplink, it is .65 bps/Hz.[1] Thus, LTE will have the capacity values as shown in Table 1.

Table 1: LTE Capacity Values

Amount of Spectrum	Downlink Capacity	Uplink Capacity.
10 MHz (5 MHz down, 5 MHz up)	7.5 Mbps	3.25 Mbps
20 MHz (10 MHz down, 10 MHz up)	15 Mbps	6.5 Mbps

Given the application requirements discussed in the next section, these capacity values, even for 20 MHz are quite finite. The capacity in 10 MHz, as is made clear below, is simply too limiting to provide a broadband network that can accommodate the needs of first responders.

Application Bandwidth Requirements

There are multiple factors that are fueling growth in data usage including:

- **Faster networks.** The faster that data can be exchanged, the more likely it is that applications will take advantage of the speeds, especially since faster speeds can mean less waiting time for workers.
- **More network-enabled devices.** New device categories such as tablets and netbooks are expanding overall data consumption, especially because of the delivery of high-quality video. Just as consumers and enterprises are adopting these new device categories, so will first responders.
- **Increasing computing speeds.** The faster the platform can compute, the more data an application can process in real time.
- **Higher screen resolution.** Greater screen resolution corresponds to higher resolution video options for users.

[1] For a detailed discussion of spectral efficiency values, refer to my report, "Transition to 4G," September, 2010. http://www.rysavy.com/Articles/2010_09_HSPA_LTE_Advanced.pdf

- **Embedded modems.** An increasing number of laptops and tablets come with embedded 4G modems, facilitating the use of mobile broadband service.

The question is how much bandwidth do applications actually need. Some typical values are shown in Table 2:

Table 2: Application Bandwidth Requirements

Application	Bandwidth Requirements
Voice over IP	10 thousand bits per second (kbps) to 20 kbps (both downlink and uplink directions.)
General-purpose audio to record all sounds	About 100 kbps.
Video	Ranges from 200 kbps on a small-screen device like a phone, to 1 million bits per second (Mbps) for medium resolution on a laptop, to 5 Mbps for high definition.
Web browsing	Usually requires about 1 Mbps or higher to provide good response time.

By comparing these throughput requirements against the capacities listed in the previous section, one can see that just a handful of first responders could easily consume the capacity of a 10 MHz LTE network. LTE in 10 MHz has a downlink capacity of 7.5 Mbps. Thus, 8 downlink streams at 1 Mbps each would consume the capacity of the cell sector. On the uplink capacity is even more constrained at 3.25 Mbps where just 4 uplink streams would consume capacity. For example, these streams could be video from patrol cars at a crime scene.

Public-safety applications will increasingly demand higher bandwidth. The same innovation shown in commercial broadband will extend to public-safety broadband. In the February 2011 report "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2010-2015," Cisco predicts a 92% compound annual growth rate in mobile traffic. There is no reason that such trends do not also apply to Public Safety. Examples of public-safety applications include:

- Wireless video surveillance.
- Aerial video from a helicopter over a scene fed to personnel below.
- Video-based training to remote emergency workers.
- Real-time license plate recognition.
- Testimony based on video transmitted from an emergency-services vehicle or command post.
- Sending and receiving high-resolution pictures.
- In-field biometrics (such as iris and fingerprint identification).
- Automated vehicle location and navigation.
- Medical applications such as telemedicine, patient records, and high-resolution video to enable medical services performed at a scene of an accident.

It is important to note that another aspect of some public-safety applications is that they demand bandwidth continuously. For example, a patrol car in an emergency situation may need to transmit a constant video stream.

The Need for 20 MHz

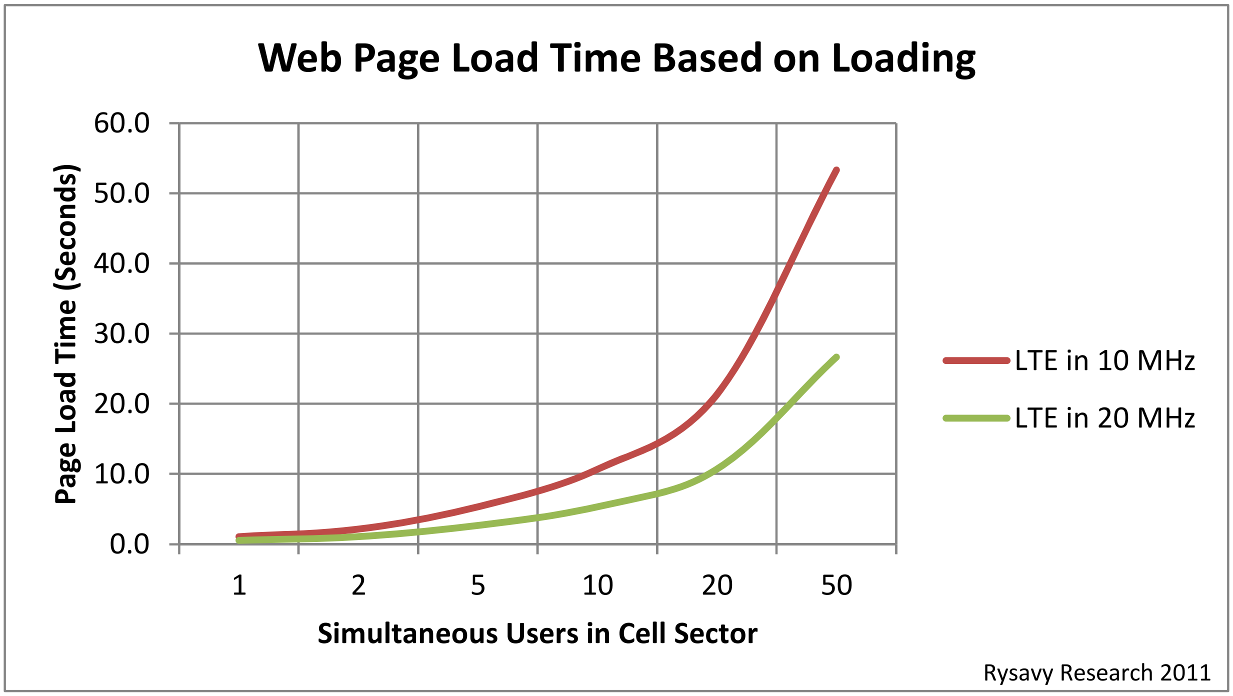
In light of the finite capacities of LTE as discussed above and growing bandwidth demands of public-safety applications, my view is that 20 MHz of spectrum for LTE is the absolute minimum to satisfy the needs of law enforcement. The available throughput per user goes down as the number of users increases. Given that many broadband applications need 1 Mbps or higher throughput, sector capacity can be exhausted quickly.

While commercial operators can design their networks for typical densities of mobile users, emergency situations can result in needing to support extremely high densities of public-safety workers. For this reason alone, the public-safety network has to have as high a capacity as possible. The network must have at least 20 MHz of spectrum. Anything less could lead to catastrophic consequences due to applications performing unreliably or failing completely.

The consequence of insufficient spectrum is restricted capacity, which combined with high demand, causes network congestion. For applications, this means sluggish behavior or outright failures.

Figure 1 shows an example of how an application begins to respond extremely slowly as the number of simultaneous users increases. Assuming a Web page of 1 MByte size, a page load time of 10 seconds (considered very slow) occurs with 10 users in a 10 MHz deployment scenario but not until 20 users in a 20 MHz deployment scenario.

Figure 1: Web Page Load Times Based on Simultaneous Users



Beyond sluggish performance in congestion situations, there is also the high likelihood that networks simply have to drop packets of data. Packets arrive at a base station over a high-speed connection such as fiber but then the base station forwards the packets using the slower radio connection. If there are too many incoming packets the inevitable result is that the base station, or infrastructure nodes prior to the base station, will drop or significantly delay packets.

Consequences of such congestion are not just slower performance but also application failures. Most communications protocols implement timeouts on their operations, including Transmission Control Protocol (TCP) itself, the packet-transport protocol used in the Internet to provide reliable end-to-end delivery. With large delays or dropped packets, communications protocols attempt to deliver data reliably, but at some level of congestion, they can no longer cope properly, and applications will either indicate a failure, or worse yet, require an application or full-system restart.

Beyond needing 20 MHz just to satisfy bandwidth requirements, there are compelling reasons for providing Public Safety 20 MHz of contiguous spectrum.

- LTE is spectrally more efficient operating in 20 MHz channels than 10 MHz channels. In other words, the network can deliver more bits per second using a 10 MHz radio channel (10 MHz down, 10 MHz up) than in two 5 MHz radio channels.
- Using non-contiguous radio channels will significantly increase the cost of the radio-access network due to the need for additional radios and antennas.
- Adding spectrum later in a non-contiguous manner will result in devices in the field likely not being able to take advantage of the new spectrum.

Challenges in Sharing Spectrum

There are arguments for alternative approaches to dedicating spectrum for Public Safety, such as sharing commercially-allocated spectrum between first responders and commercial operators, with the commercial operator serving as the primary user or licensee. This is a bad idea for a multitude of reasons.

The first reason is that the needs of commercial customers and Public Safety are inherently different. Commercial networks are developed in a highly competitive environment where operators invest in a way to provide services at the lowest possible cost to customers. These low costs are a major factor in what is driving the broadband market. First responders, however, need hardened networks that are extremely reliable. This hardening includes items such as long-term backup power, redundant backhaul, diversified routing, and explosion-proof sheltering, thus significantly increasing the cost of the network, and likely not making it viable from a competitive aspect for the private sector.

Sharing of spectrum also assumes that public-safety applications will obtain the bandwidth they need when they need it from the commercial entity. This assumption, however, is fraught with risk for the following reasons:

- **Policies implemented by commercial operators may not sufficiently address public-safety needs.** Policies, such as reserving certain amounts of bandwidth for commercial customers, may result in insufficient capacity for public-safety applications in emergency situations.
- **Prioritization schemes may not work correctly.** In an emergency situation where there is massive demand on the network from both constituencies, it is possible that prioritization schemes will not work as planned simply because they may never have been tested under such extreme conditions.

- **Users may defeat prioritization schemes.** It is already common for users to hack their devices, especially smartphones, to access services not in their current service plans. These modifications could defeat the prioritization schemes at exactly the time they are most needed.

Nevertheless, if Public Safety has control of the spectrum and they wish to lease part of their network capacity to other entities, this can be feasible and even desirable for defraying costs, so long as Public Safety can specify the terms of such arrangements, can implement the appropriate preemption capabilities, and so long as the underlying network is built to address the specific requirements of Public Safety.

Conclusion

I strongly believe that Congress should reallocate the 10 MHz D Block (758-763 MHz and 788-793 MHz) directly to Public Safety. This will enable a national broadband network for emergency services that will address the critical needs of this country. There are many reasons to have 20 MHz of contiguous spectrum available for Public Safety, including sufficient capacity, lowest-cost network deployment, and dependable network operation in emergency situations. Not doing so places this country in unnecessary jeopardy. This is a historic, and potentially last chance to allocate 20 MHz of contiguous spectrum to Public Safety. We should not squander this opportunity.

Regulation in financial translation

Spectrum valuation—an investment approach

Anna-Maria Kovacs, Ph.D., CFA

July 2011

The National Broadband Plan calls for 500 megahertz of spectrum to be made available for use by wireless broadband over the next decade, with 300 megahertz to be made available over the next five years. Spectrum is a public asset and an obvious question is how to optimize the value and use of that asset. That question, in turn, comes down to a tradeoff between the inherent value of the spectrum itself and other public interest considerations. In other words, the amount of money that an auction can raise for the Treasury—the auction as a source of Treasury funds--is impacted at least in part by controllable decisions about how the auction configures the spectrum for sale and the conditions imposed on it.

The Congressional Budget Office (CBO) has scored the value of spectrum likely to be auctioned by 2021 at $24.5 billion [CBO scoring of S.911 on July 20, 2011]. The CBO states that it is difficult to predict the amount of spectrum that might be auctioned by 2021, because it is difficult to predict what spectrum might become available and when existing users might be moved. CBO points to past experience that relocating both federal and commercial users can be very costly and time consuming. CBO estimates that between 150 to 225 megahertz of spectrum below 3 gigahertz might be auctioned by 2021, but does not specify the mix of spectrum in the lot it is pricing out. It estimates that the weighted average unit price paid by winning bidders might be lower than in recent years, estimating it at $0.70 per megahertz (MHz) per person (POP), i.e. $0.70 per MHz/POP.

It is, of course, appropriate for CBO to provide a conservative estimate. But it might also be helpful for Congress to be able to approach the issue from another angle—looking at spectrum the way investors do--taking into consideration the enormous range of valuation that is possible for the same spectrum depending on the way spectrum is configured and the conditions that are attached to its sale. In other words, the value to be extracted from spectrum can to a large extent be influenced by Congress and the Federal Communications Commission (FCC), acting under Congress' instructions. **Looking just at the broadcast spectrum that might be auctioned during 2012-2021, using valuations in Auction 73 as a proxy, depending on the amounts auctioned and the conditions attached, the proceeds of the auction could vary from $1.4 billion to $91.4 billion.** That is, of course, an enormous range, and the reasons for it are explained below. Here we will point out only the two extremes: The $1.4 billion represents the sale of 30 megahertz with extensive conditions and the $91.4 billion represents the sale of all 120 megahertz with no conditions. Please note that this paper deals only with auctions as sources of funds, but does not comment on how those funds might be used once the auction has raised them.

There are at least two sets of issues that impact proceeds from an auction. One is market conditions and the other is the usefulness of the spectrum to bidders. The economy, the ease of getting financing, and the potential universe of bidders are key elements of market conditions. The other set of issues is the inherent value of the spectrum, as modified by conditions attached to it. The inherent value of spectrum itself is a function of its propagation characteristics. But other factors also enter the equation and determine how useful and valuable that spectrum may be to potential auction-bidders. Factors include: the geographic footprint covered by a license (CMA, EA, REAG, nationwide), the band-size, the level of interference that may be expected from neighbors and/or from other users of the same spectrum such as unlicensed users, other restrictions or conditions that may be placed on the spectrum, as well as issues specific to bidders such as other spectrum they already hold. The value obtained by the Treasury from an auction is further affected by factors such as discounts provided to designated entities for public interest reasons.

One of the recommendations of the NBP was that the FCC reclaim and auction 120 megahertz from broadcasters via incentive auctions. It is not clear how much of this spectrum is included in the CBO's scoring or at what valuation. However, that spectrum is inherently similar to the spectrum in the 700MHz band that was offered in Auction 73, which ran from January to March of 2008. In this paper, we use Auction 73 as an example of the range of values that the Treasury might be able to obtain in exchange for various amounts of the proposed broadcast spectrum under various conditions.

Market conditions in early 2008 were poor. The economy had just begun its slide into the worst recession in decades, and the stock market had taken its first slide off its high point, but had not yet gone into complete free fall. The collapse of Bear Stearns on 3/18/2008 coincided with the end of auction 73, but the credit markets had begun to freeze up in late 2007, making it difficult for bidders without well-established track records to get financing. Frontline Wireless, which had been expected to lead the bidding for the D-block had to withdraw for lack of funding, despite stellar and normally very credit-worthy leadership. Thus, while the FCC did not exclude any potential bidders from the auction, the economy did so.

There are reasons to expect that there will be solid demand for spectrum in auctions during the 2012-2021 timeframe. Cisco has predicted that mobile data traffic will grow 92% per year for the next five years, driven by video. Credit Suisse issued its *Global Wireless Capex Report* on July 18, 2011 indicating that capacity utilization in U.S. networks is at 80%, well above target rates. Credit Suisse expects companies to increase capital investment in the next few years to wring all possible capacity out of the existing spectrum. But, as Rysavy Research points out in its March 16, 2011 engineering analysis of spectrum use, a report titled *The Spectrum Imperative*, there is a limit to what can be accomplished simply through more intensive network engineering. Without enough additional spectrum, network performance will suffer. As the CBO points out, the process of identifying spectrum for sale, designing and holding the auction, then clearing the spectrum for use post-auction takes several years. Bidders will plan their bids based on spectrum needs far down the road, at a point when efficiencies gained via network investment and upgrade in the 2011-2013 period will have been exhausted. If the National Broadband Plan was right and 500 megahertz are needed by 2021, and if the CBO is right that only about 30%-40% of that can be brought to market by 2021, then demand for spectrum should result in a very strong auction-bidding environment. That demand will be further enhanced if the CBO is right that the spectrum will have to be auctioned in multiple stages, so that no single auction places a glut of spectrum on the market.

While it is impossible to predict what market conditions will be when the FCC auctions spectrum over the next decade, Auction 73 provides a proxy for an auction performed under poor, if not yet completely disastrous, conditions. In other words, the market and demand environment for the auctions over the next decade are likely to be healthier than the environment was for Auction 73. And, of course, all of the blocks sold in Auction 73 were sold under the same set of market conditions, since they were all sold at the same time. In this paper, we are not predicting a specific price for spectrum in future auctions, but suggesting a reasonable proxy as well as illustrating factors that influence valuation under a given environment.

Auction 73 provides an outstanding illustration of the broad range of values that similar spectrum can attain depending on factors that are largely under the control of the FCC, such as spectrum configuration and public-interest conditions. The spectrum was divided into 5 sets of blocks, A, B, C, D, and E. The range of average final bids for these blocks ranged from $0.17 per MHz/POP for the D-block to $2.67 per MHz/POP for the B-block, for inherently similar spectrum. As described below, there were various reasons for the differences in valuation. The A-block's value was suppressed mostly by concerns about interference from the neighboring broadcast channel 51. The E-block's value was suppressed by the fact that it was a narrow, unpaired channel whose uses were inherently limited. The C and D blocks' values were suppressed mostly by the public-interest conditions that were attached to these blocks. The B-block is the best proxy for the value that can be obtained for clear spectrum that is free of conditions.

A and B were 12 megahertz wide each, and consisted of paired 6 megahertz blocks. C was 22 megahertz wide and consisted of paired 11 megahertz blocks. D was 10 megahertz, in the form of paired 5 megahertz blocks. E was an unpaired 6 megahertz block. Other characteristics included:

- Geographic coverage: A and E were auctioned by Economic Area (EA), B was auctioned by Cellular Market Area (CMA), C was auctioned by Regional Economic Area Grouping (REAG), and D was nationwide. There were 176 licenses each in the A- and E-blocks, 734 licenses in the B-block, 12 licenses in the C-block, and one in the D-block. Each license within a block represents a different geographic area. The CMA areas are smaller than the EA areas, which in turn are smaller than the REAGs, which are smaller than the nationwide area. The licenses—i.e. areas—could be combined like building blocks, so that a collection of licenses could be built into a larger area. For example, Verizon bid on REAGs, but could effectively combine the areas it won into a national footprint covering the lower 48 states.
- A was impacted by potential interference from broadcast Channel 51.
- C carried an open access condition—unlocking and unblocking. The winner of this spectrum agreed to allow porting of devices and access to any applications, subject to reasonable network management.

- D carried a variety of conditions with regard to its relationship to public safety spectrum.
- E's uses were limited by its unpaired nature.

The average value of these blocks was:

- A: $1.16
- B: $2.67
- C: $0.76
- D: $0.17
- E: $0.74

The lowest bid per MHz/POP of $0.17 was obtained for the D-block, which was heavily conditioned, required coordination between the buyer and public safety, required the winner to fund public safety's buildout as well as its own, and gave public safety priority access to the spectrum when needed but also gave the D-block winner access to public safety spectrum when it was unused. We view this as a proxy for appealing spectrum that carries extremely unappealing public-interest conditions. While in theory this spectrum was open to any bidder, the conditions were so onerous that they effectively discouraged most bidders. The tough financial conditions of the time precluded the most likely bidder—Frontline Wireless—from participating.

The second lowest bid of $0.74 was obtained for the E block which consisted of 6 megahertz of unpaired spectrum, bid by EA. In this case, the key deterrent was the unpaired nature of the spectrum. This is a proxy for less appealing spectrum (because unpaired) that does not carry conditions that might have further lowered its valuation.

The third lowest bid of $0.76 per MHz/POP was for the C block. The C-block had the advantage of being 22 megahertz wide and thus easily suited to use for broadband. It is not clear whether its division into REAGs, large geographic regions, helped or hurt valuation. For some bidders, it might have been attractive that the REAGs could easily be combined into a national footprint, while other bidders might have preferred smaller areas because those would require building out less territory and thus involve less cost. The C-block also carried open access conditions—unlocking and unblocking—which appear to have deterred bidders. We view this as the best proxy for spectrum that is inherently very attractive but carries unappealing public-interest conditions.

The second highest valuation of $1.16 per MHz/POP was for the A-block, which was bid by EAs, areas smaller than REAGs but larger than CMAs. The main deterrent here appears to have been potential interference from broadcasters on channel 51.

The highest valuation of $2.67 per MHz/POP was for the B-block, which was bid by CMAs (the smallest market size), which was not threatened by interference, and did not carry conditions. Thus, we view this block as the best proxy for valuation of clear spectrum free of conditions.

As the accompanying table shows, the value of the full 120 megahertz of broadcast spectrum could vary from $5.7billion to $91.4 billion, depending on the conditions attached. [Please note that, for comparability, we are using the same number of POPs that were used in Auction 73, i.e. 285.62 million POPs., while recognizing this number may be a bit low by now.] The letters on the left in the table stand for Auction 73 blocks that are proxies. The lowest valuation would involve heavy conditions like those that were attached to the D-block, while the highest valuation would involve spectrum that is neither threatened by undue interference nor carries conditions, i.e., similar to the B-block. The proceeds, obviously, also vary by the amount of spectrum sold. Thus, condition-free spectrum like the B-block could bring $22.9 billion for 30 megahertz, $45.7 billion for 60 megahertz, and $68.6 billion for 90 megahertz.

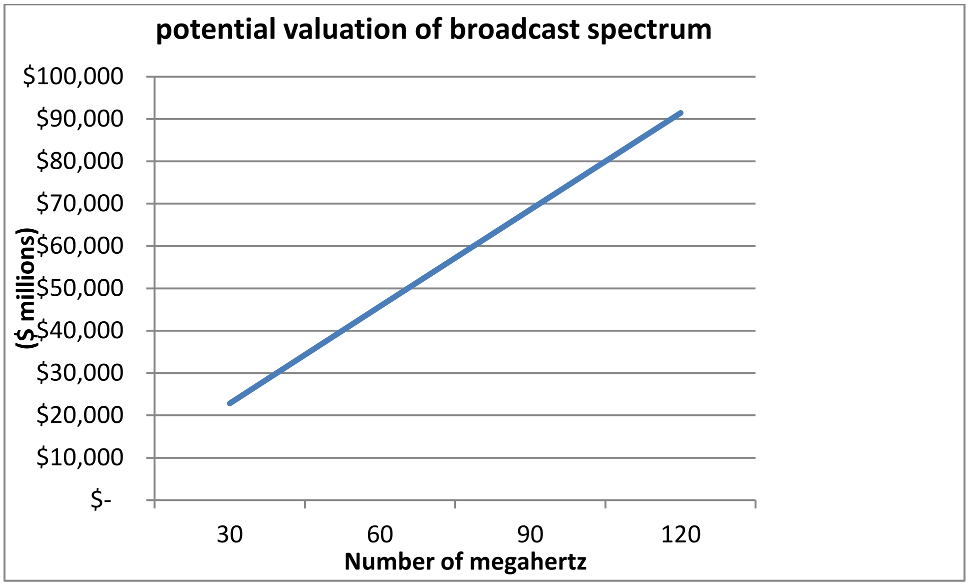
It is also possible to consider variations. For example a total of 90 megahertz could bring $52.2billion in a combination of $45.7 for 60 megahertz without conditions combined with $6.5 billion for 30 megahertz carrying conditions like those carried by the C-block. It could alternately bring $47.1 billion if 60 megahertz carried no conditions and the other 30 megahertz was conditioned as heavily as the D-block was in Auction 73. Many variations of amounts of spectrum and level of conditions are possible, and the resulting proceeds can be calculated from the table below.

The bottom line is that Congress has tremendous discretion about the amount of proceeds it could raise in exchange for spectrum. Looking just at the broadcast spectrum, depending on the amounts auctioned and the conditions attached, the auction could raise between $1.4 billion for 30 megahertz of heavily-conditioned spectrum to $91.4 billion for 120 megahertz of spectrum that carries no conditions or bidder-restrictions. Additional funds would, of course, come from the auction of other spectrum in addition to the broadcast spectrum.

The CBO provided one estimate of the value of the spectrum that might be auctioned between 2012 and 2021, and that estimate is, of course, important. Given the strong demand for spectrum that is likely and the difficulty of finding enough spectrum, the actual amount could be much higher, if even just a portion of the broadcast spectrum is auctioned, as long as the bidding is open to all possible bidders and no conditions are so onerous as to discourage bidding by either incumbents or potential new entrants.

Valuation of broadcast spectrum

	Number of megahertz			
	30	60	90	120
A	9,903	19,806	29,709	39,612
B	22,860	45,720	68,580	91,440
C	6,475	12,950	19,425	25,900
D	1,416	2,832	4,248	5,665
E	6,334	12,669	19,003	25,338



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700 MHz
Broadband Public Safety Applications And Spectrum Requirements

February 2010

CONTENTS

Preface

Since the Public Safety Wireless Advisory Committee (PSWAC) report was released in September 1996, the wireless communications landscape has undergone enormous changes. While it is true that technology has allowed for more efficient use of spectrum resources, it is equally true that public safety's need for spectrum has never been greater. In 1996 there were no broadband wireless networks or applications. Public safety's need for data communications was limited to text in the form of digital dispatch. Even then there was a shortage of spectrum available to public safety. In the interim, public safety wireless networks have continued to fall behind commercial networks in technology and capability.

Today we are at a crossroads. We can either advance public safety communications by consolidating our efforts and resources to create a nationwide public safety broadband interoperable network that supports both data and voice or we can continue to support separate networks on disparate frequency bands using incompatible technologies. We are under no illusion and fully understand that this is a formidable challenge. The vision of a converged public safety data and voice network will not be realized for several years, and then only when public safety is satisfied that broadband mission critical voice is as reliable as existing land mobile mission critical voice networks. Nevertheless, we also understand that if we do not have sufficient spectrum resources, we will never achieve our goal.

Public safety needs additional broadband spectrum that is suitable for both current and future technologies such as streaming video, automated license plate recognition, and biometric technologies including mobile fingerprint and iris identification. The 700 MHz band is ideal for public safety as it provides superior coverage and "in building" performance compared to higher frequency bands. It is imperative that public safety control this spectrum to ensure that the standards established for the Public Safety Nationwide Broadband Wireless Network regarding capacity, interoperability, priority and reliability are maintained at the highest level. Recent incidents have illustrated that commercial wireless services cannot provide the bandwidth and services needed during an emergency.

The existing public safety 700 MHz spectrum allocation is inadequate to support public safety requirements. The D Block spectrum is crucial to the development of the nationwide network because it is adjacent to the existing public safety broadband allocation. Combining the existing public safety 700 MHz spectrum with the D block will simplify network design and deployment, and will reduce handset and mobile device costs. A single wireless broadband network combining the D Block and the adjacent public safety 700 MHz spectrum is the only logical choice to satisfy public safety broadband wireless spectrum requirements. All major national organizations representing police, fire, emergency medical and prominent public safety officials have united in an unprecedented effort to support the reallocation of the 700 MHz D Block spectrum to public safety, and the creation of a truly interoperable public safety wireless broadband network.

Executive Summary

Public safety must plan now for existing and future wireless broadband needs. Many broadband applications are already being used by public safety, often using commercial networks. Public safety envisions utilizing additional broadband applications but requires public safety grade coverage, redundancy and infrastructure hardening conspicuously lacking in commercial wireless networks. This paper lists and describes many public safety wireless broadband applications and their spectrum requirements. As new commercial broadband applications are developed, some of them will undoubtedly benefit public safety agencies.

The currently proposed 700 MHz spectrum allocation is insufficient to support the applications that public safety requires now. The 700 MHz "D block" spectrum scheduled for auction is adjacent to the Public Safety Broadband Licensee (PSBL) 700 MHz Broadband allocation. The adjacent spectrum is critically needed to provide the capacity necessary to support mission critical public safety broadband applications now and in the future. A single wireless broadband network spanning both the D Block and the adjacent public safety 700 MHz spectrum is the only logical choice to support public safety requirements.

Most commercial wireless carriers have committed to deploying a fourth generation wireless technology called Long Term Evolution (LTE). This technology will be deployed worldwide and is supported on the 700MHz band. Once these commercial broadband LTE networks are deployed, public safety will gain access to lower cost infrastructure and user devices, and will reap the benefits of ongoing research and development financed by the commercial wireless industry.

The 700 MHz band is ideal for public safety as it provides superior coverage compared to the higher bands in mountainous terrain and within buildings. If the 700 MHz D Block is auctioned to commercial providers, the lack of available spectrum will force public safety to maintain separate wireless networks for data and voice in perpetuity, forcing public safety to financially support two networks and carry two devices.

A 700 MHz public safety nationwide broadband wireless network supporting both data and voice will for the first time establish true interoperability in public safety emergencies requiring a multi jurisdictional response. The September 2009 Draft of the National Broadband Plan lists an eventual converged data and voice network for public safety as a strategic goal[1]. This vision will never be realized without a commitment by the Federal government to allocate the D Block to public safety now. Auctioning the D block is shortsighted and ultimately prevents public safety from attaining its goal of a dedicated, robust and reliable broadband wireless network. We believe that the future cost savings achieved by a converged public safety data and voice network will far

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[1] See Draft National Broadband Plan Dated September 29, 2009 Page 9, National Priorities, Public Safety "Interoperable mission critical voice and broadband network".

outweigh any short term revenue collected from a second auction of the D Block spectrum.

The benefit of allocating the D Block to public safety is very significant while the cost of reallocating the spectum is very small. The Cellular Telecommunications Industry Association (CTIA) has indicated that approximately 800 MHz. of additional spectrum is needed to enable commercial broadband service[2]. While allocating 10 MHz. of spectrum in the D Block would double the broadband spectrum for public safety, removing it from auction represents a reduction of only 1¼ percent of the spectrum requested for commercial broadband. Dedicating additional spectrum for public safety broadband would benefit the entire population, who are served by dedicated Police Officers, Firefighters and Emergency Medical personnel. We therefore urge Congress to place a priority on public safety by directing the Federal Communications Commission to reallocate the D Block to public safety broadband operations.

Appendix A, is an excerpt from New York City's recent Comments filed with the Commission in the Matter of Additional Comment Sought on Public Safety, Homeland Security, and Cyber security Elements of National Broadband Plan -- NBP Public Notice # 8. The excerpt is included at the end of this document to underscore our major points and provide broadband throughput analysis data.

Section One

Public Safety Requires a Robust and Reliable Network

Reducing public safety coverage, reliability or availability requirements in order to attract potential bidders is shortsighted as such a network will not meet public safety's needs. The result will be a false sense of security that will be shattered by catastrophic network failure when the first large scale disaster occurs. All commercial enterprises are motivated by profit, commercial wireless networks are no exception. Their primary responsibility is to their shareholders, not to the welfare of the public.

Public safety's mission is to protect the public, there is no profit motive. Therefore, Public safety communications networks are more akin to military wireless networks rather than commercial wireless networks. The establishment of the Department of Homeland Security and the FCC's recent establishment of the Public Safety and Homeland Security Bureau, as well as the longer established position of Defense Commissioner all serve to underscore the increased threats that public safety agencies must contend with in the post 9/11environment.

[2] Letter from Christopher Guttman-McCabe, Vice President, Regulatory Affairs, CTIA, to Chairman Julius Genachowski, *et al,* Federal Communications Commission, GN Docket No. 09-51, September 29, 2009 ("CTIA Spectrum Needs").

Reducing the minimum required bid price undercuts the very purpose of the auction. Diluting the network coverage and reliability requirements shortchanges public safety. Rather than taking these steps to attract a potential bidder, we urge Congress and the Commission to cancel the D Block auction and assign the D block directly to public safety. This will insure that public safety has sufficient spectrum to deploy a nationwide interoperable mission critical wireless network that will ultimately support both voice and data, alleviating interoperability issues caused by legacy public safety networks operating on disparate frequency bands and incompatible wireless technology platforms.

Section Two
Benefits to Public Safety

Network Control
If public safety owns and operates its own network, or at a minimum holds the spectrum license in a public private joint venture network, they can exert greater control over future technical decisions that effect network performance. Additionally, ownership of the network allows public safety to exert influence over the network design and deployment to satisfy the immediate and future needs of public safety users.

In an emergency it is critical that public safety exert direct control over their critical communications networks. Public safety agencies must be assured that they are afforded the highest priority during emergency situations, even if others are denied service or are otherwise inconvenienced.

The addition the D block licensed to the public safety 700 MHz. allocation will put public safety in a favorable position if a public safety partnership is forged in a particular locality. Other localities may choose to build own and operate their own public safety broadband network. In either case, granting the license for the D Block spectrum through a public safety entity such as the PSBL puts public safety agencies in a better negotiating position if a partnership arrangement is desired. As licensee, public safety will be able to partner with any qualified commercial entity whereas if the D Block is auctioned, public safety can only negotiate with the D Block auction winner.

Guaranteed Access
In order to protect the public and perform their job efficiently and effectively, public safety users require guaranteed access to the communications networks they use. In recent years, public safety users have become increasingly reliant upon commercial networks. During emergencies these networks often fail due to congestion or infrastructure breakdown, since they are not scaled or engineered for emergencies.

On October 11, 2006 New York Yankee pitcher Cory Lidle crashed a small private plane into a 40 story apartment building in Manhattan. Public safety first responders arriving at the scene were unable to use their commercial wireless cell phones due to call blocking resulting from network capacity limitations. All wireless carriers were similarly affected.

Although many of the first responders had "priority access" they were still unable to access the wireless networks in most cases.

Analysis after the event revealed that a large part of the problem was that the commercial wireless networks are simply not scaled and engineered to handle the traffic spikes that result from this type of event. Further analysis revealed that "priority access" was ineffective for two reasons. First, the priority given to public safety is only "top of the queue" priority, rather than preemptive access. Given the location of the incident and the number of news media personnel present, who have learned from experience never to end their call until the incident is over, it is not surprising that few public safety calls were successful. The second factor is that the "access channel" was congested. The network could not recognize the public safety user as a priority user until the call request was recognized by the network. Since the access channel was overwhelmed, the public safety user was competing with all other users for network recognition.

Future Cost Avoidance

Both the National Public Safety Telecommunications Council (NPSTC) Statement of Requirements for the National Public Safety Broadband network and the FCC Third Further Notice of Proposed Rulemaking specify a Push to Talk (PTT) voice capability. As LTE technology matures, we are confident that a mission critical voice capability will become a reality. Setting aside sufficient spectrum for this purpose now will create a more definitive market opportunity for technology suppliers to begin early development of products knowing that a true market exists and that development costs can be recovered through sales of equipment and systems.

In the future we envision a single converged voice and data network for public safety. This vision is also expressed as a national strategic goal in the September 2009 Draft of the National Broadband Plan. If a converged public safety voice and data network becomes a reality, public safety agencies will reap significant cost savings since they will only have to support a single wireless communications network and carry a single device for both data and voice.

At the recent GSMA (Groupe Spéciale Mobile Association) Mobile World Congress, the GSMA announced the acceptance by the majority of wireless network operators of a standard for voice over Long Term Evolution (LTE). The technology will be based on IMS (Internet Multimedia Services). The GSMA believes that IMS voice services could become available over LTE as soon as the middle of 2011.

Reliability

Public safety networks are typically equipped with emergency power backup capability. Most critical public safety radio sites are equipped with a minimum of eight hours of backup power. During the Northeast blackout of August 2003 many cell sites in New York City failed within the first few hours and remained inoperative for the duration of the blackout.

Network Restoration
Public safety staff can restore service quicker than commercial entities. Public safety technical staff can more quickly access sites within disaster areas when commercial providers (civilians) are excluded due to security concerns.

Technical Staff
Public safety technical staff will respond in situations that commercial providers will not. Public safety technical staff are credentialed and screened to a higher standard than commercial provider technical staff and their subcontractors. Commercial providers often use third party subcontractors who are not focused on public safety as their primary commitment. They sometimes employ transient workers whose commitment to the mission is questionable. Such employees are rarely subjected to extensive background checks prior to employment.

During the Northeast blackout of August 2003 electrical power was out in most of New York City for approximately 25 hours. This exceeded the backup power capacity at many NYPD radio sites. However, NYPD Radio Repair Mechanics and Police Officers were able to keep these sites on the air by replacing discharged backup batteries with freshly charged batteries. These batteries weigh approximately 100 pounds and in some cases had to be hand carried up sixty floors. No commercial wireless network provider made a similar effort to maintain service, nor would we expect them to. They simply waited for commercial power to be restored.

Section Three
Long Term Evolution and Spectrum Efficiency

Long Term Evolution (LTE) has been endorsed by the Public Safety Spectrum Trust (PSST), the Association of Police Communications Officials (APCO), the National Emergency Number Association (NENA), and the National Public Safety Telecommunications Council (NPSTC) as the preferred technology for 700 MHz. Public Safety Broadband Network. Verizon Wireless, AT&T, and T-Mobile have all publicly stated their intention to deploy LTE in the United States as their fourth generation (4G) wireless network.

LTE standards are governed by the Third Generation Partnership Project (3GPP), an international wireless standards body. LTE is supported by the 3GPP and most commercial wireless carriers, worldwide. LTE supports channel bandwidths from 1.5MHz. up to 20 MHz. wide.

Spectrum efficiency is improved through spectrum aggregation. The larger the channel size the greater the potential for spectral efficiency. Within LTE, a 10MHz. block of contiguous spectrum provides significantly greater spectrum efficiency than two 5MHz. blocks of non contiguous spectrum blocks.

The current allocation for broadband public safety spectrum consists of two 5 MHz. spectrum blocks, one 5MHz. uplink channel and one 5MHz. downlink channel. Although a public safety broadband network could be created using 5MHz. uplink and downlink channels in the existing public safety broadband spectrum, and another commercial LTE network, could be deployed using the 5MHz. uplink and downlink channels in the adjacent D Block. A better solution is for public safety to be allocated the D Block channels and deploy a network consisting of two 10 MHz. LTE channels, one uplink and one downlink. This solution offers distinct advantages. First, it is more spectrum efficient as it allows higher peak power data rates and higher throughput. Second, it is more economical since the cost to deploy a network consisting of two 10 MHz. channels is approximately the same as the cost to deploy two 5MHz. channels.

The 700 MHz. D Block is the only available spectrum adjacent to the public safety broadband allocation. If the D Block is auctioned rather than being assigned to public safety, state and local governments will pay a much higher price in the future supporting public safety communications than any short term revenue gleaned through a second auction. If a commercial wireless provider chooses a technology other than LTE for the D Block, a guard band will have to be established between the D block and the Public Safety broadband spectrum.

LTE supports channel sizes ranging from 1.5MHz up to 20MHz. A network utilizing larger channels in urban environment will provide substantially greater capacity. In rural areas, larger channels will allow for the deployment of a higher site architecture network employing higher power base stations thereby reducing the number of sites required.

Section Four

Convergence of Data and Voice

As time goes on, it will become increasingly more attractive to build converged data and voice networks. This issue was raised during the PSWAC effort in 1996; however it was not technically feasible at that time. The technical environment has changed dramatically since then. A converged data and voice network solution at 700 MHz is now possible if the Federal Government, public safety and the wireless communications industry decides to move in that direction. It will not be possible if the spectrum is not available.

The National Public Safety Telecommunications Council's (NPSTC) Statement of Requirements published in November 2007[3] and the FCC Third Further Notice of Proposed Rulemaking issued in September 2008[4] both specify a commercial grade PTT voice capability as a requirement of the Public Safety 700 MHz. Broadband Network. We are confident that over time a mission critical voice capability will be developed within the LTE framework.

[3] See NPSTC Public Safety 700MHz Broadband Statement of Requirements pp20-21
[4] See FCC Third Further Notice of Proposed Rulemaking Appendix C, p189(4) and p193 (Table 1)

Federal Agencies are already beginning to use converged voice and data networks for mission critical communications.

> "The vast majority of Federal public safety agencies do not currently use broadband networks to support mission-critical voice communications. The Transportation Security Administration (TSA) of the Department of Homeland Security (DHS) is one exception. TSA uses commercial wireless broadband services in the 800 MHz spectrum for mission critical air to ground communications for Federal law enforcement officers in flight, as that is the only spectrum available for this application. This capability will soon include Voice over Internet Protocol (VoIP)."[5]
>
> "Immigration and Customs Enforcement (ICE), within DHS, is another exception. ICE uses commercial broadband networks for intranet access for laptops and other portable electronic devices, such as Blackberries, and for voice telephony applications. ICE requires exceptionally stringent security to safeguard law enforcement information and therefore allows broadband access only for authorized ICE end user equipment on which the required security controls have been installed and tested. ICE's law enforcement officers have mission-critical requirements for critical demand theater operations. The lack of law enforcement priority on commercial broadband networks also necessarily limits ICE's usage of such systems. Despite such limitations, the Commission should consider whether use of commercial broadband networks, with adequate adoption by public safety agencies, may be a first step in the path to maximized broadband network."[6]

The National Telecommunications and Information Administration (NTIA) shares the view that a converged public safety data and voice communications network will ultimately replace existing narrowband public safety voice networks.

> "As voice and data communications continue to converge, users have a greater expectation for both voice and mobile wireless data capabilities. Broadband systems that can provide reliable, interoperable voice and data systems will likely replace antiquated narrowband voice systems and low data rate networks. If mission critical voice applications are to migrate to broadband, systems will need to have sufficient control channel capability in high congestion areas, especially during special events and large gatherings, to support both a significant increase in text messaging and data traffic and call setup capability for national security and emergency preparedness (NS/EP) communications. Legacy voice networks must be effectively leveraged while the migration to broadband evolves." [7]

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[5] See NTIA Executive Branch Views On Public Safety, Homeland Security and Cyber security Elements of a National Broadband Plan, December 2009; Page 4.

[6] See NTIA Executive Branch Views On Public Safety, Homeland Security and Cyber security Elements of a National Broadband Plan, December 2009; Page 4.

[7] See NTIA Executive Branch Views On Public Safety, Homeland Security and Cyber security Elements of a National Broadband Plan, December 2009; Page 11.

Assuming that the 700 MHz. broadband public safety network will be constructed in any event, public safety should seize this opportunity to include mission critical voice as a required network component as soon as the technology permits, thereby solving voice interoperability issues and standardizing public safety communications nationwide. We realize that mission critical voice over broadband is a not available today and that public safety will not accept this technology until it equals or exceeds the capabilities and reliability of existing mission critical public safety land mobile radio networks. However, we also believe that the eventual convergence of broadband data and mission critical voice on a single network is inevitable. The alternative is to support separate public safety networks for data and voice, construct and maintain incompatible mission critical voice networks using dissimilar technologies on disparate frequency bands, and pay premium prices for narrowband user devices. We view this alternative as unacceptable.

The goal of public safety communications planners should be not only consolidation onto an integrated broadband voice and data network[8], but also an orderly migration of existing public safety mission critical voice communications systems, over time, to a common frequency band and technology platform, which will provide inherent interoperability and improved spectrum efficiency while reducing overall costs in the long term. In order to achieve these objectives, Congress should allocate the 700 MHz. D Block directly to public safety and forgo a second auction.

Section Five
The 4.9GHz. Public Safety Spectrum

Some opponents of our effort to assign the 700 MHz D Block to public safety have suggested that the public safety 4.9 GHz channels provide more than enough spectrum for public safety to deploy broadband networks. The deployment of wide area networks using 4.9GHz public safety channels is impractical for several reasons. First, the number of sites required to provide adequate coverage, especially in an urban environment is staggering. The number of sites estimated to cover New York City alone exceeds 13,000. From both a maintenance and infrastructure perspective 4.9GHz is a poor choice. It may be appropriate to use this technology in small areas for special purposes; however the poor propagation characteristics offset any derived benefit. In some localities 4.9 GHz has been used to implement wireless WANs, however this was done out of necessity, since no other spectrum was available. Currently, there are no other options available to public safety for a broadband network deployment. Another very critical issue is the backhaul requirements of a 4.9GHz wide area network; the number of sites required to provide ubiquitous coverage creates a difficult challenge to deliver backhaul infrastructure to the network. The 4.9GHz public safety channels were intended for hotspot or incident scene use only; they were never intended to be used as a wide area

[8] See Draft National Broadband Plan Dated September 29, 2009 Page 9, National Priorities, Public Safety "Interoperable mission critical voice and broadband network". Page 161 Ensuring public safety requires a high quality network; Goal:" Enhances mission critical voice over time"

network solution. 4.9GHz links can be used to transport video for spontaneous or temporary deployment over short distances.

Public safety emergencies occur in all areas, not merely in pre-defined or anticipated locations. Time is of the essence when lives are at stake. It is far more desirable for public safety first responders to have a wireless network in place that provides adequate broadband coverage in all locations than to call in a special unit to deploy an ad-hoc network. Incidents that unfold quickly or change locations further underscore the need for ubiquitous broadband network coverage rather than relying on ad- hoc networks to be set up and broken down repeatedly. Fixed wireless network assets are a much more permanent, reliable and effective solution for public safety.

The propagation characteristics of 4.9GHz virtually preclude practical wide area network deployment since the range is very limited. Although it is possible to deploy a mesh network to increase the range and circumvent obstructions, this technique severely reduces throughput and adds additional layers of complexity and potential failure. Due to the specifications of the 4.9GHz emission mask, devices deployed on adjacent channels in close proximity may interfere with each other, further reducing throughput.

Connectivity between 4.9GHz devices requires a line of sight path between transmitter and receiver; 4.9GHz signals will not bend around obstructions. These physical channel limitations are especially problematic for deployment in dense urban areas which are the very areas most likely to require the highest data throughput. The inability of 4.9GHz signals to penetrate walls, windows and other common construction materials render them virtually useless indoors.

A wide area 4.9GHz network deployment is inconsistent with the ultimate goal of a constructing a converged nationwide voice and data public safety network utilizing a single user device and operating on a common technology platform. The suggestion that 4.9GHz devices can be deployed over a wide area to provide broadband capability for public safety first responders ignores the coverage limitations of the frequency band. The 4.9GHz public safety channels are more appropriately used as hotspots at known congregation points such as Police Precincts or Firehouses, or at the scene of protracted incidents for the local exchange of broadband data and for Blue Force Tracking purposes.

The majority of public safety broadband applications will require backhaul to remote data bases so that information can be downloaded to public safety responders and to Command and Control facilities so that critical information can be exchanged between headquarters and field units. Ad-hoc 4.9GHz hotspots deployed at incident scenes without the benefit of backhaul do not provide the same level of functionality as access to a permanently installed wireless infrastructure.

Municipal Wi-Fi mesh networks deployed within the last few years by some governmental agencies and private firms have, for the most part, been shut down. This occurred due to the lack of a sound business model, the need to constantly add and relocate access points, the cost of back-haul for these networks and poor in building penetration. The inability of well funded commercial entities to successfully deploy Muni Wi-Fi networks in the lower portion of the spectrum where coverage is better than at 4.9GHz. indicates that this model is not a suitable alternative to the 700 MHz wide-area network planned for public safety.

Section Six
Public Safety Broadband Data Applications

Applications Relevant To All First Responder Agencies

1.) Incident Video
Live incident video has immeasurable benefits to public safety. The ability to stream on-scene video to responding units, operations and communications centers, supervisors and emergency managers can dramatically alter the way public safety responds to major incidents. The ability to share first responder and broadcast video among responding agencies will greatly enhance public safety's ability to manage and contain critical incidents. Integrating Geographic Information System (GIS), sensor and tactical data with video will provide first responders with critical pre-arrival information that will allow a more effective response to critical incidents. Video captured at incident scenes can be wirelessly transmitted to Command and Control facilities or responding mobile units, improving situational awareness and enhancing officer safety.

Incident Video Viewing DL	1150 kbps
Incident Video Viewing UL	28 kbps

2.) Broadband Data Dispatch
Although "digital dispatch" has been available for more than 20 years, its capability has been limited largely to text transmissions by the throughput constraints of current narrowband public safety wireless data networks. A next generation public safety broadband data network will allow broadband data to be transmitted to field units prior to their arrival at the incident location, greatly improving situational awareness.

Advanced consumer wireless features such as photos and video sharing allow citizens to capture incident information and transfer it to public safety dispatch centers. Utilizing a broadband network this information can be wirelessly transmitted to field units responding to an incident. Additionally, this capability will allow dispatchers to attach this information to the incident record, automatically send it to responding units to view or listen to all available data related to the job assignment, including for example an audio file containing the information provided during a 911 call. It will provide critical premises history information such as: prior police response, arrests, weapons, warrants, and crime report histories. This type of information can be critical in determining how the responding officers approach the individuals involved in the incident, or enable them to more effectively conduct their investigation. Broadband data dispatch will reduce radio traffic on voice channels, minimize call backlog, improve response time, improve officer productivity and enhance officer safety.

The NYPD currently responds to an average of 5,000 to 6,000 incidents per day. Over time, the voice component of the public safety dispatch function will decrease, while the broadband data component will increase dramatically. We envision that in the future, pushing broadband data to responding field units will account for 85 to 90 percent of dispatch transactions without the need for voice communications.

Digital Dispatch DL	25 kbps
Digital Dispatch UL	25 kbps
Audio and Video DL	96 kbps
Audio and Video UL	19 kbps

3.) Mobile Incident Command Vehicles

During major incidents and special events, specialty vehicles are dispatched to serve as Mobile Command Posts. These vehicles are typically equipped with multiple communication devices and critical incident management applications and contain radios, cell phones, fax machines and satellite phones. Wireless broadband connectivity will allow two-way transfer of photos, video, and audio clips to and from Headquarters in real time, improving Command and Control and situational awareness for on scene Incident Commanders as well upper echelon command staff not on scene. Additionally, applications that require high bandwidth connectivity can be supported at the incident scene over a single broadband modem.

Incident Video Viewing DL	1150 kbps
Incident Video Viewing UL	28 kbps
Website Viewing DL	90 kbps
Website Viewing UL	25 kbps
Incident Video UL	647 kbps
SFTP Transfer DL	93 kbps
SFTP Transfer UL	92 kbps

4.) Mobile Access to Geographic Information System (GIS)

Mobile units and field commands can download geographic information such as topographical and curb line maps and architectural and computer rendered drawings from government and private municipal data bases. Use of GIS and Computer Aided Drafting and Design (CADD) information will provide invaluable assistance to law enforcement and fire services during routine and major incidents. Incidents such as the Mumbai, India Hotel attack illustrate the need for better tactical information for first responders. This capability replaces the need to carry physical maps that may be out of date. GIS capabilities further provide a means to visually connect different layers of information to improve on-scene situational awareness.

GIS / CADD Request UL	20 kbps
GIS / CADD Request DL	**100 kbps
**file size assumes DWG or similar format and avg sizes	

5.) Blueforce Tracking (BFT)
The location of public safety personnel can be remotely monitored during high risk operations to enhance first responder safety. Fire and police services have been interested in this technology for several years and recent developments in the defense industry now make public safety availability likely in the immediate future. Broadband technology will allow blue force tracking solutions to be available when necessary. Since first responders are typically responding to unplanned incidents there is limited time to deploy ad-hoc or temporary networks for blue force tracking applications. BFT can be used to monitor firefighter and police officer location, and vital signs. Body worn video can be deployed to provide tactical and situational information to field and command personnel.

BFT Data Transfer UL	*25 kbps
BFT Data Transfer DL	*25 kbps
*Assumes polling at 5 second intervals	

6.) Automatic Vehicle Location (AVL)
Real time location and status of public safety agency vehicles can be wirelessly transmitted to the dispatch center, allowing the dispatcher to more effectively deploy the fleet, enhancing command and control and improving efficiency.

Data Transaction UL	40 kbps
Data Transaction DL	**60 kbps
** Estimated average transactions with 5 and 30 sec poll rates	

7.) Supervisory Field Access to **CAD and RMS Data**
Public safety supervisors need the capability to monitor personnel and incident activity. Monitoring Computer Aided Dispatch and Records Management Systems wirelessly allows field supervisors enhanced situational awareness and allows field units to react rapidly changing conditions. Although this capability has existed for several years utilizing existing data networks, the functionality has been limited by the lack of sufficient bandwidth. Supervisors are limited to text updates and as more users respond to the incident system response times deteriorate. Users are also limited to text based searches of internal databases and have no access to the internet or web based applications. Broadband connectivity will allow supervisors to search multiple databases simultaneously and receive interactive feedback to allow for further refinement of their search parameters. Secure broadband communications will also allow for access to external databases that would otherwise be restricted for security reasons. Narrowband or even high capacity channelized data systems do not have the bandwidth to sustain

multiple users accessing large amounts of information in a concentrated area. This capability was successfully used in the “Miracle on the Hudson” plane crash in January 2009 when NYPD Special Operations Division (SOD) field supervisors monitored CAD data in real time over the NYCWIN network, thereby eliminating the need for constant dispatcher updates.

Data Transaction UL	20 kbps
Data Transaction DL	**22 kbps
Data Trans. + photo/GIS UL	**40 kbps
** Estimated average transactions based on similar NYCWiN traffic	

8.) Real Time Field Supervision

The capability for Field Supervisors to monitor the location and status of mobile units assigned to them without dispatcher assistance. Utilizing AVL and GIS capabilities, field supervisors can view their area of responsibility and “see” the units on a map. AVL will allow the supervisors to select a unit’s icon and instantly see status, assignment, duration of service and other related information.

Data Transaction UL	20 kbps
Data Transaction DL	**25 kbps
** Estimated average transactions with 5 and 30 sec poll rates	

9.) Exchange of Broadband Data in the Field

Mobile units operating in the field can exchange data regarding an incident without dispatcher intervention, decongesting voice channels and allowing dispatchers to process incoming job assignments more efficiently. This data may include photos, video or audio files. This capability aids in the positive field identification of suspects, weapons, stolen items or other evidence. The exchange of data in real time between geographically separated team members improves officer productivity and enhances the investigatory process by enabling crimes to be solved faster and more effectively.

Data Transaction UL	22 kbps
Data Transaction DL	*40 kbps
* Estimated average transactions including audio, video and photos	

10.) Wireless Call Boxes

Emergency (911) call boxes can be installed in any location within the wireless network coverage footprint, regardless of the availability of wire line connectivity.

VOIP Call DL	20 kbps
VOIP Call UL	20 kbps

Police Specific Applications

1.) Mobile Crime Scene Units (Detective Division)
Crime scene investigation involves the gathering of evidence and subsequent analysis by specialists at a centralized location. Specially equipped vans staffed by detectives can respond to a crime scene to gather and analyze evidence. Immediate access to critical information will provide invaluable assistance to investigators and lead to more timely apprehensions. The information must be gathered and analyzed quickly and effectively, in real-time. Broadband connectivity will allow immediate analysis of evidence saving valuable time. Crime scene photos, video, forensic data and other information gathered at the scene can be instantly transmitted to the Real Time Crime Center or crime lab for detailed analysis.

Incident Video Viewing UL	28 kbps
Website Viewing DL	90 kbps
Website Viewing UL	25 kbps
Incident Video UL	647 kbps
SFTP Transfer DL	93 kbps
SFTP Transfer UL	92 kbps
Data Transfer DL	*25 kbps
Data Transfer UL	*20 kbps
* estimates based on current data rates from NYCWiN	

2.) Automated License Plate Recognition (LPR)
Public Safety and government vehicles equipped with Automatic License Plate Recognition systems can scan hundreds of license plates within minutes, sweeping an area for wanted or stolen vehicles with little operator intervention. Additionally, LPR systems can be used to enhance officer safety by transmitting real-time vehicle stop information to the dispatcher and automated database inquiries for car-stops. Broadband connectivity will allow agencies to quickly deploy fixed LPR systems to monitor traffic in and out of a defined area or along major roads for major incidents and temporary security operations.

License Plate Reader UL	256 kbps
License Plate Reader DL	22 kbps
Based on actual data rates from NYCWiN	

3.) Mobile or Handheld Summons Issuance
Traffic Enforcement Agents and police officers can issue summonses using hand held and mobile ticket writers connected to the broadband network. These devices can access Department of Motor Vehicles (DMV), National Crime Information Center (NCIC), National Law Enforcement Telecommunications System (NLETS), and agency databases in real time, thereby alerting the agent or police officer to a wanted or stolen vehicle, and verify the accuracy of the data entered. Photos and GIS data can be combined with the

violation for accuracy and real-time location information. Wanted vehicles can be cross-referenced in real-time with violation information to support detectives during an investigation; an activity that normally would take several days can be accomplished in minutes.

Data Transaction UL	20 kbps
Data Transaction DL	20 kbps
Data Trans. + photo/GIS UL	40 kbps

4.) Chemical, Biological, Radiological, Nuclear and Explosive Detection Devices (CBRNE)

Portable, fixed and deployable sensors designed to detect Nuclear, Biological and Chemical agents can be deployed almost immediately or strategically placed in high threat areas for remote monitoring through the broadband network. Wireless connectivity allows the sensors to be relocated rapidly if necessary without regard to wire line connectivity availability, should the threat location change. The City of New York has been testing devices over the NYCWiN network with great success. In the event of a CBRNE incident the information can be monitored at remote locations reducing risk of further exposure to the threat. The devices can also be deployed at major events such as sporting events, concerts and other large gatherings without consideration for wired data connections.

Data Transaction UL	20 kbps
Data Transaction DL	20 kbps
Data Trans. Alarm UL	**25 kbps
** Includes transfer of spectral image for interpretation	

5.) Real Time Crime Center Wireless Connectivity

The NYPD Real Time Crime Center (RTCC) allows investigators to gather, correlate and analyze data from numerous sources at speeds previously unheard of in law enforcement. The RTCC allows Officers in the field to transmit photos or video directly to the RTCC from handheld devices for analysis. Key components of the RTCC include a data warehouse, data analysis software and a video wall. Using these tools, Police Officers quickly analyze data from numerous data bases and establish relationships that otherwise are not immediately apparent. Prior to the establishment of the Real Time Crime Center, data now correlated literally within minutes could have taken days or weeks.

Broadband Wireless connectivity plays an integral role in the operation of the NYPD Real Time Crime Center. The ability to transmit photos and video clips from the field in real time, or from the RTCC to the field, greatly accelerates the investigative process. Currently the NYPD utilizes a commercial wireless provider to supply the broadband wireless connectivity. The implementation of a Public Safety 700 MHz. broadband network would provide a cost savings to the NYPD by eliminating the expense of monthly recurring charges. The 700 MHz. band provides greater in building penetration than the 2.5GHz. NYCWIN network which is used primarily for vehicle based applications. In addition a public safety 700 MHz. broadband wireless network would allow public safety agencies to purchase relatively low cost handheld devices similar to those used in commercial wireless networks.

Data Transaction UL	22 kbps
Data Transaction DL	**160 kbps
Data Trans with photos UL	**80 kbps
** Estimated average transactions	

6.) Transmission of Video from Aviation Units to Terrestrial Mobile Units.
Current technology limits the ability of aviation units (helicopters) to deliver video to multiple terrestrial mobile units. Utilizing wireless broadband connectivity will allow the video feeds transmitted from aviation to be distributed to mobile command posts and responding units. The existing equipment requires the mobile command post to be stationary and erect a receiver directed towards the helicopter. Sufficient bandwidth is required to allow for video distribution to multiple units at the scene, responding to the scene and at remote locations. Broadband wireless connectivity will allow the video to be transmitted to a central repository and re-transmitted to any mobile or fixed unit within the coverage footprint of the broadband wireless network.

Incident Video Viewing DL	1150 kbps
Incident Video Viewing UL	28 kbps

7.) Photo ID
Field Officers can verify the identity of suspects or other individuals being detained, particularly those with common names or without valid identification. This capability enables Officers to detain or release individuals with a much higher degree of accuracy.

Photo ID DL	40 kbps
Photo ID UL	60 kbps

8.) Field Officer Direct Access to Remote Databases
Field Officers can verify the validity of license data without dispatcher intervention. (DMV records, Pistol License data, Peddler Permits etc.)

Data Transactions Text DL	22 kbps
Data Trans. Text + Photo DL	*60 kbps
Data Transaction UL	25 kbps
* estimates based on file sizes from NYPD mobile data photo pilot	

9.) Gunshot Detection

Gunshot detection system have been shown to reduce incidents of gunfire in targeted areas, assist investigators with timely and accurate information and provide invaluable evidence for court cases. The systems rely on strategically placed sensors and some form of line of sight connectivity. In urban areas placement of these sensors can be difficult if not impossible using line of sight communications. Connecting the sensors via broadband affords the user optimal placement options, rapid deployment and critical file transfer capabilities. The incident information and audio files can be instantly sent to the communications center and units in the vicinity to enhance response to gunshot incidents. Additionally, the sensors can be relocated as needed without wire line installation considerations or constraints.

Incident and Audio Transfer UL	*65 kbps
Incident Transfer to Unit DL	80 kbps
Data Transaction Text Only DL	25 kbps
*assumes and average audio file size with 5 seconds of gunshot audio	

10.) Photo and Video Distribution

In an investigation of a crime or missing person the first 30 to 60 minutes are critical to the resolution process. Photos or video of missing or wanted individuals can be distributed to mobile field units in real time improving the likelihood of a successful outcome. (Amber Alert Wanted Persons etc.) The process, if done manually, may take several hours to initiate and distribute the information to the field. Broadband capability will greatly enhance response to these types of incidents.

Video UL from field	*1000 kbps
Photo UL from field	90 kbps
Video DL from Dispatch	*1000 kbps
Photo DL from Dispatch	92 kbps
* Average file sizes – not streaming	

11.) Maritime Surveillance and Monitoring

Port Security is a priority as part of the nation's efforts to protect critical infrastructure and prevent acts of terror. There is the potential for weapons and explosives to enter coastal ports on cargo ships. DHS has stepped up their inspection efforts and port monitoring, however the deployment of a wireless sensor network would greatly enhance the security of our ports. Cargo manifests, ship information and travel itineraries can be made available in real time to Coast Guard and local law enforcement to enhance investigations. Remote sensors can be deployed in strategic locations to assist in early detection of dangerous cargo. These types of systems can only be deployed if sufficient bandwidth is available to allow for exchange of critical information and the monitoring of remote sensors.

Data Transaction UL	20 kbps
Data Transaction DL	120 kbps
Data Trans. Alarm UL	**60 kbps
** Includes transfer of spectral image for interpretation and GIS	

Fire Service Applications

1.) Electronic Command Boards (ECB)

The Fire Department has developed an Electronic Command Board to support fireground operations at the scene of an incident. The ECB allows the Fire Chiefs at the scene of a fire to exchange critical information and provide live updates to the Operations Center. The ECB requires a broadband application to transfer information in a timely fashion. At the scene of many large scale incidents commercial wireless networks are often overloaded and cannot provide the necessary bandwidth for ECB to operate properly. The ECB requires a broadband connection for optimum operation. Fire Chiefs at the incident scene can track responding units and transmit this information to Fire headquarters in real time enhancing Command and Control capabilities.

Data Transaction UL	40 kbps
Data Transaction DL	120 kbps
Data Trans. CADD / GIS	**220-400 kbps
** estimates include transfer of GIS and CADD information	

2.) Wireless Access to Floor Plans, Drawings and 3D Graphical Displays

Responding units and commanders require access to building floor plans, schematic diagrams and 3D graphical displays to enhance situational awareness. For Fire Chiefs at the scene of a major incident this capability allows incident commanders to make informed decisions regarding resource deployment thereby enhancing Firefighter and citizen safety. Early transfer of critical information will allow firefighters to approach the incident tactically thereby reducing initial critical response times.

Data file transfer CADD/GIS DL	300 kbps
Incident Video Viewing UL	1100 kbps
Website Viewing DL	120 kbps
Website Viewing UL	40 kbps
SFTP Transfer DL	93 kbps
SFTP Transfer UL	92 kbps

3.) Wireless Access to Building Department Databases

Access included in Building Department records, including the presence and location of potentially hazardous materials within the incident perimeter enhances situational awareness and Firefighter safety.

Data file transfer CADD/GIS DL	500 kbps
Data file transfer CADD/GIS UL	50 kbps

EMS Applications

1.) Automatic Vehicle Location (AVL) Integrated CAD

The location and current status of all ambulances can be wirelessly fed into the EMS Computer Aided Dispatch computer. The EMS CAD computer uses this information to make recommendations to the EMS dispatcher for the next assignment. Implementation of this type of system can result in a significant reduction in response time.

Data Transaction UL	40 kbps
Data Transaction DL	**60 kbps
Data Transaction for Routing	120 kbps
** Estimated average transactions with 5 and 30 sec poll rates	

2.) Patient Tracking

Family members routinely inquire about the location of their sick or injured relatives. Access to a broadband wireless network allows EMS workers to accurately track patients and provide this information to their family members in near real time, increasing productivity and reducing patient tracking errors.

Data Transaction UL	30 kbps
Data Transaction DL	50 kbps

3.) Real Time Transmission of Medical Data

Medical data such as ECGs, photos or videos of injuries and patient history can be wirelessly transmitted to receiving hospitals in advance of a patient's arrival permitting Emergency Room staff to assemble the appropriate personnel and equipment in advance. Advances in mobile telemedicine equipment enhance the initial diagnosis and field treatment of critically injured or sick patients. Information in the form of broadband data can be exchanged between the on board Emergency Medical Technicians and the hospital medical staff to assist in patient treatment during transport. This data may include photos, video, video conferencing and other forms of medical information.

Information Transfer UL	*128 kbps
Monitor status Streaming DL	*200 kbps
Intranet Access UL	*120 kbps
Patient Video UL (1 way)	*647 kbps
Instructional Access DL	*90 kbps
Video Teleconference DL	*900 kbps
Video Teleconference UL	*900 kbps
Data Transfer DL	*25 kbps
Data Transfer UL	*20 kbps
* estimated	

Governmental Non First Responder Agency Applications

The Public Safety Broadband Wireless Network will support QOS and priority. These mechanisms will allow other municipal lower priority users to access network. Allowing non emergency municipal agencies network access improves overall spectrum efficiency. A few examples are listed below:

Sanitation Department Applications

1.) Automatic Vehicle Location (AVL) and Vehicle Monitoring

Real time location and status of Sanitation Department vehicles is wirelessly transmitted to the Sanitation Department dispatch center, allowing the dispatcher to more effectively deploy the vehicle fleet, enhancing command and control. The AVL application also monitors the status and health of the sanitation vehicles by connecting to the data interface.

Remote vehicle sensors installed in Department of Sanitation vehicles wirelessly transmit vehicle status data to the Department of Sanitation dispatch center. These sensors monitor vehicle health as well as mission status (truck full, sand or salt released, at vehicle location etc.). This data is particularly effective in managing fleet resources during snow removal operations, which are the responsibility of the Sanitation Department in NYC.

Data Transaction UL	40 kbps
Data Transaction DL	60 kbps
Data Transaction for Routing	85 kbps
Supervisory Inquiries UL	60 kbps
Supervisory Inquiries DL	100 kbps
Based on NYCWiN data	

Department of Transportation Applications

1.) Wireless Traffic Signal Control

The Department of Transportation is installing new traffic controllers equipped with broadband wireless modems that communicate with the Traffic Control Center in real time, allowing for the wireless control of traffic signals and eliminating the need for wire line backhaul. New traffic signals can be installed in any location within the wireless network footprint without regard for wire line availability, reducing installation time and expense while eliminating recurring (leased wire line) costs. The wireless modems will also allow DOT to implement ITS enhancements such as emergency vehicle priority access, route information and messaging, and traffic management.

Data Transaction UL	40 kbps
Data Transaction DL	**60 kbps
Data Transaction for ITS (future)	120 kbps
** Estimated average transactions	

2.) Traffic Monitoring
Permanent or temporary traffic monitoring cameras can be installed in any location within the footprint of the broadband wireless network without regard for wire line availability, reducing installation time and expense while eliminating recurring costs.

Data Transaction UL	*40 kbps
Data Transaction DL	*60 kbps
* assumes high traffic patterns during peak periods	

Municipal Government and Critical Infrastructure Applications

Sharing the public safety network with other governmental entities on a priority basis enhances and increases public safety agency's return on investment while simultaneously satisfying the original intent of the public safety broadband wireless network to provide ubiquitous national data coverage for first responders. A few examples are cited below.

1.) Wireless Meter Reading
Water, electric and gas meters read remotely taking advantage of the broadband wireless network and/or its backhaul infrastructure to improve accuracy and reduce labor costs.

Data Transaction UL	25 kbps
Data Transaction DL	20 kbps

2.) Wireless Leak Detectors
Water and gas leak detectors connected to the broadband wireless network can be read remotely in real time. These detectors can be installed in any location within the wireless network footprint without regard to wire line availability; reducing installation time and expense and eliminating recurring (leased wire line) costs.

Data Transaction UL	20 kbps
Data Transaction DL	25 kbps

3.) Bus Locator (AVL)
The real time location and status of municipal buses can be wirelessly transmitted to the bus dispatch center, allowing the dispatcher to more effectively deploy the vehicle fleet, enhancing command and control and providing improved service to the public. In addition, it is possible to monitor engine parameters, and emergency requests from the driver in real time, or an alert basis.

Data Transaction UL	**128 kbps
Data Transaction DL	**40 kbps
** Estimated average transactions with 5 and 30 sec poll rates	

Section Seven
Conclusion

Real time access to broadband data improves the efficiency of public safety personnel by giving them the tools they need to perform their job. The delivery of broadband data to field personnel requires access to a wireless broadband network. The FCC has taken the first steps by allocating spectrum in the 700 MHz band to Public Safety for this purpose. Unfortunately, the spectrum allocation will not meet future public safety demands. However, an adjacent spectrum block, the "D Block" has yet to be auctioned. We appeal to Congress to relieve the Commission of their legal obligation to auction the D Block and we implore Congress to direct the Commission to assign the D Block to public safety.

This document has defined some of the broadband applications public safety can benefit from with the assignment of the D block spectrum, and has demonstrated that the current assignment of two 5MHz channels is insufficient for the task. Although technology advancements will improve network capacity (throughput), they will not outpace demand for broadband spectrum. LTE is a very spectrum efficient technology. Improvements in capacity beyond LTE are possible but the physical limit of the radio channel (Shannon Boundary) will limit the magnitude of these improvements.

A unique opportunity exists to change the paradigm of public safety communications where multiple frequency bands and incompatible technologies create obstacles to interoperability and perpetuate inefficiency. We urge Congress to take the first steps to allow public safety to learn from the mistakes of the past and plan for a future in which wireless broadband networks deployed on a common frequency band using a common technology platform provide public safety with the tools they need for the twenty first century.

We endorse the vision of a broadband public safety interoperable data and mission critical voice network listed as a national priority in the September 2009 Draft National Broadband Plan[9], and in NTIA's "Executive Branch Views on Public Safety, Homeland Security and Cyber Security Elements of a National Broadband Plan"[10]. We believe that in order to achieve this vision, Congress should direct the FCC to forgo a second D Block auction and direct the Commission to assign the D block to public safety.

[9] See National Broadband Plan (September 29, 2009 Draft) Pages 9 and 161.
[10] See NTIA Executive Branch Views On Public Safety, Homeland Security and Cyber security Elements of a National Broadband Plan, December 2009; Page 11.

Respectfully Submitted,
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APPENDIX A

Appendix A is an excerpt from New York City's recent Comments filed with the Commission. It is included here to underscore our major points and provide broadband throughput analysis data.

Current and Anticipated Needs of the Public Safety Community for Mobile Wireless Broadband Networks and Applications.

New York City is closely monitoring the evolution of Long Term Evolution ("LTE") technology as it relates to both mission critical data and voice applications including duplex phone calls, push to talk, instant messaging and broadcast video. Broadband technologies are developing at a rapid pace and the possibility of LTE supporting "push-to-talk" voice communications must be investigated as an alternative to narrowband technology. The lessons to be learned from past experience is that increasing channel size (broad-banding) rather than reducing channel size (narrow-banding) leads to more efficient use of scarce spectral resources. New York City understands that the LTE standards for voice have not been fully developed and that initial forays into broadband voice communications may be a few years away, however the Commission should act now to ensure that sufficient spectrum is available and that public safety standards are developed for this technology to evolve.

Anticipated Broadband Traffic and Capacity Requirements

Using New York City's experience in building the NYC Wireless Network (NYCWiN) as a basis for analysis our team examined the impact that broadband systems may have in the future operations of the public safety. We have collected important data points by gathering application usage from the NYCWiN network in order to provide real-world operational and performance data for the Commission's discussion on broadband usage. First, the NYCWiN 2.5 GHz broadband system provided a basis to characterize the various types of broadband applications that are in use today by the NYC public safety and public sector users. These applications and associated data rates are seen in table 1 below.

Data Rates	Download (Kbps)	Upload (kbps)
Incident Video upload	12	647
AVL Monitoring	51	4
Website Viewing	90	5
SFTP Transfer	93	92
Field Video Viewing	1150	28
Mobile Audio & Video upload	19	96

Table 1 - Typical Data Rates Derived from NYCWiN

The analysis focuses on two very important areas of consideration necessary in understanding the future needs for spectrum for New York City. First we examined the impact of secure broadband applications and the relation to bandwidth to support these applications. As has been discussed throughout the proceeding related to the 700 MHz spectrum, public safety has a critical need to improve daily operations through the use of mobile and fixed applications and technology.

However, it is important to understand the public safety systems must be designed to function outside of the accepted norm for everyday operations to best understand the bandwidth requirements for first responders. As we have seen many times, commercial systems have shown the greatest amount of stress during major City disasters and special events such as:

- September 11th attacks in New York and the Pentagon
- American Airlines Flight 587: 11-12-01
- Staten Island Refinery Explosions: 2-21-03
- Staten Island Ferry Crash: 10-15-03
- Midtown Building Collapse: 7-10-06
- Cory Lidle Plane Crash: 10-11-06
- Midtown Steam Pipe Explosion: 7-18-07
- Multiple Crane Collapses: March and May 2008
- Miracle on the Hudson: 1-15-09
- Helicopter/Plane Crash on the Hudson 8-8-09
- Annual and Special Events (i.e. NY Yankees Parade: 11-6-09)
-

In many of these instances the commercial networks were overloaded with users confined to a small area rendering the networks unusable. In other cases the networks were rendered inoperable due to the lack of sufficient battery back-up or emergency power. These, as well as other real life examples, demonstrate that commercial networks are not designed to function under the stress of critical incidents and when needed the most, cannot perform as required.

We intend to demonstrate, through our analysis, that first responder and public safety services require significantly more bandwidth and capabilities than is presently allocated to public safety in the 10MHz allocation in the 763-768/793-798 MHz band segment. The City also believes that the most effective approach to a broadband public safety network necessitates the allocation of sufficient spectrum to satisfy current and future needs of First Responders.

Normal Operations Scenario

Using real data from our analysis of NYCWiN applications, and using the projected target numbers for the desired adoption of a broadband network by public safety users in New York City; we examined the impact over time for system bandwidth usage as compared to available system capacity. We used models that are similar to in structure those models used by commercial broadband providers in analysis of their capacity needs, but adapted with assumptions appropriate for public safety usage. Using real world experience and our judgment based on our knowledge of the operational goals of Public Safety and other agency plans for broadband we have defined four classes of applications; vehicle MDT installations, Automated License Plate Recognition (ALPR), operational video, and personnel handheld devices. The model assumes a conservative 5% per year increase in the per user bandwidth requirement for both the MDT and handheld users based on current trends in technology growth and additional system capabilities.

Commercial networks generally use a 5% to 10% available user to active user ratio. In simple terms, at 5% usage the assumption is that 1 out of 20 users will be using the system at any one time. For the public safety environment we determined that the commercial carrier formula is not applicable based on a number of factors. We must assume that these devices are used in the day-to-day operations of a majority of system users and are typically reused by each on-duty shift. The number is not likely to be applicable in heavy daytime operation hours for operational vehicles and handheld personal devices. Additionally, the commercial carrier assumption of 5% to 10% of registered users cannot be applied during events such as parades, demonstrations and other large deployments of public safety personnel. As such, a 25% available to active ratio was used for mobile data terminals in vehicles and a 100% ratio was used for machine-to-machine users such as license plate readers.

Normal Operations Model

Using a simple model based on accepted commercial analysis techniques, we examined scenarios that consider the impact of a 12 year program maturation period for a secure broadband network deployed in New York City at 700 MHz. The model network deployment assumes a comparable street-level coverage design to NYCWiN for the 5 boroughs within New York City and uses the known capacity and bandwidth performance of LTE standard equipment as of this writing. The demand model starts with 1,000 vehicle deployments, 40 LPR units, 100 mobile video assets, and 1,000 mobile handheld users. Over the 12 year period the users adopt the network using an "s-curve" model to a final count of 10,000 vehicles, 1,200 LPR units, 2,000 video assets, and 25,000 mobile handheld users. These numbers come from a conservative analysis of anticipated user demand for a secure network of this type by public safety users in New York City, however the potential if expanded beyond local jurisdictions to State and federal entities could easily exceed 100,000 end user devices.

The demand model is then compared against different levels of aggregate capacity that would be available based on different amounts of spectrum. In the case of a 10 MHz spectrum allocation, as illustrated by the graph in Figure 2, the conservative adoption of a 700 MHz network by agencies would result in the UL demand reaching 75% in year 5 and 100% in year 6; while the DL demand reaches 75% in year 7 and 100% in year 9. The model uses very conservative usage assumptions and bandwidth per user requirements and it is anticipated that it is likely these estimates may be low as secure broadband data access becomes an integral part of everyday operations. The commercial industry equivalent to the plausible underestimation of usage comes in the form of the stress placed on commercial carrier networks by smart phones like the I Phone from Apple. These phones have placed significant stress on the capacity of commercial network data services because of the accelerated adoption of new applications and utilization of bandwidth for these new applications.

The 20 MHz LTE analysis uses the same demand assumptions but increases the available aggregate bandwidth as a result of increasing the spectrum available to the Public Safety network from 10 MHz to 20 MHz. The analysis found that the uplink capacity of the network still reaches the 75% at year 8 but never reaches the 100% mark over the 12 year period. The DL system capacity stays below 75% over the entire period of the 12 years, but it does reach a level of >50% as early as 7 years. It is important to note that just a single major incident will require bandwidth well beyond the everyday operational capacity of the network and sufficient reserve bandwidth must be available to ensure proper operational support during a major incident. We have included a parallel analysis of a major incident in figures 3 and 4 on the following pages.

10 MHz LTE Model

Technology	LTE - 10 MHz						
DL Capacity (Mbps)	10						
UL Capacity (Mbps)	3						
Start Year	1						
End Year	12						
User Categories	Initial Number	Final Number	Duty Cycle	DL Data Rate (Mbps)	UL Data Rate (Mbps)	Growth Pattern	Yearly Increase Demand
Vehicles	1000	10000	25%	1	0.25	S-Curve	5%
LPR	40	1200	100%	0.012	0.25	S-Curve	0%
Video Cameras	100	2000	100%	0.012	0.65	S-Curve	0%
Handhelds	1000	25000	5%	1	0.25	S-Curve	5%
# of Sites	200						
Cells/sector	3						

Figure 1 - 10 MHz LTE Model Inputs

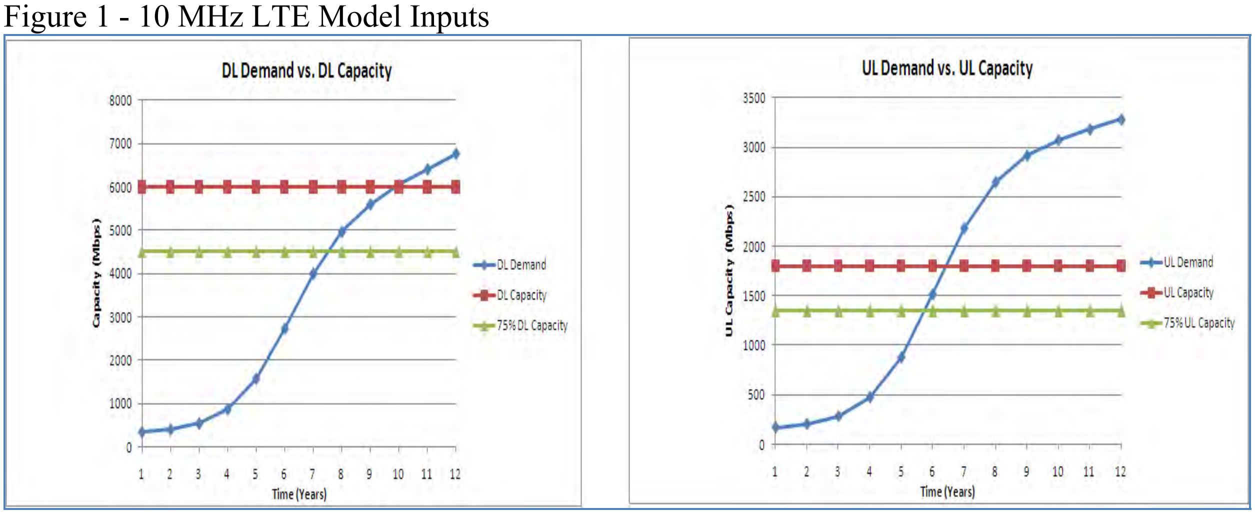

Figure 2 - 10 MHz LTE Capacity Model Graphs

20 MHz LTE

Technology	LTE - 20 MHz						
DL Capacity (Mbps)	21						
UL Capacity (Mbps)	6						
Start Year	1						
End Year	12						
User Categories	Initial Number	Final Number	Duty Cycle	DL Data Rate (Mbps)	UL Data Rate (Mbps)	Growth Pattern	Yearly Increase Demand
Vehicles	1000	10000	25%	1	0.25	S-Curve	5%
LPR	40	1200	100%	0.012	0.25	S-Curve	0%
Video Cameras	100	2000	100%	0.012	0.65	S-Curve	0%
Handhelds	1000	25000	5%	1	0.25	S-Curve	5%
# of Sites	200						
Cells/sector	3						

Figure 3 - 20 MHz LTE Model Inputs

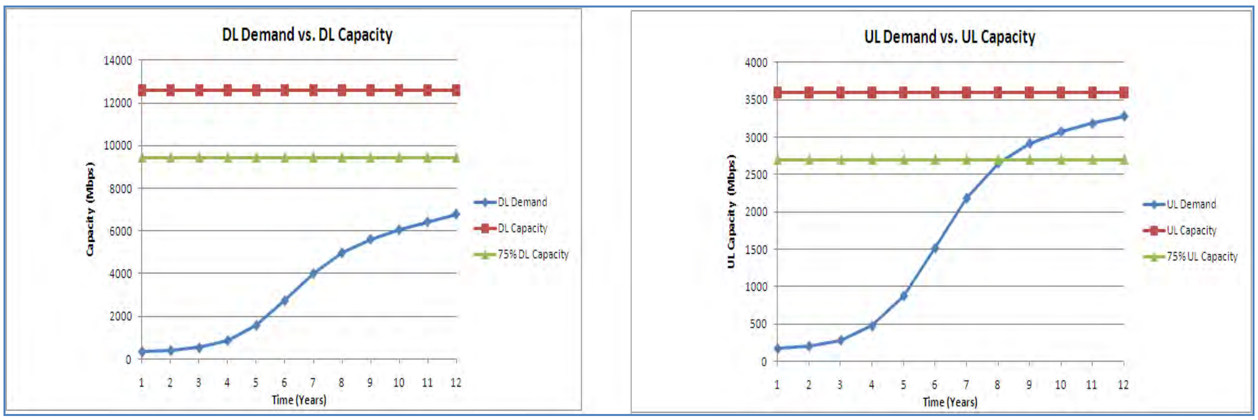

Figure 4 - 20 MHz LTE Capacity Model Graphs

Normal Operations with Voice Application

While the previous section considered only data applications to estimate the total bandwidth demand, in this section we add mobile, enterprise-class Voice as an application and analyzed its impact on overall bandwidth demand. (As standards have yet to be defined for mission critical voice for LTE, we have focused this analysis on non-mission critical use for which reasonable bandwidth estimates can be made) We start with 1000 voice users increasing to 25,000 users at the end of 12 year program maturity period. Voice is a relatively low bandwidth application requiring only about 25 Kbps of bandwidth on both the downlink and the uplink. Current industry estimates of LTE voice capacity are ~160 and ~ 320 simultaneous voice calls in 10 MHz and 20 MHz bandwidth respectively, assuming the entire capacity is dedicated to voice. Under the current assumption of a street-level coverage design of 200, 3-sectored sites, this translates to ~96,000 and ~192,000 total voice users in 10 MHz and 20 MHz bandwidth respectively.

Our assumption of maximum of 25,000 users accounts for only ~26% (~13%) of the total voice capacity if all the 10 MHz (20 MHz) capacity were to be dedicated for voice use. This shows that with the number of assumed voice users, there is still considerable capacity available in the network for other data applications. The charts below show the total demand, including voice, versus available capacity in the network for the two cases of 10 MHz and 20 MHz of bandwidth.

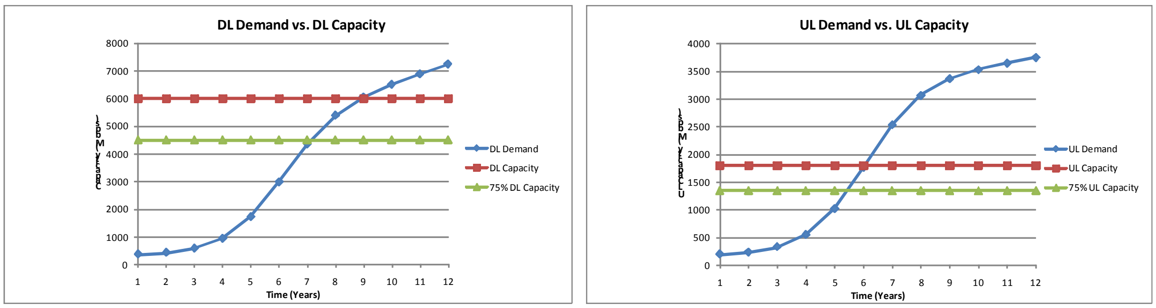

Figure 5- 10 MHz LTE Model Capacity Graphs with Voice

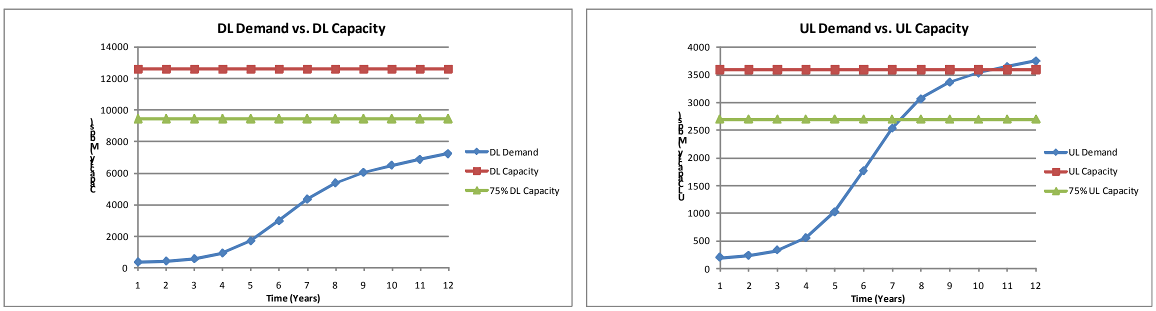

Figure 6- 20 MHz LTE Model Capacity Graphs with Voice

Comparing these charts with the case without voice, we notice a small impact on capacity. For the 10 MHz case, threshold of 75% downlink capacity is exceeded at the end of 7 year instead of 7.5 year without voice, The Tables below illustrates the capacity impact of adding voice for both the 10 MHz and the 20 MHz cases.

75% Capacity Exceeded	With Voice	Without Voice
Downlink	7 years	7.5 years
Uplink	5.5 years	5.8 years

Table 2 - Capacity with and without Voice with 10 MHz LTE Bandwidth

75% Capacity Exceeded	With Voice	Without Voice
Downlink	> 12 years	>12 years
Uplink	7.1 years	8 years

Table 3 - Capacity with and without Voice with 20 MHz LTE Bandwidth

Although the impact of adding voice to the overall capacity is small, this is true only for the number of voice users assumed in this model. If the number of users becomes significantly higher, that would result in a considerable impact on available capacity. Likewise, the model does not take into account the potential impacts on data traffic associated with the yet-to-be-defined implementation of VoIP on LTE. If, for example, the real time nature of VoIP traffic is supported by dedicated channels or bandwidth, the effective bandwidth available to other data traffic could be reduced beyond the linear model assumed in this analysis.

Critical Incident Bandwidth Requirements

While a public safety broadband wireless network provides valuable services to the public safety personnel in the execution of their day-to-day mission operations, it is during an emergency incident brought about by natural or man-made disasters that the potential of a broadband network is truly and fully realized. Public safety networks must be designed and built to meet the most stringent requirements for reliability, availability, quality of service, and security. An important aspect of public safety broadband networks that requires careful consideration is their engineered capacity, and that is strictly a function of the total amount of spectrum available for public safety use. Although the networks can be engineered and hardened to highest standards of reliability and availability, that is meaningful only if there is enough capacity available in the sites serving an incident scene to meet the communication requirements of hundreds, if not thousands, of first responders. A capacity shortfall during a major incident scene would result in blocked and delayed calls, significantly hampering the efforts of public safety personnel to save and protect lives and property. Since an incident can strike without warning at anytime and anywhere in the jurisdictional area of a network, it is imperative that all the sites in the network be provisioned with enough capacity to handle the worst case scenario that would unfold during an emergency situation.

We must assume that a major incident such as the September 11th terrorist attacks on the World Trade Center, if such an incident were to occur again, will require a large and coordinated response by federal, state and local public safety First Responders and support personnel. The purpose of the National Broadband Network is to provide high-speed interoperable data and voice communications for First Responders. The network, under normal circumstances, will be used by the local or regional agencies to conduct day-to-day operations in the conduct of their public safety mission. However, should another terrorist attack of similar proportion occur there will be a large scale response from federal, state and local jurisdictions into the incident area. In the future, when the regional segments of the network are built-out, First Responders and support personnel will be using the network while en-route to the incident and upon arrival at the scene. Because of the dense urban and suburban populations of the greater metropolitan areas there are upwards of 50,000 state and local public safety First Responders in the immediate metropolitan area. In addition, there are many federal agencies that maintain personnel in the area that could potentially respond to a major incident. It is conceivable that the number of active users could increase by approximately 75% if a large response is required.

New York City Critical Incident Response Simulation
In the following section we describe an incident scene in the New York City with the specific objective of estimating how much spectrum is required to adequately meet the communications requirements of First Responder emergency operations.

The incident involves a "dirty bomb" set-off at Pennsylvania Station in Midtown Manhattan. The device was planted in the information and ticket sales area of the Amtrak area and has caused moderate structural damage to the area and has caused secondary damage to the structure above and below Amtrak's Penn Station. The area below the Amtrak section is part of the Long Island Rail Road (LIRR) complex and has damaged passenger corridors and waiting areas. The bomb also damaged the structure above the Amtrak waiting area which is part of the Penn Plaza / Madison Square Garden Complex. Immediately above Penn Station is a large office building that is operating at 75% occupancy.

The "dirty bomb" has released nuclear contaminants throughout the Amtrak and LIRR complexes and into the areas above and below the stations. The bomb also caused fires to break out on all levels including the track levels. The fires are causing a large smoke condition throughout the complex and into the track areas of the LIRR, Amtrak New Jersey Transit, and the New York City Subway. Smoke is also billowing out of the station at the street level exits and blanketing the street area immediately around Penn Station.

Incident Assessment
There are approximately 400 injured passengers on the Amtrak / New Jersey Transit level and 500 injured passengers on the LIRR level, The injuries range from critical and serious near the center of the explosion to minor caused by fleeing passengers and the heavy smoke conditions. There are injuries on three levels of the station and above the station from falling glass and building materials.

The New York City Police Department (NYPD) has initiated a level 4 mobilization setting up command posts in the vicinity of 34th St. and 8th Ave. The FDNY's Command Tactical Vehicle, Mobile Field Communications, and Emergency Medical Field Units are set in the same area. The Office of Emergency Management has set-up their command vehicle on 8th Ave near 34th St. All of the mobile command posts are near each other.

Fire Department of New York City (FDNY) is setting up a hazardous material (HazMat) detoxification / wash-down area on 31st St. and Broadway, while Emergency Medical Services (EMS) has set up their mobile triage vehicles on 31st St. and Broadway.
The Departments of Health and Mental Hygiene and Environmental Protection have responded with their mobile command posts and have placed them in the vicinity of 35th St. and 7th 8th Ave. FDNY will use 34th St. and 8th Avenue for ambulance and bus staging and the NYPD has closed off Broadway, seventh and eighth avenues from 20th St. to 42nd Street.

New York City Transit (NYCT) has been asked to stage busses to begin transporting the injured to area hospitals and has responded with a mobile command center located near the Office of Emergency Management (OEM) command vehicle.

Emergency Response

Because of City's preparedness to handle incidents of this magnitude, there is a swift and coordinated response from a number of different agencies including Police, Fire, Emergency Medical Services, and Office of Emergency Management Services among many others. Each agency, in turn, will respond with several different units trained, equipped, and specialized in handling specific aspects of emergency response. For example, in this particular incident, NYPD will respond with, in addition to patrol vehicles, a number of different specialized units such as Detective Bureau, Intelligence Division, and Mobile Command Posts etc. Table 1 below illustrates the level of effort required to handle a crisis of this magnitude. For each of the major agencies, it lists the different units, the number of units that would be converging at the scene, and typical applications they would be using.

Table 4 - Agency Response

Police Department			
Agency	Qty	Primary Application	Secondary
NYPD Mobile Command Posts Borough and Comm. Div.	2	Requires video from deployed cameras as well as the ability to view video from other sources. Each MCP will deploy a number of wireless cameras and monitor other feeds from other MCPs and agencies. Assume each MCP has 4 cameras	Incident Management, CAD, Internet and mobile data access VoIP Comms
NYPD Emergency Services Command Posts	2	Viewing video from other sources and their own equipment. Assume each vehicle deploys 2 cameras	Incident Management, CAD, Internet and mobile data access VoIP Comms
NYPD TARU Skywatch with 4 cameras each	3	Extensive use of video and specialized equipment.	Incident Management, CAD, Internet and mobile data access VoIP Comms
NYPD CTD Command Vehicle	1	Video feeds, primarily viewing not sending Management of sensors and access to	Incident Management, CAD, Internet

		CTD databases and internet. Access to federal databases and applications. Use of portable sensors for CBRNE	and mobile data access VoIP Comms
NYPD CTD Support vehicles	5	MDSL deployed for mobile detection of CBRNE threats	
Portable Sensors	25	Monitors the levels of toxins and radiation, CBRNE	
Patrol Division Mobile Command and Support Vehicles	3	Video, access to personnel information, databases, CAD, Incident Management	Internet, VoIP Comms, mobile data
NYPD Intel Division Mobile Support Vehicles	2	Access to databases, federal databases, internet, video feeds	Incident Management, CAD, Internet and mobile data access VoIP Comms
NYPD Fleet Services Towing Services	25	AVL	
Fire Department – Includes Emergency Medical			
Agency	Qty	Primary Application	Secondary
FDNY Command Tactical Vehicles	2	Video from CTV and portable cameras, access to FD Operations Center applications, Electronic Command Board, HAZMAT databases	Incident Management, CAD, Internet and mobile data access VoIP Comms
FDNY Field Communications (Includes Command Post)	3	Audio feeds for recording Fireground, video, uplink Fireground to FDOC	Incident Management, CAD, Internet and mobile data access VoIP Comms
FDNY Heavy Rescue	4	Video, Incident Management, CAD	
FDNY Emergency Medical Command Post	1	Video, audio from Fireground	
FDNY Mobile Triage Vehicles	3	Telemetry, video, photos,	Incident Management, CAD, Internet and mobile data access VoIP Comms
FDNY Ambulances	10	AVL, telemetry, CAD, triage applications	Incident Management,

			CAD, Internet and mobile data access
Office of Emergency Management			
Agency	Qty	Primary Application	Secondary
OEM Mobile Operations Center	1	Video, downlink and uplink for 5 cameras	Incident Management, CAD, Internet and mobile data access VoIP Comms
OEM Temporary Field Operations	1	Connectivity to OEM Operations, databases and applications	Incident Management, CAD, Internet and mobile data access VoIP Comms
Other New York City Agencies			
Agency	Qty	Primary Application	Secondary
Department of Environmental Protection Mobile Operations Center	1	Access to applications, sensors, video	
Department of Health	1	Access to applications, sensors, video	
Department of Buildings	1	Access to applications, video	
NYCT	1	Radio communications, applications	
MTA Police Field Communications Emergency Services	3	Video, applications, databases, internet	
AMTRAK Command Post	1	Video, applications, databases, internet	

Bandwidth Requirements Analysis

We used the model of the expected users, command vehicles and associated applications associated with the response to estimate the total bandwidth demands that would be required during the peak response periods following the incident. We have assumed that the incident area is served by a public safety broadband wireless network that is built using fourth generation Long Term Evolution (LTE) technology and operates in the 700 MHz public safety frequency band.

Table 5 below lists the average capacities available from a single LTE sector using 10 and 20 MHz of spectrum.

Spectrum	Downlink Capacity	Uplink Capacity
10 MHz, (5 MHz Downlink, 5 MHz Uplink)	10 Mbps per sector	3 Mbps per sector
20 MHz, (10 MHz Downlink, 10 MHz Uplink)	21 Mbps per sector	6 Mbps per sector

Table 5 - Spectrum versus Capacity

The aggregate bandwidth requirements of the applications used during the incident can be compared against the available capacity. Estimated bandwidth requirements of typical applications used during at an emergency incident are listed in Table 6.

Application	Downlink Data Rates (Kbps)	Uplink Data Rates (Kbps)
Incident Video Upload	12	647
Field Video	1150	28
Data Access	10	100
CAD Dispatch	50 Kbps	50 Kbps
VoIP	25 Kbps	25 Kbps

Table 6 - Application Data Rates

As illustrated in Table 6, video applications are the most demanding in terms of bandwidth usage. However, it is also a critical application for incident management, sending images in real time from the incident scene to the command and control centers enhancing situational awareness and providing a current and consistent operating picture required for effective and coordinated response. An incident scene will typically have a large number of video cameras streaming information back to the command vehicles present at the scene as well as to the central command and control centers. Command staff personnel from each agency will make extensive use of the video feeds to get a real-time view of rapidly and dynamically changing situation at the incident scene to aid them in their decision making process and to coordinate their response with other agencies.

In the incident scene we have depicted there are 38 simultaneous downlink video streams consuming about 44 Mbps of bandwidth at 1.15 Mbps per video stream. These streams are distributed to the various public safety command vehicles present at the scene. This combined with other applications such as database access, file downloads, telemetry, computer aided dispatch, VoIP results in an aggregate sustained downlink bandwidth requirement of about 60 Mbps.

On the uplink, we have assumed that the agencies will deploy twelve portable or vehicle mounted cameras continuously sending real time images from the incident scene. This utilizes about 9 Mbps of bandwidth on the uplink. Another significant consumer of uplink bandwidth is ambulances sending triage images back to the hospitals to inform them in advance of the nature and seriousness of the injuries. We estimate that EMS will utilize about 2 Mbps of uplink bandwidth. Coupled with uplink usage of other applications, aggregate bandwidth used on the uplink is about 16 Mbps.

The aggregate bandwidth demands in above can be compared against the bandwidth that would be available in an incident scene. Available bandwidth is a function of the number of sectors/sites that would be within range of the incident scene and bandwidth available per sector, as shown in Table 5. Table 7 shows the total aggregate demand at the incident scene and the number of sectors of bandwidth that would be required to fulfill that demand.

Spectrum	Downlink Demand	LTE Sectors Required for DL Demand	Uplink Demand	LTE Sectors Required for UL Demand
10 MHz (5 MHz uplink) (5 MHz downlink)	60 Mbps	6	16 Mbps	6
20 MHz (10 MHz uplink) (10 MHz downlink)	60 Mbps	3	16 Mbps	3

Table 7 - Total Incident Scene Demand

The number of sites that would realistically available to support an incident is a function of the network design and the geographic distribution of the users. In the example provided, given the localized nature of the incident coupled with lower site count due to superior propagation characteristics of the 700 MHz frequency band relative to other higher frequencies such as 2.5 GHz and 1.9 GHz, it is likely that the incident scene would be served by only 3 sectors.

For incident scenario presented and the associated site density, 10 MHz of spectrum will fall considerably short of the required bandwidth demand. 20 MHz of spectrum is barely sufficient to meet the projected demand. We realize, however, that the incident we have utilized in our model represents an extreme case but it is entirely within the realm of possible threats for a large metropolitan city like New York. To meet the extraordinary demands that are placed on a network during emergency situations, we strongly believe that 20 MHz of spectrum is needed in order to prevent the network from being saturated and to continue providing reliable service.

Incident Scene Operations

Incident Scene Response Units	Qty	Primary Application	Secondary Application	DL Data Kbps	UL Data Kbps
Mobile Command Posts	2	Receive 4 video feeds	CAD, internet, incident mgmt, VoIP	9700	442
Emergency Service Unit (ESU)	2	Receive 2 video feeds	CAD, internet, incident mgmt, VoIP	5100	442
Technical Advisory Response Unit (TARU)	3	Uploading 4 video streams	CAD, internet, incident mgmt, VoIP	642	8664
Counter Terrorism command vehicle	1	Receiving 2 video feeds	CAD, internet, incident mgmt, VoIP	2550	221
Counter Terrorism support vehicles	5	Monitor CBRNE threats		500	
Portable sensors	25	CBRNE			625
Patrol Division Mobile Command	3	Video, database access, internet	Internet, VoIP, comms, mobile data	4200	663
NYPD Intel Division Mobile support vehicles	2	Video, database access, internet	CAD, internet, incident mgmt, VoIP	2800	442
NYPD Fleet Services Towing Services	25	AVL			625
FDNY Command Tactical Vehicles	2	Video, ECB, HAZMAT database	CAD, internet, incident mgmt, VoIP	5100	442
FDNY Field Communications	3	Video, Audio	CAD, internet, incident mgmt, VoIP	4200	663
FDNY Heavy rescue	4	Video, Incident mgmt, CAD		5600	
FDNY Emergency Medical Command Post	1	Video, audio		1400	
FDNY Mobile Triage Vehicles	3	Telemetry, video, photos	CAD, internet, incident mgmt, VoIP	4200	663
FDNY Ambulances	10	AVL, Telemetry, triage applications	CAD, internet, incident mgmt, VoIP	2500	2210
OEM Mobile operations Center	1	Video downlink, uplink	CAD, internet, incident mgmt, VoIP	2550	947
OEM Temporary Field Operations	1	database access, data apps	CAD, internet, incident mgmt, VoIP	300	221
Department of Environmental Protection applications	1	video , sensors, apps		1400	
Department of Health	1	video , sensors, apps		1400	
Department of Buildings	1	video , apps		1400	
NYCT	1	radio comms, apps		300	
MTA Police Field Communications Emergency services	3	video, database, internet		4200	
AMTRAK Commend Post	1	video, database, internet		1400	
Total in Mbps				**61**	**17**

Table 8 Incident Scene Operations

City's Response to Commission Questions Regarding Operational Requirements

The FCC has suggested three categories of operational conditions relative to demand; critical, medium and low. For the purposes of this filing we will define the three categories as follows:

> Critical – Network usage during a major incident(s) supporting a large scale response to a catastrophic event such as a bombing or natural disaster. This type of incident will initiate responses from local, federal and mutual aid agencies for initial response, rescue and recovery. Using prior incidents as a model the City can expect the number of first responders to grow exponentially as the incident progresses through its various stages and the network utilization to fluctuate between periods of extreme (>75%) utilization, heavy utilization (>50%) and medium utilization (<50%).
>
> Medium – We have assumed that medium usage refers to normal operations during the primary work hours of a public safety agency such as the police department or the fire department. Based on staffing levels the time period for medium usage will span from early morning rush hour for both vehicular traffic and public transportation, through the normal and extended workday, the end of the school day and evening hours until midnight. This period of time from approximately 5:30 AM to 12:00 AM comprises the majority workload of the New York City Police Department. This model also takes into consideration typical tourist and commuter workforce traffic travelling into and out of the City proper. This model will most likely apply to the Fire Department, specifically with regard to Emergency Medical incidents responded to by emergency medical personnel and firefighters.
>
> Low – We assume that the low usage period will consist of the period of time after the evening hours and prior to rush hour when staffing and equipment is deployed at lower levels. Typical public safety models assume that these hours are less busy than other periods and staff accordingly, however the typical per unit workload may remain similar to the workload during busy periods due to reduced staffing.

During critical usage periods we anticipate that the network will first be utilized by First Responders to coordinate multi-agency response to the critical incident and exchange critical information relative to the incident response and operational plans. This may include but not be limited to:

- Incident data from 911 calls and first responders
- Information sharing for HAZMAT and environmental information
- Coordination of response for federal and mutual aid responders
- Video from fixed cameras that are adjacent to the incident
- Maps and GIS data relevant to the area
- Personnel and equipment rosters for logistics
- Building or location information
- Executive / managerial teleconferencing
- Personnel and vehicle tracking

- Incident Management / Situational Awareness
- Mass Notifications
- Traffic Control and Traffic Advisories
- Download and consolidation of surveillance data for forensic analysis

As described earlier we believe that the type of traffic will constantly fluctuate however the usage will remain high during the initial response period. Depending on the severity the initial response may last upwards of 7 to 10 days as the various first responders arrive at the incident scene. The type of network usage will change based on the stage of the incident response. We must assume that the network will be utilized at approximately 75% of capacity for the first stage of response. The network must support the first responders throughout the period of initial response to the incident through the remaining stages of rescue and recovery.

As evidenced during the September 11th terrorist attacks the initial response was tremendous and the logistics aspect was primarily carried out through a manpower intensive effort. Not only were commercial network services overwhelmed at all levels, their infrastructure was severely damaged and ineffective. Public safety responders did not have a broadband wireless networks to supplement the coordination of the massive response effort and relied on inefficient forms of communications for such a complex event.

It must be noted that during this type of incident the City's first responder agencies must also serve the entire City and not just the area of the incident. In a City as large as New York an incident can occur in a small area with a dense population and still only involve a small percentage of the City's area.

For medium theater operations we have assumed the model of normal daily operations of the City's First Responders. In this category public safety will utilize applications designed for routine business processes. The Fire Department's typical usage will consist of dispatch information for fire and medical incidents that will require broadband communications to transfer patient data, location history and HAZMAT information, building plans and maps, driving directions, patient telemetry, AVL and telematics data and other incident related information. Prior to the adoption of NYCWiN none of this information was available to responding units with the exception of on-scene patient telemetry for EMS. As the agencies begin implementing new technology the utilization demand will rise, primarily driven by many factors; new capabilities, features and functions of systems due to the availability of the broadband network and additional bandwidth requirements as more data intensive applications are implemented. For example; the ability to quickly and efficiently transmit patient data, photos and video of patient's injuries, and bio-metric information to a physician and subsequently allow the hospital staff to assist in field treatment via video teleconferencing will provide tremendous benefit to the citizen's of New York City.

The Police Department will soon have the capability to download photos within seconds from their criminal history databases along with other critical information that will support the investigatory process in the field thus saving valuable processing time. The ability to scan bar-coded documents for traffic violations will not only save time and produce more accurate citations, it will also increase officer safety. Automated and bundled transactions will help the officer make sound decisions and alert him/her of potentially dangerous conditions. These capabilities are not available with today's 25 KHz channelized systems. Real-time data collection will create new capabilities for investigators and counter-terrorism personnel by moving data from the field to the data warehouse as fast as it is collected for critical analysis. Scanning a driver's license will provide the officer with the appropriate information within a fraction of the time previously required to type or call in the information request. The database query will return a photo in addition to the standard DMV and warrant information, helping the officer confirm the identity of the person stopped for the violation. These and many more applications will make first responders more productive and effective. But these applications require an appropriate allocation of spectrum and bandwidth to perform as specified under these normal operating conditions.

Low theater operations do not necessarily reduce the bandwidth requirements due to lower staffing or reduced activity. Individual applications will still require sufficient bandwidth to operate efficiently. However, these periods of lower activity offer opportunities for agencies to update their mobile applications and equipment with security patches, new applications and data. The mobile and portable devices and applications should be afforded the same maintenance features benefits derived from a wired network or a commercial cellular network. Updates, new applications and patches should be pushed out from a central source to the edge devices to keep the users and devices in the field, rather than ferrying devices to depots for software updates. Applying the right design parameters to the network and applications will allow for the efficient maintenance of the devices, applications and data ensuring that the mobile workforce is truly mobile.

No matter how carefully bandwidth planning is done on any type of secure public safety wireless network, the network will eventually be placed in a position of stress due to a major incident or an unplanned increase in utilization. There is not enough spectrum available to provide the necessary overhead to assure that bandwidth will be available during critical incidents where users require immediate and high priority access. It must be assumed that utilization will be higher in certain operational scenarios. Once broadband data systems become widely adopted by public safety it is highly probable, based on analogies to commercial systems, public safety networks will be extremely stressed during events similar to September 11th in New York and July 7th in London. During events such as these usage will dramatically increase, and intelligent mechanisms to handle bandwidth must be in place well before the occurrence of a large scale emergency of this type.

In our bandwidth analysis of the incident scene we discussed the various impacts of applications on bandwidth availability during emergencies. It is clear from our analysis that in scenarios where 20 MHz of spectrum is available to public safety the system will be "stressed" during periods where important characteristics of a network need to exist above and beyond what is available commercially. A public safety system must have built-in mechanisms that support Quality of Service (QoS) prioritized by both applications (voice, video, data, etc.) and by the role of the user based on the operational command structure. Next generation wireless technologies such as LTE have included these mechanisms as part of their adopted standards, however the configuration of these controls must be carefully implemented in any network supporting public safety users. It is highly unlikely that commercial carriers will break with their tradition of "best efforts" delivery and offer guaranteed message delivery and bandwidth allocation. Based on the quantity of users they must support it will be difficult to provide priority services to a small number of users when the demand will be so great from the users at large.

New York City is learning valuable lessons from our implementation of the NYCWiN program on how to deploy and operate applications on a broadband network to ensure that the available bandwidth is efficiently and effectively used in high stress utilization conditions. Application planning must include such concepts as intelligent distribution of data based on role, location, and need utilizing prioritized push technologies to control of information flow during peak and stressed network conditions.

Report for the TETRA Association

Public safety mobile broadband and spectrum needs

Final report

8 March 2010

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analysys mason

Contents

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1 Executive summary

This is the final report of a study conducted by Analysys Mason Limited ('Analysys Mason') for the TETRA Association, to undertake a review of future mobile broadband needs for public safety mobile communications, and how these needs might be addressed.

For the purposes of this report, the term 'public safety' is assumed to comprise primarily police, fire and ambulance services, although the requirements are also considered to be applicable in a wider Public Protection and Disaster Relief (PPDR) context.

The majority of public safety users in Europe currently use dedicated radio networks for their mobile communications that have been designed specifically to meet their needs, typically using digital mobile communications technologies such as TETRA or TETRAPOL and operating in spectrum in the 380–400 MHz band. These networks offer a range of low rate data services, but the speed and capacity that is available within those networks limits more widespread use of higher-speed data applications.

In line with societal trends for access to information on the move, public safety operations are becoming increasingly information-driven, requiring access to a wider range of wideband and broadband applications. These range from high-quality imaging to uploading and downloading of large data files, and real-time video.

Given the limitations in capacity of existing dedicated networks to deliver mobile broadband services, it is considered likely that a new generation of solution will be required across Europe in the next five to ten years, to meet future public safety user demands. This new solution, if delivered using new dedicated mobile broadband networks that are designed to meet public safety requirements, will require additional spectrum to deliver the services required.

In order to define the benefits of the development of a new generation of dedicated mobile broadband networks for public safety, and to support the identification of additional spectrum to meet future needs, the TETRA Association has commissioned Analysys Mason to undertake this study to gather information on future public safety user requirements, based on a review of existing documents and reports that have been published in Europe over the past few years and are available in the public domain.

We have reviewed each of the documents (listed in Annex B), with a view to determining:

- the future mobile data and multimedia applications that are envisaged to be in widespread use within the public safety sector over the short and medium term
- the network requirements that are associated with these applications, i.e. the operational requirements of mobile communications networks that will meet public safety user requirements

- the benefits to the public safety sector of the development of a next-generation of dedicated mobile data networks (requiring additional, dedicated spectrum to deliver), compared to the alternative options such as re-engineering of existing or planned commercial networks in Europe.

The authors of this report would like to thank the TETRA Association for their inputs to this study and identification of the relevant documents and reports that have formed the basis of the study's recommendations.

1.1 Summary of applications and user requirements

Current and future public safety mobile data and multimedia applications identified in the various reviewed documents cover a range of needs, including:

- mobile office
- transfer of images
- biometric data
- automatic number plate recognition
- digital mapping and location services
- remote database access
- personnel monitoring
- sensor devices/networks
- remotely controlled devices
- non-real-time video
- real-time video.

Summary of operational requirements essential to public safety mobile communications

The reviewed documents make reference to a number of specific operational requirements that are essential for public safety mobile communications, in order to ensure the availability, reliability and integrity of networks. These include:

- high levels of network availability
- high degree of network control, including the ability to implement prioritised access for specific user groups or individuals, and to reserve capacity where required
- near nationwide geographic coverage, including the ability to communicate in remote areas
- security
- low latency, specifically end-to-end voice delay of no more than 200 milliseconds
- interoperability between different public safety authorities and across borders
- highly resilient networks, including various layers of redundancy
- ability to support mixed traffic.

1.2 Summary of evolution of applications in the public safety sector

There are number of key trends apparent within the daily routines of public safety users, as well as in improved responsiveness at major planned and unplanned events, which are affecting the public safety sector's future mobile data requirements:

- ways of working are changing
- data is being used to enhance voice
- command and control is moving from command centres to the field
- there is greater awareness and use of multimedia.

These trends have been used to develop four alternative evolution paths to illustrate how future use of mobile data and multimedia applications might develop within the public safety sector, as summarised below in Figure 1.1.

Evolution path	*Description*
Steady growth	Working methods change slowly, and voice remains the dominant method of mission critical communication. Existing data applications continue to be used alongside this, with a gradual increase in use.
Data enhances voice	Incident response increasingly relies on situational awareness provided through a range of data applications on the move, and access to a range of faster data applications that can be used in a similar net-centric fashion to that of group-based voice calls (i.e. group sharing and exchange of data).
Information driven	A common operating picture is established at incident scenes through use of mobile command centres alongside central command units, and sharing of information (including voice, text, images, data and video) between the two. This drives requirements for real-time uploading and downloading of information (images, data) between field and control rooms, including use of video conferencing and other on-demand video services to aid communications and incident response.
Full multimedia reliance	A diverse range of mobile broadband applications, including high-quality imaging and real-time video applications take off, with widespread use across the public safety sector. Widespread information sharing improves the establishment of common operating pictures at incidents, facilitates real-time decisions at incidents, and enables the introduction of new video services such as remote medical applications, and personal characteristics recognition.

Figure 1.1: Evolution paths to illustrate alternative views of how future usage might evolve [Source: Analysys Mason]

Our assessment of the implications arising from each of the evolution paths in terms of future network requirements is summarised in Figure 1.2 below.

Evolutionary path	*Outcome*	*Implications*
Steady growth	Minimal changes to existing operational practices, and limited scope to achieve greater efficiencies and responsiveness through new ways of working.	Public safety users will require longer-term retention of existing dedicated networks to meet voice, narrowband and wideband data functionally, however those will be insufficient to meet future mobile broadband needs. This will constrain the development of new working methods and use of a wider range of data and multimedia applications. Limited additional sector-wide benefits are gained through migration to better, faster and more responsive ways of working, but overall growth in data usage is limited by network constraints.
Data enhances voice	Public safety users benefit from significantly greater situational awareness at incident scenes, through sharing and exchange of a range of data and images. Security of data transfer becomes increasingly significant, which limits the usefulness of commercial networks to carry sensitive data traffic.	Existing dedicated narrowband and wideband networks will be insufficient to accommodate the volumes of data traffic that will occur in everyday use. Commercial networks are not deployed to meet the operational requirements for mission-critical data applications, such as secure data transfer, nationwide coverage, guaranteed availability and control. This supports the need for a new generation of dedicated mobile broadband network designed to meet the operational needs of mission critical data.
Information driven	Mobile officers and those in command centres have access to a common picture of incident operations, facilitated by sharing of data, images and other information. This improves decision making, responsiveness and the ability of public safety officers to work in crisis situations, as well as to respond to everyday incidents. Applications such as fingerprint recognition, licence plate recognition, and access to criminal records can all be conducted remotely, in real time.	The need for data applications to be delivered over networks that ensure high availability, resilience and secure communication, and are as reliable as existing TETRA/TETRAPOL voice networks, is increased as a result of the need to access a wider range of applications from anywhere, at any time. Networks must be capable of mobile broadband information upload and download. The need for a more extensive range of mobile applications therefore requires capacity enhancement, similar to the "data enhances voice" path, which will be beyond the capability of existing dedicated networks.
Full multimedia reliance	New ways of working are implemented across the public safety community. A new generation of situational awareness applications are used in daily response as well as for major incidents. Public safety users are able to operate more efficiently, making better use of resources and reducing unnecessary travel. Real-time video is widely used – for example, video calls between mobile command and central command units, real time CCTV image transfer, and remote medicine applications.	With the evolution in data and multimedia applications, and the requirement for those applications to be available over a very wide area (to make applications such as remote telemedicine feasible), existing narrowband and wideband networks will have insufficient capacity and functionality to meet the requirements of this evolutionary path. Similarly, there are limitations in use of commercial networks due to a lack of full geographic coverage, capacity and ability to carry secure data. This evolutionary path therefore requires the development of a new generation of dedicated mobile broadband networks to deliver more network capacity, higher bitrates and a wider range of applications.

Figure 1.2: Impact of different paths on future network requirements [Source: Analysys Mason]

1.3 Summary of options to meet public safety's evolving requirements

It appears that the capabilities of existing narrowband and wideband dedicated mobile networks currently used by the public safety sector will not be sufficient to meet future requirements under three of these four evolution paths. The only evolution path that could be accommodated by existing networks is the "steady growth" path. However, this is not sustainable in the longer term since there is already growing evidence of changes in working methods and trends within the public safety sector that suggest that this path will not match future demands.

A summary of the four alternative evolution paths and their impact on network requirements is provided in Figure 1.3 below.

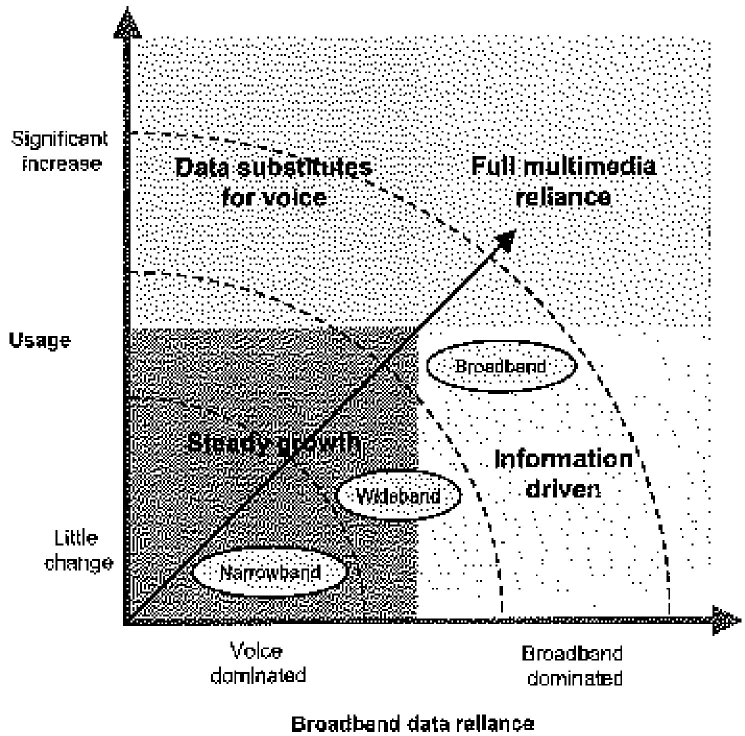

Figure 1.3: The four alternative evolution paths and their impact on network requirements [Source: Analysys Mason]

The four evolutionary paths indicate that a new generation of mobile broadband service is required to accommodate the range of future data, image and multimedia applications that public safety users will demand. The options for delivering this new generation of services are to make use of upgraded commercial networks (e.g. using HSPA+/LTE technology, with network deployment modified to meet the specific operational requirements of the public safety sector), or to develop a new generation of dedicated mobile broadband networks for exclusive public safety use.

While the new generation of data service could theoretically be delivered through upgrading and re-engineering commercial networks, the reviewed documents suggest that this might not be achievable in practice, based on a number of reasons, which range from technical limitations through to cost and commercial considerations.

In particular, there are a number of reasons why commercial operators might be unwilling to make the necessary network changes to support public safety operational needs:

- the public safety sector requires very extensive geographic coverage as well as in-depth coverage penetration inside buildings, irrespective of location, which does not match the typical roll-out requirements of a commercial network
- it is likely to be very expensive to re-engineer commercial networks to achieve all of the public safety sector's operational requirements, and there are questions about whether sufficient incentives exist for commercial operators to do this. For example, typically requirements include the need for battery back-up to be available at thousands of base station sites across the network, and for networks to be designed to ensure that they are highly resilient (including overlapping coverage, standby power supplies and fallback sites) and that no single 'point of failure' exists either in access or core networks
- there are questions about whether some of the public safety requirements are actually achievable
- there is a question about whether the required Grade of Service for public safety use can be guaranteed within a network shared with commercial users, particularly in times of very high traffic loading
- there are conflicting views on whether signalling could be encrypted over the air interface in 3G/LTE
- ensuring the specific requirements for carriage of 'restricted' or 'confidential' documents requires careful network planning and approvals, which is complex and costly to achieve
- it is not clear that networks can be dimensioned to achieve the required immediacy and guaranteed access that public safety requires.

In addition, the reviewed documents presented a further range of reasons why public safety users have been reluctant to make more widespread use of existing commercial networks, and have favoured the development of their own dedicated networks. These include the following.

Coverage	Commercial operators typically invest in coverage where populations exist, and capacity is designed to maximise revenue generation in those areas, with little incentive to invest in areas of low-density population. Public safety, by contrast, requires ubiquitous coverage across a country's geography for everyday use, irrespective of population densities.
Network design	Re-engineering of commercial networks to meet public safety's requirements might be feasible in theory, but in practice would result in large parts of the commercial network being heavily over-engineered. This is likely to be more costly for the public sector to fund than a dedicated network provisioned to meet the specific coverage and capacity needs of the public safety user based, without having to provision for additional commercial traffic.
Sabotage	There is a view that commercial networks might be more vulnerable to sabotage by criminals that dedicated networks are, if the network is known to be used for public safety communications. Dedicated public safety networks are typically more guarded against sabotage through a range of specific measures (e.g. vetted staff, secure fencing at sites, and networks designed to ensure no single point of failure in the event of sabotage, etc.).
Rollout schedules	There are precise requirements for the roll-out of public safety networks (e.g. the need to align with police/fire/ambulance area boundaries), which do not match typical commercial roll-out strategies.
Risks of shared use	There are risks such as information security, quality of service and control of service level agreements if public safety users share networks with commercial users, which previous experience suggests can be avoided through use of dedicated networks under government control and supervision.
Reliance on commercial operators	There is a reluctance for public bodies to be reliant on a fully commercial operator, in view of the potential lack of control upon future network investment, business plans and financing[1].

1.4 Conclusions

The study has found that, in line with societal trends evident within today's Information Society, a diverse range of data, imaging and multimedia applications are in demand within the public safety sector. Demand for access to a wider range of information is being driven by changes in working practices, which is creating requirements for access to a far wider range of data sources (textual, images and video) that is typical in commercial mobile networks. Sharing of various data types (textual, images, video, etc.) is being used in order to establish and maintain a common operational picture between agencies and between field and central command staff. This is being used to improve responsiveness, aid the deployment of resources, and improve timeliness and decision making in daily public safety operations and when responding to major planned or unplanned events.

Three of the four evolutionary paths developed for this study illustrate the public safety sector's need for a next generation of mobile broadband network to deliver the range of applications that are envisaged in the future. As there is a limit to the range and volume of data and multimedia applications that existing dedicated narrowband and wideband networks, and existing commercial

[1] This is referenced, for example, in ETSI TR 102 628 (SRD on additional spectrum requirements for future PSS wireless communication systems in the UHF frequency range, which refers to specific conditions in place in a number of European countries

networks, can provide, if a new generation of mobile broadband network is not made available, some new applications cannot be delivered. Ultimately, this will affect how already emerging changes to ways of working within the public safety might evolve, and, in the longer term, constrain the further development of the sector.

A new generation of services could in theory be delivered using an upgraded commercial network, with the deployment of the network engineered to meet specific public safety requirements. However, as explained in Section 6.2, this option does not appear to be achievable in practice. The only other option is to encourage industry to develop a new generation of mobile broadband networks for dedicated public safety use. To enable the industry to devote the necessary investment to develop new dedicated networks, there is a need for additional spectrum to be identified, since existing bands are already fully utilised by existing dedicated public safety systems. It should be noted that identifying suitable spectrum is on the "critical path" to support development of a new generation of dedicated mission critical mobile broadband solution, because of the timescales associated with identifying suitable spectrum.

This additional spectrum demand is based upon the combination of the various factors identified throughout this report, specifically:

- trends in the range of data and multimedia applications in demand within the public safety sector
- potential increase in user densities and intensity of use for data applications
- specific traffic characteristics of public safety operations (e.g. network-centric ways of working)
- the infrastructure and technical requirements to meet the operational requirements of the public safety community (e.g. availability, security, reliability, latency), and limitations in use of commercial networks to deliver these.

Given the cost of deploying new networks, access to spectrum in bands below 1GHz will ensure maximum commonality with existing dedicated networks deployed in the 380–385/390–395MHz bands, facilitate re-use of assets where possible (e.g. radio sites). Use of spectrum above 1GHz (e.g. bands around 2 GHz) might be feasible but would incur significantly higher roll-out costs compared to that below 1GHz, raising questions at national government level as to whether and how the additional costs can be funded.

Based on the reviewed documents, the European dimension to the public safety spectrum requirement is important for a number of reasons:

- the public safety sector is a niche market and therefore benefits from the identification of harmonised spectrum even more than commercial mobile systems (e.g. GSM or UMTS), because of the smaller user base and resulting lower volumes of equipment and terminals

- even if commercial solutions are adapted to meet specific requirements of a niche sector such as public safety, there are still costs involved in the necessary modifications, and therefore harmonised spectrum availability is key to ensure that manufacturers are able to develop products for a European market. An example of the re-engineering of existing commercial standards to meet niche requirements is that of GSM-R (the railways version of GSM) – although the GSM standard is supported by all major vendors around the world, GSM-R equipment is supplied by relatively few and the availability of harmonised spectrum for the product has therefore been important to reduce costs

- interoperability is an increasingly important requirement within the public safety sector, both to communicate between different public safety authorities within a country, and to communicate across borders. This is evidenced by a number of the documents reviewed for this study.

The lack of available spectrum is therefore a significant barrier to the further development of mobile communications capabilities tailored to meet public safety requirements, until such time as a new, harmonised band can be identified at a European level.

2 Introduction

This report has been prepared by Analysys Mason Limited ('Analysys Mason') on behalf of the TETRA Association, to present the results of a study to review the future needs and requirements for mobile data and multimedia applications within the public safety sector.

For the purposes of this report, the term 'public safety' is assumed to comprise primarily police, fire and ambulance services, although the requirements are also considered to be applicable in a wider Public Protection and Disaster Relief (PPDR) context.

The public safety sector uses a variety of communications networks at present, including a range of fixed voice and data systems within headquarters (HQ), and digital mobile networks while on the move. The majority of public safety users in Europe use dedicated radio networks for their mobile communications that have been designed specifically to meet their needs, typically using TETRA or TETRAPOL digital mobile communications technologies and operating in spectrum in the 380–400 MHz band.[2] This is the frequency band identified at a European level for digital public safety communications as a result of ERC/DEC/(96)01 and subsequent decisions.

While the public safety sector has traditionally relied on voice communication as its primary means of communication at incidents, making particular use of group calls, as well as Direct Mode Operation (DMO) and air to ground voice communications, the requirements for access to a range of mobile data applications have evolved over recent years and are now considered to be an essential part of the public safety sector's mobile communications. This is evidenced, for example, by the dependency on applications such as automatic number plate recognition (ANPR) and access to various databases by police while on the move.

The public safety sector currently has two options to address the use of a wider range of data applications:

- to upgrade existing narrowband networks to provide a wideband overlay (e.g. TEDS), providing wideband data capability
- to continue to make use of existing dedicated networks for mission critical voice and low speed data, and use commercial networks to deliver higher bandwidth, non-mission-critical[3] data.

2 In many countries in Europe, public safety users also make use of existing commercial networks (e.g. GPRS or 3G) in addition to dedicated TETRA/TETRAPOL networks. Commercial networks are often used for the provision of additional vehicle and handheld data services, typically of a non-mission critical nature. This is because commercial networks are not designed to meet the specific functional requirements for mission-critical public safety communications, which requires very high levels of network availability, low latency, very wide area coverage and various levels of security and encryption.

3 'Mission-critical' refers to a service or information for which failure to deliver, disruption or delay is not tolerable in view of its impact on public safety operations.

However, neither of these options is envisaged to meet public safety requirements in the future, since there is a need for a mobile broadband solution that can deliver mission critical high speed data, requiring a network that is designed to meet the specific operational requirements of the public safety sector. Underpinning support for the development of a next-generation of mission critical mobile broadband solution is the identification of suitable spectrum to deploy future systems. This is required because the existing spectrum available for public safety mobile communications is already fully deployed to accommodate today's narrowband and wideband networks.

The TETRA Association has therefore commissioned this study to provide an assessment of future public safety user needs, which will determine future spectrum requirements. Since much of the required information on future public safety needs exists in a range of documents and reports that have been published in Europe over the past few years, the scope of this study has not been to conduct new research into potential future user requirements, but rather to summarise the requirements that are already known to exist through a review of the existing documents.

The remainder of this document is laid out as follows:

- Section 3 describes our overall approach to the study.
- Section 4 reviews the current and future requirements and needs of the public safety sector
- Section 5 considers alternative trends of how public safety needs might evolve
- Section 6 presents the results of our analysis, in terms of options to meet future public safety requirements
- Section 7 presents our conclusions from the study.

The report includes a number of annexes containing supplementary material:

- Annex A provides a list of the acronyms used in this document
- Annex B provides the list of documents that have been reviewed as part of this study
- Annex C includes a summary of our review of each document.

3 Approach to the study

The overall approach to the study is summarised in Figure 3.1 and a brief description of each task is provided below.

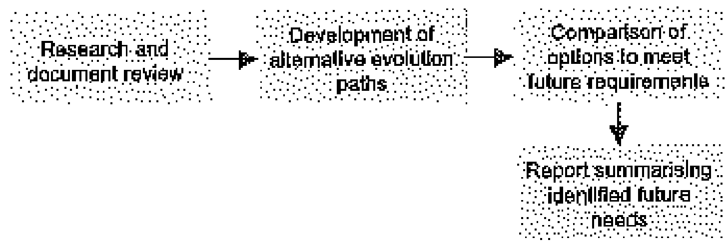

Figure 3.1: *Approach to study [Source: Analysys Mason]*

Research and document review

In this task, a wide selection of documents from a range of public-domain sources (listed in Annex B) were reviewed and used to provide an overall assessment of public safety user needs, and the associated benefits from use of dedicated mobile broadband networks to meet those needs. A summary of the findings from this document review is provided in Annex C.

An objective of this task was to review the forecast demand for data and multimedia applications as presented in the range of existing documents recommended by the TETRA Association for inclusion in this study, including assumptions on requirements for dedicated networks and the benefits of using dedicated networks compared to a shared network.

Development of alternative evolution paths

The first aim of this task was to identify which applications are considered to be driving demand for a new generation of mobile broadband networks for public safety use. This was achieved by summarising the range of applications that were presented in the reviewed documents and grouping them into similar application types.

The second aim of this task was to develop a series of alternative trends for the development of public safety user needs, illustrating how usage might evolve under different alternative views of the future. Four alternative evolution paths were developed, ranging from a steady-growth base case (i.e. continued and slightly increased use of existing applications) to a much greater reliance on a range of traffic types (voice, data and media) within mission-critical environments.

Comparison of options to meet future requirements

In this task, the options available to the public safety sector for providing mobile broadband services were summarised. In addition, the limitations of existing dedicated networks and existing commercial networks to deliver the range of requirements illustrated by the alternative evolution paths were identified, and the public safety user requirements that a new generation of mobile broadband network need to meet were considered.

Report summarising identified future needs

The results of the analysis are contained in the remainder of this report, which forms the main deliverable from the study.

4 Summary of applications and user requirements

4.1 Current and envisaged future mobile applications

Based on an assessment of the currently used applications within the public safety sector, along with those envisaged to be used in the future, it is apparent that public safety mobile communications have traditionally been voice-based, but there is a trend towards using a range of data applications alongside traditional voice applications to enhance communications.

Traditional voice services are widely used for mission-critical mobile communications, and often used in a 'network-centric' fashion[4], evidenced by the widespread use of group calls. Various documents[5] indicate that the requirement for these services will likely continue to exist. The range of voice services that public safety users rely on includes:

- group calls
- encrypted individual and group calls, with authentication
- individual calls to command centre PABX and/or public telephone networks
- direct mode operation between terminals (i.e. terminal-to-terminal communication, without a network)
- emergency calls
- air-to-ground communications.

It is now apparent that a range of data, image and video applications are emerging alongside these traditional voice services, and there is an increasing demand for these data-based applications to be used alongside voice for mission-critical communications, in many cases in a similar 'network-centric' manner to voice.[6]

Examples of emerging applications are described in Figure 4.1 below.

4 'Network-centric' refers to sharing of information between people and devices in a many-to-many (group) configuration, as is often used within the public safety sector.

5 For example, as referred to in results of TETRA Association TEDS workshop, 2007.

6 For example, personalised data is being shared amongst different users at an incident scene, which can offer benefits such as improving the situational awareness of officers at a scene. There is also a trend towards mobile offices, and mobile command and control.

Application	*Description*
Mobile office	Access to mail and intranets, transmission of incident reports from an incident scene or remote location, etc.
Transfer of images	A very wide range of image requirements, including high quality images of damage within buildings, detailed buildings plans, photographs of potential criminals, personal recognition systems (e.g. facial, iris), images of lost children, injuries at incident scenes and other incident-related images required for subsequent evidential purposes.
Biometric data	A greater range of personal recognition systems including fingerprint, facial and iris recognition of potential criminals by officers on patrolling duty, and transfer of this information in real time to HQ/command centres to be checked against biometric records. This improves the efficiency of the potential identification of criminals.
Automatic number plate recognition	A camera captures licence plate details and transmits the image back to HQ/ control centre. This is an application that has emerged in widespread use in a number of countries over the past few years, and its use is expected to continue. Transferring the image back to HQ/command centre enables officers to verify whether the vehicle is stolen, or involved in a crime or other offences. In future, this application could be extended so that image capture and checking against information contained within police databases could be conducted entirely by officers while on patrolling duties, in real time.
Digital mapping and location services	Tracking of vehicles or people, precise geographic positioning (e.g. similar to applications that are provided on commercial mobile handsets to enable navigation and identification of nearest location of interest).
Remote database access	Remote database checks of various types, used increasingly within the public safety sector to retrieve information from databases stored in HQ/command centres by offices on patrol or at incidents. Other databases that could be accessed in real time to support incident response include the Fire Service 'Gazetteer'.
Personnel monitoring	Monitoring of public safety officers in real-time to monitor health conditions while responding to incidents (e.g. fire fighters within a building, or officers involves in search and rescue operations). Other applications might include perimeter monitoring (e.g. of people entering/leaving an incident scene), vehicle or personal alarms, or tracking the location of an assigned individual for general personnel management purposes as well as in the event of an emergency.
Sensor devices/networks	Sensor networks deployed in specific incident areas, used to collect data or images within the area for onward transmission back to HQ/command centres (e.g. collection of thermal imaging from inside buildings reporting on the state of fire or other damage). Fixed or mobile sensors used to record data and images in real time (including images in a video-streaming format), which could then be distributed to other officers at the same incident (e.g. via a sensor network at the incident scene), or back to HQ/command centres. This enables officers in the command centre to have access to the same images as the officers at the incident, enabling real-time decision-making.
Remotely controlled devices	Robotics devices, used to record images within badly damaged buildings that are too unstable for officers to enter, or to operate within explosive areas or in underwater searches. Other applications include remotely turning on or off surveillance microphones or surveillance cameras (including remotely aiming or pointing the camera), and activating and de-activating alarms. Various telemetry systems also in use or envisaged within a range of public safety usage scenarios include control of moving fixed assets (e.g. vehicles, equipment in hospitals, etc.).

Non-real-time video	Capture of video streams at the scene of an incident, which are then stored (e.g. in a vehicle) and downloaded when the vehicle returns to HQ. Could also refer to slow-scan video used to gauge activity at an incident scene, but which is not of sufficient quality to be used as evidence or to support real-time decision-making.
Real-time video	Real-time video surveillance from fixed cameras permanently located along streets and in buildings or from portable cameras mounted on vehicles. Other applications include transmission of video from field officers to command centres, and vice versa, and uses within the health sector, such as remote medical services (e.g. treating patients in rural areas using video calls between the patient's home and the health centre) or treatment of casualties at an incident using real-time transfer of images between responders at the incident area and doctors in hospitals who are able to provide guidance on remote treatment at the incident scene or while the patient is in an ambulance being transported to hospital.

Figure 4.1: Summary of the range of current and future public safety mobile data and multimedia applications [Source: Analysys Mason]

The increase in data, image and video applications is driving, and will continue to drive, demand for greater bandwidth and increased functionality from public safety mobile networks.

A summary of the range of applications that are in current use within the public safety sector, along with their approximate intensity of use (on a scale of high to low use), is provided in the ERO summary of responses to its questionnaire on public safety and disaster relief produced for CEPT FM PT38, as reproduced in Figure 4.2 below.

Intensity of use	*Application*
High	Geo-location identification (of vehicles and people)
	Database query/access
	Short data/messaging
	Direct mode communication
	Image/video/map/plan/photo transfer
Medium	Group calls
	PSTN calls
	Air-to-ground communications
	Command and control (dispatch)
	Data from ambulance to hospital
	Emergency call
Low	WAP queries
	Email and mobile office
	Calls to/from PSTN and office PABX
	Tracking (e.g. RFID)
	Priority call/access
	Trunked operations
	Fire applications
	Video calls
	Radio paging

Figure 4.2: Summary of applications in CEPT WG FM38 survey response [Source: ERO]

A similar range of applications is identified in other documents, such as the ETSI Technical Specification (TS) on requirements for communications between authorities/organizations during emergencies (ETSI TS 102 181). This document also includes a different range of applications, which have been defined in terms of their impact on network throughput, timeliness (i.e. latency) and robustness. This is reproduced in Figure 4.3 below.

Service	*Throughput*	*Timeliness*	*Robustness*
Email	Medium	Low	Low
Imaging	High	Low	Variable
Digital mapping/GIS	High	Variable	Variable
Location services	Low	High	High
Video (real time)	High	High	Low
Video (slow scan)	Medium	Low	Low
Remote database access	Variable	Variable	High
Database replication	High	Low	High
Personnel monitoring	Low	High	High

Figure 4.3: Data services table from ETSI TS 102 181 [Source: ETSI]

Usage scenarios

Various documents[7] include a number of detailed usage scenarios within the public safety sector, which illustrate the range of applications that might be used within daily operations, or to respond to specific incident types. A summary of usage scenarios contained within the reviewed documents is provided in Figure 4.4 below.

7 Operational scenarios are described in a range of documents including references 9 (Mesa), 11 (WIK), 13 (Exler) and 17 (Safecom) – see Annex B.

Figure 4.4: Examples of usage scenarios within public safety [Source: Analysys Mason]

Usage scenario (source)	*Summary of applications used*
Patient services for a car crash (US Department of Homeland Security)	• Video conference call set up between the ambulance and the hospital • Ambulance's geo-location, along with vital measurements and treatments of the patient, recorded from the ambulance and transmitted wirelessly to the hospital
Major explosion/bomb (MESA/TS 70.001 v3.3.1)	• GIS used by police to establish the perimeters for the incident scene • Initial casualties information forwarded to hospitals, including images of injuries taken at the incident scene • Real-time video feeds relayed to the control room of the incident area • Fire fighters enter damaged buildings using bio-telemetry devices to monitor people and conditions within the building • Robotic devices used to confirm that no other explosives are present • Crime scene diagrams constructed using portable laptops at scene of incident • Images recorded as evidence by investigators at the scene
Traffic stop (US Department of Homeland Security)	• Situation message, police vehicle's ID and geo-location transmitted from police car at the scene of incident to other offices and to command centre • Suspect's licence plate read and sent to command centre, and queried against several databases located at HQ • Results from database query send back to police car • Video stream of the action at the incident transmitted and stored in central database, and made available on demand to dispatch/command centre. Onward message sent to other offices, along with video footage, to arrest the suspect • Arresting officer's ID loaded onto RFID handcuffs • Suspect's biometric data taken at incident scene, stored and forwarded to command centre • Case report sent electronically from arresting officer's car
Large earthquake in urban area, with many damaged buildings (MESA)	• Virtual treatment centre set up at incident scene; buildings surveyed for damage and identification of locations of further casualties • Handheld computers used to sketch building structures, entrances, etc. • Mobile command centre set up • Hazardous zones identified in buildings; fire fighters equipped with personal monitors and location tracking devices to enter hazardous areas

Large international finance summit (scenario developed by a UK agency)	• Mobile command centre established at venue, for in-building communications and to establish perimeter control, linking to central command units of police, fire and ambulance authorities • Establishment of a common operating picture using a range of data types (images, text, voice, video) • A range of mobile broadband at-venue applications available including o Enhanced personal recognition systems (iris, facial) o Ability for ambulance service to send high-quality video streams from the venue and from vehicles to hospitals, if required o Ability for fire service to send high-quality video streams from venue to command centre (e.g. in-building plans, structural plans, etc.) o CCTV camera images captured from the venue and distributed to central command centres in real time o Ability to track people and objects within the venue
Large fire in a high rise building (TR 102 485 : Technical characteristics for Broadband Disaster Relief applications (BB-DR) for emergency services in disaster situations)	• A scenario involving fire and rescue and police rapid response – within a concentrated area of $1km^2$ • Personnel protection and surveillance using sensors with panic alarms • Thermal image video capture and transmission • Asset tracking within the incident area • Video surveillance across the incident area • Perimeter zone control to track all cars going in and out of a fixed location • Data capture and control devices to capture or deliver data to the point of decision within the incident area • Back office applications enabling a range of business functions within the area

All of the above examples suggest that future public safety operations will rely on the availability of multiple data, imaging and video applications as well as voice, and demonstrate the necessity for applications to be supported within a single network, to ensure interoperability between different public safety authorities/organisations involved in the response of a specific incident.

4.2 Operational requirements essential to public safety mobile communications

Public safety networks have features that are distinct from those of commercial networks, as they need to be able to support mission-critical applications that have unique technical and operational requirements such as extensive coverage, capacity, reliability, immediacy of communications, security, redundancy and resilience. Other requirements also include the ability to support non-voice applications (in real time and non real time), interoperability within the organisation, as well as other emergency services, and cross-border communications.

The documents and reports that were reviewed make reference to a number of these operational requirements, as summarised in Figure 4.5 below.

Requirement	*Summary*
Availability	Availability in time is specified as three or four 'nines of availability' (e.g. 99.98% or better at all times) for some users. Others specify different requirements for different times, such as 99.9% per year, 99.7% per month and 99% per 24 hours (e.g. as referenced in CEPT FM38 questionnaire response on PPDR from the Denmark administration). This high degree of availability includes access to networks in all areas at all times (including under very high traffic loading conditions during which it may be necessary to reserve capacity for specific incident responders).
Control	A high degree of network control is required (e.g. to enable prioritised access or reserved capacity to be guaranteed when required)[8]. Control requirements also include the ability to queue traffic, and to manage queuing conditions and update these in real time.
Coverage	Public safety network coverage requirements differ from those of commercial networks, which are typically designed to cover areas where populations live (and therefore may provide near-100% population coverage, but do not provide the same level of geographic coverage). The public safety sector, by contrast, requires much wider geographic coverage, and the availability of the same set of applications across all geographies. Coverage must also be consistent with typical organisational boundaries within the various public safety services. Coverage requirements are specified as, for example, 99.5% (outdoor mobile), 65% or better (indoor mobile), 99.9% (air to ground).[7] Another document from a UK agency refers to at least 99% of the landmass of Great Britain needing to be covered (including offshore islands).[7]
Security	Security requirements are guided by national security and accreditation requirements, which vary in different countries. TETRA provides different layers of encryption including over-the-air and end-to-end (better than 80-bit encryption is referred to in documents we have reviewed). Other security features include two-way authentication.
Low latency	There are requirements for very short call set-up times and for limited end-to-end voice / data transmission delay (for mission-critical applications). One document refers to end-to-end voice delay being no more than 200 milliseconds.[9]

8 E.g. referenced in various replies to the ERO questionnaire on PPDR on behalf of CEPT WGFM PT38 and in ETSI TR 102 628

9 For example, as referred to in various replies to ERO questionnaire on PPDR of CEPT WGFM PT38.

Interoperability	There is an established need for different units within the public safety sector to interoperate (e.g. police, fire and ambulance, and associated services), requiring each to use the same technology. In addition, there is a growing awareness of the benefits of cross-border interoperability between different public safety units operating in different European countries.
Resilience	Networks must be highly resilient and include various layers of redundancy. Central network switching must be fully redundant, with geographically distributed switching. Interconnection between base stations must also be fully resilient and include back-up lines between key base stations. Back-up power supplies are required at different levels – for some key sites, there is requirement for up to seven-day back-up in some instances. Key base stations sites (i.e. a selected number of sites from within the overall network) need to have fallback sites available in the event of failure of the primary site.
Ability to support mixed traffic (i.e. voice and data)	An integrated network solution providing support for transmission of mixed traffic types (e.g. voice, data, images) is a requirement for public safety, in order to be able to use the same technology in all environments (e.g. ranging from day-to-day emergency response to major planned incidents and major disasters/unplanned incidents).

Figure 4.5: Public safety mobile communications operational requirements [Source: Analysys Mason]

These essential operational requirements are unlikely to change in the future, and moving forward a more diverse range network-centric requirements might be envisaged, based on increasing use of sensors and sharing of information, images and video. In particular, the occurrence of various major incidents around the world has reinforced the need for core operational requirements to be maintained in current and future-generation of public safety networks.

While future commercial networks (e.g. LTE) may be able to offer the required range of data services that are envisaged to support the usage scenarios described in Section 4.1, there will still be challenges to ensure that the operational requirements of the public safety sector can be met, particularly as commercial networks are typically optimised for financial return on investment rather than to deliver services across a wide geography (irrespective of population centres), which is what the public safety sector requires.

At present, commercial networks are not deployed to meet the core operational requirements for public safety use for a number of other reasons:

- commercial coverage, even for GPRS, is typically not nationwide and is often limited inside buildings
- 3G and LTE are likely to be deployed in 'islands' of coverage, rather than nationwide
- roll-out of sites will not be at a pace or geographically suited for a public safety network
- queued calls and the ability to control/configure queuing conditions is not provided
- there are no provisions in current standards for pre-emption capabilities or preferential measures which would guarantee capacity for public safety users in times of heavy traffic
- there are no provisions for two-way authentication or integral Direct Mode (i.e. terminal-to-terminal capability)
- there are potential issues with transporting secure information over a shared public network, both in relation to over-the-air conveyance and end-to-end encryption

- redundant switching is required for public safety applications, which commercial networks do not always guarantee
- no single point of failure must exist within the network
- high availability is not guaranteed (e.g. three or four nines of availability at all times is a typical requirement for public safety applications).[10]

10 Availability in time is also specified as 99.9% per year, 99.7% per month and 99% per 24 hours in the Danish response to the ERO questionnaire on PPDR.

5 Evolution of applications in the public safety sector

5.1 Trends in the use of mobile applications in the public safety sector

The public safety sector is following the same trends that are apparent within the wider society for access to a wide range of information on the move, and sharing of knowledge and information.

This, and a number of other trends evident within the public safety sector, is driving demand for mobile data requirements, as summarised in Figure 5.1 below.

Changes to ways of working	Ways of working are changing within the public safety sector – for example, there is a trend towards mobile command and control to enhance the effectiveness and efficiency of incident response. This is driving demand for simultaneous access to a much wider range of applications, which are being used in combination to respond to an individual incident.
Data enhancing voice	Public safety users are increasingly using data applications to enhance the mission-critical voice communications that they rely on for daily use and when managing planned and unplanned major events.
Information-driven operations	Usage scenarios for how public safety users work on a day-to-day basis while out on patrol or away from command centres suggest that usage is evolving towards greater sharing of information from a variety of sources (voice, data and video). The overall purpose and objective of this way of working is to establish common operating picture between all public safety agencies and between officers at incidents and those in HQ command centres, thus improving situational awareness. This has many benefits including better mobilisation of field teams, more timely response and more accurate information available to support decisions on incident response.
Greater awareness and use of multimedia	Increasingly more daily routines are taking advantage of a mixture of different traffic types (i.e. voice, data, images, video), which is supported by the trends towards mobile field operations and mobile offices. This requires access to the same range of applications while in the field as an officer would have while in a command centre. Multimedia applications extend across different network types, from wide-area transmission across field boundaries, through to local area transfer of incident-specific information, to personal area networking and the collection and transfer of data collected by remote sensors and/or tracking devices.

Figure 5.1: Trends affecting public safety sector requirements [Source: Analysys Mason]

The reviewed documents indicate that the range of applications in demand within the public safety sector is extending significantly beyond the 'traditional' core, group-call-based voice and data applications that have been previously associated with the sector. Interactive multimedia services, access to office applications while on the move, and a range of sensing, robotic and telemetry applications are all in demand. In addition, over time it is expected that both the range and the intensity of use of different applications will increase. This requires much higher data speeds and additional dedicated network capacity to be available, with applications being accessible through handheld devices used indoors or outdoors, and to vehicle-based users.

5.2 Alternative evolutionary paths

To explore how demand for different applications might evolve over time, and the impact of this evolution on network requirements (i.e. availability, speed and capacity), a series of alternative evolutionary paths for the public safety market have been developed. These have been built based upon the consensus regarding the range of applications that might be used within the public safety sector in the future, as ascertained from the reviewed documents. This is illustrated in Figure 5.2 below, with the applications shown in comparison to their impact on network capacity requirements (i.e. low to high capacity requirement) and their estimated stage of development (i.e. available now or envisaged in next 3–5 years).

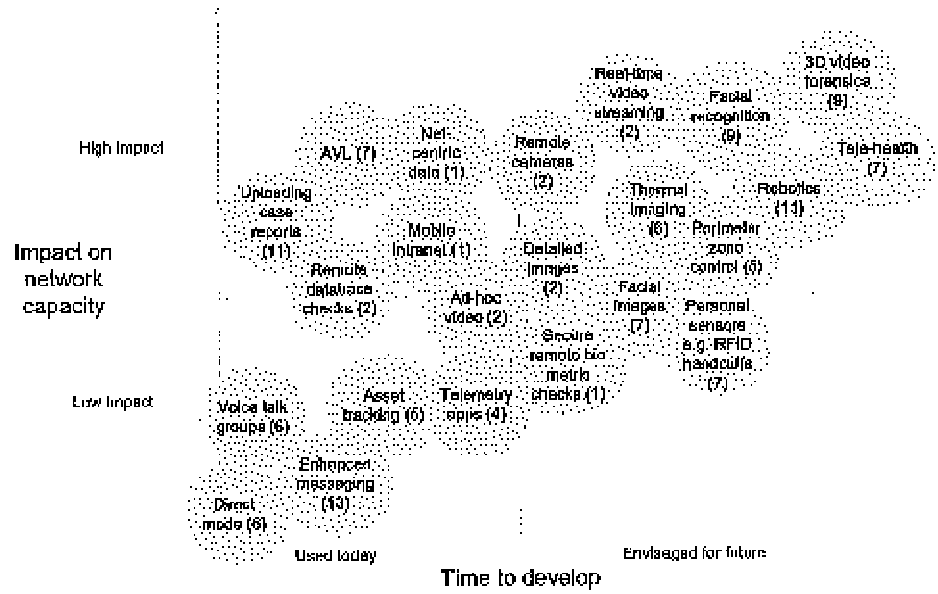

Figure 5.2: Illustration of how demand for multimedia applications might evolve within the public safety sector, and impact on network capacity [Source: Analysys Mason, various documents[11]]

Specifically, based on the envisaged range of applications in demand within the public safety sector, and an estimation of the time necessary for them to develop into full operational use, we

[11] Numbers in brackets refer to documents listed in Annex B which make reference to the various applications illustrated in this diagram.

have developed four alternative views of how data and multimedia applications usage might evolve.

These four evolutionary paths are summarised in Figure 5.3 and described in more detail below.

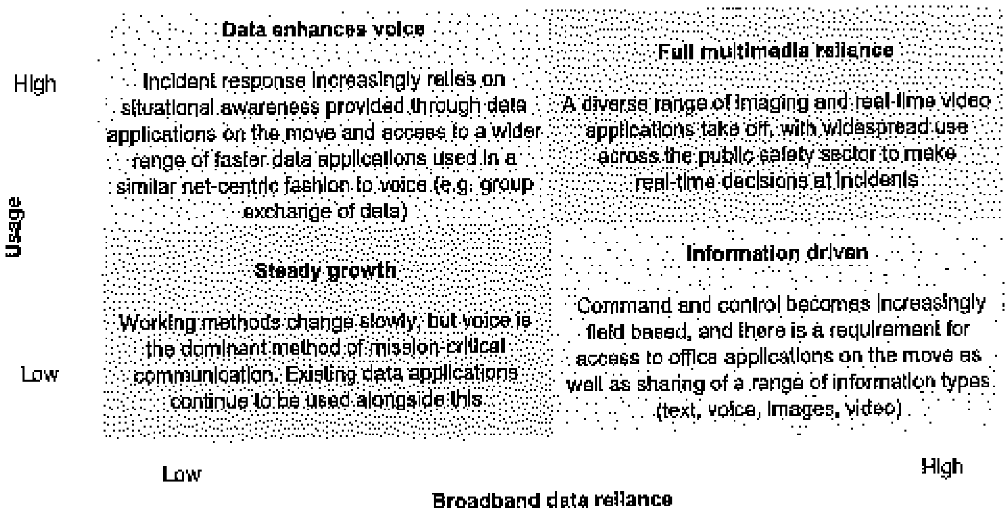

Figure 5.3: Four alternative evolution paths for use of data and multimedia applications within the public safety sector [Source: Analysys Mason]

5.2.1 Steady growth

The "steady growth" path represents the base case for market evolution within the public safety sector, under the assumption that there are no major changes to requirements or significant deviations from currently observed usage trends.

In this evolutionary path, there is a continuation of current usage patterns already evident within the sector, with a wider range of data applications being used alongside group-based voice calls. This combination of traffic types (i.e. voice and data) is evident both in daily operations and in responses to major incidents, however, mission-critical communications continue to use voice as the main delivery method, using established networks. Data usage continues to grow, but at a slow pace, constrained by lack of availability of dedicated, secure, data capacity that meets the public safety sector's core operational requirements. The communications strategy is therefore to continue to use the existing generation of dedicated TETRA network, upgraded to TEDS where practical, alongside commercial networks that are used to carry non-mission-critical data. However, it is unlikely that this strategy can be sustained indefinitely, given that the intensity of data usage will inevitably increase in line with current trends (evidenced, for example, by the significant increase in use of ANPR in recent years).

A summary of the implications of this evolutionary path is provided below.

Trend	Continuation of existing trends with greater volumes of data use, but constrained by lack of suitable networks to deliver mission-critical data in high volumes.
Outcome	Minimal changes to existing operational practices, and limited scope to achieve greater efficiencies and responsiveness through new ways of working.
Implications	Public safety users will require longer-term retention of TETRA and TEDS networks to meet voice, narrowband and wideband data functionally. This will constrain the development of new working methods and use of a wider range of data and multimedia applications. Limited additional sector-wide benefits are gained through migration to better, faster and more responsive ways of working, but overall growth in data usage is limited by network constraints.

Figure 5.4: Summary of "steady growth" evolutionary path [Source: Analysys Mason]

5.2.2 Data enhances voice

A key driver of the market for public safety applications is the trend towards network-centricity in data and multimedia operations. Similar to when using group-based voice calls, public safety users have a requirement to share data and multimedia applications on a many-to-many basis in order to ensure that everyone involved in a specific incident response is fully briefed on all information and decision making is undertaken accordingly. This manifests in the increasing demand for use of data to improve situational awareness, gained from a mixture of telemetry, sensor and video applications.

The "data enhances voice" path represents this trend of demand for access to data in combination with voice, used in a network-centric way. This path can therefore be summarised as being an extension of the current trends for greater access to data applications being used alongside voice, but with data applications becoming increasingly essential to mission-critical responsiveness. Over time, it is expected that a gradual reduction in group-based voice calls will occur as more and more communication takes place via transfer of data and images.

A summary of the implications of this evolutionary path is provided below.

Trend	Data is used alongside voice to enhance flow of information occurring in daily public safety activities and for incident response. Widespread adoption of data applications means that the capacity available on existing dedicated TETRA/TEDS networks is not sufficient to carry the data traffic that will be generated.
Outcome	Public safety users benefit from significantly greater situational awareness at incident scenes, through sharing and exchange of a range of data and images. Security of data transfer becomes increasingly significant, which limits the usefulness of commercial networks to carry sensitive data traffic.
Implications	Existing dedicated narrowband and wideband networks are not sufficient to accommodate the volumes of data traffic that will occur in everyday use. Commercial networks are not able to deliver the required functionality to accommodate secure data transfer, or the capacity or coverage to achieve the necessary network-centric ways of working. This supports the need for a new generation of dedicated mobile broadband networks.

Figure 5.5: Summary of "data enhances voice" evolutionary path [Source: Analysys Mason]

5.2.3 Information driven

There is consensus amongst various reviewed documents that there is trend towards mobile command and control in other words, enhancing traditional HQ-based command centres with mobile command centres that are set up to respond to specific events on a daily basis, or set up to assist the smooth operation of major planned events (e.g. New Years Eve celebrations, major sporting events, etc.). This drives demand to establish a common operating picture between the venue/incident and central control rooms, achieved through sharing of various information (voice, images, video). In addition, knowledge-based working requires public safety officers to have access to the full range of applications available to them in the office, whilst in vehicles or on the move.

These applications could be accessed using hand-held devices or through vehicle-based devices. Users will require immediate access to information stored in databases in order to manage command and control from the incident scene. The direction of data is both uplink (in order to transmit various images, data and video from the scene of incidents to central command) and downlink (e.g. from command centre to the incident scene, to assign resources or respond to information requests). There will also be a greater demand for mobile office applications to complete incident reports remotely rather than upon returning to HQ/command centres. As with the "data enhances voice" evolution path, there will be a greater demand for access to a wider range of data and imaging applications to enhance situational awareness and responsiveness. This will include sensory devices to gather information on conditions of buildings and people, and the ability to exchange this information wirelessly between different incident responders. Greater volumes of mission-critical data traffic will therefore emerge, which cannot be delivered by commercial networks operating on a 'best efforts' basis.[12]

12 'Best efforts' in this context refers to data that can tolerate delay or interruption, i.e. is non-mission critical.

As with the "data enhances voice" evolution path, the "information driven" path will generate data volumes that will exceed the capabilities of existing dedicated narrowband and wideband networks, and require a new generation of dedicated mobile broadband networks.

A summary of the implications of this evolutionary path is provided below.

Trend	There is a demand for access to the same range of applications in the field as those available at HQ/command and control. This includes widespread use of mobile office applications, as well as remote access to databases and ability to view, replicate and update information in real time.
Outcome	Mobile officers and those in command centres have access to a common range of situational pictures, data and other information. This improves responsiveness and the ability for public safety officers to work in crisis situations, as well as to respond to everyday incidents. Applications such as fingerprint recognition, licence plate recognition, and access to criminal records can all be conducted remotely, in real time.
Implications	The need for data applications to be delivered over networks that ensure high availability, resilience and secure communication, and are as reliable as existing TETRA voice networks, is increased as a result of the demand to access a wider range of applications from anywhere, at any time. The need for a more extensive range of mobile applications therefore requires capacity enhancement, similar to the "data enhances voice" path, which is beyond the capability of existing TETRA and TEDS networks.

Figure 5.6: Summary of "information driven" evolutionary path [Source: Analysys Mason]

5.2.4 Full multimedia reliance

In the "full multimedia reliance" path, there is a dramatic increase in both the range and intensity of use of new and innovative data and multimedia applications, including video streaming which is necessary for real-time interactive services such as telemedicine, 3D video forensics and high-quality evidential facial recognition applications. Public safety users start to make significant use of video applications alongside voice and data, driving demand for a wide range of applications to be made available over a common network interface to aid interoperability. Similar to the "data enhances voice" scenario, there is a widespread take-up of a range of data applications used in a network-centric manner. Alongside this, however, video streaming is used to further improve situational awareness at incidents and to enable a common operating picture to be established (e.g. through use of video conference calls, live CCTV video footage streaming, etc.). Future applications such as telemedicine are rolled out to improve access to medical services in rural areas. This requires access to a mobile broadband network covering a wide geographic area in order to reach the remotest areas, since the public safety organisations cannot control where unplanned incidents occur. New ways of working fully evolve so that there is substantially less reliance on HQ/command centres to store, retrieve and deliver information, since users are able to access a full range of applications while on the move.

As with the "data enhances voice" and the "information driven" paths, this evolutionary path will generate data volumes that will exceed the capabilities of existing dedicated narrowband and wideband networks, and require a new generation of dedicated mobile broadband networks.

A summary of the implications of this evolutionary path is provided below.

Trend	There is full reliance upon a wide range of traffic types (voice, data, video) in order to respond to new ways of working, and roll-out of new services such as remote telemedicine and 3D forensics. There is widespread take-up of a wide range of mobile data applications similar to the other evolution paths, alongside new multimedia applications.
Outcome	New ways of working are implemented across the public safety community and users are no longer constrained by having to return to HQ/command centres to complete certain tasks. A new generation of situational awareness applications are used in daily response as well as for major incidents. Public safety users are able to operate more efficiently, making better use of resources and reducing unnecessary travel.
Implications	With the evolution in data and multimedia applications, and the requirement for those applications to be available over a very wide area (to make applications such as remote telemedicine feasible), existing narrowband and wideband networks have insufficient capacity and functionality to meet the requirements of this evolutionary path. Similarly, there are limitations in use of commercial networks due to a lack of full geographic coverage, capacity and ability to carry secure data. This evolutionary path therefore requires the development of a new generation of dedicated mobile broadband networks to deliver more network capacity, higher bitrates and a wider range of applications.

Figure 5.7: Summary of full multimedia reliance evolutionary path [Source: Analysys Mason]

5.3 Mapping of applications to the four alternative evolutionary paths

The range of applications detailed in the various documents reviewed for this study have been mapped to the four alternative evolution paths as described above, in order to provide examples of how the use and range of applications might develop across the different evolution paths.

This mapping is summarised in Figure 5.8 below. Note that the numbers in brackets indicate references to the documents listed in Annex B. It should also be noted that since voice requirements are assumed to remain constant across all of the four evolutionary paths, voice is not included in the mapping table, although it is assumed to remain as an essential requirement for public safety operations.

Figure 5.8: *Mapping of data applications to trends [Source: Analysys Mason]*

Application	*Steady growth*	*Data enhances voice*	*Information driven*	*Full multimedia reliance*
Mobile office	Status messages, either field to field or command to field, are delivered by email in addition to short data/short messages, for resource allocation and incident control [2, 3, 6]	Emails/office applications are used for administrative messages, and access to emails and intranet whilst out of the office improves timely response to requests [1, 2, 17]	Increasing access to web applications (e.g. Intranet and Internet, online access to contacts databases etc.) is made, enabling incident reporting to be handled via mobile devices, reducing the need to return to HQ/command centre to access office applications [2, 5, 6, 17]	Incident-specific information exchanged using web applications (e.g. language translation, web-addressable cameras) in addition to use of a wide range of Mobile Office applications (contacts databases, email, Intranet) [5, 17, 18]
Database queries/updates	Database checks conducted in vehicles and via hand-held devices (e.g. passport information, Gazetteer, criminal records, patient records) [1, 2, 6]	Increased ability to updated databases with textual inputs in real time to provide additional incident details, or patient record updates whilst on the move [1, 2, 17]	Additional data updates provided from incidents and uploaded in real time (e.g. visual information, results of biometric checks) [6, 17]	Increasing upload/download of data and updating in real time (e.g. ECG traces) plus development/update of architectural plans of buildings from incident scenes [7, 8, 11]
Location-based applications	Use of geographical positioning tools (e.g. GIS) [2, 5, 6]	Asset tracking (e.g. of people and equipment) with positional information sent periodically to HQ/command centre [2, 6, 7]	Increasing use of self-forming networks (e.g. perimeter tracking at incident scenes and machine-to-machine communications) [1] [2] [6]	Fully integrated tracking / surveillance / image systems used in real time (e.g. to record location and status of fire fighters and people within a building), along with video robotics (e.g. to capture information in explosive environments) [8]
Digital mapping	Used for navigation and access to digital maps [2]	Access to 3D geographic images [1, 2]	Increasing use of images of different types and quality e.g. aerial views of incidents, high quality imagery [1, 2, 5]	Live 3D views inside buildings, and mapping of personnel and casualty locations [9]

Biometric monitoring	Use of basic telemetry applications [2, 5]	RFID used for tracking of personnel at incidents [2, 5, 7]	Biometric monitoring of personnel conditions over time [5, 7, 11]	Body worn sensors (e.g. object impact on helmet or vest, RFID-handcuffs) providing real time monitoring and information updates, improving real time structural awareness [7, 17]
Still images	Image and audio capture at incidents (e.g. push images of suspects and missing persons to field officers and images of fingerprints stored in central databases) [1, 2, 6]	Gathering of evidence at crime and incident scenes, and collation of witness information using field devices (e.g. incident scene photo transfers) [1, 2, 7]	Transmission of building floor plans and use of thermal image capture and transmission [1, 2, 7]	Evidential-quality image capture, and/or very detailed images (e.g. burns or other injuries [1, 7, 11]
Slow scan video	Sequence of fixed images exchanged between command centre and officers in the field [2, 6, 11]	Limited motion video captured and available on demand to command rooms and dispatch [5, 6, 7]	Video conference calls between field and command centre to support incident response and decision making [6, 9, 11]	Information captured by surveillance cameras at incident scenes relayed to command centres in real time, forming an essential element of mission critical communications and decision making [17, 18]
Real-time video	Relaying of ad-hoc video and surveillance camera information to control cars responding to incidents, and real-time traffic flow monitoring [7, 11, 19]	Upload of real-time standard definition video (e.g. from cars or handheld devices to command centre) [5, 7, 11, 19]	Live high definition, mission critical video footage transferred between incident and command (e.g. from ambulance to hospital), and use of mobile video conferencing [2, 6, 8]	3D video forensic applications, telemedicine and sophisticated airborne video platforms communicating with mobile devices [3, 8, 17]

6 Options to meet public safety's evolving requirements

6.1 Options to provide mobile broadband services to the public safety sector

As demonstrated in the previous sections, the various documents reviewed for this study indicate a general consensus that a wide range of data and multimedia applications will be required to meet future user demands within the public safety sector. The four alternative evolutionary paths developed for this study illustrate how demand for those applications might evolve over time, in line with changes to ways of working that are already evident with the public safety sector, such as a greater demand for mobile working, and increasing sharing of information to establish a common operating picture, often requiring upload of significant volumes of data of different types (e.g. images, video).

The options available to the public safety sector to deliver the envisaged range of applications under the different evolution paths are as follows:

- continue to use the existing generation of dedicated networks, and upgrade those to deliver wide band functionality (e.g. using TEDS).
- continue to use existing narrowband and wideband networks, and use existing commercial networks to provide additional, non-mission critical, data services
- develop a new generation of mission-critical mobile broadband network solution, either by developing a new generation of dedicated mobile broadband network or by upgrading existing commercial networks (e.g. based on HSPA+/LTE) and engineering their deployment to deliver the required public safety operational requirements of availability, coverage, security and control.

From our analysis, it is clear that, with the exception of the "steady growth" path, each of the other evolution paths will require additional high-bitrate data and multimedia applications beyond the capabilities of existing dedicated narrowband and wideband networks. Similarly, current commercial networks will not be able to support the range of envisaged applications, and in any case will not, as current deployed, meet the operational requirements of the public safety sector in terms of wide area coverage, security, resilience, control and availability.

There is growing evidence of the need for public safety to access multiple data applications simultaneously in order to establish a common operating picture, which requires use of a common infrastructure to avoid the need for multiple handsets and solutions. This is particularly true in the case of responding to major incidents, which require much more intensive use of a wider range of applications but using the same equipment and networks that are used in daily public safety operations. The combination of existing dedicated networks and existing commercial networks does not meet these requirements.

The advancement of network functionality requirements in line with the alternative evolution paths developed for this study is summarised below.

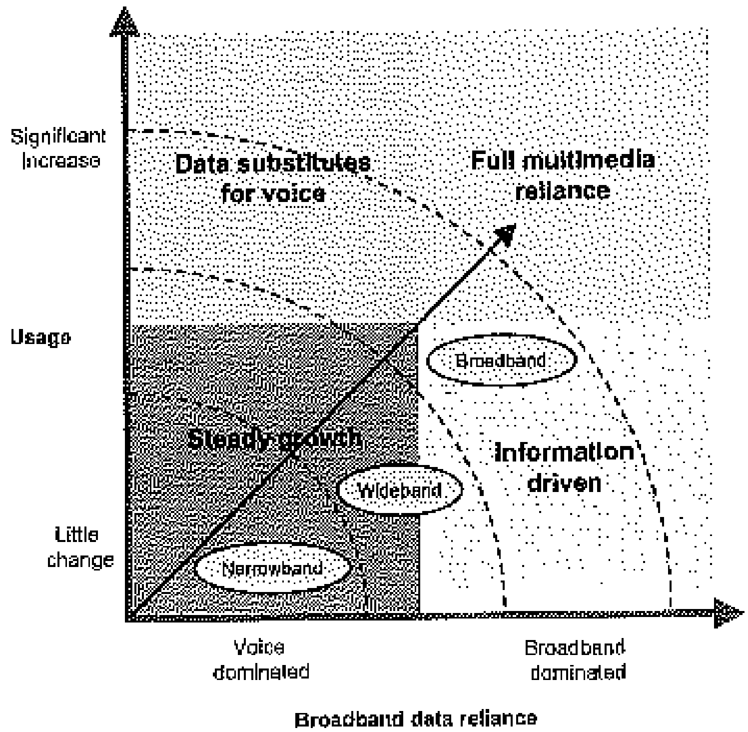

Figure 6.1: The four alternative evolution paths and their impact on network requirements [Source: Analysys Mason]

As described in Section 5.2, it appears that the "steady growth" path cannot be sustained indefinitely, given that the intensity of data usage is already increasing in line with current trends (evidenced, for example, by the significant increase in use of ANPR in recent years). This suggests that the only feasible option to meet the future evolution of public safety user requirements is to develop a new generation of mobile broadband network.

This conclusion is further evidenced by the range of usage scenarios that various documents envisaged within the public safety sector, as described in Section 4.1. The range of applications in concurrent use within these different usage scenarios demonstrates that, without a new generation of mobile broadband service being available, the full range of applications within the various scenarios will not be available in practice. This is summarised in Figure 6.2 below.

Figure 6.2: *Benefits of the development of a new generation of mobile broadband services for public safety use [Source: Analysys Mason]*

Usage scenario	*Existing public safety networks*	*Existing public safety networks plus commercial networks*	*Upgraded commercial network or new dedicated mobile broadband networks*
Patient service at car crash	Limited bandwidth to deliver video calls and images of patient injuries from ambulance to hospital, resulting in less timely response	Transferring sensitive patient records between ambulance and hospital not possible over commercial networks due to security and bandwidth limitations, leading to less timely response, and more manual paperwork	Faster identification of crash location, transfer of patient details in real time means improved emergency service response and enables more rapid diagnosis and treatment
Major explosion	Many of the envisaged applications not supported by current networks due to lack of bandwidth and limited data rate (e.g. incident perimeter tracking, real-time video feeds and bio-telemetry), resulting in less timely response, need for more resources and manual recording of information	'Best effort' nature of commercial networks means that they cannot be relied on in major incident situations. Public safety users are limited to using applications available on their dedicated networks, resulting in reduced interoperability, need for more resources, additional manual paperwork and reduced ability for crisis management	Interdepartmental communications maintained through secure, interoperable network, and network dimensioning to enable network-centric voice and data transfer improves efficiency of operational response to major incidents and more effective resource deployment, awareness and management
Traffic stop	Limited ability to capture and transmit information from the scene. ANPR in use today but increasing volumes of use mean that there are capacity constraints	Secure transfer of personal information not possible over a public network, reducing ability to capture and transfer information from the scene and possibly reducing ability to apprehend the criminal	Real-time identification of suspects and criminals, more timely response and better crime response rate
Earthquake	Mobile command and virtual treatment centre not possible using current generation of networks, leading to less effective, slower response, duplication of information and reduced ability to make real-time decisions	Levels of commercial traffic in this urban area would be high and so it is unlikely sufficient capacity can be dimensioned for public safety use. Loss of benefits such as slower response and duplication of information	Virtual treatment centre made possible through availability of higher speed, dedicated capacity leading to real-time diagnosis and treatment, better use of resources, and reduction in ambulance-hospital journeys
Fire at depot	This operational scenario illustrates that the only reliable mission critical communication methods at present are voice and low-speed data, limiting responsiveness and flow of information	'Best effort' nature of commercial networks means that reliable video transfer is not possible, reducing ability to decide upon evacuation in real time, and higher risk to deployed resources	Capture and transfer of building information and images in real time deliver more efficient decision making, better resource deployment and safer working environment for fire fighters
Large international finance summit	Relies on common operating picture being established between mobile command centre at the venue and central control rooms – this requires exchange of a range of information (voice, images, video) that are beyond the capabilities of existing dedicated networks	Transfer of sensitive personal data (e.g. iris or facial recognition) is not possible using a non-secure commercial networks. Requirement for high quality imaging applications to be available inside the venue also limits usefulness of commercial networks that do not always provide the necessary depth of indoor coverage	Capture and transfer of video and images in real time delivers a common operating picture, enabling more efficient decision making, better resource deployment and safer working environment for the summit

6.2 Limitations of upgrading commercial networks for future public safety services

As indicated in the section above, new mobile broadband services to meet future public safety user requirements could, in theory, be provided by upgrading commercial networks and engineering the deployment of these to achieve the specific operational requirements of the public safety sector. However, the consensus of the various reviewed documents is that there are a number of critical limitations inherent in using commercial networks for public safety applications, due to the core operational requirements that public safety communications need to meet.

While in theory it might be possible to upgrade and engineer commercial networks to meet these operational requirements (i.e. build new, shared, LTE networks that are engineered to meet both public safety and commercial user requirements), the balance of evidence in the reviewed documents suggests that this will be unachievable in practice. In particular, there are a number of reasons why commercial operators might be unwilling to make the necessary network changes to support public safety operational needs:

- the public safety sector requires very extensive geographic coverage as well as in-depth coverage penetration inside buildings, irrespective of location, which does not match the typical roll-out requirements of a commercial network
- it is likely to be very expensive to re-engineer commercial networks to achieve all of the public safety sector's operational requirements, and there are questions about whether sufficient incentives exist for commercial operators to do this. For example, typically requirements include the need for battery back-up to be available at thousands of base station sites across the network, and for networks to be designed to ensure that no single 'point of failure' exists either in access or core networks
- even if re-engineering costs are borne by the public sector, there is a risk that the resulting network will then be over-provisioned for commercial use. As such, commercial operators might find themselves having to pass additional costs (e.g. for the ongoing operation and maintenance of the network) on to commercial user tariffs, which is not viable given the competitive nature of the commercial mobile market. As such, commercial operators may not be willing to take on such requirements, given the potential risk to their commercial business
- there are questions about whether some of the public safety requirements are actually achievable. For example, to obtain the necessary layers of redundancy and prioritised access to capacity in urban areas might not be possible (since demand for capacity will also be high from commercial users, and hence reserving capacity specifically for public safety users might not be viable)[13]

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13 Furthermore, if the public users of the network know that in times of a local emergency they will lose the network services, this creates a disincentive for users to subscribe to that network, a risk that commercial operators are unlikely to take on.

- there is a question about whether the required Grade of Service for public safety use can be guaranteed within a network shared with commercial users, particularly in times of very high traffic loading
- there are conflicting views on whether signalling could be encrypted over the air interface in 3G/LTE
- ensuring the specific requirements for carriage of 'restricted' or 'confidential' documents requires careful network planning and approvals, which is complex and costly to achieve
- in conditions of local or national emergency, public networks typically become overloaded as the normal customer base seeks to communicate at the same time, and it is not clear that networks can be dimensioned to achieve the required immediacy and guaranteed access that public safety requires.

A further range of reasons why public safety users have been reluctant to make more widespread use of existing commercial networks, and have favoured the development of their own dedicated networks, are included in the various documents we have reviewed for this study. These include the points summarised below.

Coverage	Commercial operators typically invest in coverage where populations exist, and capacity is designed to maximise revenue generation in those areas, with little incentive to invest in areas of low-density population. Public safety, by contrast, requires ubiquitous coverage across a country's geography for everyday use, irrespective of population densities.
Network design	Re-engineering of commercial networks to meet public safety's requirements might be feasible in theory, but in practice would result in large parts of the commercial network being heavily over-engineered. This is likely to be more costly for the public sector to fund than a dedicated network provisioned to meet the specific coverage and capacity needs of the public safety user based, without having to provision for additional commercial traffic.
Sabotage	There is a view that commercial networks might be more vulnerable to sabotage by criminals that dedicated networks are, if the network is known to be used for public safety communications. Dedicated public safety networks are typically more guarded against sabotage through a range of specific measures e.g. vetted staff, secure fencing at sites, and networks designed to ensure no single point of failure in the event of sabotage, etc.).
Roll-out schedules	There are precise requirements for the roll-out of public safety networks (e.g. the need to align with police/fire/ambulance area boundaries), which do not match typical commercial roll-out strategies.
Risks of shared use	There are risks such as information security, quality of service and control of service level agreements if public safety users share networks with commercial users, which previous experience suggests can be avoided through use of dedicated networks under government control and supervision.
Reliance on commercial operators	There is a reluctance for public bodies to be reliant on a fully commercial operator, in view of the potential lack of control upon future network investment, business plans and financing.

If the upgrading and engineering of commercial mobile broadband networks is not feasible to meet public safety requirements, as this section suggests, the only alternative is to develop a new generation of dedicated mobile broadband networks designed to meet specific public safety requirements. For this to be achievable, additional spectrum will be required.

7 Conclusions

The study has found that, in line with societal trends evident within today's Information Society, a diverse range of data, imaging and multimedia applications are in demand within the public safety sector. Demand for access to a wider range of information is being driven by changes in working practices, which is creating requirements for access to a far wider range of data sources (textual, images and video) that are typical in commercial mobile networks. Sharing of various data types (textual, images, video, etc.) is being used in order to establish and maintain a common operational picture between agencies and between field and central command staff. This is being used to improve responsiveness, aid the deployment of resources, and improve timeliness and decision making in daily public safety operations and when responding to major planned or unplanned events.

Three of the four evolutionary paths developed for this study illustrate the public safety sector's need for a next generation of mobile broadband networks to deliver the range of applications that are envisaged in the future. As there is a limit to the range and volume of data and multimedia applications that existing dedicated narrowband and wideband networks, and existing commercial networks, can provide, if a new generation of mobile broadband networks is not made available, some new applications cannot be delivered. Ultimately, this will affect how already emerging changes to ways of working within the public safety might evolve, and, in the longer term, constrain the further development of the sector.

A new generation of services could in theory be delivered using an upgraded commercial network (e.g. HSPA/HSPA+ or LTE) with network deployment engineered to meet specific public safety requirements. However, as explained in Section 6.2, this option does not appear to be achievable in practice. The only other option is therefore to encourage industry to develop a new generation of mobile broadband networks for dedicated public safety use.

To enable the industry to devote the necessary investment to develop new dedicated networks, there is a need for additional spectrum to be identified, since existing bands are already fully utilised to deliver existing public safety systems.

It should be noted that identifying suitable spectrum is on the "critical path" to support development of a new generation of dedicated mission critical mobile broadband solution, because of the timescales associated with identifying suitable spectrum.

The requirements for additional spectrum are based upon the combination of the various factors identified throughout this report, specifically:

- trends in the range of data and multimedia applications in demand within the public safety sector
- potential increase in user densities and intensity of use for data applications

- specific traffic characteristics of public safety operations (e.g. network-centric ways of working)
- the infrastructure and technical requirements to meet the operational requirements of the public safety community (e.g. availability, security, reliability, latency), and limitations in use of commercial networks to deliver these.

Given the cost of deploying new networks, access to spectrum in bands below 1GHz will ensure maximum commonality with existing dedicated networks deployed in the 380–385/390–395MHz bands, facilitate re-use of assets where possible (e.g. radio sites). Use of spectrum above 1GHz (e.g. around 2 GHz) might be feasible, but would incur significantly higher roll-out costs compared to that below 1GHz, raising questions at national government level as to whether and how the additional costs can be funded.

Based on the reviewed documents, the European dimension to the public safety spectrum requirement is important for a number of reasons:

- the public safety sector is a niche market and therefore benefits from the identification of harmonised spectrum even more than other mobile systems (e.g. GSM or UMTS), because of the smaller user base and resulting lower volumes of equipment and terminals
- even if commercial solutions are adapted to meet specific requirements of a niche sector such as public safety, there are still costs involved in the necessary modifications, and therefore harmonised spectrum availability is key to ensure that manufacturers are able to develop products for a European market. An example of the re-engineering of existing commercial standards to meet niche requirements is that of GSM-R (the railways version of GSM) – although the GSM standard is supported by all major vendors around the world, GSM-R equipment is supplied by relatively few and the availability of harmonised spectrum for the product has therefore been important to reduce costs
- interoperability is an increasingly important requirement within the public safety sector, both to communicate between different public safety authorities within a country, and to communicate across borders. This is evidenced by a number of the documents reviewed for this study.[14]

The lack of available spectrum is therefore a significant barrier to the further development of mobile communications capabilities tailored to meet public safety requirements, until such time as a new, harmonised band can be identified at a European level.

14 For example, Council of the European Union, Draft Council Recommendation on improving radio communication between operational units in border areas

Annex A: List of acronyms

ANPR	Automatic number plate recognition
AVL	Automatic vehicle location
CEPT	European Conference of Postal and Telecommunications Administrations
ETSI	European Telecommunications Standards Institute
GHz	Gigahertz, 1GHz is equal to 10^9 hertz
GIS	Geographic information system
GPRS	General packet radio service
GSM	Global System for Mobile Communications, the most prevalent international standard for second-generation cellular mobile systems
GSM-R	GSM-Railway, an adapted version of the GSM standard used by Network Rail (UK) and other railway authorities in Europe to provide train-to-track signalling
HSPA(+)	High Speed Packet Access, a protocol that can form an overlay to existing 3G networks to speed up network capacity and transmission rates
ITU	International Telecommunication Union
LTE	Long Term Evolution, the next generation of 3GPP standard, which uses an OFDM radio interface – sometimes referred to as "4G"
MHz	Megahertz, 1MHz is equal to 10^6 hertz
NATO	North Atlantic Treaty Organization, the military alliance of countries in Europe and the USA
OFDM	Orthogonal frequency-division multiplexing, the air interface that is used in WiMAX systems and will be used in LTE
PABX	Private automatic branch exchange, a telephone exchange serving a particular business/office
PBR	Private Business Radio, generic term used to describe the variety of two-way, self-provided, mobile radio systems used by a variety of business users in Europe (including airports, taxi firms, local authorities and the Emergency Services pre-Airwave analogue radio systems)
PSTN	Public switched telephone network
RFID	Radio frequency identification
TEDS	TETRA Enhanced Data Service
TETRA	Terrestrial Trunked Radio, the digital trunked radio standard used by the Airwave service in the UK and in other Emergency Services mobile radio systems in a number of other countries Europe and around the world
UHF	Ultra high frequency, i.e. between 300MHz and 3000MHz
UMTS	Universal Mobile Telecommunications System, the European standard for third-generation cellular mobile systems
VHF	Very high frequency, i.e. between 30MHz and 300 MHz
WCDMA	Wideband CDMA, the technology used in current 3G systems
WiMAX	Worldwide Interoperability for Microwave Access, the technology forming the IEEE802.16e wireless broadband
WGFM	Working Group FM
WRC	World Radiocommunication Conference, the International conference held by the ITU every few years to update the international frequency allocation table
3G	Third-generation mobile systems
3GPP	3rd Generation Partnership Project, a partnership between ETSI and standards bodies in the USA and Asia, responsible for developing industry equipment standards for 3G systems

Annex B: List of documents reviewed for this study

This annex contains a list of the selection of documents from a range of public-domain sources, which have been reviewed for the study.

No.	*Document reference*	*Document title*	*Author*	*Version*	*Publication date*
1	Results from last TC-Tetra workshop in Brussels	TETRA Association Future Vision workshop held in Brussels on 25th February 2009	Various	-	February 2009
2	Results from previous TETRA Association workshops on mobile data [*two workshops*]	a. TETRA Association Applications workshop in London (December 2009) and mobile data applications questionnaire b. TETRA Association TEDS workshop (March 2007) and TWC questionnaire (2008)	Various	-	December 2009 / March 2007
3	Results of Analysys Mason study	Exploiting the digital dividend – a European approach	Analysys Mason	Final report	14 August 2009
4	PCWG ad-hoc group studies	Police Cooperation Working Group – Improving radio communication between operational police units in border areas; analysis of the responses received to the data capture exercise on cross border working	Police cooperation working group	-	December 2008 16 March 2009
5	ETSI System Reference Document on future Public Safety and Security (PSS) Systems	TR 102 628: System Reference Document; Land Mobile; Additional spectrum requirements for future Public Safety and Security (PSS) wireless communications systems in the UHF range	ETSI	V1.1.1	10 June 2009
6	Results from ERO questionnaire on PPDR	FM38(09)15 Rev 2 Annex 3, Result of Questionnaire on PPDR	ERO summary in response to CEPT WGFM PT38	Rev 2	April 2009
7	Results from TC-RSS WG4 questionnaire	RRS08_018_ETSI_TR_102_733 and TR 102 734 (Aug draft)	ETSI	V0.0.12	November 2009
8	Results from the expert group on police cooperation	Draft Council Recommendation on improving radio communication between operational units in border areas	Council of the European Union	Draft	20 May 2009
9	Document from MESA	Project MESA; Service Specification Group - Services and Applications; Statement of Requirements (SoR)	MESA	V3.3.1	March 2008
10	EU-TOIA report on digital dividend	Extract: Toia Report on Digital Dividend/2008-09-26 - Text adopted	Rapporteur - Patrizia Toia	P6_TA-PROV(2008)09-24	24 September 2008
11	WIK study	Safety first – Reinvesting the digital dividend in safeguarding citizens	Kenneth R. Carter and Val Jervis	-	5 May 2008

12	PSC-Europe response to digital dividend	PSC Europe response to the digital dividend hearing	PSC Europe	-	11 June 2008
13	EULER End User Requirement	EULER End User Requirements Deliverable 2.3-1	Dimitrios Symeonidis	V0.8	17 September 2009
14	TETRA Association Spectrum Group study	What data service will the future bring – from a TETRA perspective	TETRA Association Spectrum Group	Draft	November 2009
15	Wireless broadband study by Public Safety Spectrum Trust Chairman, Harlin McEwen	Public Safety Radio Communications; Wireless Broadband is not an alternative to LMR mission critical voice systems	Chief Harlin R. McEwen	Draft	12 October 2009
16	Hansard Report	Column 761	Lord Lucas	-	2 December 2009
17	Safecom document	Public Safety Statement of Requirements for Communications and Interoperability	US Department of Homeland Security	Volume II Version 1.2	August 2008
18	Westminster e-Forum	Westminster e-Forum keynote seminar, Emergency Services and Public Safety Spectrum	Westminster e-Forum	Transcript of event	11 June 2009
19	PSC Europe white paper	Public safety first	Jeppe Jepsen	-	-
20	Report for BAPCO	The "Business Case" for Blue Light Spectrum	David Happy	-	26 August 2009

Annex C: Summary of document review

C.1 TETRA Association Future Vision Workshop (Brussels)

Item	*Description*
Document title	TETRA Association Future Vision workshop held in Brussels on 25th February 2009
Author	Various
Publication date	February 2009
Abstract	Various presentations discussing the future vision for TETRA towards a fully integrated ICT solution providing NB/WB/BB wireless communications for 'mission-critical' and traditional PMR/PAMR applications, through the enhancement and/or provision of user driven services and facilities and the utilisation of the latest in technology, innovations and standards. The workshop discussed applications including data rate, bandwidth and QoS, user requirements for broadband data, and other areas of consideration in the selection and standardisation of a broadband solution.

Requirements or needs identified in report	The need for the industry to evolve TETRA towards a fully-integrated seamless ICT solution providing NB/WB/BB wireless communications for mission-critical and traditional PMR/PAMR applications.
	Data and image applications are emerging as a strongly needed requirement to improve users' efficiency and safety.
	The fundamental requirements are:
	• Ability to communicate in all locations (100% radio coverage)
	• Instant access at all times (perfect Grade of Service)
	• Never goes wrong (100% reliability)
	• Voice and data (V+D) communications
	• Perfect voice quality in all operational environments (ability to recognise who is talking)
	• Ability to support all V+D applications
	• Private and secure communications when required
	• RF coverage in black spots and outside main network
	• Additional capacity when localised traffic demands are high
	• Fall-back communications if base station and/or network fails
	• Ability to support all non-voice applications (real-time and other)
	• Standardised technology solution providing:
	  ▪ competition
	  ▪ choice
	  ▪ second source security
	• Interoperability:
	  ▪ within the same organisation
	  ▪ within other related organisations as required (e.g. police, fire, ambulance, military, transport, utility, etc.)

- cross-border with other nations as required
- Interworking with other technologies as need (Public Networks, 3G, etc.)
- Evolution:
  - backward compatibility
  - maximum reuse of existing infrastructures
  - future proof
  - enhancement
  - integrated and seamless ICT
- Current mission-critical communication needs to be:
  - dedicated
  - wide-area
  - secure
  - reliable
  - available
  - fit for purpose.

Possible applications identified in report

Real-time applications, where source generates the information to the destination and strict constraint to delay and its variation over the network is fundamental for using the application.

Non-real time applications, where the source has the information and sends it to the destination. Source can send part of the information missing and re-order the packets.

Applications include:

- Automatic stolen car plate recognition (approx 10byte/plate required throughput)
- Biometric check
  - fingerprint required throughput per officer – check rate: 8 people/min
  - y=(8people/min) / (60sec/min) x 1kByte/People =133byte/sec = 1.06kbit/s
- Image transmissions
  - target acceptable resolution: dimension 20kByte = 160kbit/ user
- Face recognition
  - the minimum number of pixels to recognize faces is 40PPF (pixels per foot) the minimum number for reading license plates is 80PPF
- Mobile office
- Database queries
- Video surveillance from the field
- Mobile command centre sharing an accurate situation picture of an incident
- Delivering images, maps and floor plans to the field
- Detailed ECG traces from ambulance to hospital and other telemedicine applications
- Fingerprint identification/authentication
- Image/audio capture
- Geographical positioning

	• Electronic identity document reading • Voice communications • Data connectivity • Optical character recognition (OCR) • Electronic signature certificate management • Cryptography
Possible benefits identified in report	Not applicable
Can the benefits be realised using commercial networks	Not applicable
Possible scenarios identified	Not applicable
Any other relevant information from the report	Possible TEDS broadband solution: • Integration of other technologies with TETRA ▪ Use of TETRA 2 infrastructure as the core network ▪ 3G technologies such as HSPA, LTE or EV-DO, UMB ▪ WiMAX (preferably narrowest channel options at lowest designated WIMAX frequencies) • TEDS Technology Evolution ▪ Use of wider carriers than TEDS ▪ More spectral efficient channels ▪ Other features under discussion in WG4 ▪ Acquisition of new spectrum for interoperable TETRA 2 (plus BB enhancement) networks? • Other comparative considerations ▪ LTE, WiMAX and other public BB networks designed for mass market/urban applications ▪ Wider and wider carriers, smaller and smaller footprints ▪ Design criteria: capacity limited, maximum commercial return ▪ No slack capacity for emergency communications ▪ PPDR networks design criteria: coverage limited ▪ Full national coverage essential for PPDR; capacity is not an issue ▪ Narrowest bandwidth/lowest frequency band compatible with required PPDR applications and spectrum availability ▪ NB, WB and BB in the same frequency band ▪ PMR type security, availability and reliability • Operational use for video must be understood ▪ What is required in a court case (used as evidence)? ▪ What is required in emergency response? ▪ What is required for surveillance, facial, licence plate recognition?

C.2a TETRA Association Applications Workshop and mobile data questionnaire

Item	*Description*
Document title	TETRA Association Applications workshop held in London on 2nd December 2009 Mobile data applications questionnaire results
Author	Various
Publication date	December 2009
Abstract	Various presentation discussing applications for TETRA.

Requirements or needs identified in report	Security, safety, cost and service are the critical features of an optimal mission-critical data solution, along with a requirement for an integrated system that can be used throughout the response chain (i.e. services all accessible via the same terminal or device) and data services as reliable as TETRA voice.
	
	Customer specific applications that enhance the functionality or usability, versatility and productivity of the TETRA radio terminal for different purposes.
	
	Existing applications require more capacity.
	
	Ability to move office applications into the field.
	
	Operational needs: resilience; availability; security.
	• Ciphering and encryption
	• Mission critical communication
	• Availability of resources under all circumstances
	  ▪ operational even when public networks are congested
	• Resilience
	  ▪ ability to work in crisis situation (major electrical disruption, transmission network failures, etc.)
	• When all public communication infrastructure are out of order, the radiocommunications network should be kept operational.

Possible applications identified in report	Current applications:
	• Collect and share common situation picture
	• Allocate right resources efficiently
	• Distribute and obtain information instantly
	• Collect surveillance, medical, etc. monitoring information
	• Automate administrative routines
	
	Future applications:
	• Fingerprint recognition
	• Licence plate recognition
	• e-Passport reader
	• RFID reader
	• JAVA applications on TETRA terminals:
	  ▪ Access information in remote databases
	    o Vehicle databases
	    o Criminal records
	    o Hazardous materials

	▪ Report location - related information o Task progress o Intelligence information o Support requests ▪ Push images to field officers o Suspects from surveillance camera o Missing persons o High risk suspects • Streaming video ▪ Transmission of live videos simultaneously to/from the central command and field personnel ▪ Relaying ad-hoc videos and surveillance camera to the central command and field personnel ▪ Air-to-ground video • Real-time collection of large medical data ▪ Sending full data on a patient's condition from the ambulance ▪ Remote surveillance of smoke divers' vital functions ▪ Remote surveillance of patrolling officers' vital functions • Access to geographic images ▪ Aerial photographs ▪ Satellite images and maps ▪ Plans of buildings • Remote database queries for passport and biometric details • Sending photographs of lost children and wanted people • Access too the Fire service 'Gazetteer' for information on HazMats on premises • Transmission of live video to and from the central command and field personnel • Relaying ad-hoc video and surveillance camera • Sending full data on patient's conditions from the ambulance • Integrated broadband data services which are emerging as an important PSS need require more bandwidth – ideally two paired 15MHz channel • Telemedicine • Extensive geo-location capabilities • Web applications • Full email • Over-the-air downloads for software upgrades
Possible benefits identified in report	Not applicable
Can the benefits be realised using commercial networks	There are network availability issues with commercial networks, for example: • Motorway Car Crash – statistics show that the network call volumes increase during a major auto crash. People involved call loved ones, witnesses call for assistance and other drivers call to say that they will be late. What is the impact to data?

	• Major Sport Events – peak GSM/GPRS load times are before, half time and after the match = critical times for secured communications. Historically mobile telephony calls can fail during these periods
	• Natural disasters and terrorism – after the Madrid bombings; the mobile phone network collapsed at 8:05am and was out of use for eight hours
	• Public networks do not meet PS user requirements
	  ▪ Coverage, Availability, Security, Resilience, Interoperability
	  ▪ Control, Functionality
	• Public network operators are able to prioritise PS users, but
	  ▪ When the public is cut off, they call the emergency services to get information.

Possible scenarios identified	Not applicable

Any other relevant information from the report	▪ Mission critical applications can be optimised to reduce the amount of data that is transmitted over lower bandwidth wireless networks: the communication payload:
	  ▪ TCP/IP – 40bytes
	  ▪ UDP/IP – 28bytes
	  ▪ Radio optimised TCP/IP – 10 to 15bytes
	• Mobile data helps effectively to:
	  ▪ Collect and share common situation picture
	  ▪ Allocate right resources efficiently
	  ▪ Distribute and obtain information instantly
	  ▪ Collect surveillance, medical etc monitoring information
	  ▪ Automate administrative routines.

C.2b TETRA Association TEDS workshop and TWC survey

Item	Description
Document title	TETRA Association TEDS workshop held in Bonn on 27th March 2007 TWC questionnaire in 2008
Author	Various
Publication date	March 2007
Abstract	Various presentations discussing user requirements, technical specifications for TEDS, spectrum and regulatory issues and applications for TEDS.
Requirements or needs identified in report	There is a need for mission critical data and data speeds beyond the TETRA 1 narrow band service. The capacity enhancements brought by TEDS are also needed so that systems can handle the load of multiple, concurrent narrow band data services such as database access and ID-card or fingerprint verification. The usage scenario in the field seems to be developing towards a network-centric way of working that relies on personalised data and where an overview of the incident is shared, which improves the situational awareness. More and more daily routines are expected to move to take advantage of data and there is a trend towards mobile offices – activities traditionally confined to an office environment are possible in the field. Need for the "higher bit rates" in wider channels: • Higher bit rates (150–500kbit/s?) • Wider channels (150kHz?) • Spectrum (2×5–10MHz?) • Timing TIP certified product available: 2010? Need for TEDS spectrum in PSS (based on re-use factor of 20 or more): • One 50kHz layer ▪ 2×20×50kHz = 2×1MHz absolute minimum ▪ 2×30×50kHz = 2×1.5MHz reasonable minimum • Double 50kHz layer (100kHz per site) ▪ 2×20×100kHz = 2×2MHz absolute minimum ▪ 2×30×100kHz = 2x3MHz reasonable minimum Applications need to work on multiple networks to maximise available coverage area and bandwidth Key Nødnett (Norwegian PS Network) TEDS User Requirements: • Basic user requirement is for the transfer of 100KB of data (e.g. picture) from a radio terminal within 10 seconds • No specific data applications identified at this stage but rather the expectation that there will be a strong operational need for higher speed data applications in the future • TEDS upgrade must minimise any disruption to the 'live' network • Level of encryption must be at least as good as TETRA 1
Possible applications identified in report	• Personalised information • Mobile command and control – dispatching • TEDS as data only layer – voice services provided by TETRA 1

- Location tracking
- Narrow band services
    - Scanned images (ID-cards) for verification
    - Database access
- Wide band services
    - Video, both uplink and downlink
    - Messaging including attachments
    - Maps and drawings, images to vehicles
    - Remote maintenance – download of terminal configuration, firmware, software

Top TEDS data applications identified at workshop:

- Navigation / location tracking / AVL
- Database queries (medical journal lookup, simple query and image-query)
- High resolution still pictures (pictures from field, maps, fingerprint, vital data sampling)
- Instant Messaging / email / news (field-to-field and office-to-field)
- Electronic forms (paperwork, ambulance, home nurse)
- Telemetry (sensors in vehicle / on patient)
- Web browsing
- Video streaming (surveillance) and video conferencing

Possible benefits identified in report

Not applicable

Can the benefits be realised using commercial networks

No, as commercial data services cannot be expected to be available at all times.

Possible scenarios identified

Not applicable

Any other relevant information from the report

TEDS features:

- To be included in the TEDS TIP:
    - Security
    - Modulation 4/16/64 QAM
    - Service interaction
        - Voice services offered to user busy in TEDS data service
        - Concurrent voice and data
    - Quality of Service
    - TEDS PEI (MEX)
    - Multi-slot operation
    - Sectored cells (extended coverage)
    - High speed
- Additional TEDS Features which would first need standard update:
    - Multicast
- Devices:
    - Data only TEDS devices
    - Mobile and hand portable TEDS enabled voice & data devices

TEDS does not cause significant interference to other systems but TEDS cannot co-exist with military air-ground-air radios.

C.3 Analysys Mason study on digital dividend

Item	*Description*
Document title	Exploiting the digital dividend – a European approach
Author	Analysys Mason, DotEcon and Hogan & Hartson LLP
Publication date	14th August 2009 (Final report)
Abstract	This document summarises the work carried out on behalf of the Information Society and Media Directorate General of the European Commission to ascertain what action needs to be undertaken at EU level to ensure the benefits of the digital dividend are maximised, including: • conducting an inventory of the situation in each Member State regarding the digital dividend • carrying out analysis to understand the demand for the spectrum as well as the social and economic value of potential users • reviewing technical issues, such as technology trends, interference issues • developing a range of scenarios for a co-ordinated EU approach, and a cost/benefit analysis of each approach. The report identifies seven potential uses of the digital dividend – DTT, commercial wireless broadband, services ancillary to broadcasting and programme making (SAB/SAP), broadcast mobile TV, cognitive technologies, wireless broadband for public protection and disaster relief (PPDR) and an innovation reserve. The study offered a set of recommended actions for a co-ordinated approach and a proposed roadmap for implementation.
Requirements or needs identified in report	The need for high bandwidth wireless services. PPDR is widely perceived as a high-value use of spectrum and the value of this use cannot be expressed solely in economic terms, as PPDR systems are used for safety of life and are regarded as necessary government services.
Possible applications identified in report	High-speed data transfer, e.g. paramedics need to transmit medical images and or reports to colleagues ahead of their arrival at the hospital. Real-time video transmission, e.g. to improve efficiency; ability to see what is happening at the scene; and instantly collaborate with central command, co-workers and other agencies.
Possible benefits identified in report	A PPDR network would be a key asset in the development of public health services and security for all, and as such would sustain the quality of life of citizens across Europe.
Can the benefits be realised using commercial networks	Commercially available wireless broadband technologies (e.g. WiMAX and LTE) could offer economies of scale and superior handset availability but may not be sufficiently reliable as they are optimised for different objectives than PPDR.
Possible scenarios identified	Not applicable
Any other relevant information from the report	The emergency services rely on good in-building coverage in order to communicate effectively at the scenes of incidents, and so spectrum below 1GHz is particularly suited to meet their requirements. In its 2008 Communication on "Reinforcing the Union's Disaster Response Capacity" , the Commission stated that "European citizens expect the Union to protect their lives and assets inside the EU" and stated that the "challenge of disaster prevention, mitigation and response…require[s] a comprehensive

approach by the EU to the continuum of disaster risk assessment, forecast, prevention, preparedness and mitigation (pre- and post-disaster), bringing together the different policies, instruments and services available to the Community and Member States working as a team'.

Wireless broadband for PPDR (in addition to or to replace existing services) could realistically only be deployed terrestrially using spectrum below 1GHz, deployment at high frequencies would be too costly. It may be possible to deploy such a service in other bands, such as 450MHz, but less spectrum is available and it would require concerted coordination across Member States. Thus the incremental value is either (a) the additional value over and above existing national services; or (b) any extra costs or changes in service quality from using another band.

C.4 PCWG ad-hoc group studies

Item	*Description*
Document title	Police Cooperation Working Group – Improving radio communication between operational police units in border areas; analysis of the responses received to the data capture exercise on cross border working
Author	Police cooperation working group
Version	-
Abstract	Based on two documents – responses from 12 administrations to a questionnaire sent out on cross border working and a technical brief discussing the medium and long term goals for cross border emergency services mobile communications requirements following the survey. The Police Cooperation Working Group created a technical ad-hoc expert group on the future of radio-communications in July 2008, following the EURACOM seminar whose main objective is to identify technical solutions to foster interoperability between police forces, especially in border areas. The document puts together some ideas of how interoperability and cross border communications might be accomplished at a technical level and discusses a number of the issues that arise. The questionnaire addresses the requirements for voice, data, coverage, encryption requirements, spectrum and consideration of using a public network. The outcome of a three country pilot experiment in cross border communications was carried out between Germany, Belgium and the Netherlands was also presented.
Requirements or needs identified in report	• Full interoperability across Europe • Ability to create talk groups across networks • Pan-Europe direct mode capability • Ability to handle biometrics and other imagery and video-mobile broadband capability • Access to both home and local databases (this must be managed carefully with respect to security issues) • End-to-end encryption is preferred but air interface only encryption is accepted by some administrations • Full area seamless communications / interoperability across Europe (ISI?) • Border zone coverage, approx 15km • Access to both home and local control rooms (language issues will be highly significant and may be a greater obstacle then the technical issues) • Ability to create talk groups including home and visiting officers (patch functions) • Point to point calls and telephone interconnect • Automatic location capability for persons and vehicles and assets • Access to home databases and local databases for visiting officers including biometric databases • Harmonised spectrum – spectrum for mobile broadband minimum 2x10MHz, more realistic to look for 2x16MHz. Harmonised spectrum is key to providing full access across borders.
Possible applications	Voice

analysys mason

identified in report	• Full communications with home control room • Access to local force communications control room • Group based communications Data • Biometry • Video (on-line streaming) from field officer • Video (on-line streaming) to field officer • GPS position location information • Database access • Transmission of patient data, maps, building drawings • Others including SDS, SMS, status messaging, situational awareness and common picture functionality
Possible benefits identified in report	More successful and efficient cross border inter-working.
Can the benefits be realised using commercial networks	All the responses provided a consensus that public networks including GSM, 3G, etc. can be used as a backup to dedicated service and for non-critical traffic only.
Possible scenarios identified	Not applicable
Any other relevant information from the report	For a cross border mobile broadband capability European harmonised radio spectrum is an absolute requirement, as it has been for the current voice communications capability. This point needs to be clearly understood and communicated to spectrum management administrations. Failure to achieve harmonised spectrum will remove the possibility for secure and resilient cross border mobile broadband communications for the foreseeable future. A much more difficult situation is cross border communications between TETRA and TETRAPOL networks. Since TETRA is a TDMA based technology and TETRAPOL is based on FDMA the two air interfaces are physically incompatible. There would therefore be limited benefit in the development of an ISI. TETRA networks mainly provide emergency mobile communications in Europe, but there are also some TETRAPOL systems. Most operate at or close to 380/400MHz. Given the difficulties noted above it likely that full successful interoperability will only be achieved across Europe when all the participating countries are: • using a common air interface standard for voice and data • operate a minimum defined set of network features • have deployed a set of agreed configuration parameters • operating in a common frequency band. There is a requirement for the following: emergency call, individual call, group call with units on both sides of a border, duplex individual calls to telephone networks (telephone interconnect), fast set up for group and point to point calls. As countries develop their mobile communications services new technologies are likely to be introduced. The UK is in the process of commissioning the Future Communications Programme (FCP) to replace the Airwave TETRA network for both voice and data communications. No decision has yet been made on the technology to be deployed. FCP will start to enter service from 2014. Cross border issues will need to be considered from the outset of the commissioning process for new networks.

Full interoperability should imply access to local control rooms and the ability to create talk-groups across networks. Effectively this suggests the formation of a super network of interconnected networks. Thought needs to be given to the creation of a standard feature set and the management of this super network capability including issues of confidentiality and national security.

A three country pilot experiment in cross border communications was carried out between Germany, Belgium and the Netherlands. The outcome:

- Four pilot groups were available however, it was not possible to select a national group in a foreign network and it was not possible to indicate which network the terminal was registered
- Emergency calls were transferred to the selected (international) group and audio could be heard by all dispatchers and radios in the three networks within this selected group
- Emergency call signalling was only possible in the network in which the call was initiated, signalling was not transferred to the other networks.
- Possible to make an individual call to another radio when both radios were registered in the same network. The reason for this is that signalling was not being transferred to the other foreign networks.
- Telephone call was supported, however the set up of a telephone call was different for each network.
- Fleetmap – each subscriber that wanted to migrate to another network needed to have a unique ITSI that was not used in the foreign network. In other words, the ITSI needed to be known and equal in all three networks. This was similar for groups and the corresponding GSSI's.

C.5 ETSI SRD on Public Safety and Security (PSS) Systems

Item	*Description*
Document title	TR 102 628 - System Reference Document; Land Mobile Service; Additional spectrum requirements for future Public Safety and Security wireless communications systems in the UHF range
Author	ETSI
Version	V1.1.1 (2009)
Abstract	This document describes the spectrum requirements of future PSS communications for wideband and broadband applications. The document refers to narrowband and wideband PPDR applications in Europe being covered by TETRA Release 1 and TETRA Release 2 (TEDS), but that there is a need for interoperable, secure and wide-area communications for public safety users for wideband and broadband applications. This cannot be accommodated in existing spectrum available to PSS users since that spectrum is already fully used by voice traffic and some data usage. The document summarises spectrum requirements of 2 separate contiguous blocks of 10 MHz plus two separate non-contiguous blocks of 6 MHz dedicated to PSS and harmonised across Europe; the total of 16 MHz for each direction to fit within a tuning range. The required frequency range is between 300 MHz and 862 MHz, preferably in the lower parts of the band. The document advocates allocation of a dedicated spectrum band for harmonised wide-area communications capable of high-speed IP based data applications. Spectrum should be sufficient to meet the requirements of day-to-day PSS traffic and also cater for peak usage during major incidents
Requirements or needs identified in report	▪ Mission critical PPDR communications are exhibiting an urgent and growing need for inter-operable high-speed data services. ▪ The wideband ECC Decision for 380-470 MHz does not give the PPDR community extra data capability, since the actual spectrum available is insufficient to accommodate high speed data applications ▪ Lack of further availability of spectrum will risk the future development of the PPDR community through inability to support new services requiring more data (e.g. identify cards, photographs, fingerprints), failing to keep pace with societal developments where society is increasingly adopting advanced data applications, and inability to manage major disaster scenarios efficiently ▪ User communities have determined that mobile data is equally as missions critical as voice, and therefore cannot be safety transported over commercial mobile networks. This is because officers will become more and more reliant and dependent on mobile data communications in support of their day-to-day operations ▪ PSS TETRA networks will start being replaced, at least in part, from around 2012 onwards, with new technology needed to support voice, narrowband, wideband and broadband data services and be backward compatible and interoperable with existing (TETRA) networks ▪ Spectrum requirement includes one contiguous component of at least one broadband channel width (10 MHz). Split of spectrum or fragmented spectrum is not viable due to RF front end complexities and difficulties with interoperability ▪ Specific public safety operational requirements include control over security implementation and other operational aspects of the network, redundancy of components on cell sites (e.g. transceivers, site controllers, antennas), redundancy of UPS power supply capability,

including battery and generator powered supplies, a high degree of network resilience (e.g. overlapping coverage from multiple cell sites), fallback strategies to allow stand-alone operation of sites disconnected from the rest of the network, redundant switching and a high level of RF coverage

- DMO is required in all radio terminals, plus availability of the associated repeaters and gateways to provide RF coverage in difficult areas or where base station coverage has been lost
- Need for fast communications set-up in combination with a much higher call set-up success rate, typically 99% or even higher for PSS compared to what is offered by public networks

Possible applications identified in report

- At present, operational PSS networks support voice and narrowband data services only. Whilst those applications will continue to be required, others that are needed include video conferencing, video streaming, full satellite navigation, secure passport and bio-metric checks, online access to various databases, full email internet browsing, and improved transfer of files (including maps and pictures)
- Ability to move the back office into the field
- Sending detailed photographic images of lost or wanted people
- Relaying ad-hoc video camera and surveillance camera real time information to patrol cars
- Sending detailed maps and plans
- Sending biometric data from an incident in real time, rather than having to return to the office
- The ability to transfer video data back to incident commanders to make faster and more informed decisions
- Cross-departmental communications
- References data service attributes from ETSI TS 102 181 of email, imaging, digital mapping, location services, real time video, slow scan video, remote database access, database replication and personnel monitoring

Possible benefits identified in report

- Socio-economic benefits include: saving lives of citizens and public safety officers, minimising damage to properties, faster response, more efficient communications, enhancement of a single emergency communication network with high reliability, availability and security, better co-ordination between different public safety organisations and agencies both nationally and over borders
- Potential to enhance investments in European national public safety infrastructures through evolutionary enhancement
- Single wide-area coverage network resulting in major cost savings in the network infrastructure compared to use of multiple solutions
- Creation of a pan-European or global harmonised set of equipment requirements, resulting in higher economies of scale and lower costs.

Can the benefits be realised using commercial networks

- The mandatory services and facilities required by public safety organisations can only partially be provided on networks designed for commercial use, since those networks cannot be used to carry mission critical traffic
- In many commercial networks, data is sent at lower priority than voice, which could be a significant problem for public safety users who often find themselves in areas where voice services are being used intensively, but that data services are also needed

	• Even if a commercial network was designed to meet the operational needs of public safety users – i.e. resilience, QoS, security – many Governments would still need to ensure that ownership of the operator would be under Government control, or alternatively may require continued guaranteed financial viability and/or options to take management control of the network when needed
Possible scenarios identified	• Large fire encompassing 3-4 blocks in a large city or a large forest fire • Large public event e.g. Commonwealth Heads of Government Meeting, G8 Summit, Olympics • High-resolution video communications from wireless clip-on cameras to vehicle-mounted laptop used during traffic stop or response to other incidents, and video surveillance of security entry points such as airports with automatic detection based on reference images, hazardous materials or other relevant parameters • Remote monitoring of patients and remote real-time video view of the single patient
Any other relevant information from the report	• Annex A.2 refers to recent survey conducted by Motorola and APCO of more than 200 public safety administrators and officers in the top 100 US markets regarding current and future use of communications • Annex B.2 refers to technology evolution e.g. narrowband-wideband-broadband

C.6 Results of the questionnaire on PPDR prepared by ERO on behalf of CEPT WGFM PT38

Item	*Description*
Document title	FM38(09)15 Rev 2 Annex 3, Result of Questionnaire on Public Protection and Disaster Relief
Author	CEPT European Radiocommunications Office (ERO) on behalf of CEPT Working Group Frequency Management (FM), project team 38 (FM38), with responses from spectrum authorities, PSS users and industry
Version	Questionnaire issued February 2009, results April 2009 Contained in zipped file ERO_401925899884269
Abstract	The questionnaire was prepared by CEPT WG FM38 and issued to CEPT spectrum authorities/regulators to gather information concerning future mobile radio applications, and associated spectrum requirements, associated with Public Safety and Disaster Relief (PPDR) – also referred to as Public Safety and Security (PSS). Spectrum authorities that participate in the FM38 group were asked to forward the questionnaire to public safety users within their countries (i.e. police, fire and ambulance authorities) and invite them to respond to the questionnaire too. The questionnaire had two purposes (i) to collect information from users to clarify the user requirements and needs for mobile radio applications for PPDR (ii) to invite authorities/regulators to consider possibilities to identify additional spectrum for public safety use, and candidate bands below 1 GHz. 52 replies received – 23 from authorities/regulators, 19 from user organisations and 10 from industry.
Requirements or needs identified in report	Current applications will continue to be required in future, along with a range of new applications, with increasing emphasis on: • Broadband (e.g. real time video surveillance, including live CCTV images and images captured and relayed from helicopters) • Enhanced graphical data exchanges • On-site expert medical support • Situational awareness at fire incidents, to inform control/field decision making • Giving the officer in the field in charge of a major incident the same functions as an operator in the control room ("taking the control room out into the field") • Remote situational assessment and control • Automatic facial recognition • Much higher data rates for database querying, geo-location etc. • Mobile office • Licence plate checks.
Possible applications identified in report	All present applications (listed in table below) also required in future, along with increasing emphasis on much higher data rates to improve efficiency of current applications, mobile control room, mobile office, video surveillance.
Possible benefits identified in report	1. Many of the companies who produce TETRA equipment are based in the UK and therefore the UK export market has benefited from the harmonised development of the TETRA standard 2. Vital for national security reasons

Can the benefits be realised using commercial networks	PSS users have specific operational requirements that public networks cannot deliver: • Resilience – overlapping cell coverage, redundancy of components, multiple backhaul links from individual radio sites, resilient switching (adjacent cells to be connected to different switches), fall back sites, power standby, etc. • Commercial networks do not offer professional radio oriented services (e.g. semi-duplex voice transmission for group calls, direct mode, different user priority levels and pre-emption) • Lack of security with commercial networks • In some countries there are limitations relating to the ownership/share structure of operating companies providing secure Government communications, which prevents use of commercial operators
Possible scenarios identified	Not applicable
Any other relevant information from the report	Questionnaire responses confirm PSS users currently use a mix of dedicated and commercial systems across Europe (TETRA, TETRAPOL, commercial GPRS/3G,satellite, RFID). Emphasis in future is integration i.e. simultaneous voice and video over the same network.

C.7 Results of the TC-RSS WG4 questionnaire

Item	*Description*
Document title	ETSI TR 102 733 and ETSI TR 102 734, Re-configurable radio systems (RSS): System aspects for public safety and user requirements for public safety
Author	ETSI TC TTS WG4
Version	V0.0.12 (November 2009)
Abstract	ETSI technical reports referring to a feasibility study of the system aspects (703) and requirements (704) for re-configurable radio systems (i.e. cognitive technologies etc.) for public safety. It identifies and defines the requirements of RRS to the public safety domain, incorporating the results of a questionnaire distributed by ETSI TC RRS WG4 to end-users across Europe. The scope refers to re-configurable radio systems only, and does not define requirements/system requirements for a complete radio replacement system for public safety users.
Requirements or needs identified in report	Defines the role of different public safety authorities, e.g.: • Law enforcement – patrolling to identify and intervene in cases of offence to criminal law, criminal investigation, customs verification, law enforcement in the transportation domain (air, road, rail, sea), custody and transportation of criminal convicts • Emergency medical and health service – provide critical and supportive care of sick and injured citizens and the ability to transfer citizens in a safe and controlled environment. Information required by EMS providers includes patient information, medical information, resource information, incident information and geographical information • Border security (including coast guards) – verification of illegal immigration, verification of the introduction of illegal substances, verification of introduction of goods in offence to customs regulations • Fire-fighting – including fire fighting, search and rescue, management of hazardous materials, protecting the environment, salvage and damage control • Protection of the environment (forests etc.) – typically employing sensor devices • Search and rescue • Crisis management – typically requiring situational information/situational awareness. Requirements defined as: joint operations between different PSS users, ability to operate in unpredictable conditions, ability to communicate when networks are unavailable (i.e. direct mode), terminals interoperability, limited budgets, security of various levels, resilient networks, resource management (i.e. support dynamic prioritisation of available capacity) and scalable networks From the user survey (RRS WG4 questionnaire), the following requirements are identified: • Broadband connectivity • Interoperability between different PS users • Avoid need to use multiple terminals • Communications in tunnels/underground/indoors • Increased capacity, coverage, grade of service, voice quality, robustness

	to interference, reduced call set up time. • Messages of large sizes, access to databases, access to web, video, video conferencing, distribution of images and buildings plans, medical information, bio metric data, weather/traffic information, software updates to terminals in real time.
Possible applications identified in report	1. *Verification of biometric data.* Public Safety officers may check the biometric data of potential criminals (i.e. fingerprints facial/iris recognition) during their patrolling duty. The biometric data could be transmitted in real-time to the headquarters or a center with the biometric archives and the response could be sent back to the Public Safety officers. This would be a positive method of identification during field interrogation stops. 2. *Wireless video surveillance and remote monitoring.* In these types of applications, a sensor (fixed or mobile) can record and distribute data in video-streaming format, which is then collected and distributed to public safety responders and command & control centers. 3. *Automatic number plate recognition where a camera captures license plates and transmits the image to headquarters* or a center with the plate data to verify that the vehicles have not been stolen or the owner is a crime offender. 4. *Documents scan.* In patrolling or border security operations, public safety officers can verify a document like a driving license in a more efficient way. Documents scan is also useful in border security operations where people, who cross the borders, may have documents in bad condition or falsified. 5. *Database checks.* This application area includes all the activities where public safety officers must retrieve data from the headquarters to support their work. 6. *Location/Tracking for Automatic Vehicle/Officer Location.* The public safety officer has a GNSS position localizer on the handheld terminal or the vehicular terminal. The positions are sent periodically to the headquarters so that the command centre can organized and execute the operations in a more efficient way. 7. *Transmission of Building/Floor plans and Chemical data.* In case of an emergency crisis or a natural disaster, Public Safety responders may have the need to access the layout of the buildings where people may be trapped or where dangerous chemicals are kept. Chemical data, building or floor plans can be requested to the headquarters and transmitted to the public safety responders. 8. *Monitoring of Public Safety officers.* Vital signs of Public Safety officers could be monitored in real-time to verify their health conditions. This is particularly important for firefighters at fire incidents and officers involved in search and rescue operations. 9. *Remote emergency medical service.* Through transmission of video and data, medical personnel may intervene or support the team in the field for an emergency patient. 10. *Sensor networks.* Sensors networks could be deployed in a specific area and transmit images (thermal) or data to the Public Safety responders operating in the area or to the command centre at the headquarters.
Possible benefits identified in report	Not applicable
Can the benefits be realised using commercial networks	PSS requirements capture routine operations, emergency crisis, major planned events, natural disasters and search and rescue – all of which require ubiquitous communications, and the ability to concentrate capacity in incident areas, which commercial networks do not provide. Lack of network

capacity is mentioned as a key problem during emergency incidents.

The document also cites the following reasons (these relate to why PSS requires re-configurable radio systems in addition to voice/data wide area networks to overcome the limitations of existing public safety communications systems in large incident situations, but some are also valid reasons against use of commercial networks):

The locations where emergency and disaster relief operations occur are unpredictable and the availability of communications facilities is not guaranteed in the incident area.

Even if wireless communications infrastructure exists in the incident area, the first responders may not have the appropriate terminals.

Public safety responders need wide area coverage, e.g., in the event of natural disasters like earthquakes or flooding, where a large area may be affected. Support for wide area coverage and higher transmission output is a conflicting requirement with low power consumption and extended battery life for handheld terminals.

Public safety organizations must operate in uncertain conditions and difficult environments both from a physical as well as from a radio propagation point of view, due to the presence of radio interferences or obstacles (man-made or natural).

Public safety responders have special requirements regarding reliability, responsiveness and security of their communication systems.

Possible scenarios identified

Refers to four scenarios contained in SAFECOM document from US communications programme of the Department of Homeland Security – Public safety statement on requirements for communications and interoperability:

1. Emergency Medical Services (EMS): Routine Patient Services and Car Crash Scenario. A voice conference call is set up between the ambulance and the hospital, while the vehicle's geo-location as well as the vital measurements and treatments of the patient are recorded and transmitted wirelessly.

2. A residential fire scenario: as in the first scenario, geo-location and vital measurements of multiple victims, first responders and vehicles is wirelessly transmitted; additionally, GIS information on building plans, fire hydrant locations, etc is accessible.

3. A traffic stop scenario: the situation message, the police vehicle's ID and geo-location are transmitted; the suspect car's license plate is read and sent to dispatch, where it's queried against several law enforcement databases, and the results are sent back to the police officer; a video stream of the action is available on demand to dispatch; the officer decides to request backup, the nearest vehicle is located by the backup system and the request is forwarded; when the suspect is arrested, information about the crime, the police officer, etc is loaded onto the RFID embedded in the handcuffs; after the arrest, biometric data from the suspect is sent to dispatch, queried against databases, and the answers are sent back; the officer communicates with the tow truck company; evidence and other information is transmitted to the sheriff's office; the case report is sent electronically to the officer's supervisor.

4. An explosion scenario: here the communications analysis is from the incident commander's point-of-view, while all the first-responder requirements described in the previous scenarios are still considered valid; the various (diverse) units that arrive on the scene form an ad-hoc overlay network and provide information about their location and status; GIS information is available on demand to the commanders; distributed sensors

	on the first-responders relay their readings to central command; a secondary perimeter is set up, and a reverse 911 call is sent to fixed and mobile users (civilian) inside the perimeter to evacuate or find shelter; at the same time, the Department of Transportation is notified to divert traffic from the area; critical infrastructure (gas, electricity) is shut down; the commander decides the explosion is not an accident, and directs field agents to treat it as a crime scene, while calling in detectives to investigate; the number of casualties is assessed too high for local hospitals, so coordination with other medical centers is necessary; at the end of the incident all-but-one of each type of team is released.
Any other relevant information from the report	The two ETSI TR refer to various other documents upon which requirements have been based: ETSI TS 102 181 (**EMTEL**) requirements for communication between authorities/organisations during emergencies TS70.001 – Service specification group services and applications Project MESA: Service specification group statement of requirements SAFECOM, Department of Homeland Security – public safety statement of requirements for communications and interoperability ETSI TR 102 182 – requirements for communications from authorities during emergencies Project OASIS – European disaster and emergency management system WIDENS (wireless deployable network system) – supported by EC IST Framework programme 6. Builds upon MESA statement of requirements.

C.8 Results from the expert group on police cooperation

Item	Description
Document title	Draft Council Recommendation on improving radio communication between operational units in border areas
Author	Council of the European Union
Publication date	20 May 2009
Abstract	The paper discusses recommendations on improving radio communications in border areas and more effective cross-border cooperation including interoperable radio communication systems in border areas and between operational services from different Member States. Difficulties in the use of radio communications in border areas are caused mainly by the lack of interoperable interfaces between current systems, which prohibit effective roaming; needs to be addressed. Therefore, significant improvement in voice and low-speed data interoperable capability could be achieved by interconnecting systems where possible. In the long term, law-enforcement and public-safety radio communication systems will need to support and to be able to exchange high-speed mobile data information. However, current law enforcement, public-safety and public networks may not be able to support this. The document recommends that: • Intersystem interfaces be developed and encourages the European Commission to provide funding for them • CEPT / ECC be tasked to study the possibility of obtaining sufficient additional frequency allocation below 1GHz for the development of future law-enforcement and public-safety voice and high-speed data networks; • European standardisation bodies be invited to start producing a European standard satisfying law-enforcement and public-safety services' operational requirements regarding high-speed data communication and roaming functionality in the medium term • In the long term, after the life cycle of current TETRA and TETRAPOL systems has ended, voice and all data functionalities (high and low speed) be integrated in a tightly integrated solution that provides a migration path including interoperability from existing law enforcement and public-safety systems to the new solution • Member States allocate additional frequencies at national level in a coordinated timeframe in cooperation with CEPT • Member States adopt any appropriate local measures in the short and medium term to improve cross-border cooperation.

Requirements or needs identified in report	• A common network standard or standards operating in harmonised frequencies to facilitate fully interoperable communications;
	• Taking into account investments in existing systems, significant improvement in interoperability in border areas can be achieved as follows:
	  ▪ in the short term, countries with common borders can work together to improve communications with local solutions;
	  ▪ in the medium term, current law-enforcement and public-safety mobile communications systems need to be connected to provide a more effective solution for cross-border communications and facilitate roaming;
	  ▪ in the longer term, a solution for mobile broadband data is required.

	A common standard operating in a harmonised frequency band will make this possible • existing frequency allocations for law-enforcement and public-safety networks may not be sufficient for the development of dedicated infrastructures satisfying operational requirements for high-speed data communication; • there may be opportunities below 1 GHz, to acquire new harmonised spectrum; • In discussing possible additional frequencies, account should be taken of the investments in current networks and also of the increased overall demand for radio spectrum and the fact that it is a scarce resource.
Possible applications identified in report	Not applicable
Possible benefits identified in report	Improve cross border cooperation between operational services
Can the benefits be realised using commercial networks	This was not discussed in length but did mention that current public networks may not be able to support and enable high-speed mobile data information exchange.
Possible scenarios identified	Not applicable
Any other relevant information from the report	Not applicable

C.9 Project MESA

Item	*Description*
Document title	Project MESA; Service Specification Group – Services and Applications; Statement of Requirements (SoR)
Author	MESA
Version	MESA TS 70.001 V3.3.1 (March 2008)
Abstract	Public Safety Partnership Project (PSPP) produced this Technical Specification (TS) during the course of Project MESA (Mobility for Emergency and Safety Applications). It describes the services and applications, which a future advanced wireless telecommunications system should be able to support in order to realize the most effective operational environment for the Sector. Emphasis has been placed on those applications, which current applied technology cannot carry out to the full, but which have been identified by the users and their agencies to be key requirements and capabilities, providing a profile of the common operational and functional requirements of next-generation aeronautical and terrestrial-based, mobile and fixed systems. The document reflects the requirements of public service and public safety agencies to have priority service and system restoration, extremely reliable service, and ubiquitous coverage within a user's defined service area. The document is intended to be a unique source of information in the aim of understanding the often very difficult and dangerous working environments, which the user community is facing, such that industry can provide the most effective and accurate technical solutions. It establishes an understanding that the advanced needs of the PPDR Sector should be based on a high-mobility, broadband wireless network or related capabilities that allow for the provision of dynamic bandwidth, offering of self healing characteristics and secure network access. Project MESA SoR also reflects the vision of a mobile broadband-shared network that can be simultaneously accessed by multiple users, with multiple applications in a specified geographical area fully independent from availability of public networks and supply of electrical power.
Requirements or needs identified in report	These include but not limited to: • Improvements in spectrum efficiencies. • Incorporation of frequency neutrality and/or agility. • Life-cycle procurements. • Security requirements. • Economical and ergonomically friendly design. • Digital migration in place. • Consistency with existing standards. • Compatibility with multiple international standards. • Two-way communication. • Multiple levels of security. • Multiple levels of availability of service. • End-to-end network integrity. • High-speed, error-free service. • System and network access. • Compliance with the need of the participating nations.

Possible applications identified in report

Wireless data requirements include such uses as mobile computing terminal applications, geographic position and automatic location data, emergency signals, transmission of reports, electronic messaging, home incarceration monitoring, and perimeter and vehicle alarms.

Multimedia systems employing both photographic and fingerprint transmission in conjunction with report automation.

Remotely controlled radio devices are routinely used for turning on and off surveillance microphones, activating kill switches in vehicles, arming and disarming alarm and monitoring systems, and aiming video cameras. This control can be a one-time data burst or can be a continuous data stream.

Unattended electronic sensors/monitors, for border surveillance, parolee monitoring and other remote-sensing technologies.

Global location services for vehicle and personnel tracking, security, and inventory control

Institutional monitoring such as remote electronic monitoring devise for house arrests and *environmental monitoring* such as real time monitoring of public resources, such as water flow and quality

Telemetry systems may also provide both an inventory of remaining infrastructure and the control of moving fixed assets, such as fire trucks, snow ploughs, police cars, ambulances, and many other types of equipment used in emergency response, including changeable signs and traveller information radio systems, as well as weather and road condition data transfer from remote sites.

Personal location device to track the location of an assigned individual for general management purposes and in the event of an emergency.

Transmission of forms and reports to central sites from mobile and remote locations. This capability will be used to transmit long data streams to and from central locations and the field in just a few seconds.

Video capabilities (real-time and close to real-time) including traffic surveillance, disaster relief, emergency medical services video, point-to-point and broadcast, transmission of videos from field operatives to command and control as well as the other way.

Robotic devices for hazardous material and explosive disposal, which require full-motion video that can be transmitted over a short distance (up to 1000 meters), from the control device to the robotic devices. This application may require the use of equipment and technologies developed for explosive atmospheric conditions and/or that will not initiate the explosive device being rendered safe.

Lifeguard/water safety personnel often require the support of robotic devices in underwater search and rescue operations, especially when persons, planes, and ships are submerged in water depths greater than 200 feet.

Possible benefits identified in report

Not applicable

Can the benefits be realised using commercial networks

The Project MESA SoR reflects the need for a network that is fully independent from availability of public networks and supply of electrical power that satisfies the following requirements:

- Transparent and seamless wide-area network applications.
- Include multiple levels of security and data encryption schemes that may be a function of the network or a function of the application or communication device to ensure end-to-end data protection.
- Offer robust operational management and control systems capabilities.

	• Reflect the requirements of MESA users to have priority operational services and priority system restoration. • An extremely reliable service model and ubiquitous coverage within a user's defined service area.
Possible scenarios identified	Describes a number of details scenarios in pages 40-43 of the document: • Law enforcement – Court house murder • Law enforcement – U.S. State and Urban Police Response to Earthquake Damage.
Any other relevant information from the report	The document includes a detailed statement of specific/unique requirements for the different government and emergency services organisations, giving examples of application needs - some of which are typically not supported in commercial terminals, which supports the argument about the requirement for dedicated networks (and associated terminals).

C.10 Toia Report on Digital Dividend

Item	*Description*
Document title	Extract: Toia Report on Digital Dividend/2008-09-26 - Text adopted
Author	Rapporteur - Patrizia Toia
Version	24 September 2008
Abstract	European Parliament resolution of 24 September 2008 on reaping the full benefits of the digital dividend in Europe: a common approach to the use of the spectrum released by the digital switchover (2008/2099(INI)).
Requirements or needs identified in report	Confirms the societal value of public safety services and the need to include support for their operational requirements in the spectrum arrangements arising from the reorganisation of the UHF band resulting from the switch-off of analogue services. Considers that the part of the harmonised spectrum at Community level dedicated to emergency services should be capable of providing access to future broadband technologies for the retrieval and transmission of information needed for the protection of human life through a more efficient response on the part of the emergency services.
Possible applications identified in report	Not applicable
Possible benefits identified in report	Societal value
Can the benefits be realised using commercial networks	Not applicable
Possible scenarios identified	Not applicable
Any other relevant information from the report	• Recognises that the increased spectrum efficiency of digital terrestrial television should allow for around 100 MHz of digital dividend to be re-allocated to mobile broadband and other services (such as public safety services, radio-frequency identification and road safety applications) whilst ensuring that broadcasting services can continue to flourish • Acknowledges that coordination at EU level would encourage development, boost the digital economy and allow all citizens affordable and equal access to the information society • Calls on the Members States, whilst fully respecting their sovereignty in this regard, to analyse the impact of the digital switchover on the spectrum used in the past for military purposes, and, if appropriate, to reallocate part of that specific digital dividend to new civilian applications • Emphasises the contribution that the digital dividend can make to the provision of enhanced interoperable social services, such as e-government, e-health, e-vocational training and e-education to citizens, in particular those living in less favoured or isolated areas, such as rural and less developed areas and islands • Encourages Member States to consider, in the context of allocating white space, the need for unlicensed open access to spectrum for non-commercial and educational service providers and local communities with a public service mission • Emphasises that Member States may consider technology-neutral auctions for the purpose of allocating frequencies that are liberated because of the digital dividend and making those frequencies tradable; considers, however, that this procedure should be in full compliance with ITU radio regulations, national frequency planning and national policy

objectives in order to avoid harmful interference between services provided; warns of spectrum fragmentation which leads to the sub optimal use of scarce resources; calls on the Commission to ensure that a future coordinated spectrum plan will not create new barriers to future innovation

- In order to achieve a more efficient use of spectrum and to facilitate the emergence of innovative and successful national, cross-border and pan-European services, supports a coordinated approach at Community level, based on different clusters of the UHF spectrum for uni-directional and bi-directional services, taking into account the potential for harmful interference arising from the co-existence of different types of networks in the same band, the outcomes of the ITU Geneva RRC 06 and WRC 07 and the existing authorisations.

C.11 WIK Study

Item	*Description*
Document title	Safety first – Reinvesting the digital dividend in safeguarding citizens (WIK_white paper_full_final)
Author	WIK Consult
Version	Bad Honnef, 5 May 2008
Abstract	Report produced by WIK and Aegis Systems with input from selected public safety organisations, regulators and TETRA vendors. The report recommends that public safety users require dedicated networks because of the unique technical and operational requirements associated with providing mission critical communications, which are extensive coverage (e.g. excess of 99% geographic coverage), capacity (e.g. public safety networks have to be capable of nationwide call set up with latencies of less than 0.5 seconds), reliability (99.999%) and redundancy (e.g. 1+1 or 1+n redundancy, power supply redundancy is essential, etc.). The report goes on to suggest that sub-1 GHz spectrum is required for public safety networks in order to meet their technical and operational requirements. Suggests that there is a 'moral obligation' to assign spectrum to public safety since PSS services are indispensable. Since emergency response ranges from routine to extreme, might be possible to use some novel spectrum allocation methods e.g. pre-emptive spectrum assignment, to provide a 'core' band for PSS use and additional spectrum that can be used when required – but when not required, can be used for commercial systems. Possible for commercial users to share a PSS networks, but not vice versa (other than for non-mission critical applications) due to the cost, complexity and risks associated with upgrading a commercial network to achieve the ubiquitous coverage, reliability, redundancy and capacity that PSS networks require.
Requirements or needs identified in report	Mission critical applications have unique technical and operational requirements, which are not met by commercial networks, since the latter are optimised for financial return on investment. They require dedicated spectrum and control of their own networks because of the flexibility it affords and ability to meet their own specific requirements of security, robustness, immediacy of communications. Public safety users have different requirements with respect to user terminals compared to commercial users – typically public safety terminals need to be designed for use and support for 5-6 years (as opposed to 1-2 for commercial handsets), due to budgetary considerations, training requirements and reliability. All handsets must have the same user interface and all operate in the same way. Mission critical refers to information that must be transmitted because it is crucial to the successful resolution of the emergency operation, requiring: coverage everywhere, instant access to resources, fixed and deployable networks, ability to support mixed traffic, flexibility, security, resilience, and additional network operation e.g. peer to peer/DMO (terminal to terminal communications without connection via the infrastructure).
Possible applications identified in report	• Remote checking of information such as passports and biometric details • Sending detailed photographic images of children lost or people wanted to officers in the field, so they can act on requests immediately • Providing access to Fire Service 'Gazetteer' which is document containing information on which hazardous materials might be kept in particular premises

	• Transmission of live video information from an incident to central command and control, so they have access to the same images as those in the field (and thereby improve decision making) • Relaying ad-hoc video and surveillance camera real time information to patrol cars responding to incidents • Sending of full data on a patients condition from the ambulance to the hospital • Video streaming (e.g. CCTV on scene) • Online access to contacts database • Email and Internet • Ability to move the back office into the field • Real time evidence collection • Licence plate recognition • Traffic light sensors.
Possible benefits identified in report	• Improved establishment of command and control – public safety agencies are increasingly moving to field command (although command and control rooms will still remain) • Dissemination of timely information (e.g. medical records, details of dangerous substances, maps, pictures and videos) • More timely response e.g. able to act on requests immediately • Better decision making – those in command and control and in the field have access to the same information at the same time • Interoperability - possibly public safety interoperability can be achieved using DMO only • Better mobilisation of teams and people • More frequent updates on emergency situational reports • Better preparation (e.g. informing hospitals of likely numbers of casualties and the sorts of treatment required) • Better incident provision from the incident area • Voice is still the central means of command and control for public safety, but they are increasingly using data applications • Better 'location' information e.g. location of fire fighters and people within a building, real time viewing of building plans, better ability for incident commander to take decisions such as building evacuation (e.g. if building is about to collapse) • Real time structural awareness.
Can the benefits be realised using commercial networks	The two main problems with using commercial networks for safety critical applications are availability and performance. Cost to upgrade a commercial network to provide the operational requirements public safety need in terms of resilience, redundancy, capacity and coverage needs to be borne by public sector since it is not commercially viable. Problems of public safety users relying on a commercial network operator include: risk of commercial operator becoming insolvent, risk of commercial operator imposing unexpected price increases, meeting specific information security requirements etc. Having a dedicated network allows public safety users to have control over QoS, SLAs etc. (possible that operation and maintenance could be outsourced to a private company). Current commercial networks do not provide 0.5 second call set up, nor

	99.999% reliability, nor power supply redundancy.
Possible scenarios identified	The report refers to a case study of the Buncefield fire – the explosion of the UK's fifth largest fuel distribution depot in Hertfordshire. Explosion took place on a Sunday when public networks were not being extensively used and in area of low population density, and so public safety users were able to make use of GSM/GPRS on that occasion – no need to ask for priority access to the network on that occasion. Problems in obtaining good voice clarity across all of the incident area were experienced.
Any other relevant information from the report	Annex D of the report summarises its main arguments and counter arguments.

C.12 PSC Europe response to the digital dividend

Item	Description
Document title	PSC Europe response to the digital dividend hearing
Author	PSC Europe
Publication date	11 June 2008
Abstract	It is a summary of the response provided by PSC Europe.
Requirements or needs identified in report	ETSI has been developing a system reference document. That document, in its current form, concludes that 2 times 15 MHz would be a reasonable amount of spectrum for the new services. However, there are other applications that would require more spectrum. This figure has been developed by ETSI and communicated to the CEPT.
Possible applications identified in report	Not applicable
Possible benefits identified in report	Value should be considered as judged by the end user and the value to citizens and society, as the value for society is not merely economic but includes important social benefits, and will place a high value on the prevention of accidents and/or the rapid handling of incidents that do occur. Generated value is something beyond just the economic value. Total value cannot always be quantified in economic units. Economies of scale – with European PS Agencies, we have a market size of only a few million devices. Harmonization will therefore have huge impact on prices and therefore the industry and the tax payers Cross-border cooperation – as demanded under the Schengen Agreement. As many EU Member States have common borders with several other Member States and therefore many operations or emergency interventions in common, cross-border operation is a vital component of emergency service provision now and in the future.
Can the benefits be realised using commercial networks	No, as public safety: • Needs an infrastructure that is independent from the common commercial networks • Needs an optimised design to carry out group calls (voice, video and data multicasting) • Needs quick connections • Needs independence • In practice, the commercial operators do not accept to grant pre-emptive priorities to the PS agencies.
Possible scenarios identified	Not applicable
Any other relevant information from the report	The combination of: • operational cross-border requirements, • economic benefit to governments and the funding taxpayers via volume effect on unit cost and • facilitation of industry business case in this limited volume but high-tech market, form a package with overriding justification that allows the EC to proceed with e.g. specific mandate or other appropriate measures. Both for operational cross-border cooperation reasons and for economic reasons that help both the investing taxpayers and the industry to build reasonable business case, harmonised frequency arrangements for the PS Services would permit the emergency agencies to deploy data services in an economically feasible way.

C.13 EULER End User Requirement

Item	*Description*
Document title	EULER End User Requirements Deliverable 2.3-1
Author	Dimitrios Symeonidis
Version	V0.8 (September 2009)
Abstract	The objective of EULER (European Software Defined radio for wireless in joint security operations) is to answer the operational question of how a major civil international crisis can be rapidly resolved jointly given the various types of radios used by different national emergency services. The end user involvement package is organised around a framework for usage scenarios and requirements and systematic methodology for the harmonisation of needs at the European level. The document summarises the End-user involvement framework definition and lists past projects, where the conclusions are summarised and the methodology for requirements classification, requirements harmonisation and matching of the EULER scope are presented. EULER intends to provide added value in comparison to the past projects by providing a harmonised, classified and prioritised collection of requirements from past projects, which includes: • SaBeCom analysis • Wintsec analysis • Safecom analysis • MESA analysis • Chorist analysis. The scenario presented is that of a Tsunami describing first hours operations capabilities, communication flows priority, organisation network composition and communication link requirements.

Requirements or needs identified in report	• Interaction between users
	  ▪ Real-time exchange of information between several authorized emergency personal
	• Applications and services
	  ▪ Data to be transported
	  ▪ Network congestion management requirement
	• Interoperability, adaptability and flexibility
	• Reliability and information assurance
	• Robustness
	• Sustainability
	• Environmental safety
	• Security
	  ▪ Authentication
	  ▪ Access control
	  ▪ Confidentiality
	  ▪ Integrity
	  ▪ Availability.

Possible applications identified in report	• Speech – speech quality, point to point duplex communications, direct mode, ambient listening

- Short messages – paging services, status monitoring, location services
  - able to identify the requested authorized emergency agent(s), and then deploy the appropriate technology to contact them
  - Status monitoring may include breathing air tank levels, accountability monitoring, distress buttons and vital signs monitoring.
  - Location services provide real-time information regarding the position of personnel or vehicles to a command point. The network must support three-dimensional geo-location information transmission.
- Access to databases
  - Variety of data applications including email (text messages), imaging, digital mapping / geographical information services, location services, video (real-time), video (slow-scan), remote database access, database replication, personnel monitoring
- File transfers
  - Supports bulk file transfer
- Images
  - Support images and scene photo transfers
- Video
  - Incident area network video communication service supporting full-duplex, peer-to-peer, mission-critical video and allow for late entry.
  - Near real-time video streaming.
- Multimedia conferencing
  - Incident area network highly interactive service transaction data
  - The network must support a signalling protocol that is capable of providing session control for both voice and video applications, as well as instant messaging
- Web
  - The network must support World Wide Web browser-based applications
- Email
  - Especially useful in noisy environments, or for difficult-to understand data, such as a license plate or a passport number
- Telemetry
  - Environmental telemetry e.g. waters flow and quality, providing instant information and a timely warning of severe change in conditions and early warnings.
  - Transmission of user and patient monitoring telemetry e.g. from inside the ambulance to the receiving hospital's emergency room
  - Transmission of geographical location data (Galileo) e.g. useful for tracking the location of field officers
  - Network of sensors, which are embedded into the field officer's terminals, such as temperature or dangerous gas sensors.
- Instant messaging - peer-to-peer
- Paging including voice paging to one or more participants
- Quality of service
- Pre-emption

	▪ Within all speech services there may exist a requirement for prioritisation and pre-emption of calls. ▪ This service shall allow an authorized user to intervene in an ongoing authority-to-authority call. • Priorities • Two-way communications • Multi-point to multi-point communications ▪ Belonging to groups ▪ Dynamic group creation/ deletion/ modification ▪ Dynamic Group Number Assignment ▪ Group members ▪ Talk group ▪ Group communication interoperability ▪ Group contain • Dynamic updating of data fields ▪ support two-way operation to accommodate the implementation of "smart" systems that automatically update data fields being transmitted from authorized and authenticated user devices
Possible benefits identified in report	Future public safety communications will benefit from the use of massive data transmissions to improve the efficiency of disaster recovery operations. An efficient radio spectrum management optimises the spectrum sharing between the different public safety organizations according to their respective and evolving needs. Sophisticated spectrum management algorithms, which can adapt to changes in the radio environment, can help using radio spectrum more efficiently. EULER proposes a system in which each subset is able to dynamically change the operating frequency band and bandwidth, is able to reallocate its use of radio spectrum bands, is aware of the existence of other wireless communications systems transmitting in the incident area, has sensing capabilities, and is able to inform the other subsets of its spectrum usage in its coverage. All of this contributes to provide a wireless system that is more reliable and resistant to interferences.
Can the benefits be realised using commercial networks	Not applicable
Possible scenarios identified	First Hours of International, state and local Public Safety Operations in response to a Tsunami. • Tsunami monitoring systems are positioned at strategic locations. • First hours: until local and mobile command centres are activated and connected to country's Emergency Operations Centres (EOC), which can last some days due to inundation and receding water. • Ground based wire and fibre communications to the outside world are temporarily disrupted. • First link establishment of V-UHF radio communications (air-to-ship, air-to-ground, air-to-air, ground-to-ground (voice, video, data)). • Information flow – search and rescue first operators, situation awareness video supported.
Any other relevant information from the report	Not applicable

C.14 TETRA Association Spectrum Group study

Item	*Description*
Document title	What data services will the future bring – from a TETRA perspective
Author	TETRA Association Spectrum Group
Version	Indicated as "draft" (November 2009)
Abstract	The document discusses the killer application for TETRA being mission critical group calls, and then discusses the feasibility of carrying missing critical group calls, and other public safety data applications, over LTE networks. The conclusion is that LTE is unlikely to be feasible to replace private networks in the short term, because (i) the LTE standard would need to be modified to support true multicasting group call capability (currently group calls via LTE are proposed to be delivered through a set of unicast IP streams, which means each member of the call receives his/her own copy of the voice stream. This can lead to quality problems (due to echo) and capacity issues due to the cell load created through transmission of multiple copies of the same IP stream), and (ii) LTE would also need to be modified to support direct mode (i.e. terminal to terminal calls that do not go via the LTE network) (iii) Emergency Services require a range of terminals (rugged, environmentally sensitive, covert) which commercial vendors do not provide, and so this would require special development (refers to the case where the GSM standard was modified for the railways, however the modifications required to GSM to create GSM-R were sufficiently large that whilst GSM is supported by many vendors, GSM-R is limited to very few, and prices for GSM-R are even higher than for TETRA).
Requirements or needs identified in report	1. Group calls where all users on the call, without substantial network overheads and/or cell capacity issues, receive the same transmission simultaneously. 2. Nationwide coverage, including 'difficult' geographies and indoors 3. Layered priorities/pre-emption (i.e. enabling emergency services to have priority access over commercial traffic, and enabling higher ranks of officer pre-emptive access over lower-ranked officers where required) 4. Queued calls, and the ability to configure queuing conditions 5. User prioritisation (e.g. calls cant go ahead until nominated callers join the call) 6. Encryption of different levels (over the air and end to end)
Possible applications identified in report	Mainly refers to existing functionality e.g.: • Direct mode – radio to radio communications outside the infrastructure • Individual calls using half duplex PTT (push to talk) mode • Status messages, which are used as fast efficient messages in addition to the more standard Short Data/Short Message text services • Multiple levels of encryption, both end to end and air interface. • Dynamic group management – providing groups over the air, temporarily or permanently • Broadcast calls, both with static and dynamic user base • Group scanning with talkback functions • Paging from one service into another, and simultaneous services Also refers to the need for dispatcher terminals
Possible benefits identified	Bespoke, privately run networks for the emergency services can be developed to give the required level of terminal ruggedness, environmental

in report	protection, audio levels, battery life, accessories, and resilience, coverage, availability and security at the network level. These factors make it difficult to reuse networks and terminals taken from the consumer market and to obtain the economies of scale that the consumer market brings.
Can the benefits be realised using commercial networks	Primary reason given is that there is currently no standardisation activity going on at present to adapt LTE to meet emergency services requirements, and if there was to be activity, this would take some time to complete. Also refers to the additional cost to modify commercial networks to deliver emergency services functionality [which *assumes* this cost is higher than the cost to deploy a new, bespoke private network for the emergency services]. Reasons listed in the document: 1. A public network provider will want to invest in coverage where the population, and so where the revenue generation is, with little incentive to invest in areas of low-density population. The cost of network expansion may have to be borne by the public safety community alone. 2. The public safety community will – through a tender process – have to select one of the providers, and fund the expansion of that system to provide the required degree of coverage. That in turn will distort competition and may be the basis for litigation. 3. Bespoke mission critical networks are usually designed with higher degrees of resilience, including multiple levels of fallback with emergency power supplies, alternate link routing and local call switching even within a single base station. These facilities are not provided to the same degree on a public network. 4. In conditions of local or national emergency, public networks typically become overloaded as their normal customer base naturally wants to communicate at the same time. It can be difficult to guarantee the public safety community access in these conditions. 5. In high threat conditions, e.g. terrorist threats or in times of war, public networks can be deliberately switched off to prevent terrorist communications for coordination or for remote activation of attacks.
Possible scenarios identified	Not applicable
Any other relevant information from the report	Refers to WiMAX being "easier to deploy for a privately owned mission critical user base", due to network scalability (more flexible bandwidth choices and no need for harmonised paired bands) and less spectrum being needed (i.e. because it uses unpaired spectrum).

C.15 Wireless broadband study by Public Safety Spectrum Trust Chairman

Item	*Description*
Document title	Public Safety Radio Communications; Wireless Broadband is not an alternative to LMR mission critical voice systems
Author	Chief Harlin R. McEwen Chairman, Communications & Technology Committee International Association of Chiefs of Police
Version	Draft (12 October 2009)
Abstract	The paper discusses using wireless broadband for data sharing purposes and the danger of assuming that wireless broadband will offer an alternative to traditional LMR (land mobile radio) mission critical public safety voice systems.
Requirements or needs identified in report	Before LMR systems could be supplanted, broadband services would first need to be deployed to the level that provides the same extensive coverage that mission critical voice systems provide, including in-building coverage in many instances. Because coverage area decreases as data rate increases, covering the same area at the same level of reliability with broadband services will require even more sites than the number used today for voice. If LTE developers were to eventually develop standards for mission critical broadband voice, the public safety community would need to be involved in the equipment development and would need to see it tested and work in the actual public safety environment on a trial basis before they would be convinced it would be reliable enough to use as an alternative to current LMR narrowband voice systems. System operators and users then would need time to procure and deploy appropriate equipment and devices. The reality of broadband coverage build-out, standards and equipment development, testing in the public safety environment, and follow-on procurement means it would likely be 10 to 15 years or more before most public safety entities would be in a position to seriously consider substituting broadband voice for today's LMR mission critical voice solutions. The goal is that a Shared Wireless Broadband Network would give public safety: • Broadband data services (such as text messaging, photos, diagrams, and streaming video) not currently available in most existing public safety land mobile systems • A hardened public safety network with infrastructure built to withstand local natural hazards (tornadoes, hurricanes, earthquakes, floods, etc) that would include strengthened towers and backup power with fuel supplies to withstand long term outages of public power sources • Nationwide roaming and interoperability for local, state, and federal public safety agencies (police, fire and EMS) and other emergency services such as transportation, health care, and utilities • Access to the Public Switched Telephone Network (PSTN) similar to current commercial cellular services • Push-to-talk, one to one and one to many radio capability that would provide a back-up to (but not replace) traditional public safety land mobile mission critical voice systems • Access to satellite services to provide reliable nationwide communications where terrestrial services either do not exist or are temporarily out of service

Possible applications identified in report	Not applicable
Possible benefits identified in report	Not applicable
Can the benefits be realised using commercial networks	The fact is there are currently no standards being developed or even planned to provide such a service. The public safety community has endorsed Long Term Evolution (LTE) as the preferred broadband standard for public safety data products and the latest version of that standard (V8) is strictly a data standard that does not include voice capability. The next version (V9) due in late 2010 or early 2011 is planned to include VoIP capabilities but that version will not have any capability to provide one-to-many communications and talk around (unit to unit) voice necessary for mission critical public safety communications. LTE is a commercial standard that does not recognize the mission critical voice communications needs of public safety. That means that if a first responder cannot reach the network (i.e. a police officer in trouble in a building and his radio unit cannot reach a repeater) or there is no network then the unit is useless. That means no communications and a possible life-threatening outcome for the police officer.
Possible scenarios identified	Not applicable
Any other relevant information from the report	On September 11, 1996, PSWAC released a report setting forth the current and future spectrum needs of public safety. Among the findings of the PSWAC report was that 97.5 MHz of new public safety spectrum was needed by 2010, including 25 MHz within five years (i.e., by 2001). In November 2007, the FCC issued the Public Safety Spectrum Trust (PSST) a nationwide Public Safety Broadband License (PSBL) for 12 MHz of spectrum in the upper 700 MHz band (10 MHz of broadband spectrum and 2 MHz of guard band spectrum). The FCC Second Report and Order also directed that the Public Safety Broadband Licensee would negotiate with the commercial operator(s) to set appropriate rules and technical standards to ensure maximum interoperability, reliability, redundancy, competition, innovation and choices for public safety customers using this spectrum. The network would include a satellite-based element to ensure continuous operations when terrestrial/ground-based equipment is knocked out or in areas where there is no terrestrial service. From January 24, 2008 through March 18, 2008, the FCC conducted Auction 73. Almost all of the 700 MHz spectrum, with the exception of the D Block, was sold with the proceeds reaching almost $20 billion. Although there has been a lot of speculation as to why the D Block was not sold, most in public safety believe it was because the industry had its eye on the unencumbered spectrum that did not include any public safety requirements. On March 20, 2008, the FCC issued an order delaying further D Block action until further notice. One issue raised in the Hearing by some Members of Congress were concerns about how much it will cost to build a nationwide public safety broadband network and how it will be funded. Estimates of $10 billion to $40 billion have been floated without any real supporting documentation. There is general agreement that if public safety and the private sector can leverage existing private and public infrastructure the cost can be significantly reduced. One commercial company has said that if existing commercial infrastructure was used their cost estimate would be about $13 billion. Eventual total cost of the network will also be influenced by local build-out decisions. Some commercial companies who have indicated their interest and support for a nationwide public/private network have said it is feasible to fund a nationwide public/private network through the public/private partnerships envisioned. This appears to be the only current option unless Congress were to fund the build out.

C.16 Hansard Report

Item	Description
Document title	Lords Hansard text (debate on the second reading of the Digital Economy Bill) – document reference XEMS1002 – Lords Hansard text
Author	www.parliament.uk (transcript of debate)
Publication date	2 December 2009
Abstract	During the second reading of the Digital Economy Bill, Lord Lucas raised a proposed amendment relating to reserving spectrum for the Emergency Services, suggesting that 15 MHz of spectrum within the band 'allocated by the EU' (referring to spectrum below 1 GHz, and digital dividend spectrum specifically, which is discussed in Council recommendation 10141/09). The amendment asks Ofcom to consider reserving spectrum for Emergency Services use.
Requirements or needs identified in report	"We will want our emergency services to have a really modern and effective system that is equivalent to the iPhone".
Possible applications identified in report	Not applicable
Possible benefits identified in report	1. Many of the companies who produce TETRA equipment are based in the UK and therefore the UK export market has benefited from the harmonised development of the TETRA standard 2. Vital for national security reasons
Can the benefits be realised using commercial networks	Not applicable
Possible scenarios identified	Not applicable
Any other relevant information from the report	Not applicable

C.17 Safecom document

Item	Description
Document title	Department of Homeland Security, Public Safety Statement of Requirements for Communications and Interoperability (including annex on SAFECOM summit)
Author	US Department of Homeland Security Office for Interoperability and Compatibility (OIC)
Publication date	Volume II Version 1.2 (August 2008)
Abstract	Document contains the assembled requirements for system of interoperable public safety communications across all local and national 'first responder' emergency services communications systems. Describes the public safety environment and the types of applications that might be expected to be used in the future. Two volumes exist – volume 1 is a qualitative description of the types of application that might be required, and volume is quantitative (i.e. in terms of specific network performance requirements and metrics).
Requirements or needs identified in report	Requirements include: • Different hierarchies of users and system • Different modes of communication (with/without a network) • The need for security in communications and in information • Support for command and control processes (i.e. mobilisation of teams, prioritisation of communication, decision making) • Describes a 'system of systems' incorporating all public safety communications modal requirements from wide area networks through to local networks, incident-specific networks and personal area networks (e.g. representing the set of devices that an individual public safety officer users) • Ground based and aerial pictures taken at the scene of an incident, to inform follow on action (e.g. alert hospitals to numbers and types of casualty) • Telemedicine techniques require high quality video images to enable viewing of things like patient's burns or skin/bone details • Emergency button for high-priority treatment of emergency calls • Need to establish connection with a large number of users • Ability to restrict access to information to selected individuals.
Possible applications identified in report	Includes a detailed list of different voice, messaging, data, image and video applications for each of police, fire and ambulance services, including who the communication occurs with, for what purpose and with what special constraints. Examples: • Personal area networks e.g. if a bullet-proof vest detects an impact or a fire-fighters helmet is impacted, it can originate a message to the appropriate person • Full duplex, peer to peer and mission critical voice applications • Peer to peer instant messaging • Automated database updating • Bulk file downloads/uploads • Email/Internet

	• Biometric identification techniques • Voice language translation.
Possible benefits identified in report	Diagnosis and treatment in routine health cases for remote/rural communities e.g. remote doctor's viewing of a patient.
Can the benefits be realised using commercial networks	Special constraints include: • High priority calls that need to be secured to protect privacy and maintain chain-of-command authority • Very high resolution video pictures • High priority images requiring rapid transportation between different officers • Voice communications needed to authenticate and authorise personnel to follow specific courses of action • Requirement to be able to communicate when local infrastructure may not be operational (e.g. due to a major incident).
Possible scenarios identified	Describes a number of details scenarios in pages 14-18 of the document: • EMS – routine patient services and car crash scenario • Fire – residential fire scenario • Law enforcement – traffic stop scenario • Multi service – explosion, hurricane, earthquake.
Any other relevant information from the report	The document includes a detailed statement of functional requirements for device/terminal features for police, fire and ambulance users, e.g. interfaces, storage requirements - some of which are typically not supported in commercial terminals, which supports the argument about the requirement for dedicated networks (and associated terminals).

C.18 Westminster e-Forum

Item	*Description*
Document title	Westminster eForum keynote seminar, Emergency Services and Public Safety Spectrum
Author	Westminster eForum (transcript of event)
Publication date	11 June 2009
Abstract	The document describes proceedings at the Westminster eForum keynote seminar on public safety spectrum held during June 2009.
Requirements or needs identified in report	Discusses the different functional requirements that the Emergency Services have: • Complete resilience • Pre-emption functionality • Coverage • Confidentiality • Confidence (that a connection can be made immediately) • Operation in remote and extreme conditions.
Possible applications identified in report	Possible need for a portfolio of technologies including sensing devices etc. Requirements for "all functionality in one device" Emergency button functionality important Talk groups/dispatch More data/faster data Transfer of images and pictures.
Possible benefits identified in report	Not applicable
Can the benefits be realised using commercial networks	Commercial networks not designed for resilient communications (comment from Ericsson: can resilience not be provided through emergency services having access to all five mobile networks, rather than just the one? Also, pre-emption functionality is built into 3GPP standards, it is just not fully implemented at present).
Possible scenarios identified	Not applicable
Any other relevant information from the report	Discussion about different spectrum alternatives and digital dividend spectrum. Martin Cave gave presentation on evaluating alternatives – suggesting there is a "substitution margin" between using dedicated networks and using general (commercial) networks, that should be evaluated.

C.19 PSC Europe White Paper

Item	Description
Document title	Public Safety First
Author	Jeppe Jepsen
Version	-
Abstract	This white paper discusses the need for spectrum for Public Safety Services (PSS), through the reallocation of Digital Dividend spectrum, putting forward arguments for further dedicated spectrum for mission critical communications and provides a view of the technical and usage characteristics of next generation PSS radio systems.
Requirements or needs identified in report	Need to be able to gain access to a wireless service to increase efficiency, make it easier to share information, reduce costs, while on the move, and using networks, which are secure, reliable, resilient and available across a wide geographic area regardless of population density. The need for ubiquitous coverage and spectrum between current PSS allocations (around 380MHz and 862MHz) is essential. PSS mission critical broadband communications will empower PSS organizations to move human resources into field, increasing situational awareness and facilitating command and control. Broadband communications will be used to collect and disseminate timely information such as medical records, details of dangerous substances, maps, pictures and video to the various emergency responders. Broadband communications can, for example, support Most mission critical operations depend on voice communications and currently have only two 5 MHz-wide blocks available in the harmonised spectrum. There are already problems with supporting voice traffic at major incidents and planned events. The integrated broadband data services, which are emerging for PSS organizations, require more bandwidth - ideally two paired 15 MHz-wide blocks – 15 MHz, for day to-day use and additional 15 for major incidents. PSS organisations require this dedicated spectrum and their own networks because of the flexibility it affords – the ability to meet their own specific requirements so that they can maximise the advantages provided by broadband services. Dedicated networks employing a dedicated spectrum band are widely used today because it is considered the best way to provide secure, robust and immediate communications for PSS radio systems. The spectrum released can provide access to spectrum in the amounts and within the timescales needed by PSS organizations. PSS organisations require their own spectrum to deploy whatever technologies can meet their service and application needs in an appropriately designed network to meet their operational requirements. Also important when identifying spectrum to take into account other considerations including a sufficient size market for the development of equipment by vendors and the cost of ownership of networks required to support the services and the match against future budgets such as economies of scale and potential for inter-operability.
Possible applications identified in report	These include: • remote checking of information such as passport and biometric details • the sending of detailed photographic images of children lost or people

	wanted to officers out in the field so they can act on requests immediately • providing access to the Fire services Gazetteer – a document containing information on what hazardous materials might be kept on a premises • transmission of live video information to the central command and control personnel so they can have access to the same visual information as their personnel in the field • relaying of ad-hoc video and surveillance camera real time information to patrol cars responding to incidents; or • sending of full data on a patient's condition from the ambulance to the hospital.
Possible benefits identified in report	Societal welfare – to protect life, welfare, and property.
Can the benefits be realised using commercial networks	Possibly some services offered by commercial networks are suitable for certain public safety applications. However, because the mission for PSS organisations necessitates specific requirements for robust mission critical communications in terms of access, redundancy and quality of service, these demands are not suited for commercial networks.
Possible scenarios identified	Not applicable
Any other relevant information from the report	There is a significant risk that basing the award of spectrum on price or average utilization will fail to provide PSS users with sufficient spectral resources. The utilization rate of public spectrum ranges from near constant (e.g. some radar systems and fixed point to point radio links), to mostly idle (e.g. some emergency communications spectrum). A dedicated network in a dedicated spectrum band allocated and assigned to PSS users is the best way to ensure secure, robust and immediate radio communications.

C.20 Report for BAPCO

Item	*Description*
Document title	The "Business Case" for Blue Light Spectrum
Author	David Happy
Publication date	26 August 2009
Abstract	This document was written for BAPCO to justify the request for dedicated and harmonised spectrum for blue light services. It discusses the operational need, current policy, why the current system is not working and why it is not possible to quantify a human life.
Requirements or needs identified in report	Changes in operational needs due to: • Terrorist threats (9/11, July bombings etc.) • Natural disasters (flooding in the UK) • Technical advances of mobile technology • Future events e.g. London 2012 Olympics In a serious accident, the ability for services to inter work seamlessly would improve coordination and lead to markedly improved service levels.
Possible applications identified in report	The ability of a police or fire operative to be able to transmit in real-time images of casualties to local Hospital professionals could assist in preparing the Casualty departments with information and knowledge that would otherwise not be available until the triage process started on arrival at Casualty. Missing person tracing and the ability to use technology to "fit" real-time images of suspects with data already held on them is another way in which the UK could "work smarter."
Possible benefits identified in report	Safety of life.
Can the benefits be realised using commercial networks	Possibly but there is not enough spectrum for the network to work properly.
Possible scenarios identified	Not applicable
Any other relevant information from the report	In the USA, there is a nation-wide reservation of 97MHz of spectrum following on from a review of spectrum shortage. During 9/11 there were communication problems that could have been prevented and which led to many avoidable deaths amongst fire fighters. During June 2009, The European Council adopted a Recommendation (recommendation 10141/09) setting out the importance of cross border cooperation between police forces. This follows the so-called "Pruem decision" on the stepping up of cross border cooperation, particularly in combating terrorism and cross-border crime. It is widely recognised that in an increasingly interconnected world, more crime will be of a cross border nature – and that this trend will increase. The Council make several critical recommendations as regards next generation spectrum for the use of the blue light services, including (page 4): "the Electronic Communication Committee (CEPT/ECC) be tasked to study the possibility of obtaining sufficient additional frequency allocation below 1GHz for the development of future law-enforcement and public-safety voice and high speed data networks." And: "that ministries responsible for police and justice be encouraged to contact their counterparts responsible for spectrum policy to ask for their assistance

with the above proposal, given the important role of the national frequency administrations."

The Cave Audit of 2005 at section 8.5 already makes reference to emergency spectrum, and makes clear that the Cabinet Office is responsible where there is an emergency. We have a pandemic now, swine flu, and therefore the circumstances already exist for this provision to be invoked should the blue light services so request.

Defence Research and Development Canada | Recherche et développement pour la défense Canada

DEFENCE R&D DÉFENSE

700MHz Spectrum Requirements for Canadian Public Safety Interoperable Mobile Broadband Data Communications

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Defence R&D Canada – Centre for Security Science

DRDC CSS CR 2011-01

28 February 2011

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Abstract

In response to a request for technical advice by Public Safety Canada on behalf of national public safety stakeholders, the Centre for Security Science conducted a technical assessment of the 700 MHz spectrum requirements for broadband mobile data communications for public safety and security. The impetus to this assessment relates to the Industry Canada call for consultation SMSE-018-10. The goal was to determine how much spectrum is required to meet the needs of the public safety community for mobile broadband wireless data communications within a 20-year time frame. The data demand for recurring emergency situations was modeled through an interactive process with active participation from Canadian public safety stakeholders. In addition, the capabilities of LTE technology to support the data demands were also modeled. The results show that the amount of bandwidth required to satisfy the needs of public safety is greater than 20MHz in the near-to-mid term, and likely to also exceed 20MHz in the long term, despite advances in technology. This result is based on an analysis that applies relatively conservative estimates for the growth in demand for mobile data communications for public safety and security applications, and relatively aggressive estimates for the rate of technological improvement of spectrum efficiency projected into the future.

Résumé

En réponse à une demande de conseils techniques faite par Sécurité publique Canada au nom des intervenants nationaux de la sécurité publique, le Centre des sciences pour la sécurité a effectué une évaluation technique des besoins de la fréquence de 700 MHz pour la transmission mobile à large bande de données destinée à la sécurité publique. C’est l’appel de consultation SMSE-018-10 d’Industrie Canada qui a motivé l’exécution de cette évaluation. L’objectif consistait à déterminer quelle part du spectre est requise pour répondre aux besoins du milieu de la sécurité publique pour la transmission mobile de données à large bande au cours des 20 prochaines années. La demande en données pour les situations d’urgences récurrentes a été modélisée à l’aide d’un processus interactif auquel les intervenants de la sécurité publique du Canada ont participé activement. Il y a de plus une modélisation des capacités de la technologie LTE pour répondre aux demandes de données. Les résultats démontrent que la part de la bande passante nécessaire pour répondre aux besoins de la sécurité publique est supérieure à 20 MHz à court et à moyen terme, et dépassera aussi probablement 20 MHz à long terme, et ce, malgré les progrès technologiques. Ce résultat repose sur une analyse ayant recours à des évaluations relativement prudentes de la croissance de la demande pour la transmission mobile de données à des fins de sécurité publique, ainsi qu’à des évaluations relativement ambitieuses du degré d’amélioration technologique de l’efficacité spectrale dans le futur.

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Executive summary

700MHz spectrum requirements for Canadian public safety interoperable mobile broadband data communications.

Claudio Lucente, MARTELLO DEFENSE SECURITY CONSULTANTS INC.

DRDC CSS CR 2011-01

In response to a request for technical advice by Public Safety Canada and on behalf of the national public safety community, the Centre for Security Science, with technical oversight by the Communications Research Center, conducted a scientific assessment of the 700 MHz spectrum requirements for broadband mobile data communications. This assessment is provided in support of the Industry Canada call for consultation SMSE-018-10.

The conversion of the broadcast television from analog to digital signals and the resulting re-allocation of the channels has attracted significant interest for the vacated RF spectrum on the part of commercial, private, and public entities. In particular, the Canadian public safety community has a strong interest in a segment of the 700MHz spectrum as described in the Industry Canada call for consultation (SMSE-018-10). Given the excellent propagation properties of this frequency band, it views this as a unique opportunity to lay the foundation for a national mobile broadband communications network that will allow various public safety agencies to better plan, coordinate, and execute their missions, for their day-to-day operations and when responding to crisis events.

New technologies and applications are at hand that can enhance situational awareness and improve coordination between public safety personnel. The mobile broadband wireless network must have suitable bandwidth to provide the data throughput required by the many applications required by today's public safety personnel such as real-time video surveillance, vehicle and blue force tracking devices, ambulance patient video. The bandwidth requirements will evidently vary depending on the operations being conducted be it day-to-day routine calls, crowd control, or major emergency situations. Since the network must be designed to provide connectivity that responders can rely on at all time, the bandwidth requirements must be addressed in the context of how responders intend to use the mobile broadband network during emergencies.

In order to assess the requirement with appropriate context and relevance, stakeholders were consulted across the nation, facilitated through linkages provided by the Canadian Interoperable Technologies Interest Group. Three incident scenarios were selected as case studies for public safety stakeholders to develop the incident-response profiles. The profiles consisted of establishing how many resources and assets would be assigned to each incident and, what applications would they make use of during each incident. The incidents that were chosen as case studies represent major but commonly re-occurring events (such as a sports event). We know that catastrophic events of the scale of a major earthquake or a concerted terrorist attack (9/11) would create demands that would far exceed any available spectrum and so such situations were not considered in the analysis.

The data throughput for each application was derived from empirical studies conducted by public safety agencies, support organizations, and research labs. Thus, the Data Demand Model (DDM) is derived from the incident-response profiles and the applications throughput requirements, in addition to growth assumptions over a 20-year horizon. Particular attention was paid to tactical video as it is expected to prevail in enhancing situational awareness and is often critical, particularly to security operations. It is also the largest consumer of bandwidth. As such, various techniques are considered in the DDM to reduce the preserve bandwidth requirement in the presence of video traffic.

Because of the large push by the commercial sector to deploy Long Term evolution (LTE) networks as the 4th generation of cellular system and since the United States has selected LTE as the technology for public safety mobile broadband, using the same technology in Canada would leverage the economies of scale and enhance interoperability between Canadian and US public safety agencies LTE was therefore selected as the basis to develop the Capacity Model for this report. There are substantial research efforts underway to enhance the capacity of LTE and therefore, the Capacity Model introduces a factor to account for a number of anticipated enhancements in spectral efficiency at various intervals over the 20-year horizon of the model.

Finally, the required bandwidth is revealed by correlating the data demand with the capacity. Several fundamental assumptions are used in the models such as the rate at which research into spectral efficiency is transformed into reality and, the number of users accessing the same applications simultaneously. The effect of varying these assumptions on required bandwidth is examined, as is the effect of uncertainty in predictions, which increases with time particularly as we look into the future 15-20 years.

The result of the modeling, taking into account uncertainty factors, shows that the amount of bandwidth required to satisfy the needs of public safety to conduct their missions during commonly re-occurring major emergency situations with modern tools and applications is greater than 20MHz in the near-to-mid term, and likely to also exceed 20MHz in the long term, despite advances in technology. Clearly even with the full 10 + 10 MHz allocated, the community will need to take measures to efficiently manage broadband data communications carefully during periods of peak demand.

Sommaire

Évaluation technique des besoins de la fréquence de 700 MHz réservée à la sécurité publique pour la transmission mobile à large bande de données

Claudio Lucente, MARTELLO DEFENSE SECURITY CONSULTANTS INC.

DRDC CSS CR 2011-01

En réponse à une demande de conseils techniques faite par Sécurité publique Canada au nom de la collectivité nationale de la sécurité publique, le Centre des sciences pour la sécurité, sous la supervision technique du Centre de recherches sur les communications, a mené une évaluation scientifique des besoins de la fréquence de 700 MHz pour la transmission mobile de données à large bande. Cette évaluation vient en soutien à la demande de consultation SMSE-018-10 d'Industrie Canada.

La transition des signaux analogues aux signaux numériques des services de télédiffusion et la nouvelle répartition des canaux ont suscité un vif intérêt vis-à-vis du spectre des radiofréquences libéré chez les entités commerciales, privées et publiques. Le milieu canadien de la sécurité publique s'intéresse énormément à un segment de la bande de 700 MHz tel qu'il est décrit dans la demande de consultation SMSE-018-10 d'Industrie Canada. Étant donné les excellentes propriétés de propagation de cette bande de fréquence, on considère qu'il s'agit d'une occasion unique de jeter les bases d'un réseau national de transmission mobile à large bande qui permettra aux divers organismes de sécurité publique de mieux planifier, coordonner et exécuter leurs mandats, tant dans le cadre de leurs activités quotidiennes que lors des interventions en situation de crise.

Il existe de nouvelles technologies et applications qui peuvent accroître la connaissance de la situation et améliorer la coordination entre les intervenants de la sécurité publique. Le réseau mobile sans fil à large bande doit avoir une bande passante suffisante pour fournir le débit de données nécessaires aux nombreuses applications exigées de nos jours par les intervenants de la sécurité publique, comme la vidéosurveillance en temps réel, les appareils de suivi des véhicules et des forces bleus et la vidéo de patients transportés par ambulance. Les besoins en bande passante varieront évidemment en fonction des activités, qu'il s'agisse d'appels quotidiens de routine, du contrôle des foules ou de situations d'urgence majeures. Puisque le réseau doit être conçu de manière à offrir une connectivité à laquelle les intervenants peuvent se fier en tout temps, il faut tenir compte des besoins en bande passante en fonction de la manière dont les intervenants ont l'intention d'utiliser le réseau mobile à large bande pendant des situations d'urgence.

En vue d'évaluer les besoins en fonction des bons contextes et de leur pertinence, on a consulté des intervenants partout aux pays, grâce aux liens fournis par le Groupe d'intérêt canadien en technologie de l'interopérabilité. Trois scénarios d'incident ont servi d'études de cas aux intervenants de la sécurité publique pour définir les profils d'intervention des incidents. Les profils visaient à établir la quantité de ressources et de

biens qui seraient affectés à chaque incident et à déterminer quelles applications ils utiliseraient dans chaque cas. Les incidents choisis à titre d'études de cas représentent des événements majeurs récurrents (comme une manifestation sportive). Nous savons que les catastrophes comme un important tremblement de terre ou une attaque terroriste concertée (attaques du 11 septembre) engendreraient des demandes qui iraient bien au-delà de tout spectre disponible. Par conséquent, de telles situations n'ont pas été prises en considération dans l'analyse.

Le débit des données pour chaque application a été obtenu à partir d'études empiriques effectuées par des organismes de sécurité publique, des organismes de soutien et des laboratoires de recherche. Par conséquent, le modèle de demande de données repose sur les profils d'intervention aux incidents et les besoins des applications en débit des données, ainsi que sur les hypothèses de croissance pour les 20 prochaines années. On a porté une attention particulière à la vidéo à des fins tactiques puisque celle-ci devrait s'imposer pour améliorer la connaissance de la situation et s'avère souvent essentielle, notamment aux activités de sécurité. C'est aussi elle qui utilise le plus de bande passante. Le modèle de demande de données a donc pris en considération diverses technologies pour réduire le besoin de bande passante réservée en présence de trafic vidéo.

En raison de l'offensive du secteur commercial visant la mise en place de réseaux LTE en guise de 4^{e} génération de système cellulaire et puisque les États-Unis ont choisi la technologie LTE pour la transmission mobile à large bande de la sécurité publique, l'utilisation de la même technologie au Canada permettrait de faire des économies d'échelle et améliorerait l'interopérabilité entre les organismes de sécurité publique des États-Unis et du Canada. La technologie LTE a donc servi de base à l'élaboration du modèle de capacité du présent rapport. D'importants travaux de recherche sont en cours en vue d'améliorer la capacité de la technologie LTE. Par conséquent, le modèle de capacité introduit un facteur qui tient compte de certaines améliorations prévues de l'efficacité spectrale à divers intervalles au cours des 20 prochaines années du modèle.

Enfin, la bande passante nécessaire est déterminée par la corrélation entre la demande de données et la capacité. Les modèles utilisent plusieurs hypothèses de base, comme la vitesse à laquelle la recherche sur l'efficacité spectrale se transforme en application pratique et le nombre d'utilisateurs accédant simultanément aux mêmes applications. On examine les répercussions d'une variation de ces hypothèses sur la bande passante ainsi que l'incidence de l'incertitude dans les prédictions, qui augmente au fil du temps puisqu'il s'agit d'une évaluation portant sur les 15 à 20 prochaines années.

Les résultats de la modélisation, qui tient compte des facteurs d'incertitude, démontrent que la part de la bande passante nécessaire aux activités du milieu de la sécurité publique ayant recours aux outils et aux applications modernes lors de situations d'urgence majeures et récurrentes est supérieure à 20 MHz à court et à moyen terme, et qu'elle dépassera probablement 20 MHz à long terme, et ce, malgré les progrès technologiques. De toute évidence, même avec une pleine attribution de 10 + 10 MHz, la communauté devra prendre des mesures pour gérer efficacement et prudemment la transmission de données à large bande pendant les périodes de demande de pointe.

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Acknowledgements

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1 Introduction

The demise of analogue broadcast television and the resulting re-allocation of broadcast television channels has attracted significant interest for the vacated RF spectrum on the part of commercial, private, and public entities. In particular, the Canadian public safety community has expressed a strong interest in a segment of the 700MHz spectrum. It views this moment in time as a unique opportunity to lay the foundation for a national mobile broadband communications network that will allow various public safety agencies to better plan, coordinate, and execute their missions, whether it is for their day-to-day operations or when responding to crisis events.

Such a network could enable interoperable broadband communications among Canadian public safety entities and with international agencies during joint operations, such as with the US Department of Homeland Security, provided that technology and spectrum are aligned between Canada and the US. It would enable the goals of Canada's National Strategy for Communications Interoperability[*] .

The demands placed on a mobile broadband data communications network by the public safety community depends strongly on the nature of the missions it executes and the applications it uses during those missions. Situational Awareness (SA) and the ability to coordinate broadly and effectively in improvised circumstances are fundamental capabilities in order to execute a mission in the safest and most expedient manner possible. Whereas, currently, voice communications via Land Mobile Radio (LMR) is the most commonly used method to coordinate and establish SA, it is expected that tactical video, will play an increasingly important role to enhance SA, while LMR will remain the key voice communications tool for the foreseeable future.

Mobile broadband data services will give rise to new applications and innovative uses for data communications by the public safety community. It is envisaged that access to a mobile broadband network will extend to a user-group that is peripheral to first responders and those that occupy supporting roles. As such, the data demands will be driven by the use of new tools, new users, and new applications which, in turn, will foster greater reliance by first responders on the tools and supporting community in the response to incidents.

The goal of this study is to determine how much spectrum is required to meet the needs of the Canadian public safety community for mobile broadband wireless data communications within a 20-year time frame. The results of this study and its conclusions are derived from the correlation of the community's data demands and the capacity of 4th Generation wireless technology to support the applications that first responders intend to use. Fundamental assumptions are validated and inputs are obtained via an interactive process with active participation from public safety stakeholders and federal government researchers. The methods, assumptions, and results are benchmarked against similar studies that have been performed in the USA. [1, 3, 21]

[*] http://www.publicsafety.gc.ca/prg/em/cisapc-scicpa-eng.aspx

1.1 The 700MHz band

The channelization of the Canadian 700MHz band is under study by Industry Canada and so the US 700MHz spectrum allocation is shown here for reference. Figure 1.1 illustrates the US channelization plan for the 700MHz spectrum. Note that Band-14 (circled) spans 10MHz in the down-link (758MHz – 768MHz) and 10MHz in the up-link (788MHz – 798MHz). If the FCC and US Congress allocate the D Block to public safety then that would represent 2x10MHz of spectrum. In this report references to 10MHz LTE pertain to either the up-link or down-link channel bandwidth. When referring to both the up-link and down-link channel bandwidths then it is stated as 10+10MHz or 20MHz.

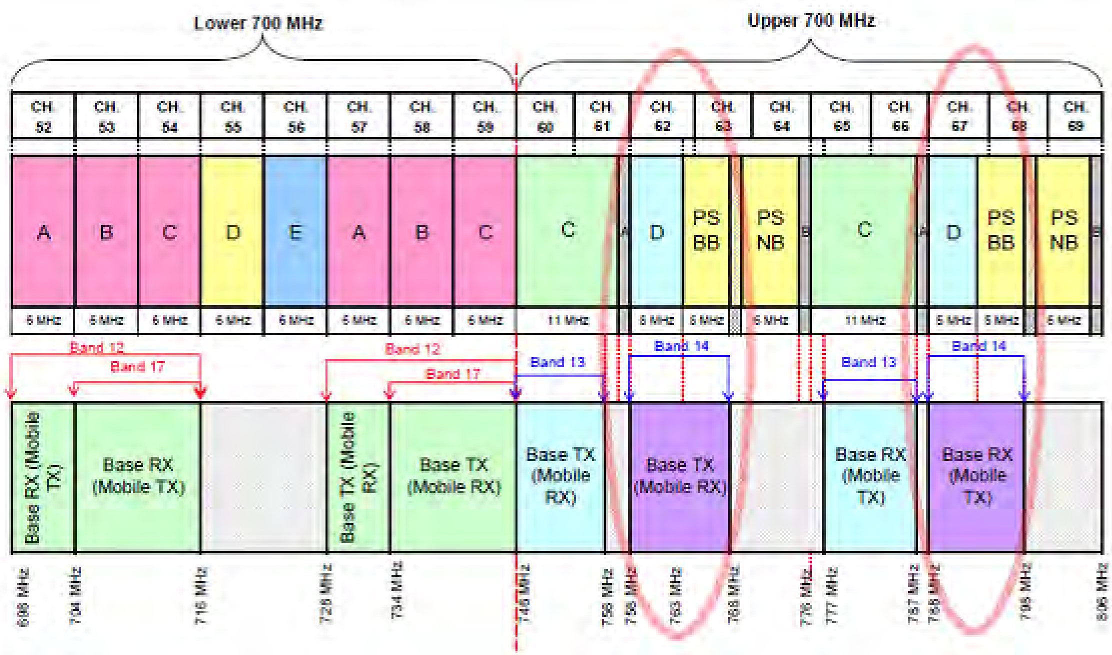

Figure 1.1: US channelization plan for 700MHz spectrum

2 Methodology

The bandwidth required to support public safety operations is based on a number of factors, of which the two most important ones are:

a) Usage in terms of data demand

The data demand, expressed in bits per second, is defined by the sum of the Up-link and Down-link data rates required to sustain the various applications needed to support public safety's data communications needs in day-to-day operations and when responding to emergency situations.

b) Network infrastructure

The amount of bandwidth required to carry the data demand is based on the network infrastructure selected, the communications protocol, and the network architecture.

In this Chapter, the methodology used to define both the data usage and the bandwidth, based on the infrastructure is discussed. The data demand is derived and quantified in §3.

2.1 Usage

The process to establish the data demand is illustrated in Figure 2.1. It involves public safety stakeholders to define how they would use a mobile broadband network and what applications they would make use of. The demand is evaluated for day-to-day operations and for three incident scenario case studies, which represent recurring emergency situations typically encountered by public safety agencies. The case studies are described in §3.1. The Model includes a demand growth factor to account for applications which the stakeholders did not identify or, at the time of the survey, could not predict using in the future.

Once the data demand model was established, another round of feedback was undertaken to validate the assumptions. The Data Demand Model was also reviewed and validated as a sound technical approach with Canadian Government scientists.

Several sources were used to determine the application data rates. These are discussed in more detail in §3.3.1.

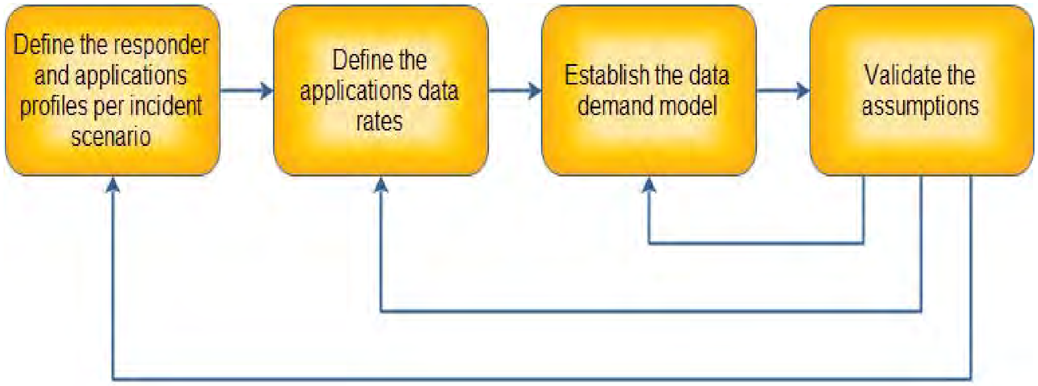

Figure 2.1: Process to develop the Data Demand Model

2.2 Network Infrastructure

The Capacity Model is based on the capabilities of Long Term Evolution (LTE). LTE is the latest generation of mobile broadband technology being deployed by commercial carriers around the world for their 3.9G networks with a migration path to LTE-Advanced (4G). Figure 2.2 illustrates the actual and announced deployments of LTE globally. A large uptake of this technology is expected to drive cost down and provide more incentives for the development of new features and capabilities. In addition, the US Federal Communications Commission (FCC) has recently mandated that public safety broadband networks must use LTE. Canadian public safety can leverage the economies of scale driven by the commercial carriers and be inter-operable with US public safety organizations by selecting LTE as the network infrastructure technology for public safety in Canada.

LTE is currently being deployed commercially at Rel.8 and in pilot stages for a small number of public safety agencies in the US. The 3GPP organization is currently defining Rel.9, 10, and 11. Each successive release introduces new capabilities and especially, improved spectral efficiencies. This is discussed in §4.2.

The Capacity Model and related assumptions were also reviewed in detail with Canadian Government scientists having expertise in the wireless communications domain and the approach was judged to be technically valid and appropriate for the purposes of this study.

Figure 2.2: Locations with actual LTE deployments (blue markers) and announced deployments (red markers) [*]

[*] www.ltemaps.org

3 Demand for mobile data communications

The need for responders to communicate and access information is felt most acutely during the response to an incident. During these events the mobile broadband network will see the greatest demand for data throughput. Figure 3.1 illustrates that an incident is a localized event and so, unlike day-to-day operations where the data demand is spread over a territory that spans multiple cell sites, an emergency event will drive data demand from within a small geographic area.

Although an incident may arise anywhere on land or on water across the entire Canadian territory, this study focuses on the data demands from public safety agencies in a mid-to-large size urban setting. It is assumed that the deployment of a mobile broadband network will launch in urban centers first before expanding to sub-urban and, eventually rural areas. Urban centers will have the greatest density of users and greatest number of recurring events requiring the intervention of public safety and security forces.

It is important that sufficient capacity be available during an emergency event, as well as suitable congestion management policies to effectively deal with peaks in demand that exceed the instantaneous available capacity. The assertion of congestion management mechanisms must not impede the ability of the responders to execute their mission during the events.

In this section the foundation of the Data Demand Model (DDM) will be described. It considers the demand for data communications during an emergency event overlaid on the data demands of day-to-day operations.

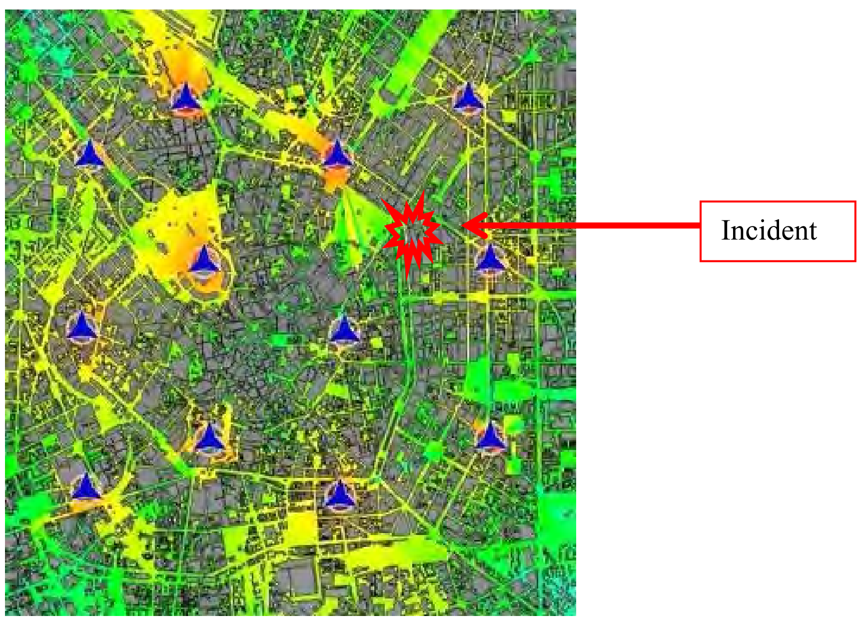

Figure 3.1: Illustration of a localized incident in a multi-cell network deployment.

3.1 Incident scenarios

In consultation with first responder stakeholders and in alignment with similar assessments recently performed in the US, the estimate of the data demands were based on common occurrences and predictable incidents. Three hypothetical, but plausible scenarios have been identified to serve as case studies. These case studies represent events that public safety agencies expect to encounter and for which Standard Operating Procedures (SOP) have been formulated. They are:

- Chemical Plant Explosion and Fire
- A Severe Multi-Vehicle Accident
- Sports Event Riot

A number of representatives of the public safety community from across Canada contributed to defining the nature of the response to each scenario in terms of the number and types of responders and support agencies, and what applications the stakeholders would use during each event. Below are descriptions of the incident scenarios that were used as case studies.

Catastrophic incidents such as a major earthquake or a major terrorist attack are not modelled in this study since the magnitude of the response at that time would overwhelm any mobile data network dimensioned for more routine events such as those which are considered here. Other measures would be required such as diverting or extending capacity from surviving commercial networks.

3.1.1 Chemical Plant Explosion

This case study was adapted from a scenario developed by the Wireless Innovation Forum – Public Safety Special Interest Group* and is based on a hypothetical scenario of a chemical plant explosion, with events drawn from a number of sources including the chemical plant explosion scenario developed as part of the US DHS SAFECOM Public Safety Communications Statement of Requirements/TR-8 Broadband Task Group, and analysis of actual events of the fire at a hazardous waste transfer plant in Apex, NC, in October 2006. This scenario is relevant to other types of incidents such as an explosion at a refinery.

<u>Narrative</u>

A large explosion occurs at a 75,000 sq.ft chemical plant in the industrial area of a mid-sized city. The blast shatters windows of buildings in the immediate vicinity. There are a significant number of casualties both from within the chemical plant and outside. Multiple sensors detect and report the incident to the 911PSAP. Within minutes the 911PSAP is also flooded with calls from motorists, pedestrians, and residents. Soon, commercial cellular networks become overloaded.

Air quality sensors around the area detect hazardous substances emanating from the site of the accident. The wind speed and direction reported from environmental monitoring stations indicate that the chemical plume will drift over a residential area with an elementary school, a high school, a library, a hospital, and numerous retail businesses. As it drifts over roads and highways car accidents ensue and some motorists abandon their cars to escape the plume on foot.

Debris expelled by the explosion damages a nearby electrical sub-station, causing a localized power failure.

* http://www.wirelessinnovation.org

First responders report that a type of liquid is escaping from the chemical plant and flowing into the on-site retention basins. However, the condition of the basins is unknown.

3.1.2 Severe Multi-Vehicle Accident

This case study is based on serious accidents that are likely to occur for any of a number of reasons, such as poor weather, driver fatigue, mechanical failure, etc… This scenario is also relevant for a train derailment, aircraft emergency landing, and other similar situations.

Narrative

It's early winter and the temperature is rising from many days below freezing to settle just around the freezing mark with precipitation turning to ice pellets. Icy patches form on a highway running through a major urban centre and a foggy mist reduces visibility.

The flow of traffic on the icy highway in front of a semi-trailer comes to a rapid halt and the driver realizes he is unable to stop in time to avoid colliding with the cars in front. He attempts to swerve but his tractor regains traction while the trailer does not. The rig jack-knifes and flips over the median finally, landing onto its side on the opposing lanes. Vehicles immediately following the tractor/trailer are unable to stop and collide with it. Others, while swerving to avoid it cause accidents in their adjacent lanes. A similar scene is playing out on the opposite side and an oil tanker is also involved. It has also ended up on it side. Oil is leaking but no fire has started. The trailer has a hazardous products sign on the rear door.

Drivers are injured and some of them are trapped in their vehicles. Other drivers fearing that a fire will start, abandon their vehicles on both sides of the highway and run along the highway's shoulders.

All traffic stops on both sides of the highway.

3.1.3 Sports Event Riot

This case study is based on a riot that arises from a victory celebration of a local sports team. Although the premise is a sports event, the scenario is also relevant for any large event that attracts crowds and protesters with the potential for violence.

Narrative

It's mid-June and we're in overtime of game 7 of the Stanley Cup finals when the unimaginable happens at Maple Leaf Gardens – the home team scores an incredibly fluky goal. After a seemingly interminable moment, stunned audiences explode with joy. Crowds empty into the streets from the Garden, bars, cafes, and homes from all areas of the city. Soon many streets are clogged with people and the downtown core becomes a grid-locked parking lot.

Emotions rise and without notice the celebration turns ugly. Gangs begin to break store-front windows. Looting ensues. Cars are set alight. Riots break out spontaneously in various parts of the downtown core and the rioters quickly move from one area to another. They twitter to help coordinate their movements.

A number of people are injured by flying debris and others are trampled by surging crowds in tight quarters. Some riot police officers and rioters are also injured.

3.2 Day-to-day operations

In addition to demands for data during incidents, mobile data communications plays a vital role during the day-to-day operations for public safety and security, and other municipal and government agencies. It is conceivable that in urban environments these agencies would share a single mobile broadband data network. Some examples of day-to-day operations are:

- Issuing traffic citations
- Fire-fighting
- Health emergencies
- Patrols
- Incident reporting
- Database querying and records look-up
- Work-site inspections
- Maintenance and waste management services
- Public transit
- Utilities: meter reading, service upgrades or restoration

Incidents, when they arise, do not displace day-to-day operations. Incidents occur while day-to-day operations continue.

Table 3.1 illustrates the profiles for the three incident scenario case studies of §3.1 and for Day-to-Day Operations in terms of the number and types of assets that are assigned to each situation. For the purpose of quantifying the number of devices that generate or consume data, this study defines "assets" as vehicles and assumes that data communications devices are detachable so they can be vehicle-borne or person-borne.

3.3 Applications

In a poll conducted among representatives of the Canadian public safety community (municipal police forces, RCMP, Fire Services, Emergency Medical Services, Provincial Emergency Management, and National Search and Rescue), the participants indicated which applications they were likely to use across a mobile broadband data service. The City of New York, in its analysis of 700MHz spectrum requirements, identified a similar set of applications[3]. The candidate applications are listed in Table 3.2. They are broadly categorized as:

- Video Applications
- Collaborative tools
- Monitoring
- Database access and records upload
- Messaging

The same representatives also identified the main applications they were likely to use during emergencies. The results are shown in Table 3.3.

Assets	Chemical Plant	Multi-Vehicle Accident	Sports Event Riot	Day-to-Day Operations
Mobile Command Posts				
Fire Services	1	0	0	
EMS	2	0	1	
Police	1	1	1	
Fire chiefs and commanders				
Division	1	0	0	
Platoon	2	1	0	
Department	1	1	0	
District	3	2	0	5
Deputy Chief	1	0	0	
Safety officer	1	1	0	
Fire-fighting vehicles				
pumper trucks	8	3	0	15
ladder trucks	3	1	0	5
Specialized Fire Services Units				
Rehab unit	1	0	0	
Rapid intervention unit	2	1	0	
Rescue unit	2	1	0	
Air mgmt	1	0	0	
Hazmat	4	3	0	
Public safety trained security officers	0	0	4	
Public safety apparatus	0	0	6	
Portable sensors	12	0	12	
Medical/paramedical				
1st Responder Units	12	6	10	20
Bike Medics	0	0	8	8
Ambulances	30	15	15	110
Specialized and supervisory EMS Units				
Emergency Task Force	2	2	6	2
Buses	1	1	1	1
Trucks	1	1	1	1
Supervisors	6	4		12
Public Order units	0	0	6	0
Police patrol units and vans				
Cruisers	15	10	80	420
Vans	2	2	10	33
Inspectors	0	2	8	1
License Plate Readers	0	0	0	30
Utilities, municipal services, govt civil agencies				
Electrical	2	0	0	50
Gas	2	0	0	30
Buses	2	1	5	1000
Public Works	3	1	4	200
Judicial Services	0	0	1	0
Transport ministry	0	1	0	20
Environment ministry	1	1	0	20

Table 3.1: Response profiles for three incident scenarios case studies and Day-to-Day Operations

Video applications	Database access and records upload
Surveillance video	GIS information
Tactical video	still images
Ambulance patient video	Building plans and information
Public Transit video	Hazmat inventory
Video conferencing	medical records
News feeds	NG911 video file
	Weather information
Collaborative tools	internet access
Electronic Command Board	Patient triage
Computer-Aided Dispatch	Traffic advisories
Records Management System	e-Ticketing
	Vehicle Registration
Monitoring	Biometric data
Automated Vehicle Locating	License Plate Reader
Blue Force Tracking	
Vital signs monitoring	Messaging
Automotive telemetry	SMS
Tracking evacuees	MMS
	email

Table 3.2: Broadband data applications

	Surveillance video (ext)	Tactical Video	Patient video	Public Transit Video	Video conference	News feeds	Collaborative tools	Database access	Messaging	Monitoring
Mobile Command Posts	RCV	XMT-RCV		RCV	XMT-RCV	RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
Fire Services										
EMS										
Police										
Fire chiefs and commanders	RCV	RCV			XMT-RCV	RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
Division										
Platoon										
Department										
District										
Deputy Chief										
Safety officer										
Fire-fighting vehicles	RCV	XMT-RCV				RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
pumper trucks										
ladder trucks										
Specialized Fire Services Units	RCV	RCV				RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
Rehab unit										
Rapid intervention unit										
Rescue unit										
Air mgmt										
Hazmat										
Public safety trained security officers										
Public safety apparatus										
Portable sensors										XMT
Medical/paramedical	RCV	RCV				RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
1st Responder Units										
Bike Medics										
Ambulances	RCV	RCV	XMT		XMT-RCV	RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
Specialized and supervisory EMS Units	RCV	RCV				RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
Emergency Task Force										
Buses										
Trucks										
Supervisors										
Public Order units										
Police patrol units and vans	RCV	XMT-RCV		RCV	XMT-RCV	RCV	XMT-RCV	XMT-RCV	XMT-RCV	XMT
Cruisers										
Vans										
Inspectors										
License Plate Readers										
Utilities, municipal services, govt civil agencies				XMT				XMT-RCV	XMT-RCV	XMT
Electrical										
Gas										
Buses										
Public Works										
Judicial Services										
Transport ministry										
Environment ministry										

Table 3.3: Association of broadband data applications to public safety assets and direction of data flow.

3.3.1 Applications performance requirements

Table 3.4 lists the data rates used in the Data Demand Model. They are separated into UL and DL directions since the LTE spectral efficiencies are different for UL and DL.

	Datarates (kbps)		
Video applications	DL	UL	
Surveillance video HR	1536	0	streamed to Users on demand
Surveillance video LR	64	0	streamed to Users on demand
Tactical video LR	64	64	distribution of tactical video for composite view; constant streaming
Tactical video HR (monitor)	1152	1152	Viewing video imagery on monitors; per selected feed.
Ambulance patient video (LR)	0	64	distribution of patient video for composite view; constant streaming
Ambulance patient video (HR)	0	768	Viewing video imagery on monitors; per selected feed.
Public Transit video (LR)	64	64	distribution of public transit video for composite view; constant streaming
Public Transit video (HR)	384	384	Viewing video imagery on laptops; per selected feed.
Video conferencing	384	384	per User
News feeds	768	0	streamed to Users on demand.
Collaborative tools	50	50	average data rates per user.
Emergency Management System			
Computer-Aided Dispatch			
Records Management System			
Database access and records upload	50	20	average data rates per user.
GIS information			
still images			
Building plans and information			
Hazmat inventory			
medical records			
NG911 video file (pre-recorded)			
Weather information			
internet access			
Patient triage			
Traffic advisories			
e-Ticketing			
Vehicle Registration			
Biometric data			
License Plate Reader	50	256	
Messaging	40	20	average data rates per user.
SMS			
MMS			
email			
Monitoring	30	60	occurs in the background and is assumed to be a constant rate
Automated Vehicle Locating	5	10	
Blue Force Tracking	5	10	
Vital signs monitoring	5	10	
Automotive telemetry	5	10	
Tracking evacuees	5	10	
CBRNE sensors	5	10	

Table 3.4: Applications data rates (kbps).

The following are the different types of video traffic used in the model:

a) Surveillance video HR: scaled from the Incident Video High Resolution (HR) because of the wider angle scene captured by fixed surveillance cameras. Capable of full-motion 30fps.

b) Incident video HR: based on empirical data used in the report by the City of New York to the FCC. [3]

c) Ambulance Patient Video HR: near-field scene capture.

d) Public Transit video HR: mid-level frame rate 15fps, near-field scene capture

e) Video conferencing: near-field scene, mid-level frame rate15fps.

f) News Feeds HR: lower resolution than surveillance or incident video. Full-motion.

g) LR video (Surveillance, Incident, Patient, and Public transit): low-rate transmission of un-viewed video streams. See §3.3.2.1 for further discussion on dual-rate video.

The US National Telecommunications and Information Administration's (NTIA) recommended minimum data rate for tactical video for Standard Definition viewing is 768 kbps for H.264, also known as MPEG-4 Part 10, or AVC (advanced video compression). [4]

3.3.2 Video traffic management

Video applications represent the largest consumer of capacity on a broadband network. As such, management of this application merits particular attention. In this section we will discuss various approaches to make more efficient use of video applications. The techniques described in the following sections will be used in the Data Demand Model to minimize the bandwidth required by the various video applications.

3.3.2.1 Dual Rate Video

As discussed in §3.3.1 the data rate requirement for video depends on the intended use. For example, a high resolution video would be required to view a wide-angle scene on a monitor and be able to distinguish relatively fine details but a much lower resolution video would be needed for simple traffic monitoring,. Figure 3.2, shows a typical picture of a traffic surveillance camera. In order to read license plates from this scene a much higher resolution stream would be required.

However, it is highly unlikely that video captured at high resolution would be needed continuously for its details. Therefore, in order to limit bandwidth, we include in the Data Demand Model a component for dual-rate video, where the lowest data rate is set to 64Kbps and the maximum rate is as given in Table 3.4 for the different types of video. Dual-rate video is a variation of Adaptive Rate Video currently used by Apple, Adobe, and Microsoft, albeit each with their proprietary algorithms[5]. Although video is sampled at the highest rate possible at the source, it is transmitted at low resolution (LoRes) if it's not viewed.

Figure 3.2: Scene captured from a surveillance camera.

Figure 3.3 illustrates one video stream being viewed, thereby sent at high resolution (HiRes), and three video streams displayed as "thumbnails" which are not actively viewed. The latter are carried across the broadband data network at 64Kbps. In this example if a viewer selects from one of the thumbnail scenes, the selected scene would switch to HiRes mode and the previously viewed one would become a thumbnail and revert to LoRes mode.

Figure 3.3: Illustration of one actively viewed video stream and three "thumbnail" streams

In Figure 3.4 sources V1 and V4 are displayed as thumbnails on viewers M1-M4 only. As such their uplink data rates are 64Kbps, whereas V2 and V3 are viewed in expanded mode so they are uplinked at the HiRes data rates.

The DDM applies a video de-rating factor (VDF_{HiRes}) to the average HiRes video data rate, which takes into account the number of sources of video (VS) and the number of authorized viewing instances (VI). VDF_{HiRes} is expressed in Eq.(1):

$$VDF_{HiRes} = 1 - [(VS - 1)/VS]^{VI} \quad (1)$$

3.3.2.2 Video management policy

Another way to manage video traffic is to limit the number of video sources admitted into the pool of viewable feeds and to limit the number of authorized viewers. This is a policy matter that requires an Operations Support System (OSS) to be able to assign higher priority to some video sources over other sources. For example, in the case study of the Chemical Plant Explosion, video feeds from police cruisers that are re-directing traffic around the affected area may be assigned lower priority than video feeds from fire-fighters.

The OSS would need to permit ad hoc adaptation of the policy to react to evolving circumstances. Following from the previous example, police video feeds may have a higher priority while they are on-route to the incident site and then be assigned a lower priority when the fire-fighters arrive.

The DDM includes a second bandwidth-preserving component by limiting the number of viewable HiRes and LoRes video feeds at any one time. Table 3.5 outlines the video management policy as implemented in the DDM.

Table 3.5: Video Management Policy

	Emergency Operations Centre	Incident Command Vehicles	Authorized First Responders *
Max simultaneous HiRes views	8	2 (each)	1 (each)
Max simultaneous LoRes thumbnails	no limit	10 (each)	3 (each)
Max number of simultaneous video conferencing participants	4	4	4

* not all First Responders would be authorized or equipped to access video feeds. It would be specific to the incident.

3.3.2.3 Multimedia Broadcast Multicast Service

Multimedia Broadcast Multicast Service (MBMS) over an LTE wireless network allows the same video stream to be viewed simultaneously by multiple subscribers with only minimal overhead penalty. One stream consumes capacity in the down-link direction irrespective of the number of simultaneous viewings. [6]

Figure 3.3 illustrates the function of MBMS through an example of 2 downlink users, M1 and M3, viewing the same scene from V2. Only one feed is streamed in the downlink direction to serve 2 simultaneous viewers.

When there are more viewers than sources of video, MBMS can be treated as a gain which reduces the amount of downlink traffic. MBMS Gain is calculated according to Eq. 2.

$$\text{MBMS Gain} = \frac{[\text{\# of viewers}] \times [1 - \text{MBMS overhead}]}{[\text{\# of video sources}]} \qquad (2)$$

where MBMS overhead is 10%.

If the number of sources exceeds the number of viewers, then MBMS gain is set to 1 and MBMS overhead is 0.

MBMS was released by the 3rd Generation Partnership Project [*] (3GPP) as part of Rel.6 (High Speed Uplink Packet Access – HSUPA) in Dec.2004 and further updated in 2009. LTE Rel.9 includes E-MBMS (Enhanced MBMS), which supports multi-cell reception for improved spectral efficiency at cell-edge.

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[*] www.3gpp.org

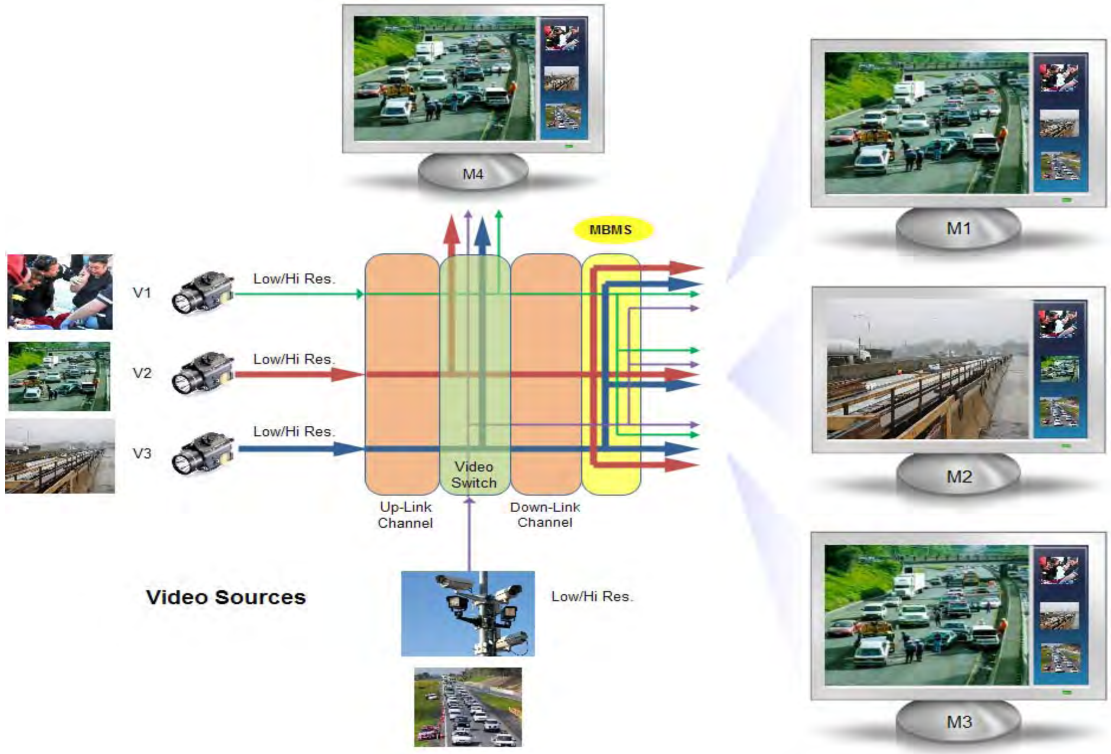

Figure 3.4: Illustration of MBMS function.

3.4 Growth Projections

The global demand for mobile broadband data is experiencing exponential growth in the commercial space fueled primarily by the continued deployment of laptop and netbook computers, and smartphones. Figure 3.5 illustrates the forecasted global demand for mobile broadband data.

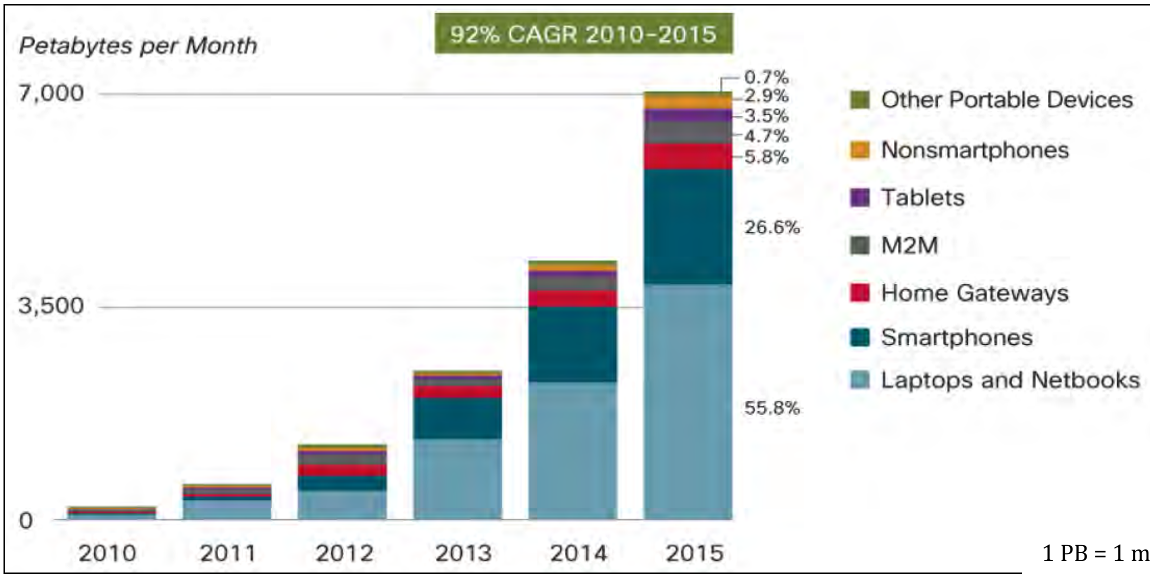

Figure 3.5: Forecasted global demand for mobile broadband data [7].

It is unlikely that public safety's demand for mobile broadband data will experience the same exponential growth, in part because the amount of spectrum allocated for public safety is less than what is allocated for commercial users. Nonetheless, there are growth drivers that will affect public safety's demand for mobile data. For example:

- Adoption rate among public safety agencies of devices which allow access to a mobile broadband network. In a given city, region, or territory the rate at which responders will be equipped with the capability to access a broadband network will be strongly affected by budgets allocated for this purpose.
- Introduction of new applications and tools that have not yet been identified in Table 3.2. Innovative new applications and tools that increase safety, improve the way missions are executed, and increase cost effectiveness are highly desirable. It is foreseeable that public safety agencies will adopt new applications and tools over time as they are vetted for stability, as SOPs are created and validated, and as budgets permit. New applications and tools are expected to increase the data throughput requirements.
- Organic growth of the public safety community in line with the growth of the general population.

The DDM has a growth component in the model to account for the contributing elements above as summarized below.

a) Rate at which public safety agencies will equip their staff with capabilities to access a broadband wireless network: **40% of responders equipped at YR-1 followed by 10% per year incremental growth.**

b) Rate of growth of data throughput required by new applications and tools: **5% per year.** It is assumed that the applications of Table 3.2 will be deployed in the 1st three years and that new applications would be introduced starting in Year-4

c) Organic growth rate of public safety personnel and assets: **3% per year**.

3.5 Data Demand Model (DDM)

The demand model uses the following elements:

a) The number and mix of responders that converge onto typical incidents. Table 3.1.

b) Applications that public safety will likely use with a mobile broadband network. Table 3.2.

c) How the applications are used and by whom. Table 3.3.

d) Applications data rates. Table 3.4.

e) Video Management Policy. Table 3.5.

f) Multimedia Broadcast Multicast Services (MBMS) DL gain.

g) Growth projections according to §3.4

3.5.1 Variables

In addition to the above factors, the DDM uses a number of variables. These are listed below in Table 3.6.

The Statistical Gain (SG) is also referred to as over-booking factor and accounts for the fact that not all Users are accessing data at the same time, thus the sum of the Users' data rates is divided by the SG. The City of New York report states that during an incident, first responders make more intense use of the communication tools and, therefore, use SG = 4, compared to SG = 20 during normal operations.

Typically, SG is a static value that network engineers assign to their dimensioning models. The thesis cited as a reference here proposes an approach whereby SG could be specific to the application[8]. So, some applications would have different SG than others. As shown in Table 3.6, the DDM uses different values of SG, which are:

- SG = 4 for streaming video and interactive applications,
- SG = 10 for video conferencing,
- SG = 1 for monitoring applications.

Table 3.6: List of Variables used in the Data Demand Model.

Video management policy	Incident scenarios	Day-to-Day Operations
Number of simultaneous HR feeds that can be viewed at EOC	8	8
Number of simultaneous LR feeds that can be viewed at EOC	balance of feeds	
Number of simultaneous HR feeds that can be viewed at MCV	2	2
Number of simultaneous LR feeds that can be viewed at MCV	10	10
Number of simultaneous HR feeds that can be viewed by selected 1st Responders	1	1
Number of simultaneous LR feeds that can be viewed by selected 1st Responders	3	3
Number of simultaneous video conferencing participants	4	4
Number of Patient Videos that can be viewed simultaneously at med.ctr.	4	40
Number of fixed Surveillance video cameras (not backhauled with LTE)	4	100
Number of live News feeds	1	6
Multicast Broadcast Multimedia Services (MBMS) overhead	10%	10%
Statistical Gain		
streaming video	4	20
video conferencing	10	20
interactive applications	4	20
background polling application	1	1
Growth variables		
Penetration rate for mobile broadband services (per year)	10%	10%
Growth of the user community - assets and people (per year)	0%	3%
Introduction of new and as-yet uknown applications and devices (annually, after year-3)	5%	5%
Area of Operations		
size of the territory (sq.km)		630
radius of a cell (km)		2
number of sectors in a cell		3

EOC means Emergency Operations Centre.
MCV means Mobile Command Vehicle.

3.5.2 Growth Rate

The growth rate of the data demand is assumed to be 5% per year, compounded annually. This is the same value that is used in the City of New York report, which the authors state as being conservative. In §4 the aspect of error in the estimates will be discussed. The actual increase in demand that will be experienced depends on many variables. Some examples:

- Public safety is currently not using some applications due to limited BW availability. When a broadband network is in place, the experience may be higher than what is assumed in this model.
- New tools will appear that will support different types of responses to incidents or day-to-day use. This could increase the data demands of the response profile in the future.
- Lessons-learned from the response to incidents will lead to changes in Standard Operating Procedures, which could have an impact on how tools and applications are used, which ones are used, at what time, and to what degree of intensity.

The model also assumes that a policy is in place to manage the use of incident video and the consumption of video feeds, in general. Video is the application which demands the most bandwidth and, as such, a video management policy would limit the amount of video transmitted on the wireless network.

The Model does not account for improvement in efficiencies for various applications. For example, video coding has migrated from MPEG-2 to MPEG-4, which essentially improved the coding efficiency by 50%. But, a counter-balancing assumption is that software applications become more complex and less efficient in their performance.

3.6 Data Demand profile

Figure 3.6 shows the DL, UL, and aggregate data demand for the 3 incident scenarios added to day-to-day operations, including the effects of compounded growth in demand.

From YR-1 to YR-10, the growth in demand is dominated by the 10-year capital investment plan to equip public safety. Each year 10% of the user group is equipped, culminating in 100% of the users being equipped in YR-10. From YR-11 to YR-20, the growth in demand is driven by the growth factors discussed in §3.4.

The projected growth of data demand for public safety is in sharp contrast with the projected growth for the commercial segment, as seen in Figure 3.5. Whereas the commercial growth follows an exponential trend, the growth for public safety demand follows a quasi-logarithmic trend. The projected growth in commercial demand fuels a vigorous research environment into methods to be able to cope with the expected demand. This will be discussed further in §4.

Another assumption is that the capital investment to equip public safety with the tools and applications that are considered in this study is made incrementally over a 10-year period, with 1/10th of the investment made each year. The responder profiles and applications in Tables 3.1, 3.2, and 3.3 are for a fully equipped responder community, which corresponds to YR-10 in Figure 3.6.

The responder profiles for each incident case study and application data rates have a strong influence on the demand. The incidents that were selected as case studies could have been different, which would have resulted in higher data demands.

For comparison purposes the City of New York published a demand growth profile and is highlighted in Figure 3.7. Note the inflection in the slope, which indicates that the growth in demand slows down after the inflection point, around year-8.

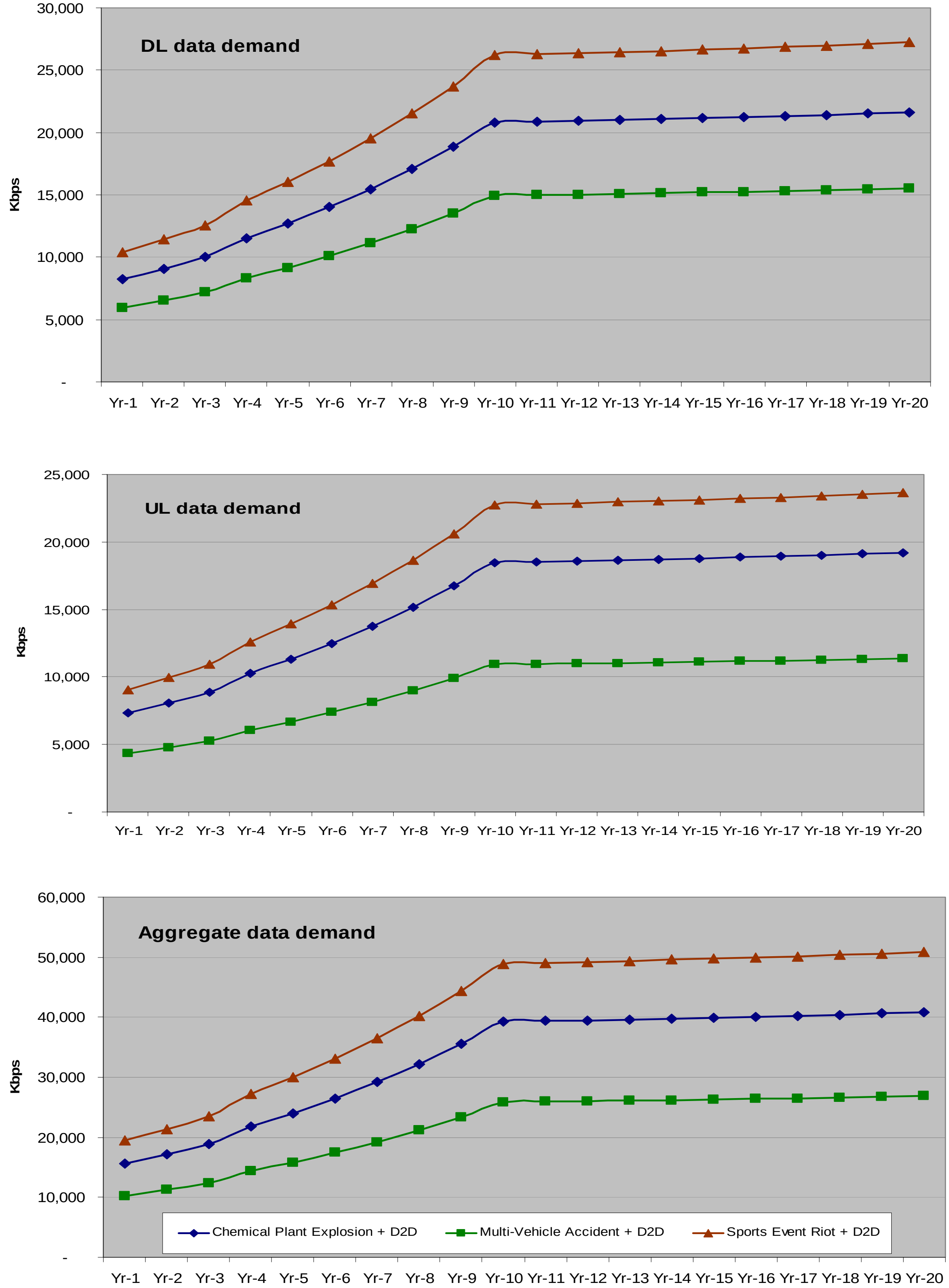

Figure 3.6: Data demand profiles for DL, UL, and Aggregate, including growth effects and day-to-day operations.

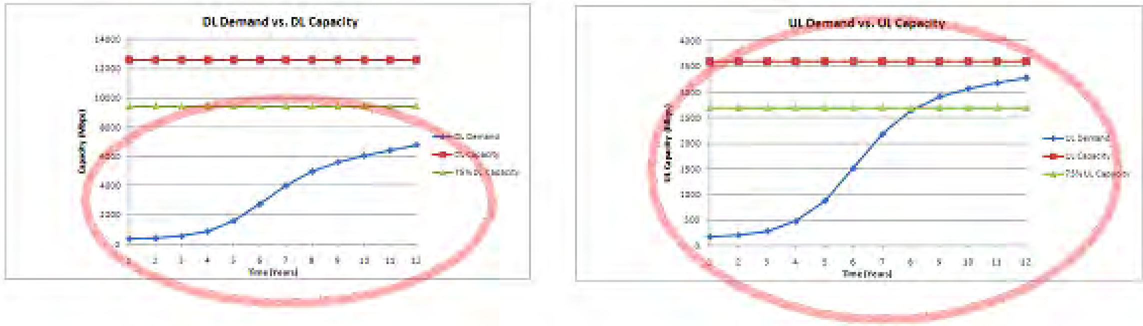

Figure 3.7: Data demand growth profile as reported by the City of New York [3]

4 Capacity model

The Capacity Model establishes how much data can be transported over an LTE system. The model treats Up-Link and Down-Link directions separately since LTE spectral efficiency is asymmetric. The 3GPP has released specifications for Rel.8 and 9, and there is on-going work to define the specifications for Rel.10 and 11. There is also substantial research activity at university and industry levels on ways to improve efficiencies. New features for LTE will one day be implemented and the benefits will be realized, perhaps not to the same extent as predicted, but we can reasonably expect the capacity to increase as the vendor community transforms the research into commercially viable products.

Some technologies, currently under development or the subject of research, were examined for their potential to increase spectral efficiency. Based on these, a hypothetical technology roadmap was established in order to quantify spectral efficiency improvements in the Capacity Model. The various technologies that were examined are described in §4.3.

In §4.4 are the basic assumptions that are considered in the Capacity Model.

4.1 Long Term Evolution (LTE)

Long Term Evolution is the latest standard for mobile wireless access from the same industry group that developed the specifications for GSM and UMTS/HSPA, namely 3GPP. LTE improves upon the performance of previous generations of wireless systems in terms of increased capacity, reduced latency, and support for multimedia applications. Its current release, Rel.8, is referred to as 3.9G. LTE-Advanced (Rel.10) with even superior performance is intended as the first release to cross the threshold into 4G. Some of the key specifications are:

- Peak downlink data rates: 326 Mbps (4x4 MIMO [1]); 173 Mbps (2x2 MIMO) in 20 MHz bandwidth.
- Peak uplink data rates: 86 Mbps with a single transmit antenna in 20 MHz bandwidth.
- Latency: 5ms or less.
- Backwards compatible with: GSM, CDMA-One, UMTS, and CDMA2000
- Able to operate in Frequency Division Duplex (FDD) and Time Division Duplex (TDD) modes.
- Able to operate in carrier bandwidths of 1.4MHz, 3MHz, 5MHz, 10MHz, and 20MHz.
- Frequency bands: as shown in Table 4.1 for FDD and Table 4.2 for TDD[*]

[*] TDD approved in Europe, China, India, Japan, Malaysia, Australia.

Table 4.1: LTE frequency bands for FDD

LTE BAND NUMBER	UPLINK (MHZ)	DOWNLINK (MHZ)
1	1920 - 1980	2110 - 2170
2	1850 - 1910	1930 - 1990
3	1710 - 1785	1805 -1880
4	1710 - 1755	2110 - 2155
5	824 - 849	869 - 894
6	830 - 840	875 - 885
7	2500 - 2570	2620 - 2690
8	880 - 915	925 - 960
9	1749.9 - 1784.9	1844.9 - 1879.9
10	1710 - 1770	2110 - 2170
11	1427.9 - 1452.9	1475.9 - 1500.9
12	698 - 716	728 - 746
13	777 - 787	746 - 756
14	788 - 798	758 - 768
17	704 - 716	734 - 746
18	815 - 830	860 - 875
19	830 - 845	875 - 890
20	832 - 862	791 - 821
21	1447.9 - 1462.9	1495.5 - 1510.9
22	3410 - 3500	3510 - 3600

Table 4.2: LTE frequency bands for TDD

LTE BAND NUMBER	ALLOCATION (MHZ)
33	1900 - 1920
34	2010 - 2025
34	2010 - 2025
35	1850 - 1910
36	1930 - 1990
37	1910 - 1930
38	2570 - 2620
39	1880 - 1920
40	2300 - 2400
41	3400 - 3600

4.2 The concept of Spectral efficiency

Spectral Efficiency (SE) is a measure of how much information can be carried in a transmission bandwidth normalized to 1Hz, expressed in bps/Hz. It is the key parameter by which to determine the capacity of a wireless network. SE is a function of the signal to noise ratio (SNR) because a higher SNR allows the signal component to occupy more states and thus carry more information. Figure 4.1(a,b) illustrates a sample constellation of signal states for 16QAM and 64QAM modulation. 64QAM can transport 50% more information than 16QAM, but due to the higher density of signal states, 64QAM requires a higher SNR than 16QAM. This is why User Element (UE) which are closer to the base station can support a higher data rate. Since SNR is lower at greater distances from the transmitter, UEs which are at the cell edge have lower data rates.

Spectral Efficiency is also affected by interference. Similarly to noise, interference reduces the space between signal states and leads to a higher probability of incorrectly detecting the instantaneous state of the received signal. In cellular networks interference is a major impairment to spectral efficiency and is the subject of significant research for ways to mitigate its negative effects on SE. However, the effort to improve SE by increasing SNR delivers correspondingly fewer gains relative to the increases in SNR since SE has a logarithmic relation to SNR. Claude Shannon in his seminal paper on the Theory of Communications [1] postulated the mathematical relationship between channel capacity and SNR. His theory is illustrated in the graph of Figure 4.2. SNR is expressed as Eb/No which is the normalized form for SNR.

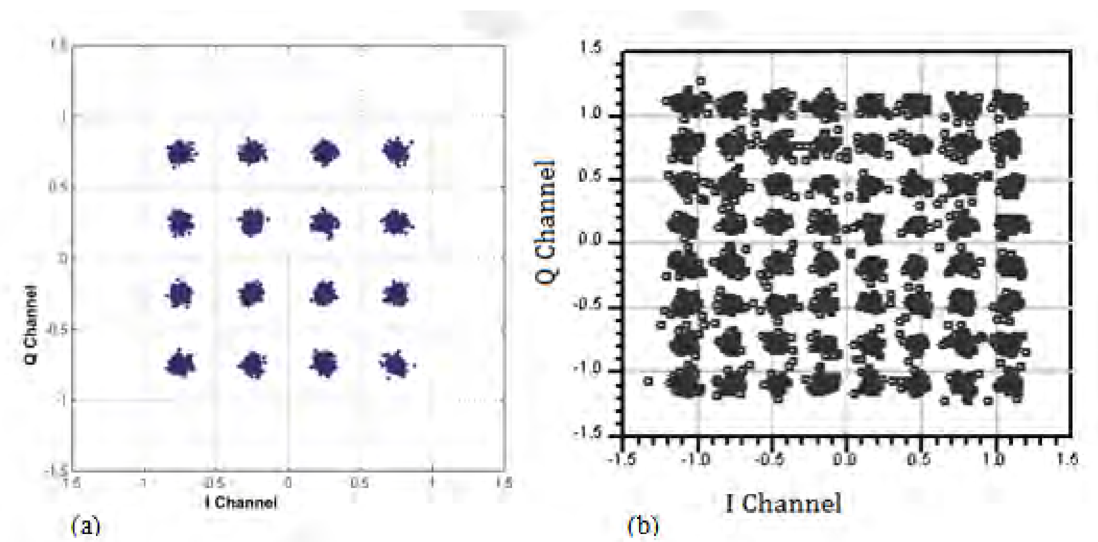

Figure 4.1: Signal state constellation diagrams for (a) 16QAM and (b) 64QAM with noise-induced impairments.

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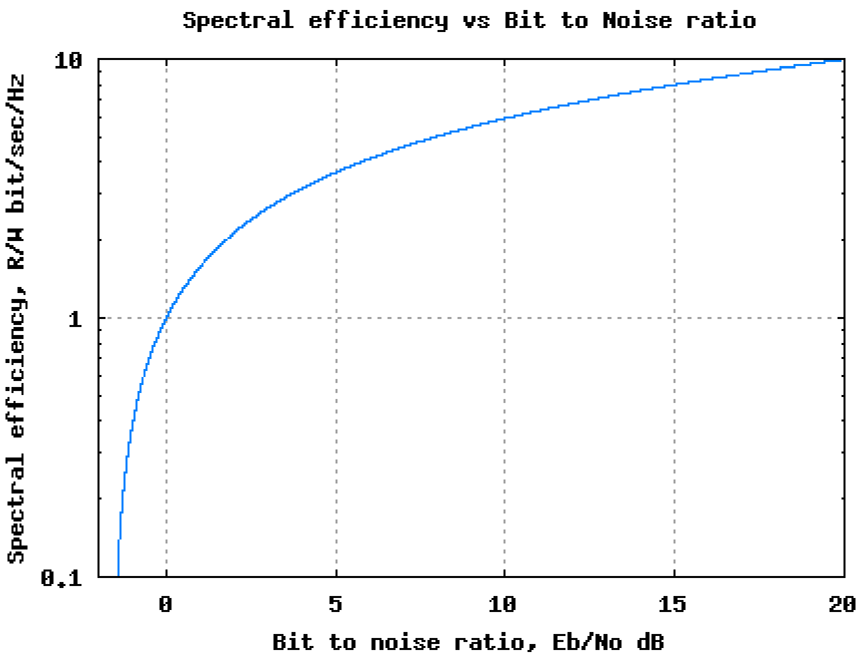

Figure 4.2: Relationship between Spectral Efficiency and Signal-to-Noise Ratio.

4.2.1 Interference effects

Inter-cell interference is one the most important factors limiting the spectral efficiency of a cell. When interference power is combined with Additive White Gaussian Noise (AWGN), the Signal to Interference + Noise Ratio (SINR) ratio is reduced. A User Element (UE) with low SINR means that it must operate at a lower modulation index to keep packet error ratios to an acceptable level for the applications used by the particular UE. A lower modulation index means that the spectral efficiency is reduced for that UE, which in turn reduces the average spectral efficiency for the cell. In essence, higher interference lower SINR lower modulation index lower spectral efficiency.

Figure 4.3 illustrates a typical case where interference triggers the hand-off of the UE from one base station (eNB) to anther eNB. As the UE moves away from its serving eNB, the signal power of the serving source reduces, while the signal power of the adjacent eNB increases. While the UE is still served by the left-hand eNB, the signal from the right-hand eNB appears as interference. Thus the UE experiences a reducing SINR (reducing spectral efficiency) as it moves towards the cell edge. The hand-off process is initiated when the SINR reaches a threshold point.

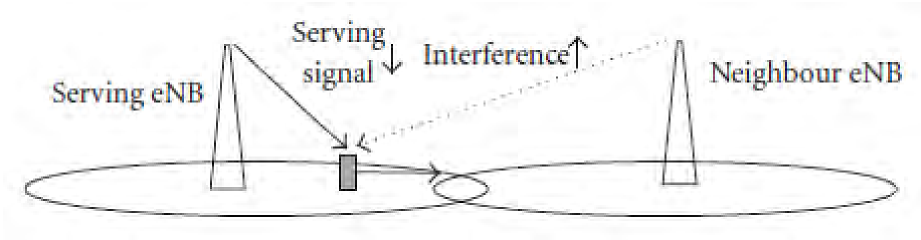

Figure 4.3: Reducing SINR as the UE moves towards the edge of the serving eNB [10].

Interference effects are more significant at cell edges and where cell sectors overlap. A typical cell would be configured into 3 or 6 sectors. Figure 4.4(a) illustrates a 3-sector cell.

One approach cellular network engineers use to mitigate interference is to assign different frequencies to adjacent sectors. In Figure 4.4(b) the Frequency Re-use (FR) factor is 3, but in practice may be as high as 7. The consequence of this approach is to assign 1/3 to 1/7 of the RF spectrum to each sector. Each sector would then have 1/3 to 1/7 of the aggregate throughput.

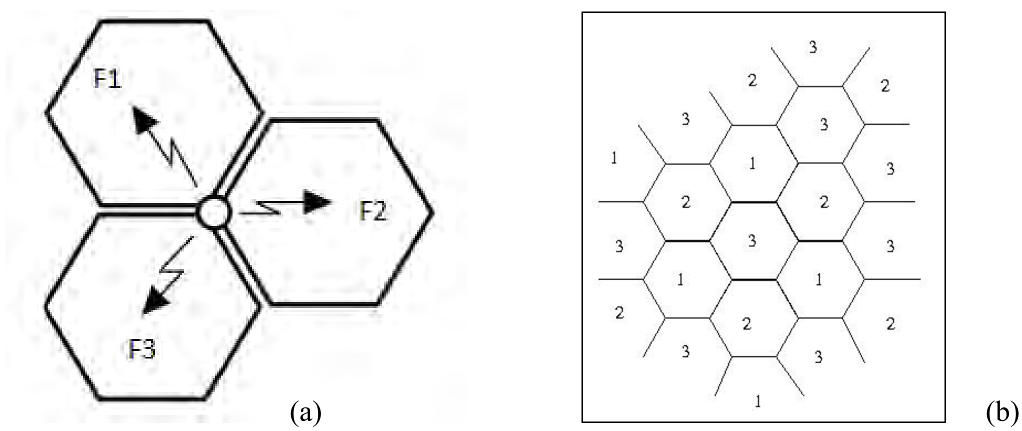

Figure 4.4: (a) frequency assignments in a 3-sector cell with FR = 3; (b) network frequency assignments for FR = 3.

Maximizing throughput by various interference mitigation strategies is a rich area of study and will be examined further in this section. The sections that follow review some of the technologies more frequently found in technical literature and oft-cited research.

4.3 Spectral Efficiency Roadmap

Each new generation of wireless technology improves upon the capacity of the previous one. LTE, currently at Rel.8 and Rel.9, will continue to evolve new capabilities into Rel.10, 11, and beyond. Some of the new capabilities will increase spectral efficiency. The Capacity Model assumes a progressively increasing spectral efficiency. Some of the technologies currently under development or in early stages of research are discussed below. Their potential impacts on spectral efficiency are included in the Capacity Model as illustrated in Table 4.3. The SE Roadmap is specific to the Capacity Model. The actual sequence of technology deployment may differ from that shown in the table or the values of SE may also be different.

Table 4.3: Spectral Efficiency Roadmap specific to the Capacity Model.

	T0: YR1-3	T1: YR4-6	T2: YR7-9	T3: YR10-12	T4: YR13-15	T5: YR16-18	T6: YR19-20
bps/ Hz	**LTE Rel.8**	**Fractional Frequency Reuse**	**Adaptive Fractional Frequency Reuse; 4x4 MIMO**	**Multi-User MIMO**	**Cooperative Multi-Point**	**Dirty Paper Coding**	**Femto-cells Relays**
DL	0.686	0.860	1.060	1.329	1.923	2.398	2.849
UL	0.300	0.375	0.457	0.652	1.051	1.485	1.737

4.3.1 Fractional Frequency Reuse

One of the most active areas of research is to increase the throughput of LTE systems by mitigating the effects of inter-cell interference. Inter-cell interference is a dominating factor in limiting the throughput. An important goal is to reduce the FR factor to as near unity as possible. Figure 4.5 illustrates that with FR=1 the network bandwidth is essentially available in each sector. With FR=3, the network BW is divided by 3. Fractional Frequency Reuse (FFR) is made possible by the X2 communications link between LTE base stations. The mechanisms that are applied in a coordinated manner between eNBs are known collectively as Inter-Cell Interference Coordination (ICIC). ICIC-enabled FFR can achieve lower values of FR such as 3/2 as illustrated in Figure 4.6.

FR factor affects the total network capacity (TNC) as in equation (3). A lower value of FR increases total network capacity.

$$\text{TNC} = \frac{[\text{\# of cell sites}] \times [\text{\# of sectors/site}] \times [\text{SE}] \times [\text{available BW}]}{\text{FR}} \tag{3}$$

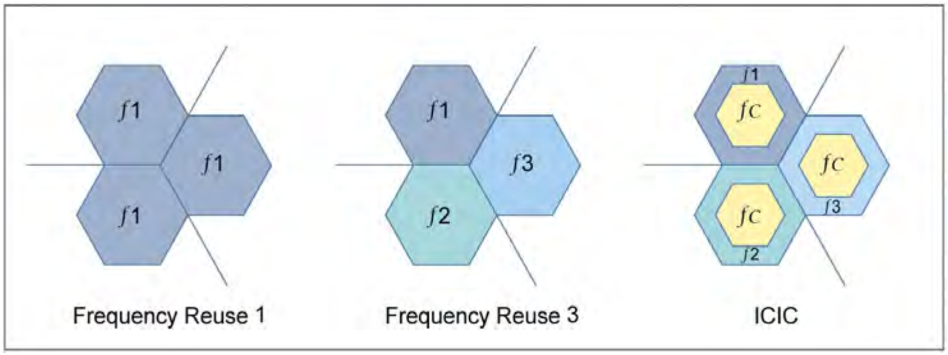

Figure 4.5: Frequency re-use plans FR=1, FR=3, and Fractional Frequency Re-Use (FFR).[11]

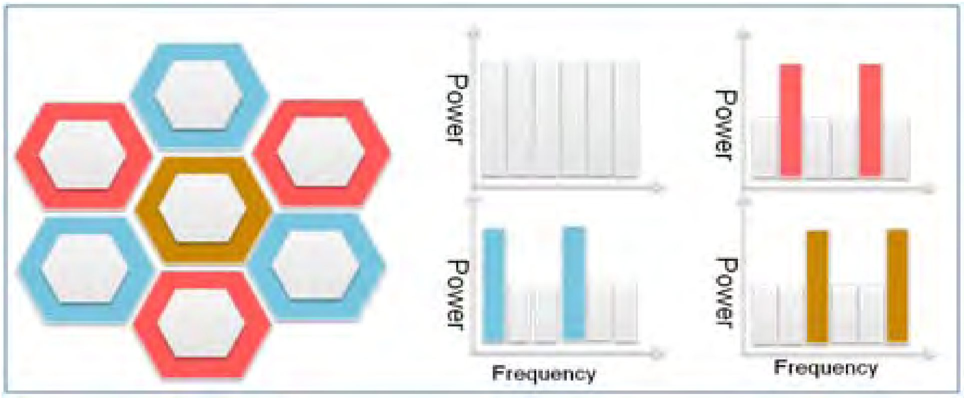

Figure 4.6: Illustration of FR=3/2 using ICIC and associated Power Bandwidth Profiles.

Adaptive Fractional Frequency Reuse (AFFR) is a closed-loop scheme that uses the Channel Quality Indicator feedback from the UE in order to dynamically adapt the scheduling, power level, and channel assignment to the UEs. In addition, AFFR coordinates the actions among all the adjacent eNBs. Simulation results indicate that near unity FR can be obtained. See Table 4.4 for a comparison of simulated LTE sector throughputs for N=1 and AFFR. In the cited article, N ≡ FR. AFFR achieves 99% of the throughput of FR=1.

Table 4.4: comparison of simulated LTE sector throughputs for N=1 and AFFR [12]

	FR =1	AFFR
Sector Throughput (Mbps)	8.01	7.89

4.3.2 Multiple Input Multiple Output (MIMO) techniques

MIMO techniques are used to improve SE. One MIMO scheme, referred to as Spatial Multiplexing (SM), can be used to transmit multiple information streams simultaneously from eNB to the UE. MIMO is also used to cancel interference on streams carrying the same information. LTE Rel.8 is able to dynamically adapt the MIMO scheme in order to maximize throughput using feedback from the UE. This is known as Closed Loop MIMO (CL-MIMO). Figure 4.7 illustrates 2x2, 3x2, and 4x4 MIMO configurations.

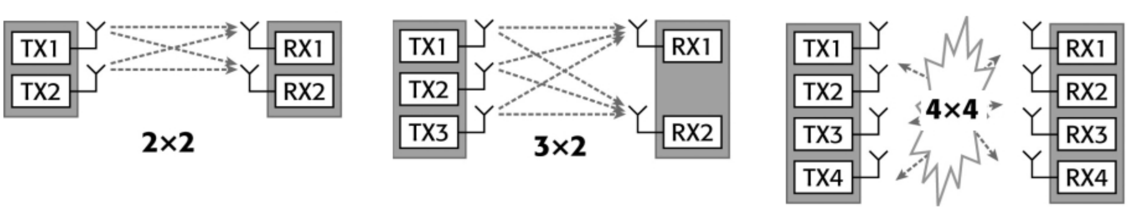

Figure 4.7: Transmitter and receiver arrangements for 2x2, 3x2, and 4x4 MIMO.

Table 4.5 refers to SU-MIMO (Single User MIMO). In this arrangement, the eNB transmits on multiple antennas, whereas the UE transmits on one antenna but receives on multiple antennas. The SE for 2x2 and 4x4-MIMO is given in Table 4.5.

Table 4.5: Average spectral efficiencies for down-link and up-link for 20MHz bandwidth [13] [14]

Down-Link	Spectrum Efficiency		Mean User Throughput		Cell-Edge User Throughput		
	[bps/Hz/cell]	x UTRA	[bps/Hz]	x UTRA	[bps/Hz]	x UTRA	
E-UTRA 2x2 SU-MIMO	1.56	x3,0	0,16	x3,0	0,04	x2,3	Rel.8
E-UTRA 4x4 SU-MIMO	2.41	x4,6	0,24	x4,6	0,08	x4,8	Rel.10

Up-link	Spectrum Efficiency		Mean User Throughput		Cell-Edge User Throughput		
	[bps/Hz/cell]	x UTRA	[bps/Hz/user]	x UTRA	[bps/Hz/user]	x UTRA	
E-UTRA 1x2	0.681	x2.2	0.068	x2.2	0.0044	x2.0	Rel.8
E-UTRA 1x4	1.038	x3.3	0.104	x3.3	0.0094	x4.2	Rel.10

Figure 4.8 compares average spectral efficiencies across different channel bandwidths. The spectral efficiency for 10MHz bandwidth is ≈98% of that for 20MHz bandwidth.

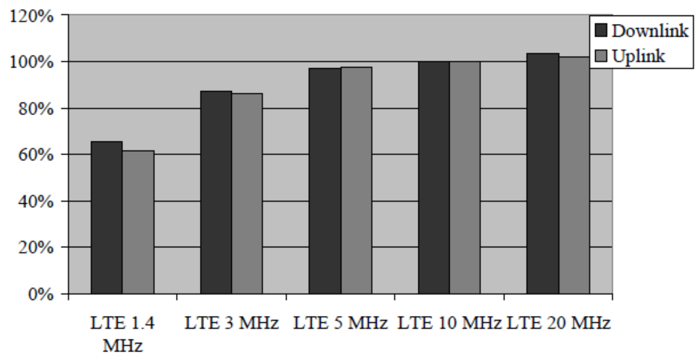

Figure 4.8: Comparison of spectral efficiencies relative to 10MHz channel bandwidth[15].

4.3.3 Multi-User MIMO Uplink

Multi-User MIMO-UL (MU-MIMO-UL) is the equivalent of spatial diversity in the Uplink direction. As in the previous case, interference is estimated from the received signals using Successive Interference Cancellation . Figure 4.9 illustrates a block diagram for the MU-MIMO-UL. Note the feedback from the UE towards the eNB.

This technique can provide ≈ 70% improvement in UL spectral efficiency relative to LTE Rel.8. Refer to Figure 4.10 for a comparison of various techniques being researched by Deutsche Telkom Laboratories to improve SE.

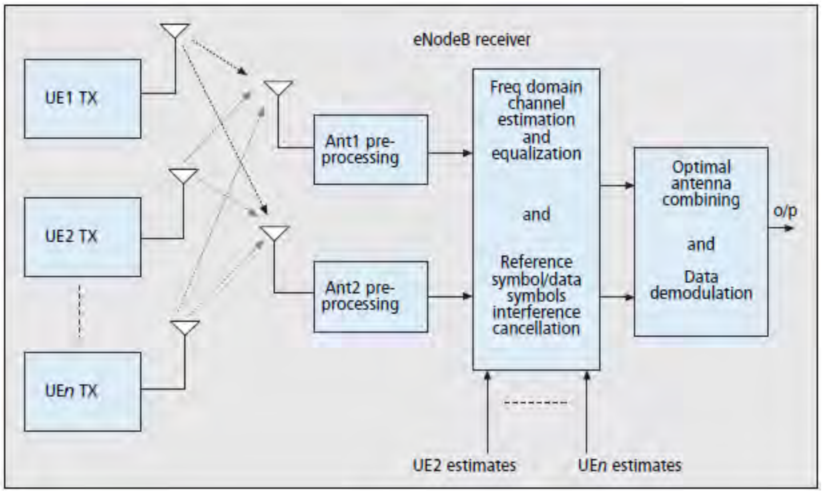

Figure 4.9: MU-MIMO-UL block diagram [12]

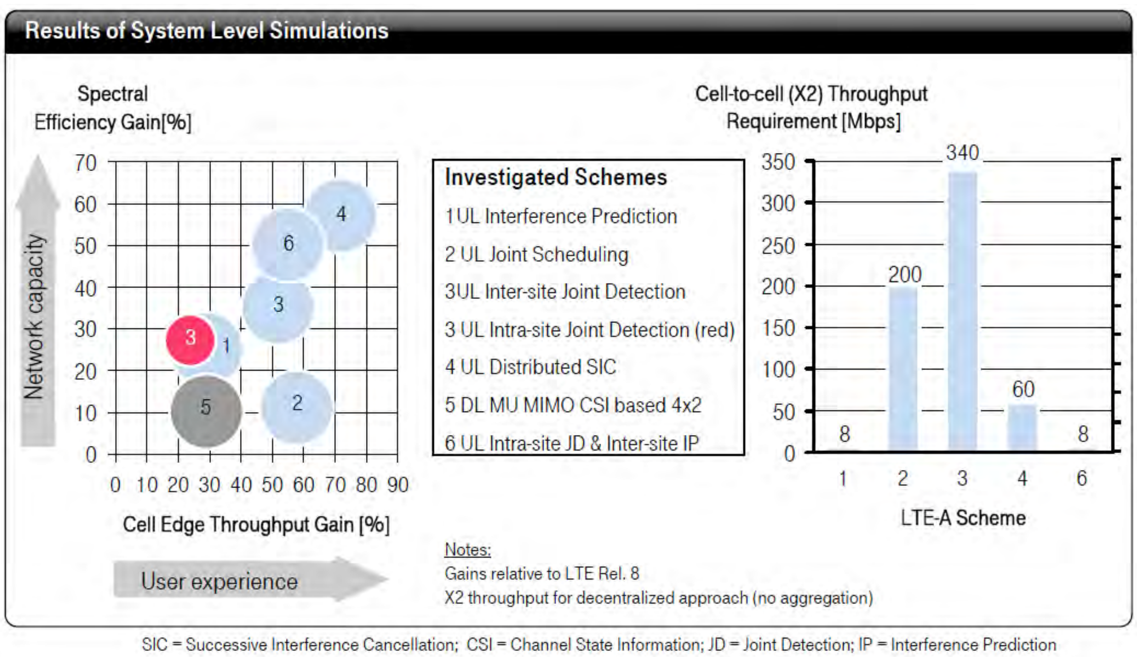

Figure 4.10: Spectral Efficiency Improvements under study. [17]

4.3.4 Multi-User MIMO Downlink, Coordinated Multi-Point

Coordinated Multi-Point (CoMP) with Organized Beam-forming improves the SE at the cell-edge. The average cell throughput is also increased. In organized beam-forming eNBs exchange scheduling and beam-forming information so that multi-site scheduling can be performed. This reduces inter-cell interference. Figure 4.11 illustrates the principle of CoMP. Simulation shows that SE in the DL can be improved by up to 1 bps/Hz using this technique..

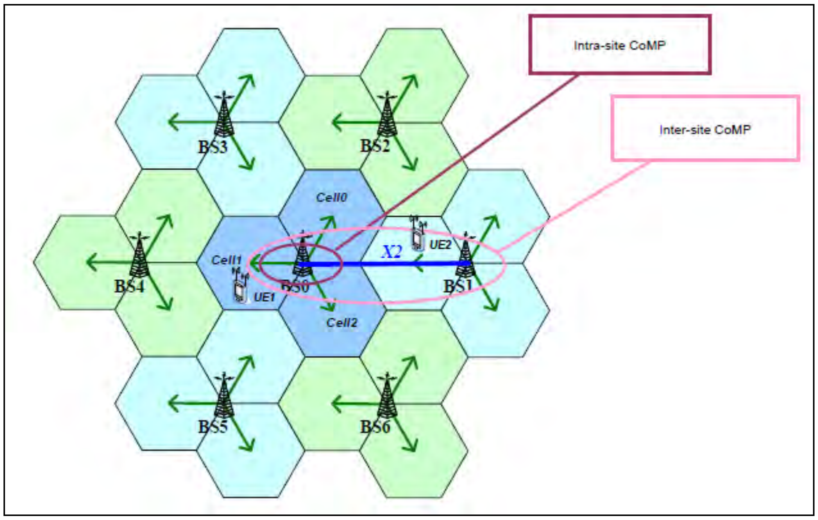

Figure 4.11: Coordinated Multi-Point conceptual diagram [18].

4.3.5 Dirty Paper Coding

Dirty Paper Coding (DPC) is a technique whereby the data is pre-coded at the transmitter using interference information fed back from the UE on the side channel referred to as Channel State Information (CSI). In essence, the transmitter adapts to the interference. Information theorists have presented mathematical arguments that DPC with CSI feedback can approach the performance of Gaussian Noise channels, thereby almost completely cancelling the interference. [19]

Other researchers arrived at numerical results which indicate that DPC can improve the SE of 2x2 MIMO systems by up to 0.8 bps/Hz, and improve the SE of 4x4 MIMO systems by up to 1.35 bps/Hz. [20]

4.3.6 Femto-cells and decode/forward Relays

Femto-cells and relays are used to increase the capacity in a specific location such as malls and conference centres. Femto-cells off-load traffic from the macro node. Relays are used to fill in gaps in coverage from the macro node. See Figure 4.12 for an illustration of the use of Femto cells and Relays.

Both approaches increase capacity although it can be difficult to quantify in general terms since the actual gain is implementation-specific. The Capacity Model assumes a 10% increase in UL and DL SE through the use of Femto-cells and Relays.

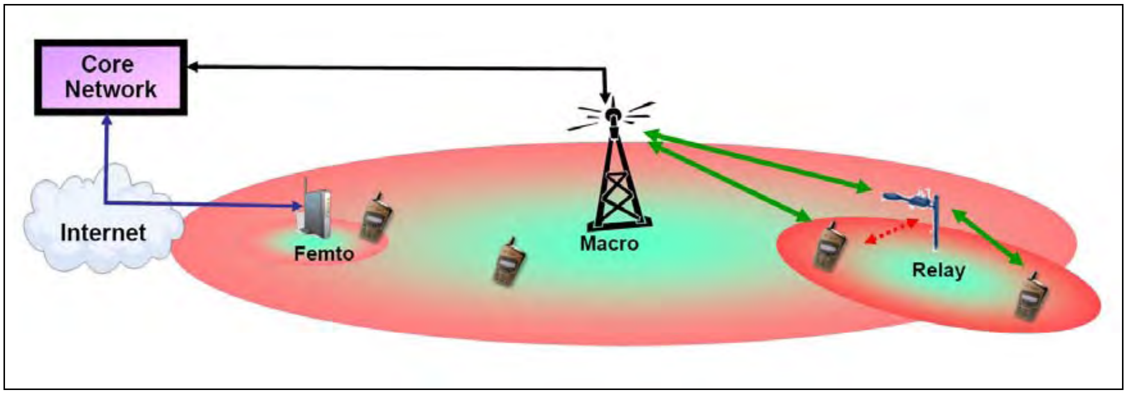

Figure 4.12: Femto cells and Relays used to augment the capacity of a Macro cell.

4.4 Input data and assumptions

The following input data and assumptions and have been used in the Capacity Model.

1. Spectral efficiencies stated in Table 4.5 represent the average of reported results from a number of LTE system and sub-system vendors. They are:
   - Alacatel-Lucent
   - Huawei
   - InterDigital
   - Motorola
   - NEC
   - Nortel
   - Nokia-Siemens
   - Samsung
   - Qualcomm
   - Texas Instruments

2. The introduction of new technology into a network will likely encounter implementation issues and the Capacity Model assumes that there will be a gap between anticipated SE improvements vs. realized improvements. However, the Model also assumes that the gap will reduce in time as the technology matures and implantations issues are worked out. Therefore, the Model applies a de-rating factor to the SE according to the profile: 33%, 25%, 10%, 5%. This means the SE improvement is de-rated by 33% when first introduced, 25% after 3 years, 10% after 6 years, and 5% after 9 years. The un-derated SE values are in Table 4.6. These values are not used in the Capacity Model, but serve as baseline from which de-rating factors were applied.

3. New technology is introduced in the LTE network in 3-year intervals. Even though some technology could be available sooner than it is introduced in the Model, it is assumed that budgets will constrain the ability to procure and update existing facilities. Another assumption is that public safety agencies will be somewhat conservative in upgrading. There will also be some time spent to pilot the upgrades before introducing them into live networks.

4. It is assumed that an incident is a localized event that would be contained geographically within one sector.

5. For FR=3 and FFR, an overlap of 25% is assumed between adjacent sectors. When AFFR is introduced the Model approaches FR=1 and as such no additional capacity is factored into the Model due to overlapping sectors since closed-loop ICIC mechanisms are intended to avoid duplicate scheduling of UEs.

6. SE is a dependent upon the speed of the UE. The Model assumes that the speed of most responders is <3kph at the scene of the incident. LTE SE is higher for lower speeds.

Table 4.6: Un-derated Average Spectral Efficiency (b/s/Hz/sector) not used in the Capacity Model.

	T0	T1	T2	T3	T4	T5	T6
DL	1.529	1.529	2.362	2.362	3.543	3.543	3.897
UL	0.667	0.667	1.017	1.729	1.729	2.729	3.002

5 RF spectrum requirements

This section discusses the results of correlating the data demand with capacity, which is the RF spectrum (bandwidth) required for public safety. It presents the nominal bandwidth and the error introduced by the uncertainty of future predictions. In §5.2 a sensitivity of the bandwidth is analyzed as a function of two key variables. There is also an analysis which presents to what degree public safety would have to back off their requirements in order for 5+5MHz to satisfy the reduced requirements.

Figure 5.1 is an illustration of the growth of data demand (from Figure 3.6) compared to the growth of Spectral Efficiency (from Table 4.3), with YR1 as the reference point. The difference in the growth rates is notable. Given the pressures that commercial carriers face due to the exponential nature of the growth in demand they are experiencing (see Figure 3.5) from commercial users, with no sign of abating, it is expected that they will continue to invest in new technologies to cope with the anticipated growth in data demand. In fact, there is an intense level of research into improving the spectral efficiency of mobile broadband networks 10. The cited article cites a further 64 references.

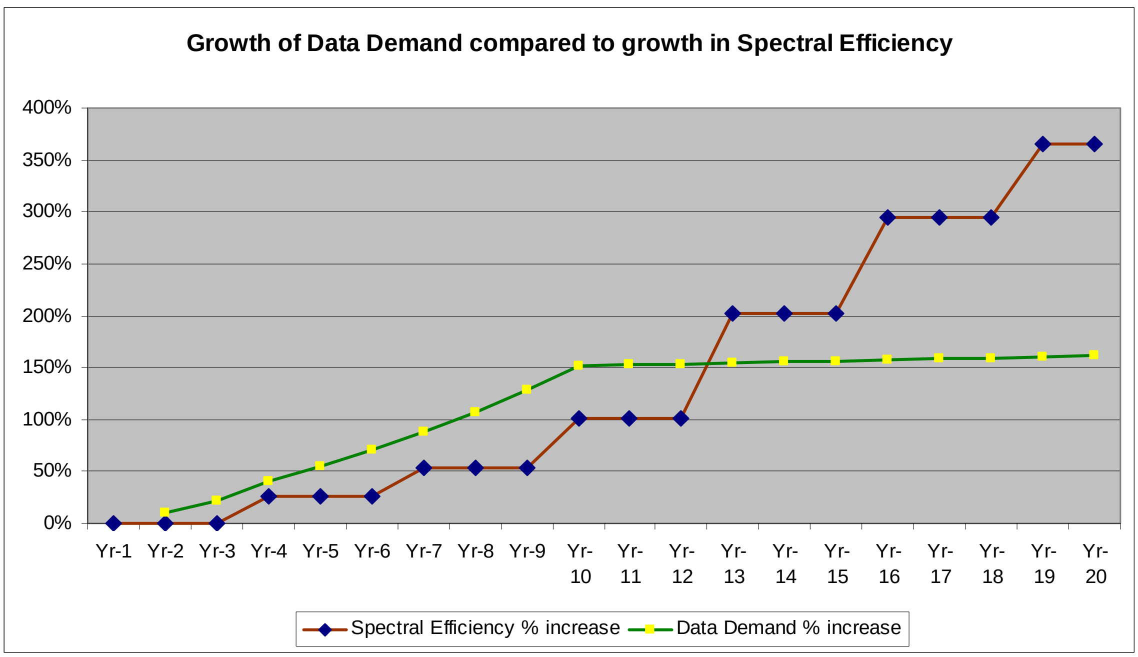

Figure 5.1: growth of data demand compared to the growth of spectral efficiency

It is very difficult to predict what will happen in the future, especially over a 20-year period. Even though it may be easier to predict what the demand could be in the next 1 or 2 years, or what technology would likely be developed in the near-term, there is nonetheless an uncertainty in whatever prediction is made. The degree of uncertainty becomes larger for prediction-horizons that are further out in time.

The Capacity Model has factored an estimating error into the predictions for RF spectrum. Figure 5.2 shows the same growth projections as in Figure 5.1, but also shows the effect of uncertainty using a 10% annually compounded estimating error for demand and the same for SE.

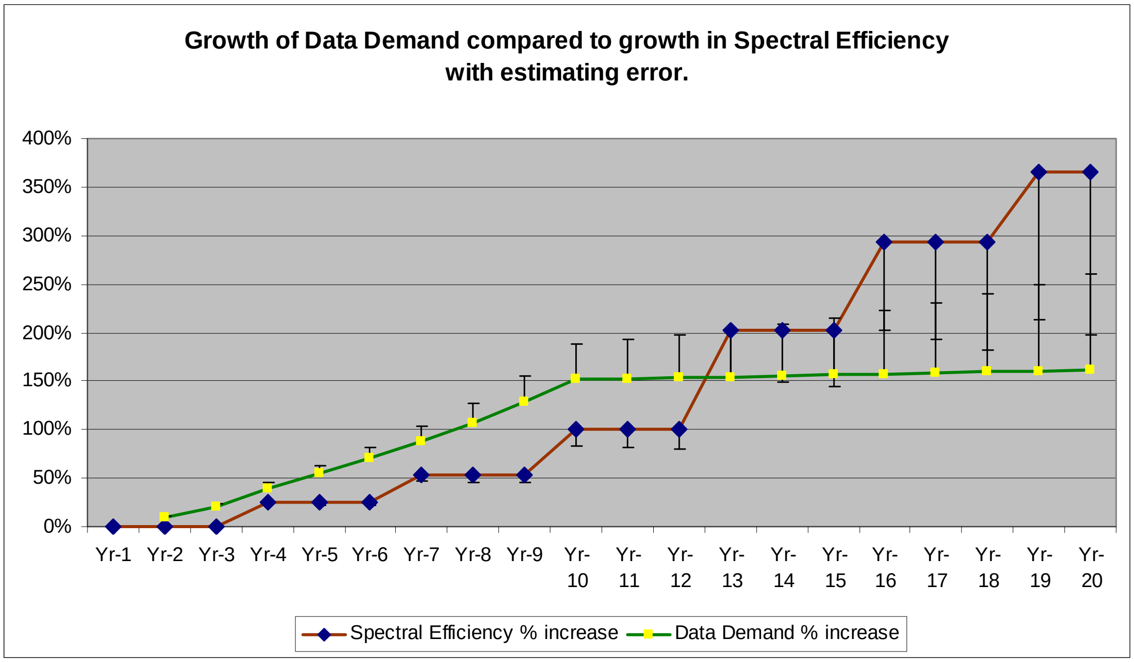

Figure 5.2: Growth of demand and SE with 10% annually compounded estimating error applied to demand and SE.

5.1 RF spectrum requirements – results

This section presents the bandwidth requirements using the inputs below. Alternative scenarios based on sensitivity to SE and SG are examined in §5.2.

(i) Data Demand profiles as shown in Figure 3.6,

(ii) SE values from Table 4.3,

(iii) Estimating error due to uncertainty of predicting future events as shown in Figure 5.2.

Equation (4) is used to calculate the aggregate required bandwidth (BWr):

$$BWr\ (MHz) = \frac{\text{DL Data Demand (kb/sec)}}{\text{DL SE (b/sec/Hz) x 1000}} + \frac{\text{UL Data Demand (kb/sec)}}{\text{UL SE (b/sec/Hz) x 1000}} \qquad (4)$$

Figure 5.3(a,b,c) shows the RF spectrum required for an LTE network to provide sufficient throughput to support the data communications needs for the 3 incident case studies, namely Chemical Plant Explosion, Multi-Vehicle Accident, and Sports Event Riot, respectively. The graphs also show the influence of estimating error. In each graph two curves are shown: one curve for the RF Spectrum required to support the aggregate (UL+DL) data demands for the specified incident, and one curve for the aggregate Usable BW based on a 10+10MHz allocation.

Since an incident is a localized event, only one sector's capacity is available, plus the overlap from the adjacent sector. At the outset, the usable capacity within one sector in either UL or DL direction is the Network capacity (based on 10+10MHz) ÷ 3 (FR) x 1.25 (sector overlap) x 75% (frequency re-use efficiency). If 20MHz is allocated, then only 6.25MHz is actually usable in a sector until further improvements in Frequency Reuse are implemented. The Model assumes that, over time, 95% of the Network capacity becomes available within a sector.

The period where RF spectrum requirement increases (YR1-10) is dominated by investments in LTE UE for the User community. Once the user community has been fully outfitted with LTE UE devices, the subsequent period (YR11-20) is dominated by investments in the LTE eNB infrastructure. These investments are characterized as improvements in spectral efficiency. The effect of introducing improvements in SE can be seen in the graphs as step-wise reductions in required bandwidth.

The following conclusion can be drawn from Figure 5.3:

1. Improvements in spectral efficiency outpace the growth in demand and so it is expected that the applications will require progressively less bandwidth when the penetration of LTE devices in the public safety community has saturated and the investments are turned towards accelerating the improvements in the infrastructure. According to Figure 5.3, the saturation point is at YR10.

2. 10+10MHz (UL+DL) is insufficient spectrum in both UL and DL to meet the data communications needs of public safety during commonly recurring incidents, given the anticipated spectral efficiency of LTE for the near-to-mid term.

3. When LTE technology becomes more spectrally efficient, 10+10MHz could be sufficient spectrum to support the data communications requirements for less severe incidents. This may occur beyond YR15 for benign incidents such the multi-vehicle accident.

4. When estimating error is included, 10+10MHz is insufficient spectrum for all cases throughout the 20-year horizon.

5. There is a significant gap between required spectrum and usable spectrum. During the events of the nature considered in this study, public safety will most likely not be able to use all the applications they identified, nor in the manner in which they expect to use them. In order to deal with situations where demand exceeds capacity bandwidth management policies will need to be established, access privileges would need to be asserted, controlled and monitored, and the use of applications will need to be prioritized. The policies and procedures could be re-visited over time as greater efficiencies are introduced into the network.

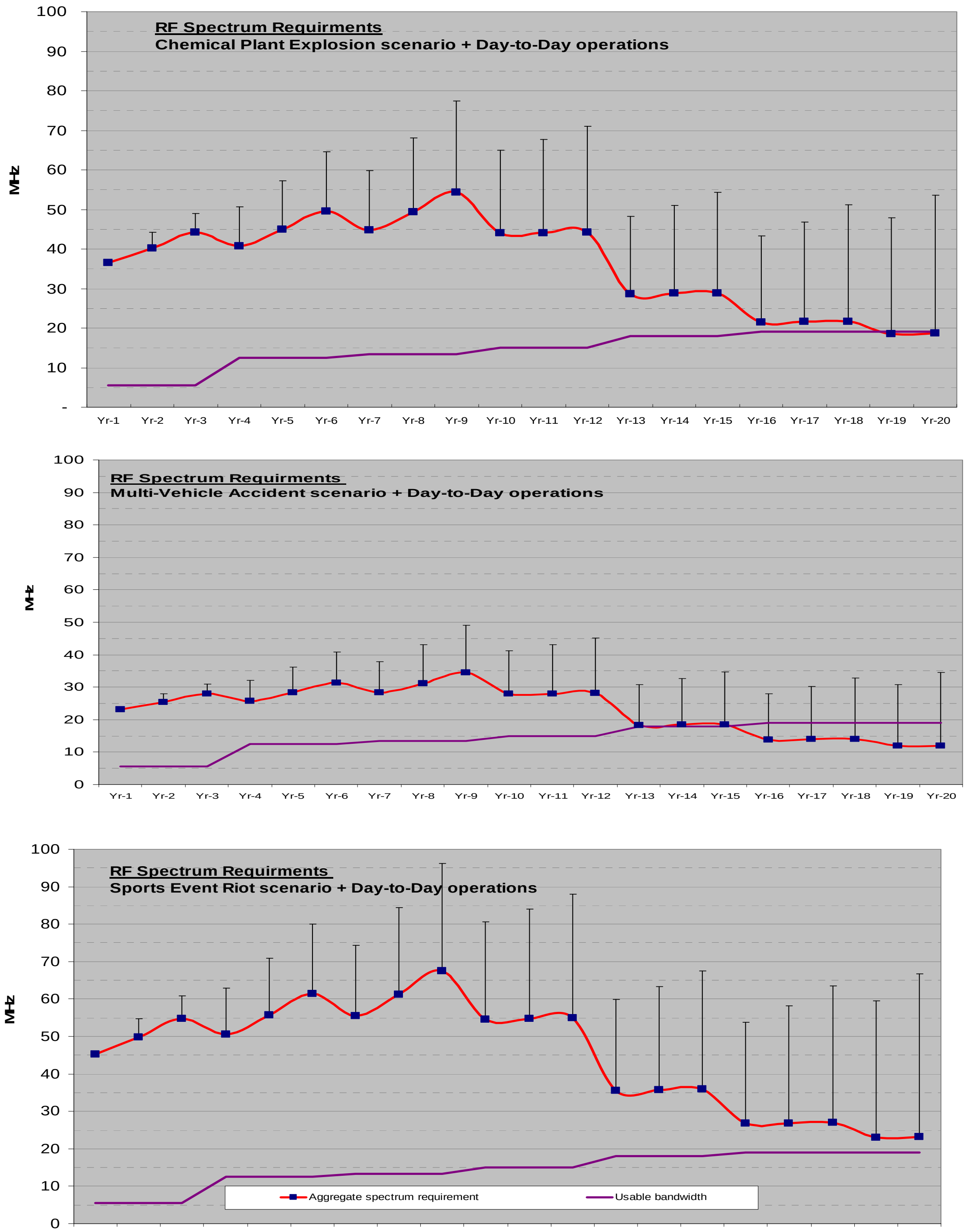

Figure 5.3: Aggregate (UL+DL) RF Spectrum requirements

5.2 Alternative scenarios

The effects of varying some key parameters on RF spectrum requirements will be examined in this section. Two cases examine the effects of aggressive approaches to dimensioning the network. Of course, the results show that less RF spectrum is needed. However, the conclusions of §5.1 remain essentially the same. The only exception would be for less severe incidents, where 10+10MHz would likely be sufficient when technology improves, but 5+5MHz would likely be insufficient.

A third scenario examines how aggressively the parameters need to be adjusted in order to reduce the data demand such that all three incident case studies can be fulfilled with 5+5MHz of RF spectrum.

5.2.1 Accelerated introduction of higher spectral efficiency.

In the Model, de-rated SE values are used to account for slower adoption of new technology in public safety networks due primarily to more restrictive budgets in municipalities or government than in commercial carriers. Public safety will likely have a longer vetting process before adopting new technologies. There would also be less economic/business pressure to upgrade the technology in public safety than in commercial networks.

If the public safety network were to be upgraded at the same pace as a commercial network, this scenario examines the effect of optimistic values of spectral efficiency on required RF spectrum. The un-derated SE values of Table 4.6 are reproduced below. The resulting required RF spectrum is shown in Figure 5.4 (a,b,c).

(copy) Table 4.6: Un-derated Average Spectral Efficiency (b/s/Hz/sector) not used in the Capacity Model

	T0	T1	T2	T3	T4	T5	T6
DL	1.529	1.529	2.362	2.362	3.543	3.543	3.897
UL	0.667	0.667	1.017	1.729	1.729	2.729	3.002

5.2.2 Lower intensity of use of the network.

A key factor in the data demand model is the over-booking factor (OBF). Since first responders will make more intense use of their data communications tools during an incident than during non-emergency situations, the Model uses an OBF ratio of 4:1 for streaming video and interactive applications. Commercial users also make more intense use of the network during emergencies. During these events typical OBF ratios of 20:1 or 50:1 for commercial users no longer apply.

Nevertheless, in this scenario the OBF for streaming video and interactive data is doubled from 4:1, as in the Model, to 8:1. The results for the three incidents case studies are illustrated in Figure 5.5(a,b,c).

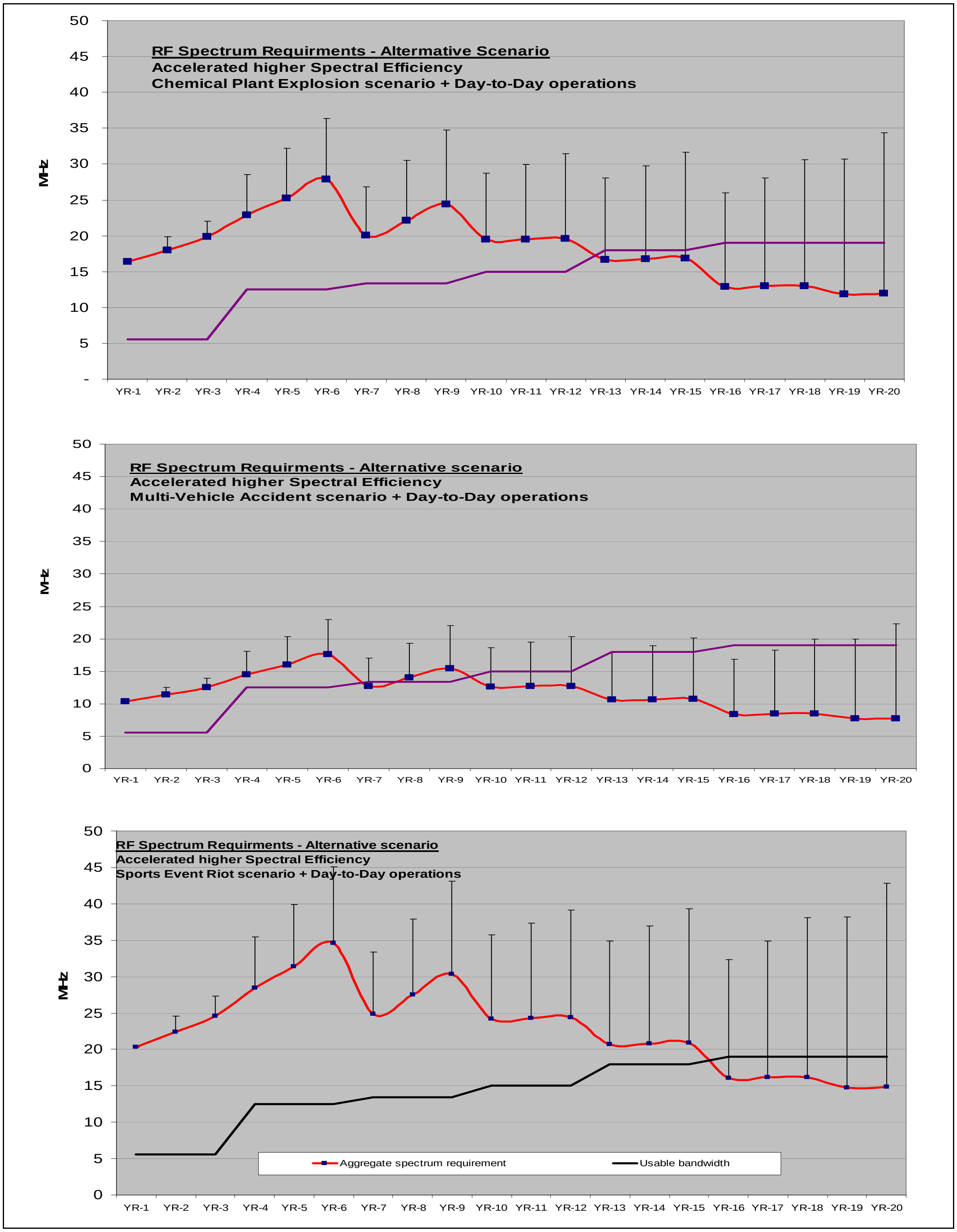

Figure 5.4: Aggregate (UL+DL) RF spectrum requirements considering accelerated improvement in SE.

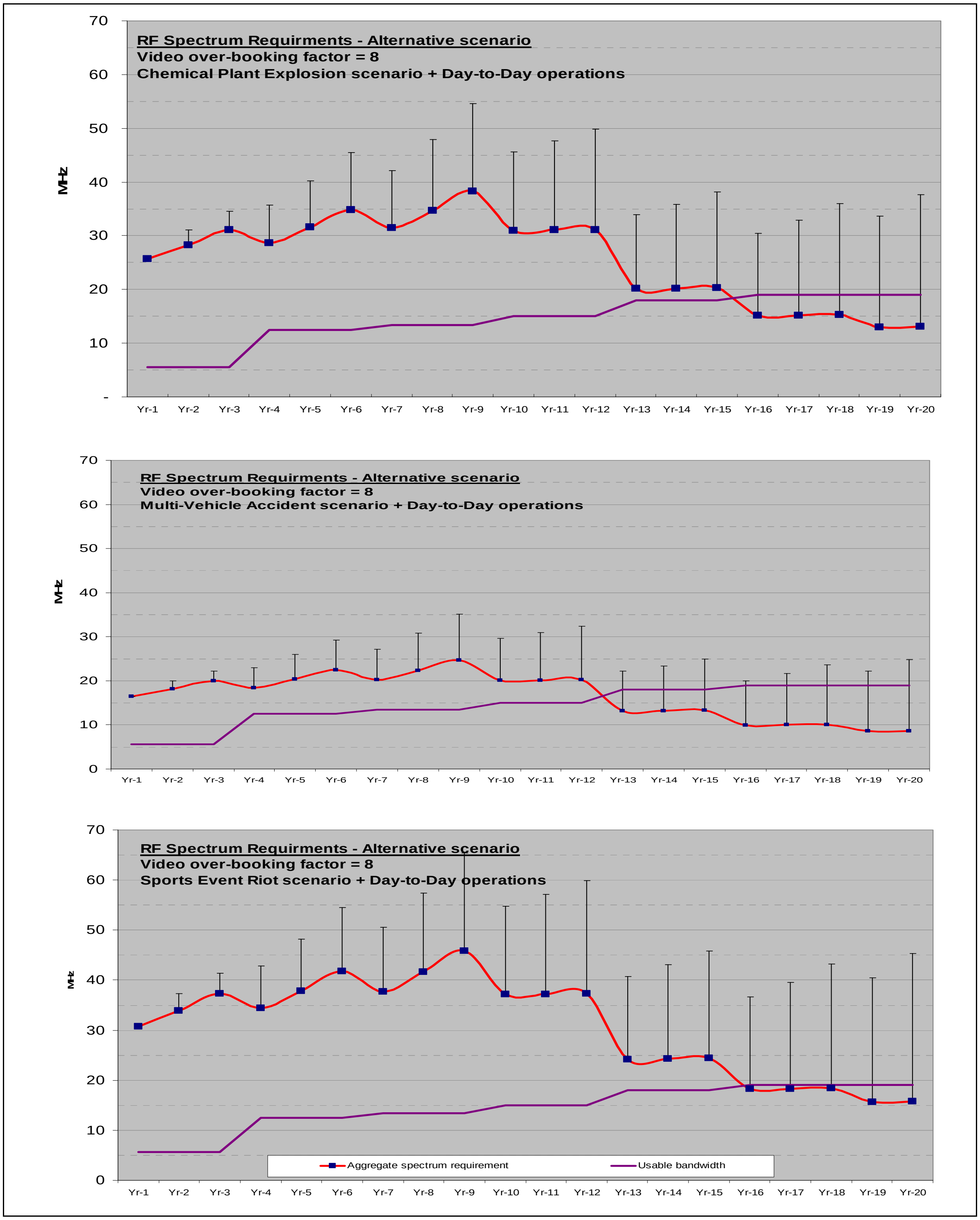

Figure 5.5: Aggregate (UL+DL) RF spectrum requirements considering aggressive OBF.

5.2.3 Level of compromise required to fit into 5+5MHz

Three parameters are simultaneously varied in order to determine how far public safety would have to back off from their requirements in order to fit into 5+5MHz of spectrum. The three parameters are:

- Video data rate
- Over-booking factor
- Spectral efficiency

In Figure 5.6(a,b,c) are graphs of RF Spectrum requirements which can be satisfied with 5+5MHz allocation. In order to fit into this profile, the following adaptations to the Model were made.

a) Video data rates were reduced by 50% compared to the values in the Model.

b) Over-booking factor was set to 20:1

c) Spectral efficiency was set to the un-derated values as in §5.2.1.

This means that in order for the data demands of the three incident case studies to be satisfied with 5+5MHz of the spectrum,

1. Video would not be usable to distinguish people, labels on chemical containers, or other similar level of detail.

2. The use of the network would have to be scaled back so that 1 in 20 users would be able to send or receive data simultaneously versus 1 in 4. One in 20 is the same OBF used by commercial carriers to dimension their networks for consumer-grade service.

3. New technology would need to be evaluated and implemented by public safety at the same pace as commercial carriers.

Item 3 above is based on optimistic expectations for technology roll-out. Items 1 and 2 would restrict the ability of first responders to make beneficial use of the network during emergencies. They would have to make significant compromises compared to how they intend to use a mobile broadband network if only 5+5MHz of spectrum would be available.

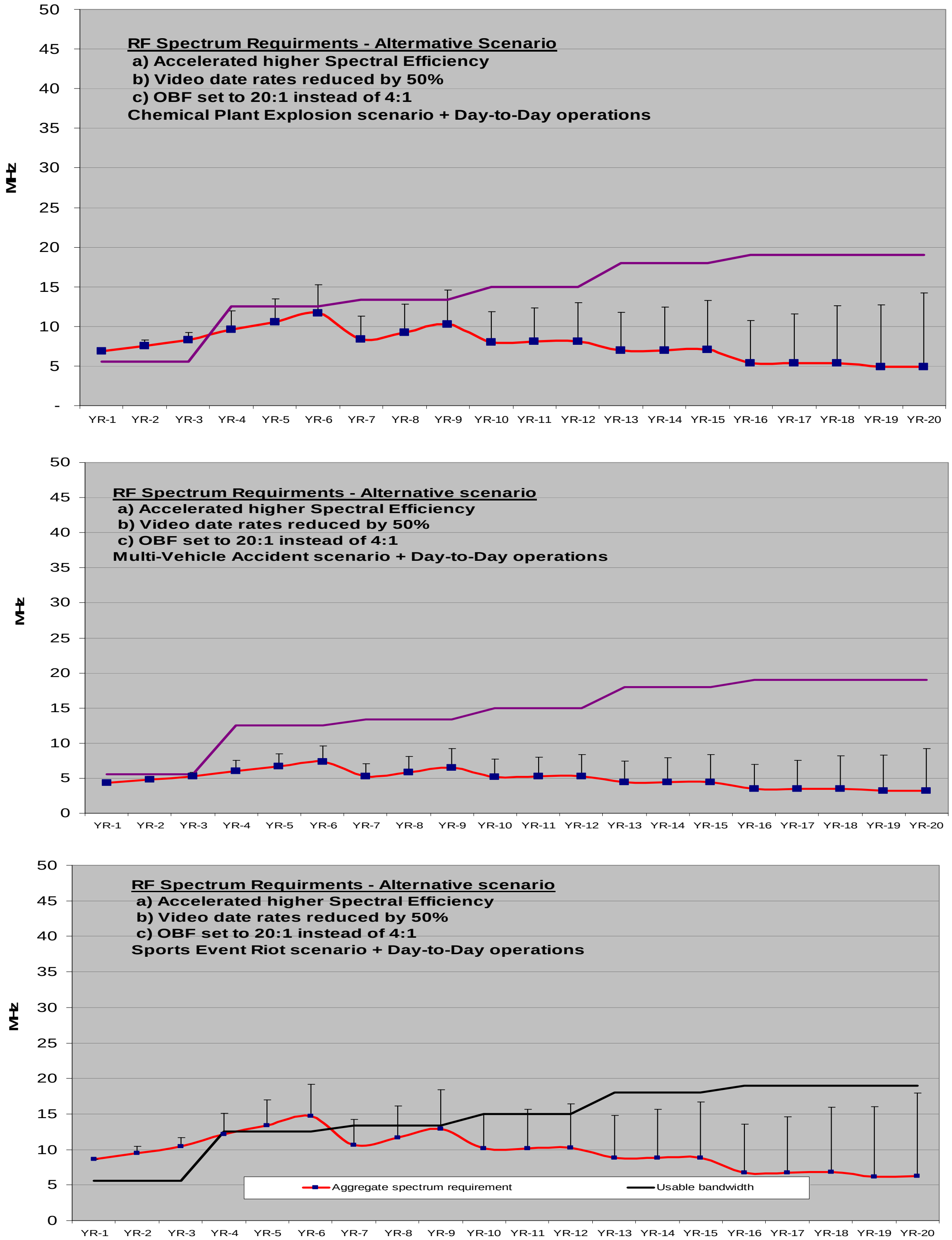

Figure 5.6: Level of compromise needed to fit spectrum requirements into 5+5MHz (UL+DL)

6 Conclusion

The question of how much bandwidth a mobile broadband network requires to meet the needs of public safety is answered by examining how the public safety community would use the technology and what throughput the technology offers.

This study followed a similar approach that others have taken to establish the anticipated usage. That is, to determine the data demand for incident scenarios of emergency events which are recurring in nature. Representatives from Canadian public safety stakeholders provided their views on how they anticipate using a mobile broadband network for three scenarios and how they would use the network in the course of their day-to-day operations.

The throughput requirements for each application that public safety could use were established based on empirical results from other studies and in consultation with the Communications Research Centre of Canada. The data demand profiles were determined from the anticipated usage and the applications data rates.

Correlating the data demand with the spectral efficiency of the mobile broadband network yields the required bandwidth. The analysis is performed for a 20-year horizon. LTE is the technology used in the study.

This study attempts to present a balanced perspective on demand and on capacity. It is unique in examining the effects of anticipated advances in technology to improve spectral efficiency over time and ways to manage high data-rate traffic such as video. The introduction of estimating error into the model is an innovative approach to quantify uncertainty of predicting future demand and capacity.

The key conclusions that are derived from this study are:

a) 10+10MHz is insufficient bandwidth to support the needs of public safety in the 10-15 year horizon.

b) Improvements in spectral efficiency will likely outpace public safety's demand for data and as a consequence, the requirement for bandwidth should begin to attenuate beyond YR10, which is the point when penetration of LTE devices in the public safety community is expected to saturate.

c) Despite the rapid pace of technical innovation, the ability to meet the needs of public safety with 10+10MHz of spectrum in a distant future, ie beyond 15 years, is not evident, but it is likely that 10+10MHz will not be sufficient at that time either..

In anticipation of being granted 20MHz of spectrum, and for the foreseeable future, congestion management will be an essential component of the mobile broadband network. The public safety community should develop policies and procedures, and make use of appropriate bandwidth management technology in order to avoid congestion-related issues during emergency situations.

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In response to a request for technical advice by Public Safety Canada on behalf of national public safety stakeholders, the Centre for Security Science conducted a technical assessment of the 700 MHz spectrum requirements for broadband mobile data communications for public safety and security. The impetus to this assessment relates to the upcoming Industry Canada call for consultation SMSE-018-10. The goal was to determine how much spectrum is required to meet the needs of the public safety community for mobile broadband wireless data communications within a 20-year time frame. The data demand for recurring emergency situations was modeled through an interactive process with active participation from Canadian public safety stakeholders. In addition, the capabilities of LTE technology to support the data demands were also modeled. The results show that the amount of bandwidth required to satisfy the needs of public safety is greater than 20MHz in the near-to-mid term, and likely to also exceed 20MHz in the long term, despite advances in technology. This result is based on an analysis that applies relatively conservative estimates for the growth in demand for mobile data communications for public safety and security applications, and relatively aggressive estimates for the rate of technological improvement of spectrum efficiency projected into the future.

En réponse à une demande de conseils techniques faite par Sécurité publique Canada au nom des intervenants nationaux de la sécurité publique, le Centre des sciences pour la sécurité a effectué une évaluation technique des besoins de la fréquence de 700 MHz pour la transmission mobile à large bande de données destinée à la sécurité publique. C'est l'appel de consultation SMSE-018-10 que lancera bientôt Industrie Canada qui a motivé l'exécution de cette évaluation. L'objectif consistait à déterminer quelle part du spectre est requise pour répondre aux besoins du milieu de la sécurité publique pour la transmission mobile de données à large bande au cours des 20 prochaines années. La demande en données pour les situations d'urgences récurrentes a été modélisée à l'aide d'un processus interactif auquel les intervenants de la sécurité publique du Canada ont participé activement. Il y a de plus une modélisation des capacités de la technologie LTE pour répondre aux demandes de données. Les résultats démontrent que la part de la bande passante nécessaire pour répondre aux besoins de la sécurité publique est supérieure à 20 MHz à court et à moyen terme, et dépassera aussi probablement 20 MHz à long terme, et ce, malgré les progrès technologiques. Ce résultat repose sur une analyse ayant recours à des évaluations relativement prudentes de la croissance de la demande pour la transmission mobile de données à des fins de sécurité publique, ainsi qu'à des évaluations relativement ambitieuses du degré d'amélioration technologique de l'efficacité spectrale dans le futur.

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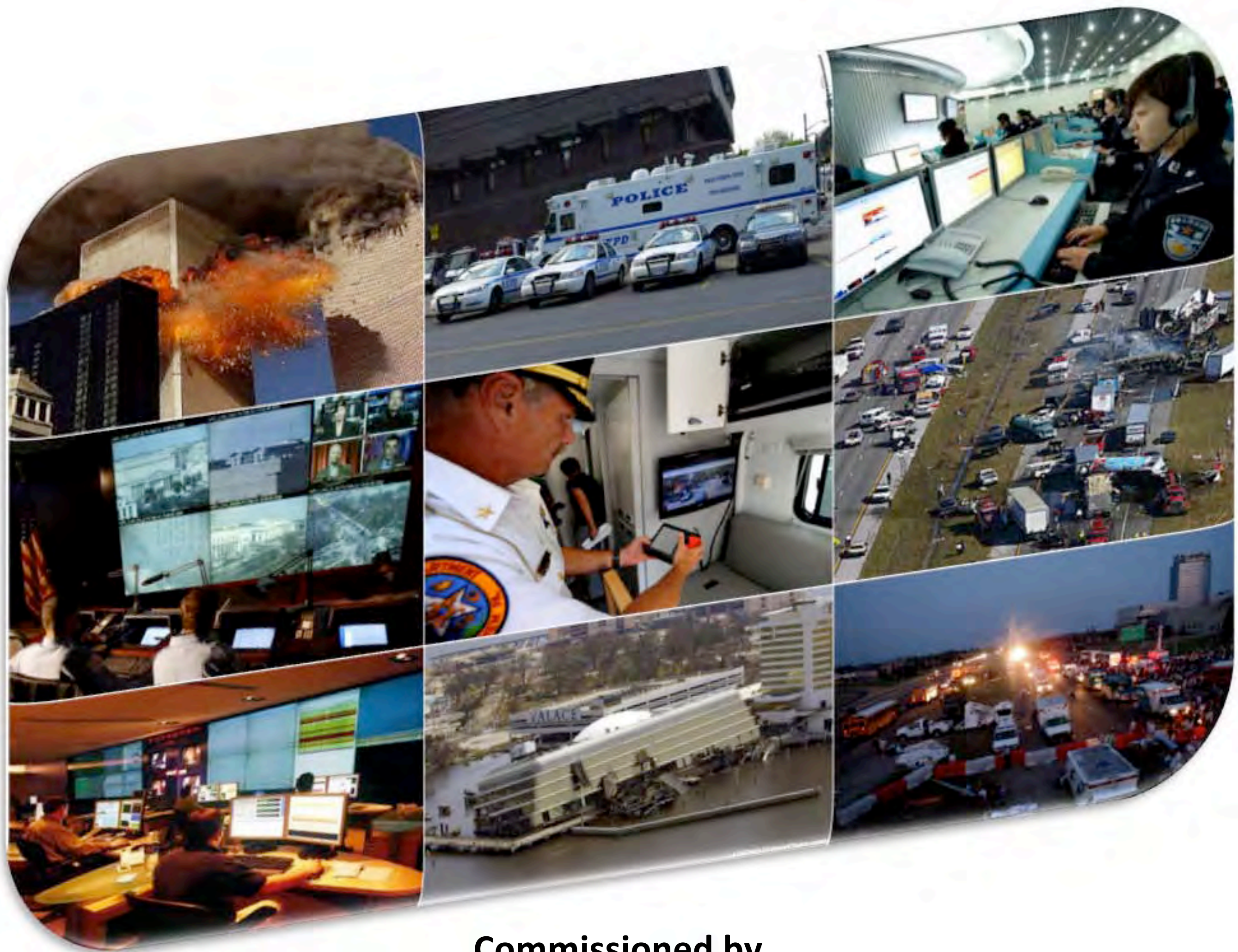
Emergency, management, planning, communication, Interoperability, 700 MHz, Broadband Communication, LTE, Long Term Evolution, video, public safety network, spectrum, allocation, data, mobile, technical, assessment.

Public Technology Institute

700 MHz "D" Block: Public Safety Application Needs Assessment

White Paper January 2010



Commissioned by

PSFA

Public Safety Foundation of America

Public Technology Institute

700 MHz "D" Block

Public Safety Application Needs Assessment

January 2010

Commissioned by the Public Safety Foundation of America

Prepared by
Dr. Alan R. Shark, DPA
Executive Director
Public Technology Institute
Washington, DC

Table of Contents

Preface

In November 2009, the Public Technology Institute (PTI) was commissioned by the Public Safety Foundation of America to develop a briefing paper on critical application needs for public safety pertaining to the "D" block of the 700 MHz spectrum. PTI, a 501 (c) 3 nonprofit organization has been serving the technology needs of local governments for over 37 years and is one of the most respected organizations of its kind.

Special Thanks

PTI is indebted to Dr. Andrew Afflerbach, Ph.D., P.E., who is one of the most recognized engineers in the country when it comes to public safety system engineering. Dr. Afflerbach serves as the Director of Engineering for Columbia Telecommunications Corporation (CTC) and was most generous in sharing data from a recent CTC Report titled ***An Engineering Assessment of Select Technical Issues Raised in the Re-location of the D Block Spectrum*****,** which he authored, submitted in June 2008, prepared for the National Association of Telecommunication Officers & Advisors, National League of Cities, National Association of Counties, and the U.S. Conference of Mayors.

Also contributing to this paper is the City of Houston, the City of Phoenix and the endorsement of PTI's Public Safety Council.

About the Author

This paper was prepared and coordinated by Dr. Alan R. Shark, who serves as PTI's executive director. Dr. Shark was previously the CEO of the American Mobile Telecommunications Association (AMTA) for over 13 years and during his tenure served on the board of the Land Mobile Communications Council (LMCC). Dr. Shark is a fellow of the Radio Club of America and is a fellow of the National Academy of Public Administration. Dr. Shark is also on the faculty of Rutgers University for Public Affairs and Administration where he serves as an Assistant Professor.

About PTI

Public Technology Institute (PTI) is a national, not-for-profit member-supported organization based in Washington, D.C.

As the only technology organization created by and for cities and counties, PTI works with a core network of leading local government officials—the PTI membership—to identify opportunities for technology research, to share solutions and recognize member achievements, and to develop best practices that address the technology management, governance, and policy issues that impact local government.

Officials from PTI member governments participate in Councils and Forums that address specific technology areas. Through partnerships with industry, federal agencies and other governmental organizations, PTI shares the results of its activities and the expertise of its members with the broader audience of the more than 30,000 U.S. cities and counties.

About PSFA

The PSFA, a 501(c)(3) charitable organization, was established in January 2002 by the Association of Public-Safety Communications Officials International (APCO). The mission of PSFA is to engender cooperation among public and private groups to provide financial and technical support to the public safety communications community.

Funding for the PSFA has been provided by a variety of sources, including donations from corporations, APCO members and staff and the Wireless E-911: PSAP Readiness Fund, a non-profit organization established by Nextel Communications and dedicated to supporting the timely implementation of wireless E-911.

Executive Summary

When and how the 700 MHz D Block is ultimately allocated is critical to the deployment of a new and dynamic plethora of advanced high-tech public-safety applications. The 700 MHz band is exceptionally well suited for the new and demanding requirements of a new generation of video/data/voice devices. When compared to the 4.9 GHz public safety frequency allocation, the 700 MHZ band is far superior to that of the 4.9 GHz band because of the line-of-sight requirements and dramatically greater call density needs.

Public safety must not only plan for existing applications, it must also plan for the unanticipated crisis. Public safety has been plagued until now with inefficiencies of interoperable network operations, lack of quality and efficient broadband spectrum, and a lack of equipment, due largely to the uncertainties of the marketplace.

Public-safety-grade service demands special requirements that simply cannot be found in commercial systems. Commercial providers do not offer hardened network operations centers or hardened towers/repeaters, power surge capabilities, or quality-of-service outside of major Interstates and other high-density population centers.

This can be summed up with six factors as to why commercial grade networks are inadequate for public safety needs.

1. Coverage: Commercial networks are designed to be where the customers are, not necessarily where emergencies will occur. Not only are large land areas left un-served, but commercial systems are vulnerable to “dead zones” within service areas (e.g., inside buildings, in gaps between cell sites, areas blocked by terrain)

2. Reliability: Commercial networks generally lack the same degree of redundancy, power backups, hardened sites, and other controls necessary to limit outage times and the impact of outages.

3. Service restoration: A public-safety-controlled network will restore service much faster than a network controlled by a third party. The end user is not beholden to the network provider; it’s the other way around.

4. Capacity control: especially important during emergencies. Without absolute priority and control, critical communication could be sidelined by commercial service demands. With recent advances in commercial priority management, the system is still under the operational control of the commercial provider, and the technologies have as yet to be proven in times of an emergency.

5. Security: less of an issue than in the past, because of encryption, but still a concern as commercial systems are open to system-wide cyber attacks from its massive customer base.

6. Control: users of commercial networks have no say in future network upgrades, software changes, network management, etc, all of which have an impact on the service quality and cost.

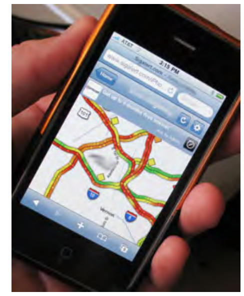
This Assessment highlights 13 out of over 25 distinct applications aimed to demonstrate the need for a larger universal broadband spectrum designated for public safety. A review of these applications should make it clear that these applications are not only real and necessary – they are bandwidth-intensive. According to what is referred to as Cooper's Law, "every 30 months the amount of information that can be transmitted over a given amount of radio spectrum doubles." (Marty Cooper, inventor of the hand-held cellular telephone).

This document also demonstrates rather conclusively that the 700 MHz D-Block and Public Safety Broadband License (PSBL) should be combined as a complete block, because of the mission-critical requirements and applications that have been highlighted.

Finally, this assessment briefly addresses the benefits to the public by way of improved safety and crime prevention, as well as more cost-saving efficiencies. It addresses the ability to better fight crime and terrorism, and the benefit of D block spectrum to the economy, as well as protecting our society against unknown threats.

Section One – Defining Application Needs Today

Critical Broadband Applications for Public Safety



The evolution of wireless communications continues at a maddening pace. In mid-2007 the iPhone was first launched - and lost in all the fanfare was that this phone was produced by a computer manufacturer and not a cell phone manufacturer. This device would change everything for consumers as every other manufacturer attempted to match or beat the iPhone. Today there are over 100,000 applications available, and there is no question that these devices have quietly morphed into powerful handheld computers that just happen to offer a decent phone as an "app."

The significance to the public safety universe is enormous, as often the first to a scene, be it a natural disaster, a car accident, a fire, or crime incident is the public. They are sending or downloading (or attempting to) photos and videos, and often as not, public safety systems are unable to fully take advantage of this new technology. However, as capable as some of these consumer devices are, there have been rising complaints regarding dropped calls, serious delays in text messages, and other network slowdowns caused by overtaxed or underbuilt networks in many key locations.

Consumer systems are quite different from public safety systems in that they are more market-oriented, whereas the public seems willing to accept inconsistent services in return for new and "cool" devices. In times of emergency, consumer devices become overwhelmed, and entire systems have been known to crash. Power outages also present a tremendous liability - consumer networks lack the adequate power back-ups that they may have once enjoyed with landline systems. Furthermore, the devices are not built to withstand the demanding public safety requirements, and thus the general public is fortunate to have a device lasting more than two years.

CIOs, CTOs, and public safety technologists were asked to articulate the many public safety applications that are either being deployed today or are being contemplated for the very near future. Of all the applications listed, everyone agreed that the Public Safety Broadband Spectrum (10 MHz) combined with the D-Block Spectrum (10 MHz) offers the most logical and necessary home for these new applications. The three reasons most often cited are:

1. 700 MHz has exceptionally good propagation characteristics when compared to alternative frequency bands.

2. The combined public safety broadband spectrum and the "D" block contain the desired bandwidth for important applications, especially video-related.

3. The size of the full block makes multi-usage systems possible and provides great economy of scale.

The following applications are either being deployed piecemeal or are being planned for the near future. Because public safety agencies lack a common spectrum for the newer technologies, the cost of equipment is far greater than it would be if the applications highlighted below were located in a single spectrum block, with appropriate rules and standards. Current systems that may operate on 700 MHz, 800 MHz, general pool, 800 MHz vacated spectrum, and NPSPAC are subject to a hodge-podge of situational-specific FCC rules, which make it very unlikely to be able to operate as a unified network.

Mobile Crime Scene Units

Most local enforcement agencies have mobile crime units of some kind; some in the form of buses, or vans. For mobile command applications to take better advantage of the latest technologies and communications systems, they will require greater bandwidth and spectrum to better integrate high-speed, high-definition video, data, and voice communications. Typically, the equipment used includes mobile, fingerprint reading and analysis, video crime scene analysis, and blood sample analysis, as well as perimeter protection and monitoring, and scene ID authentication.

Mobile Incident Command Centers

When natural disasters, major structural fires, hazmat incidents, hostage situations, or terrorism incidents strike, a mobile command center is required to coordinate and establish a mobile command system. The command center serves as the central hub for receiving and analyzing various voice communication paths, data monitoring and analysis, bio-monitoring, 3D building schematics and diagrams, GIS mapping, individual first-responder tracking, vehicle assets placement and tracking (AVL), incident ID authentication.

Automated License Plate Readers

This relatively new technology allows public safety officers to passively or actively scan vehicle license plates, either moving or parked. Data is retrieved from a specialized video camera and automatically sent to a database for immediate response. Such devices are particularly helpful with event management, "amber" or "silver" alerts, and seeking out individuals of interest.

Mobile Ticket Writer Systems

Mobile ticket writer systems allow for near-instant license look-up with full driver picture display, along with address, driving record, and any outstanding warrants. This type of system has been proven to dramatically increase productivity in ticket writing and leads to greater law enforcement personnel protection. Moreover, mobile ticket writing systems help ensure officer safety, as he or she would know instantaneously whether the subject is more than merely a traffic violator.

Streaming video and graphical display

Streaming video and graphic display requires its own category, as either separate or combined they require a huge amount of bandwidth – especially if offered as high-definition broadcast. Streaming video is required for mobile incident feeds and supplies critical visual information to various agencies and sites for improved coordination and multi-agency engagement.

Mobile Geospatial information systems

Leading city, county, and state agencies are increasingly relying on 3D geographical information databases where building schematics, wiring, ventilation systems, street conduits, underground structures, pipelines, subways, and other critical infrastructures are displayed. Mashed-up data is considered essential in being able to quickly respond to incidents and crises requiring immediate analysis and response.

Wireless Video Surveillance

Video surveillance offers public safety officials the ability to connect responding units within minutes and receive immediate feeds. The latest video technology provides for extreme low-light capture plus high-definition resolution. These must-have units also come with a large requirement for intensive bandwidth.

Multi-Modal Biometrics Monitoring Devices

Major cities and counties are looking to purchase multi-mode biometrics monitoring devices that are either fixed or mobile. Fixed units are designed to be deployed in or around major transportation hubs as well as in high-risk government buildings and structures, and landmarks. Mobile units are designed to be deployed at planned incidents such as parades, festivals, etc, and to warn of potential threat. Mobile units may also be deployed when an incident may be about to occur or has already occurred, and precise measurements are needed to ascertain site safety for first responders and the general public.

Fire Electronic Command Boards

New technology provides fire electronic command boards at the site where they are most needed and shared simultaneously with other command centers. A mobile command center is required to coordinate and establish a mobile command system when natural disasters, major structural fires, hazmat incidents, or terrorism incidents strike. The command board serves as the central hub for receiving and analyzing various voice communication paths, data monitoring and analysis, bio-monitoring, 3D building schematics and diagrams, GIS mapping, individual first-responder tracking, vehicle assets placement and tracking (AVL), and incident ID authentication.

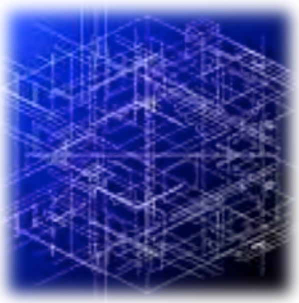
Emergency Medical Services AVL and Telemetry

Cities and counties have turned to AVL and telemetry systems to better coordinate their dispatch of first-responder units through improved tracking and system status management. ALS and BLS units can also broadcast key vital signs to medical experts in other locations, helping to better ensure life-saving care. With patient telemetry hospitals can be better prepared to offer life-saving measures before the patient arrives.

Facial Recognition/Video Analytics

With a growing population it is more important than ever before to deploy technologies that can utilize facial recognition to seek out persons of interest, or to simply permit passage of authorized first-responders to an incident or crime scene. Video analytics scans for visual anomalies, thus helping to track, guard, and monitor buildings, sites and events for suspicious behavior.

Floor plans, drawings, 3D graphical displays



Ideally, the benefits are obvious if every public safety vehicle has the capacity to view floor plans and have access to records, photos, and other 3D graphical displays. Each vehicle would be required to have a more powerful data terminal and screen capable of viewing high-definition video and audio. The irony here is that many believe the general public will have access to similar features with the next generation of broadband devices - slowed only by network capability and non-public-safety-grade equipment devices.

Patient tracking & video information systems

Emergency services and hospital and clinic facilities can benefit from deploying wireless systems that track patients at every stage of admittance, where staff can also view not only the tracking but also have the ability to access what procedures, meds, and other medical record information has been prescribed. As importantly, there is a critical need for incident commanders to track resources functioning at a common incident at any given instant.

Section Two: Efficiencies of 20 MHZ

Because public safety agencies lack a common spectrum for the newer technologies, the cost of equipment is far greater than it would be if the applications highlighted below were located in a single spectrum block, with appropriate rules and standards. Current systems that may operate on 700 MHz, 800 MHz, general pool, 800 MHz vacated spectrum, and NPSPAC are subject to a hodge-podge of situationally-specific FCC rules, which make it very unlikely to be able to operate as a unified network.

Of all the applications listed, there is overwhelming consensus among the public safety community the combination of "D" block and the public safety broadband block offers the most logical and necessary home for these new applications. The three reasons most often cited are:

1. 700 MHz has exceptionally good propagation characteristics when compared to alternative frequency bands.

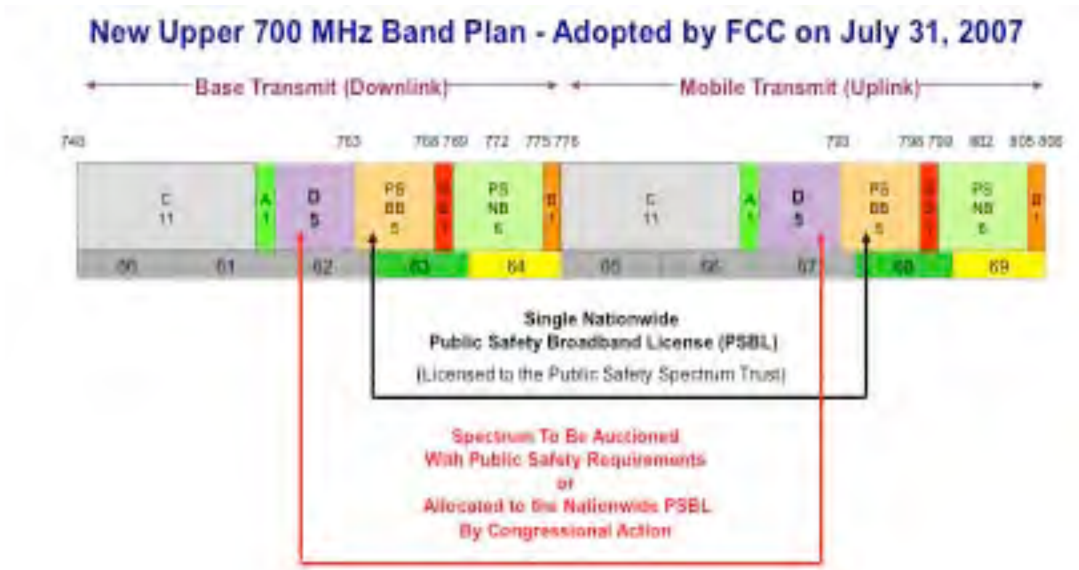
2. The additional "D" block will allow for the desired bandwidth to carry bandwidth intensive applications, especially video-related,

3. The additional "D" block will provide the capacity necessary during worst-case scenarios as an alternative to a more costly infrastructure.

With advances in technology, especially device processing power, and the need for quick reaction by emergency personnel near-total situational awareness at the resource unit level will be paramount. This is possible today through the utilization of cost-effective wireless technologies which make use of smart radio resources sharing techniques with appropriate quality of service (i.e. for user experience and priority mechanisms) and the right amount of spectrum. As demonstrated by a recent filing by New York City agencies to the FCC, given the kind of applications envisaged in the near to medium term and the number of first responders that are likely to intervene in a major event, the amount of broadband spectrum currently allocated to public safety will be insufficient to meet the needs of responders. In particular, the authors of the NYC Report note "It is clear from our analysis that in scenarios where 20 MHz of spectrum is available to public safety the system will be "stressed" during periods where important characteristics of a network need to exist above and beyond what is available commercially".

Furthermore, while not reflected in the previous section on foreseen applications, it is becoming apparent that in the years to come there may be a desire to provide more spectrally-efficient voice services either as an alternative to current LMR or as a backup to the latter; more so if there is a desire by first responders to carry a single single-mode (rather than multi-mode) device. As reflected in the NYC analysis, the provision of such voice services would stress a broadband system further unless additional bandwidth is available.

The size of the full block makes multi-usage systems possible and provides great economy of scale. Given some the frustrations stemming from significant delays in broadcast migration and a failed auction for the D Block, some have concluded that new methods should be devised to allocate spectrum. However, based on numerous reviews of public safety communications planning, a single block is not only economically necessary, it is required for sound spectrum management implementation.



PTI, as well as most authoritative experts in spectrum management, believes that keeping the D Block and the public safety broadband block together is advisable from a technical standpoint. That spectrum combination should enable a more efficient use of spectrum and other technical resources.

The following is taken verbatim, with permission, from ***An Engineering Assessment of Select Technical Issues Raised in the Re-location of the D Block Spectrum*** authored by Dr. Andrew Afflerbach, Ph.D. P.E., of Columbia Telecommunications Corporation (CTC) submitted in June 2008, prepared for the National Association of Telecommunication Officers & Advisors, National League of Cities, National Association of Counties, and the U.S. Conference of Mayors. In this engineering assessment, Dr. Afflerbach states several reasons why this is a technical benefit to keep the D Block intact:

a. It’s a significant advantage to *commercial* D Block customers—they will be receiving services from a public-safety-grade network that is clearly superior to other commercial networks, because it was designed to meet first-responder needs.

b. Operating a single network in the spectrum will enable a greater body of users to benefit from the antennas, radios, towers, and backhaul systems that will need to be built. If there were separate commercial and public safety networks in the 22 MHz of spectrum, the infrastructure would cost twice as much to operate. Efficiency arises from the sharing, by commercial and public safety networks, of a single platform with a single set of antenna structures, base stations, backhaul, management systems, and RF designers.

If a service provider must build a new network to activate a separate channel band, the cost of the activation may be millions or tens of millions of dollars in a single metropolitan area. Carrier broadband wireless architectures may require base stations every 1.5 kilometers. Individual base station costs vary widely, depending on environment and the needs of a particular area, but are on the order of magnitude of \$100,000, plus ongoing lease fees. Backhaul costs are significant, with \$50,000 to \$150,000 required to build a mile of fiber optic cable, or thousands or tens of thousands of dollars per month required to lease comparable capacity from a service provider.

c. A joint build-out will result in less impact to the public rights-of-way, because fewer towers, antennas, microwave infrastructure, and/or fiber infrastructure would need to be constructed.

d. Larger spectrum blocks enable operation with large channel bandwidths and high power—making it possible for devices to attain a given speed with fewer towers, each serving a larger area. This type of operation is particularly suitable for blanketing a larger geographic area, as would be necessary to cover rural areas.

e. Larger blocks of spectrum increase the flexibility for serving areas near international borders. King County, WA, for example, has noted the extreme difficulty of operating a wireless network in a major U.S. metropolitan area (Seattle) that adjoins a major Canadian metropolitan area (Vancouver)—and in which each of these networks must share spectrum with the other.

f. If, instead, two adjacent, non-coordinated networks operate in the aggregate 22 MHz, the spectrum allocation will require a guard band between the two allocations, which are currently not separated by a guard band, on the assumption that the two blocks will be operated as a whole. Adding a guard band will entail decreasing the allocation of spectrum to the D Block. A greater loss of spectrum use will result, because of the need for guard bands and mitigation of RF interference among the many individual providers/bands.

Section Three: The Value to Public Safety and the Citizens Served

This assessment would not be complete without mentioning the benefits to the public by way of improved safety and crime prevention, as well as more cost-saving efficiencies. In light of the Oklahoma City bombing and the World Trade Center disasters the public is demanding better protection and security everywhere. During the past several years the public safety communities have rallied together and have responded to citizen needs in no less than three ways.

1. First, the public safety community has deployed new video surveillance systems, bio-monitoring devices, and improved communications systems aimed at not only improving internal communications but to address citizen needs for information in a direct and timely manner.

2. Second, many of the applications mentioned in this assessment address the need for greater speed in responding to disasters – be it man-made or natural.

3. Third, a majority of the applications highlighted are designed to actually save both lives and monies. Wireless applications can reduce the need for more personnel and improve upon efficiencies of scale through shared networks, realizing efficiencies through more intelligent deployments and improved field operations.

While all these efficiencies and benefits are being realized, the public safety community remains committed to retaining the good will they enjoy through continued vigilance in adopting new technologies that protect our citizens against known and unknown threats.

Additional Resources

- An Engineering Assessment of Select Technical Issues Raised in the Re-auction of the D Block Spectrum Prepared for National Association of Telecommunications Officers and Advisors National League of Cities National Association of Counties U.S. Conference of Mayors, Prepared by Andrew Afflerbach, Ph.D., P.E. Director of Engineering (June 2008) (http://www.broadband.gov/docs/ws_pshs/pshs_afflerbach_report.pdf)
- Comments of the City of New York in the Matter of Additional Comment Sought on Public Safety, Homeland Security, and Cybersecurity Elements of National Broadband Plan, FCC's NBP Public Notice # 8. (http://fjallfoss.fcc.gov/ecfs2/document/view?id=7020348894)
- Federal Strategic Spectrum Plan (March 2008) (http://www.ntia.doc.gov/reports/2008/FederalStrategicSpectrumPlan2008.pdf)

Source Material in FCC Dockets

- APCO Comments in response to NBP Public Notice #14 (12/1/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- NENA Comments in response to NBP Public Notice #14 (12/1/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- Public Safety Spectrum Trust Comments in response to NBP Public Notice #14 (12/1/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- City of New York Comments in response to NBP Public Notice #8 (11/17/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- Alcatel-Lucent Comment in PS Docket 06-229 (11/17/09)
- Qualcomm Comments in response to NBP Public Notice #8 (11/12/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- NENA Comments in response to NBP Public Notice #8 (11/12/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- Motorola Comments in response to NBP Public Notice #8 (11/12/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- APCO Comments in response to NBP Public Notice #8 (11/12/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- Public Safety Spectrum Trust Comments in response to NBP Public Notice #8 (11/12/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- Waukesha County Department of Emergency Preparedness Comments in response to NBP Public Notice #8 (11/12/09), FCC GN Docket Nos. 09-47, 09-51 and 09-137
- APCO Comments in PS Docket 06-229 (9/22/09)
- Public Safety Spectrum Trust ex parte submission of Broadband Task Force Report in PS Docket 06-229 (12/15/09)
- Northrop Grumman Information Technology ex parte submission in PS Docket 06-229 (11/13/09)
- Motorola ex parte submission in PS Docket 06-229 (10/28/09)

Appendix B – Letters of Support

United States Senate
COMMITTEE ON COMMERCE, SCIENCE
AND TRANSPORTATION
WASHINGTON, DC 20510-6125
Web site: http://commerce.senate.gov

August 26, 2011

The Honorable Julius Genachowski
Chairman
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Dear Chairman Genachowski,

This week's 5.8 magnitude earthquake on the East Coast was just the most recent example in which many Americans were unable to use a communications network they rely upon for their safety and security. Residents and first responders along the East Coast may again face this problem as they brace for the predicted landfall of Hurricane Irene this weekend. As we are now in the midst of hurricane season, the Federal Communications Commission (FCC) should work to make sure that our nation's communications infrastructure is up to the task. Americans should expect that they can reach their loved ones during an emergency. But our commercial networks are asked to do much more. Because first responders still do not have a nationwide wireless broadband network of their own, they must rely on these same commercial networks if they hope to access any mobile data services, such as text messaging and emails.

Despite being six years from the devastation caused by Hurricane Katrina and ten years from the tragic events of 9/11, we still do not have an interoperable wireless broadband network for public safety. We must not allow any more potentially life-threatening disasters to occur before our nation's first responders get the interoperable public safety communications system they need to keep us safe. And, as the communications troubles following the earthquake reminded us, we cannot require public safety to rely exclusively on commercial networks for their mission-critical, advanced wireless communications needs.

While many people were frustrated by the overloaded commercial networks this week, the stakes of such problems can become a matter of life or death for first responders. Some of the brave men and women who risk their lives every day to protect the rest of us experienced the same inability to communicate following this week's earthquake. In fact, the threat was so serious that the Federal Emergency Management Agency asked members of the public to refrain from making calls on their mobile phones for a period of several hours following the quake so that emergency officials could continue to receive and respond to urgent communications. Many first responders were forced to rely on their voice-only land mobile radios because commercial networks are not reliable for mission-critical services during emergencies. Unfortunately, until we can provide public safety with the spectrum and funding they need to build a dedicated nationwide interoperable wireless broadband network, our first responders and the Americans who depend on them will be at the mercy of increasingly congested networks for their advanced wireless communications needs.

The commercial network infrastructure has greatly improved in the past decade, but the congestion following Tuesday's earthquake clearly demonstrates the need for more commercial spectrum. In recent years, wireless congestion has sometimes been a problem for consumers even in the best of times, let alone during the worst of times. Indeed, network problems like we saw this week may become even more frequent if the government does not act quickly to make more spectrum available for advanced wireless services.

As you know, we are working to address these problems. Earlier this year, we introduced S. 911, the Public Safety Spectrum and Wireless Innovation Act. This bi-partisan measure has the support of our nation's first responders, as well as President Obama and our nation's Governors and mayors. The bill would give our nation's first responders the dedicated spectrum and funding necessary to deploy an interoperable wireless broadband network for public safety use. It would also pump a huge amount of spectrum into the commercial wireless ecosystem. Our bill addresses one of the last outstanding recommendations of the 9/11 Commission, promises to save lives, would create hundreds of thousands of jobs without costing taxpayers a dime, and provides billions for deficit reduction. We will continue to press our colleagues in Congress to approve this measure as soon as possible.

We understand that the FCC is conducting a thorough assessment of the outages associated with this week's earthquake to determine what steps may be appropriate to improve communications services during emergencies. We urge you to complete that analysis as quickly as possible.

Sincerely,

Jay Rockefeller

John D. Rockefeller, IV
Chairman
Senate Committee on Commerce, Science, and Transportation

Kay Bailey Hutchison

Kay Bailey Hutchison
Ranking Member
Senate Committee on Commerce, Science, and Transportation

BIPARTISAN POLICY CENTER

June 7, 2011

The Honorable Jay Rockefeller
Chairman
U.S. Senate Committee on Commerce,
Science, and Transportation
253 Russell Senate Office Bldg.
Washington, DC 20510

The Honorable Kay Bailey Hutchison
Ranking Member
U.S. Senate Committee on Commerce,
Science, and Transportation
253 Russell Senate Office Bldg.
Washington, DC 20510

Dear Chairman Rockefeller and Ranking Member Hutchison:

The inability of first responders to communicate with each other was a critical failure on September 11, 2001. Incompatible and inadequate communications led to needless loss of life. To remedy this failure, the 9/11 Commission recommended legislation to provide for the expedited and increased assignment of radio spectrum for public safety purposes.

We commend the Senate Commerce Committee for marking up the SPECTRUM Act (S. 911), which will allocate an additional 10 MHz of radio spectrum—the "D block"—to public safety. Using this spectrum, public safety agencies will be able to build a nationwide interoperable broadband network, allowing diverse agencies to communicate with each other, and supporting mission critical voice, video, text, and other data transmissions.

This legislation takes an important step forward in improving interoperability for first responders. We note, however, that first responders utilizing the D block public safety network may not be able to communicate on other networks should the D block go down in an emergency. Therefore, we urge the committee to examine how this type of interoperability can be achieved through this or other legislation.

We support the expeditious allocation of the D block spectrum to public safety. Congress must not approach this urgent matter at a leisurely pace, because quite literally lives are at stake.

Thank you for your vital efforts in this area.

Sincerely,

Tom Kean
9/11 Commission Chairman
Co-Chair, National Security
Preparedness Group

Lee Hamilton
9/11 Commission Vice Chairman
Co-Chair, National Security
Preparedness Group

Alcatel·Lucent

January 12, 2010

Alcatel-Lucent position statement on proposed D Block auction

Over the past few years, Congress has taken important first steps to address the vital issue of public safety interoperability by expediting the increased assignment of radio spectrum for our nation's first responders. There is clearly no debate on the fact that the public safety community must have effective, reliable and interoperable communications, especially during times of national emergency, but also on a day-to-day basis whenever a police officer, fire fighter or other public safety must respond quickly and efficiently. Unfortunately, although Congress provided 24 MHz in the 700 MHz band for public safety narrowband and broadband use to be administered by the Federal Communications Commission, this effort has fallen woefully short in terms of moving interoperability issue forward.

Once again, the FCC is planning to address this issue by the disposition of the D Block via auction, a process that failed miserably when previously implement. Public safety officials, service providers and infrastructure vendors agree that a more effective method would be to allocate the D Block directly to public safety organizations in order to create a national broadband network that would meet the critical needs of first responders.

Alcatel-Lucent has been at the forefront in supporting the creation of a national interoperable public safety broadband network. We strongly oppose another FCC auction and vigorously support the Congress directly reallocating the D Block to public safety.

Moreover, we support federal funding of a public safety nationwide interoperable broadband network for our nation's first responders. Congress' support in the American Recovery and Reinvestment Act of 2009 to partially address potential funding for public safety networks via the Broadband Technology Opportunities Program ("BTOP") directed by the National Telecommunications and Information Administration is a crucial first step, but more needs to be done.[1] Additional federal grant opportunities focused on 700 MHz broadband first responder networks will facilitate the rapid deployment of these networks across the United States. But there is a need to get started today and BTOP funding would allow those jurisdictions that have filed FCC waiver requests to begin deployment of public safety broadband networks this year. Fourteen jurisdictions across the country have petitioned the Commission via waiver to early deploy under the FCC's rules an interoperable 700 MHz public safety broadband network, as was envisioned by the 9/11 Commission. These jurisdictions include the States of New York and Hawaii, large and small cities New York and Chesapeake, Virginia and larger regions, such as the San Francisco Bay Area and the Los Angeles Region.

We encourage Congress to take action that would ensure the FCC grants waiver requests that not only meet the Commission's rules, but also result in networks that are clearly in the public interest and that result in saved lives.

[1] *See* American Recovery and Reinvestment Act, Pub. L. No. 111-5, § 6001(b)(4) (2009).

July 21, 2010

AT&T Statement on Sen. Rockefeller and Public Safety Legislation

Background – Senator John D. (Jay) Rockefeller IV, Chairman of the U.S. Senate Commerce, Science, and Transportation Committee, today announced his intent to introduce the Public Safety Spectrum and Wireless Innovation Act (S. 3756). The following statement may be attributed to Tim McKone, AT&T Executive Vice President-Federal Relations.

"AT&T applauds Senator Rockefeller's commitment to introduce the Public Safety Spectrum and Wireless Innovation Act. Spectrum is a scarce and valuable national commodity, but we are encouraged by Senator Rockefeller's action today that public safety will have sufficient resources to support a nationwide wireless broadband network. It is vital that our first responders have access to a robust, interoperable network to ensure the public's safety and preserve national security.

"By authorizing the FCC to conduct incentive auctions, the Act will create a mechanism that will not only unleash new spectrum allocations for the wireless networks of the future, but will provide critical funding support. This Act is poised to be a tremendous win for public safety and for wireless consumers."

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National Governors Association
National Conference of State Legislatures
The Council of State Governments
National Association of Counties
National League of Cities
The U.S. Conference of Mayors
International City/County Management Association

April 14, 2010

The Honorable John D. Rockefeller
Chairman
Committee on Commerce, Science, and Transportation
United States Senate
Washington, D.C. 20510

The Honorable Kay Bailey Hutchison
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate
Washington, D.C. 20510

The Honorable John Kerry
Chairman
Subcommittee on Communications and Technology
Committee on Commerce, Science, and Transportation
United States Senate
Washington, D.C. 20510

The Honorable John Ensign
Ranking Member
Subcommittee on Communications and Technology
Committee on Commerce, Science, and Transportation
United States Senate
Washington, D.C. 20510

Dear Chairman Rockefeller, Chairman Kerry, Ranking Member Hutchison and Ranking Member Ensign:

As national organizations representing state and local government officials, we request that you oppose a commercial auction of the 700 MHz D block and support legislation to reallocate the D block of spectrum to public safety. The utilization of broadband technology is crucial to the future of public safety and will enhance the ability to save lives by quickly sharing information with first responders, public institutions and private citizens. Allocating the D block directly to public safety is the only way to ensure a robust, modern and reliable nationwide interoperable network.

For years, state and local first responders have sought to build a national interoperable communications network that allows real-time information sharing through high speed video and data. This requires an appropriate, dedicated band of spectrum that can accommodate the everyday needs of firefighters, police officers and emergency medical personnel, as well as provide excess capacity during times of emergency. The 700 MHz D block finally provides this opportunity. While the Federal Communications Commission's National Broadband Plan proposes to provide public safety roaming and priority access on other commercial 700 MHz networks for a fee, this proposal relies on untested technologies and new regulations that cannot ensure reliable and resilient communications capabilities to meet stringent public safety needs.

We urge you to support reallocation of the D block to ensure this one time opportunity to develop a nationwide interoperable network for public safety is not lost.

Sincerely,

Raymond C. Scheppach, Executive Director
National Governors Association

William Pound, Executive Director
National Conference of State Legislatures

David Adkins, Executive Director
The Council of State Governments

Larry E. Naake
Executive Director, National Association of Counties

Donald J. Borut, Executive Director
National League of Cities

Tom Cochran
CEO and Executive Director
United States Conference of Mayors

Robert J. O'Neill, Executive Director
International City/County Management Association

cc: The Honorable Henry Waxman, Chairman, House Committee on Energy and Commerce
The Honorable Joe Barton, Ranking Member, House Committee on Energy and Commerce
The Honorable Rick Boucher, Chairman, Subcommittee on Communications, Technology, and the Inter, Senate Committee on Energy and Commerce
The Honorable Cliff Stevens, Ranking Member, Subcommittee on Communications, Technology, and the Internet, House Committee on Energy and Commerce
The Honorable Julius Genachowski, Chairman, Federal Communications Commission
Jaime Barnett, Chief, Homeland Security and Public Safety Bureau, Federal Communications Commission

City of Bridgeport
DEPARTMENT OF POLICE
OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Senator Richard Blumenthal
30 Lewis Street STE 101
Hartford, CT. 06103

Dear Senator Blumenthal,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Public Safety Spectrum and Wireless Innovation Act* (S. 28), sponsored by Sen. Jay Rockefeller (D-WV)** The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support **S. 28**, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

Senator
I appreciate your attention to this matter.
Thanks,

City of Bridgeport
DEPARTMENT OF POLICE
OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Senator Joseph Lieberman
One Constitution Plaza 7th Fl.
Hartford, CT. 06103

Dear Senator Lieberman,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Public Safety Spectrum and Wireless Innovation Act*** **(S. 28), sponsored by Sen. Jay Rockefeller (D-WV)** The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support **S. 28**, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

City of Bridgeport
DEPARTMENT OF POLICE
OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Congressman Jim Himes
211 State St 2nd Fl.
Bridgeport, CT. 06604

Dear Congressman Himes,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Broadband for* First Responders Act *(H.R. 607), sponsored by Reps. Peter King and Bennie Thompson*.** The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support **H.R. 607**, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

City of Bridgeport
DEPARTMENT OF POLICE
OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Congresswoman Rosa DeLauro
59 Elm St.
New Haven, CT. 06510

Dear Congresswoman DeLauro,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Broadband for First Responders Act*** (H.R. 607), ***sponsored by Reps. Peter King and Bennie Thompson.*** The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support **H.R. 607**, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

City of Bridgeport
DEPARTMENT OF POLICE
OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Congressman Joe Courtney
77 Hazard Ave. Unit J
Enfield, CT. 06082

Dear Congressman Courtney,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Broadband for* First Responders Act *(H.R. 607), sponsored by Reps. Peter King and Bennie Thompson*.** The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

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I am proud to support **H.R. 607**, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

City of Bridgeport
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OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Congressman John Larson
221 Main St. 2nd Fl.
Hartford, CT. 06106

Dear Congressman Larson,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Broadband for* First Responders Act *(H.R. 607), sponsored by Reps. Peter King and Bennie Thompson*.** The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

City of Bridgeport
DEPARTMENT OF POLICE
OFFICE OF THE CHIEF
300 Congress Street • Bridgeport, Connecticut 06604 • (203) 581-5111 • Fax (203) 576-8130

JOSEPH L. GAUDETT, JR.
Chief of Police

April 27, 2011

Congressman Chris Murphy
114 West Main Street Suite 206
New Britain, CT. 06051

Dear Congressman Murphy,

As Chief of the Bridgeport Police Department, I am writing to advise you of my strong support of the ***Broadband for* First Responders Act *(H.R. 607), sponsored by Reps. Peter King and Bennie Thompson***. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support **H.R. 607**, and I urge you to support our efforts as well.

Sincerely,

Chief Joseph L. Gaudett, Jr.
Chief of Police, Bridgeport, CT.

California POLICE CHIEFS Association Inc.

P.O. Box 255745 Sacramento, California 95865-5745 Telephone (916) 481-8000 FAX (916) 481-8008
E-mail: lmcgill@californiapolicechiefs.org • Website: californiapolicechiefs.org

April 28, 2011

The Honorable Diane Feinstein
United States Senate
Hart Bldg #331
Washington, DC 20510

Dear Senator Feinstein:

As president of the California Police Chiefs Association, I am writing to advise you of my strong support of the *Public Safety Spectrum and Wireless Innovation Act* (S. 28), sponsored by Sen. Jay Rockefeller (D-WV). The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support S. 28 and I urge you to support our efforts as well.

Sincerely,

David L. Maggard Jr.

David L. Maggard
President

CWW **Conference of Western Wayne**

May 13, 2011

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Sumpter
Van Buren

Marsha S. Bianconi
Executive Director

Helen Foster
Deputy Director

The Honorable John Conyers, Jr.
United States House of Representatives
2426 Rayburn House Office Building
Washington, DC 20515

Re: Support for D Block Spectrum to Public Safety Community

Dear Congressman Conyers:

The Conference of Western Wayne is a bi-partisan and regional organization of eighteen Western Wayne County municipalities. Our Board of chief elected officials speaks to you unanimously and on behalf of their 700,000 residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The CWW Board along with Michigan's first, second and situational responders are confident in your leadership.

Sincerely,

Marsha Bianconi

Marsha Bianconi
Executive Director

39293 Plymouth Road, Suite 101 • Livonia, Michigan 48150
Ph: 734.953.8834 • Fx: 734.542.1546

Conference of Western Wayne

CWW

May 13, 2011

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Marsha S. Bianconi
Executive Director

Helen Foster
Deputy Director

The Honorable Debbie Stabenow
United States Senate
133 Hart Senate Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Senator Stabenow:

The Conference of Western Wayne is a bi-partisan and regional organization of eighteen Western Wayne County municipalities. Our Board of chief elected officials speaks to you unanimously and on behalf of their 700,000 residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

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Executive Director

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Ph: 734.953.8834 • Fx: 734.542.1546

C WW Conference of Western Wayne

May 13, 2011

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Marsha S. Bianconi
Executive Director

Helen Foster
Deputy Director

The Honorable Carl Levin
United States Senate
269 Russell Senate Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Senator Levin:

The Conference of Western Wayne is a bi-partisan and regional organization of eighteen Western Wayne County municipalities. Our Board of chief elected officials speaks to you unanimously and on behalf of their 700,000 residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The CWW Board along with Michigan's first, second and situational responders are confident in your leadership.

Sincerely,

Marsha Bianconi

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Executive Director

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Conference of Western Wayne

CWW

May 13, 2011

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Marsha S. Bianconi
Executive Director

Helen Foster
Deputy Director

The Honorable Thaddeus G. McCotter
United States House of Representatives
2243 Rayburn House Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Congressman McCotter:

The Conference of Western Wayne is a bi-partisan and regional organization of eighteen Western Wayne County municipalities. Our Board of chief elected officials speake to you unanimously and on behalf of their 700,000 residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The CWW Board along with Michigan's first, second and situational responders are confident in your leadership.

Sincerely,

Marsha Bianconi

Marsha Bianconi
Executive Director

39293 Plymouth Road, Suite 101 • Livonia, Michigan 48150
Ph: 734.953.8834 • Fx: 734.542.1546

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May 13, 2011

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Marsha S. Bianconi
Executive Director

Helen Foster
Deputy Director

The Honorable John D. Dingell
United States House of Representatives
2328 Rayburn House Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Congressman Dingell:

The Conference of Western Wayne is a bi-partisan and regional organization of eighteen Western Wayne County municipalities. Our Board of chief elected officials speaks to you unanimously and on behalf of their 700,000 residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The CWW Board along with Michigan's first, second and situational responders are confident in your leadership.

Sincerely,

Marsha Bianconi

Marsha Bianconi
Executive Director

38293 Plymouth Road, Suite 201 • Livonia, Michigan 48150
Ph: 734.953.8834 • Fx: 734.542.1546

May 18, 2011

The Honorable Carl Levin
269 Russell Senate Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Senator Levin:

The Western Wayne County Fire Department Mutual Aid Association (WWCFDMAA) is an organization of 23 fire departments in Wayne, Oakland and Washtenaw counties that represents nearly one million Michigan residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The MMCFDMAA is confident in your leadership.

Sincerely,

Fire Chief Rich Marinucci
President

Western Wayne County Fire Department Mutual Aid Association
33365 Raphael Road
Farmington Hills, MI 48336
(248)231-8422 *Western_Wayne@gmail.com*

May 16, 2011

The Honorable Debbie Stabenow
133 Hart Senate Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Senator Stabenow:

The Western Wayne County Fire Department Mutual Aid Association (WWCFDMAA) is an organization of 23 fire departments in Wayne, Oakland and Washtenaw counties that represents nearly one million Michigan residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

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We look forward to receiving your commitment of support for D Block legislation. The MMCFDMAA is confident in your leadership.

Sincerely,

Fire Chief Rich Marinucci
President

Western Wayne County Fire Department Mutual Aid Association
33365 Raphael Road
Farmington Hills, MI 48336
(248)231-8422 *Western_Wayne@gmail.com*

SBE COUNCIL
Small Business & Entrepreneurship Council

D Block Support Statement

"The Small Business and Entrepreneurship Council (SBEC) supports fully allocating 20 MHz of contiguous spectrum from the 700MHz D Block to public safety so that police, fire, and emergency personnel possess the dedicated spectrum necessary to build and operate a nationwide interoperable wireless broadband network. Public safety's communications requirements are vastly different than those of commercial users, such as needing a state of the art network capable of handling peak loads and providing high bandwidth access to thousands of users simultaneously. The only way such a network is possible is with spectrum dedicated exclusively for public safety use."

Karen Kerrigan,
President & CEO, Small Business & Entrepreneurship Council
(SBE Council)

SBE Council · 2944 Hunter Mill Road · Suite 204 · Oakton, VA 22124 · 703-242-5840
www.sbecouncil.org
Protecting Small Business, Promoting Entrepreneurship

NATIONAL GOVERNORS ASSOCIATION

Christine O. Gregoire
Governor of Washington
Chair

Dave Heineman
Governor of Nebraska
Vice Chair

Dan Crippen
Executive Director

July 8, 2011

The Honorable Harry Reid
Majority Leader
U.S. Senate
Washington, D.C. 2051

The Honorable Mitch McConnell
Minority Leader
U.S. Senate
Washington, D.C. 20510

The Honorable John Boehner
Speaker of the House
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Nancy Pelosi
Minority Leader
U.S. House of Representatives
Washington, D.C. 20515

Dear Majority Leader Reid, Senator McConnell, Speaker Boehner, and Representative Pelosi

On behalf of the nation's governors, we are writing to urge your support in passing S. 911, *the Public Safety Spectrum and Wireless Innovation Act*, before the 10th anniversary of the terrorist attacks of September 11, 2001. This bipartisan legislation would protect critical public safety communications now and into the future by providing the necessary spectrum, governance and funding to make the nation's first interoperable public safety network a reality.

On the morning of September 11, 2001, the nation watched as thousands lost their lives in the tragic and unprecedented terrorist attacks on the nation's soil. On that day, firefighters, police officers and emergency medical personnel immediately responded to assist the injured and prevent further loss of life. Unfortunately, many of these heroic men and women lost their lives due to the inability to communicate with other first responders on site. Since that time, governors have worked with public safety officials and the federal government to strengthen first responder communications. One important step toward this national goal is the development of a nationwide interoperable *broadband* network for public safety.

As we begin developing the nationwide network, we have a unique opportunity to dramatically transform how first responders communicate and how we deliver life-saving and life-sustaining services to our citizens. Similar to the demand for commercial spectrum, public safety also requires additional spectrum to cost-effectively build and maintain a network. This can best be achieved by reallocating the 10 MHz of D block spectrum to public safety.

Reallocating the D block will meet the critical needs of first responders and allow state and local governments to establish new and innovative partnerships to improve the delivery of government services and provide funding to maintain these systems over time. Combining the D block with the existing public safety broadband spectrum will also help reduce costs by allowing the future consolidation of voice and data systems. On the other hand, the failure to reallocate the D block will preclude public safety entities, and the state and local governments that support them, the opportunity to pursue these cost reductions and programmatic advantages.

Despite the nation's troubling economic conditions, our law enforcement, firefighters and emergency medical personnel must continue to save lives and protect us from harm. S. 911 recognizes the imperative of providing public safety with the capabilities they require while balancing important financial considerations. Not only does the legislation reallocate the D block to provide sufficient contiguous spectrum, but it pays for this reallocation while also providing funding to develop the network and reduce the deficit by billions of dollars.

We thank you for your support and hope you share our desire to pass this important legislation as quickly as possible.

Sincerely,

Janice K. Brewer

Governor Janice K. Brewer
Co-Chair
Special Committee on Homeland Security and Public Safety

Governor Martin O'Malley
Co-Chair
Special Committee on Homeland Security and Public Safety

911

Ottawa County Central Dispatch Authority

Timothy F. Smith
Executive Director
Mark A. Jongekrijg
Deputy Director

April 21, 2011

The Honorable Fred Upton
Chairman, House Energy and Commerce Committee
United States House of Representatives
Washington, DC 20515

Dear Representative Upton

I urge you work with your colleagues in the House Energy and Commerce Committee to quickly take up legislation that will allocate the D Block spectrum to the public safety community and will provide the funding necessary to build out a nationwide interoperable and mission critical broadband network.

I feel strongly that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies to communicate with each other across various agencies and jurisdictions. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that addresses this will allocate D Block to public safety will ultimately send a clear message to your colleagues in Congress, at the Federal Communications Commission and in the current Administration that wireless broadband for first, second and situational responders is a top national priority.

I look forward to receiving your commitment as the Chairman of the House Energy and Commerce Committee to make this a top priority for your Committee. Michigan's first, second and situational responders are looking to you to lead the way on behalf of the entire public safety community.

Sincerely,

Timothy F. Smith
Executive Director

Patrick McGinnis
Policy Board Chairman

September 21, 2010

The Honorable John D. Rockefeller
Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Chairman Rockefeller:

The universal availability of secure, reliable, priority access and public safety grade broadband communications is critical to the advancement of emergency medical care for patients in the United States. The best way to assure this availability is to allocate the 700 MHz D block to public safety for use in conjunction with the 700 MHz broadband spectrum licensed to the national public safety broadband license holder, to fund network development, and to coordinate both sets of spectrum through that license holder and its public safety representative board. We strongly endorse your legislation, S. 3756 - the Public Safety Spectrum and Wireless Innovation Act of 2010, and hope that it will become the vehicle to accomplish this.

As national organizations representing emergency medical service (EMS) provider agencies, professionals, and EMS system and service officials, we wish to emphasize that the potential provided by new field EMS diagnostic and treatment technology is impeded by the limitations of the narrowband communications systems we have used, basically without change, since the early 1970's. We believe that EMS may well become one of the biggest users of public safety broadband to bring lifesaving capabilities to our patients. We encourage your staff to work with leaders of the Public Safety Alliance and Public Safety Spectrum Trust to tailor this legislation to best meet these needs.

We offer you our support in making S.3756 a success for the Nation.

Sincerely,

President
American Ambulance Association

President and Director-At-Large
Association of Air Medical Services

Diane Gurney

President
Emergency Nurses Association

President
National Association of Emergency
Medical Technicians

President
National Emergency Medical Services
Management Association

President
Association of Critical Care Transport

President
Advocates for Emergency Medical Services

President
National Association of Emergency Medical
Services Physicians

President
National Association of State Emergency
Medical Services Officials

President
National Association of EMS Educators

State of Louisiana

Bobby Jindal
Governor

Post Office Box 94004
Baton Rouge, LA 70804-9004

Office of the Governor

February 17, 2011

Senator Jay Rockefeller
31 Hart Senate Office Building
Washington, DC
20510

Senator Kay Bailey Hutchinson
284 Russell Senate Office Building
Washington, DC
20510

Dear Senators Rockefeller and Hutchison,

I want to take this opportunity to support the reallocation of the 700 MHz D block spectrum for public safety. This would address the frequency inadequacies currently inhibiting the build-out and operation of public safety 700 MHz radio systems.

Currently, Louisiana has one of the largest 700 MHz statewide radio systems in existence. Given the name Louisiana Wireless Information Network (LWIN), this system is comprised of over 100 tower sites that provide almost 95% statewide coverage available to all local, tribal, state, and federal partners. Supporting over 60,000 users, the system provides communication capabilities that supported over 95 million "push-to-talk" conversations in Louisiana during the 2010 calendar year. This achievement has been made possible by dedicating hundreds of millions of dollars in local, state, and federal monies over the past five years.

Just one example of LWIN's advanced capabilities can be seen in the system's performance during the BP Oil Spill in the Gulf of Mexico. Coordinating with sister-states of Mississippi and Texas as well as the city of Orange Beach, Alabama, the State of Louisiana managed the creation of the Gulf Wireless Information Network (GulfWIN). GulfWIN created a series of patches and interstate connections between the different radio systems to give the responders coverage from Corpus Christi, Texas, to Pensacola, Florida. GulfWIN allowed the myriad jurisdictions, functional areas, and geographically dispersed responders the ability to communicate using a standard, shared resource. As with any emergency response, the judicial use of and conservation of scarce resources has a major impact on the ability of public safety responders to function. GulfWIN not only provided an interoperable communication path for easier coordination, but it also alleviated the need to duplicate efforts if each local, state, and federal partner had been required to establish their own radio system.

While this is just one example of LWIN's success, there are still many hurdles that must be overcome. Frequency allocation is one of the most critical issues that currently impacts the establishment and expansion of statewide radio systems. This is especially important in Louisiana as we look to add additional capacity to LWIN and establish data interoperability for Louisiana's first responders. As with any resource, there is a limit to the amount of frequencies that are available to public safety. With the ever expanding demand for first responders to be able to handle any threat, be it natural or man-made, the need for interoperable communications between the different levels of government becomes ever more

(225) 342-7015 ✤ Fax (225) 342-7099 ✤ www.gov.state.la.us

crucial. In conjunction with this need for interoperable communications, there is an increasing need for additional spectrum.

LWIN and GulfWIN are considered examples of excellence for the rest of the Nation. GulfWIN can also be held as a model for the implementation of a national public safety radio system. Therefore, I support and encourage the allocation of the 700 MHz D block spectrum to be reallocated to public safety.

Sincerely,

Bobby Jindal
Governor

One Hundred One North Carson Street
Carson City, Nevada 89701
Office: (775) 684-5670
Fax No.: (775) 684-5683

555 East Washington Avenue, Suite 5100
Las Vegas, Nevada 89101
Office: (702) 486-2500
Fax No.: (702) 486-2505

Office of the Governor

June 10, 2011

The Honorable Harry Reid
U.S. Senate Majority Leader
522 Hart Senate Office Building
Washington, DC 20510

Dear Majority Leader Reid:

I am writing to ask your support in reallocating the D-block of spectrum to public safety which will meet the emergency communications needs of our first responders.

For years, state and local first responders in Nevada and around the country have sought to build a national interoperable communications network that allows real-time information sharing through high speed video and data. This requires a dedicated band of spectrum that can accommodate both the everyday needs of firefighters, police officers and emergency medical personnel, as well as provide excess capacity during times of emergency. The D-block finally provides this opportunity.

As you know, the Federal Communications Commission (FCC) plans to auction the D-Block for commercial purposes. In its National Broadband Plan, the FCC proposes to meet public safety spectrum needs by providing roaming and priority access on other commercial 700 MHz networks for a fee. This proposal is insufficient because it will not meet stringent public safety requirements necessary to protect lives and will increase the costs of achieving and maintaining operable and interoperable emergency communications for years to come.

By reallocating the D-Block to public safety, you have the opportunity not only to ensure that our police officers and firefighters have access to advanced technologies the rest of us take for granted, but also to ensure we avoid the mistakes of the past that have made public safety communications systems complex and costly. The location of the D-Block offers a unique opportunity to ensure first responders not only have access to sufficient spectrum, but will also allow state and local governments to take advantage of efficiencies of scale and reduce the costs of such systems that must be maintained by taxpayers over time.

The bipartisan Spectrum Act, S.911, has been introduced in the Senate to reallocate the D-Block to public safety. I urge you to support this legislation and to ensure this one time opportunity to develop a cost-effective nationwide interoperable network for first responders in Nevada is not lost.

Sincere regards,

BRIAN SANDOVAL
Governor

May 5, 2010

The Honorable Julius Genachowski
Chairman
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Subject: Public Safety Need for 700 MHz and D Block

Dear Chairman Genachowski:

The undersigned have diverse backgrounds in business and the public sector and we share the privilege of having been early leaders at the U.S. Department of Homeland Security. We are acutely aware of the vital need that America's first responders have today for substantially expanded access to broadband spectrum and we write to request your support for these spectrum needs.

One of the most solvable problems from such nightmares as the terrorist attacks of 9/11 and landfall of Hurricane Katrina remains unsolved. That problem is the guaranteed availability of adequate interoperable public safety communications when such catastrophic disasters occur. A huge step can be taken toward ensuring such access by allocating the 10 MHz of the 700 MHz spectrum, known as the D Block, to public safety. We strongly support the petition of New York City and numerous other first responder organizations that "a single wireless broadband network combining the D Block and the adjacent public safety 700 MHz spectrum is the only logical choice to satisfy public safety broadband wireless spectrum requirements."[1]

The nation has rightfully insisted that our first responders and other key municipal services operate smarter. A host of technologies to support daily operations and surge operations would use this spectrum. Excess capacity during non-surge periods can be efficiently leased to commercial users. Allocating the D Block to public safety will dramatically improve emergency *preparedness*, allowing first responders to *perform* better. It would also incentivize device manufacturers to offer more sophisticated, integrated single-device solutions to manage daily needs and surge needs for mission-critical voice and data transmission – and do so at reasonable prices. It will similarly encourage rapid development of new voice, data and video applications that improve safety and security.

Precisely in the periods of utmost need, when all communications demand surges, our first responder community needs to have guaranteed access to the broadband spectrum that will support its growing need for increased throughput and interoperability. This is indeed a fateful public policy decision.

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[1] White Paper co-authored by the New York City Police Department, New York City Fire Department and New York City Department of Information Technology and Telecommunications, *700 MHz Broadband Public Safety Applications And Spectrum Requirements* (February 2010). This report offers compelling evidence about the spectrum capacity needed to support the public safety community. Squeezing public safety into a narrow slice of spectrum that would not permit the effective leveraging of commercial broadband technologies, including the crucial evolution to LTE technology (that must have 20MHz), and would deny the spectrum for the essential "paired bands" of 2x10MHz.

We recognize that there would likely be numerous sensible ways to structure the commercial lease transactions. We do not have a specific brief for how the D Block spectrum is to be managed nor do we write to advocate how revenue from such commercial transactions should ultimately be allocated. We also understand that a national broadband policy that protects the needs of first responders will need the support of Congress as well as that of the FCC.

We are convinced, however, that the FCC's proposed broadband plan seriously shortchanges the first responder community and simply will not give these vital public servants adequate spectrum to do their jobs when it matters most, during times of crisis. Therefore, we respectfully request that FCC reconsider its proposed D Block allocation proposal and instead support allocation of the D Block to public safety providers.

Thank you for your consideration of this important policy matter.

Tom Ridge

Tom Ridge
Former Secretary of Homeland Security (2003-2005)

James M. Loy

James M. Loy
Former Deputy Secretary of Homeland Security (2003-2005)

Michael Jackson

Michael P. Jackson
Former Deputy Secretary of Homeland Security (2005-2007)

cc: Commissioner Michael J. Copps
Commissioner Robert M. McDowell
Commissioner Mignon Clyburn
Commissioner Meredith Attwell Baker

Current Affiliation and mailing address of Signatories:

The Honorable Tom Ridge
President and Chief Executive Officer
Ridge Global, LLC
1101 16th St. NW, Suite 308
Washington, DC 20036

The Honorable James M. Loy
Senior Counselor
The Cohen Group
500 Eighth St. NW, Suite 200
Washington, DC 20004

The Honorable Michael P. Jackson
President
Firebreak Partners, LLC
1061 Vista Drive
McLean, VA 22102

HARRIS

D Block Spectrum Should be Reallocated to Public Safety

Harris Corporation ("Harris") supports the public safety community's request for legislative action to reallocate the 10 MHz of spectrum known as the D-Block for public safety use. Such a reallocation, combined with the 10 MHz of spectrum already allocated for public safety use, will create a contiguous, nationwide 20MHz swath of broadband spectrum for wireless public safety applications. With Congress' leadership and financial support Harris believes that the nation's goal for a 700MHz nationwide, interoperable broadband public safety network can be realized and our nation's first responders will be afforded the same state-of-the-art communications technology as the citizens they protect.

In 2008 the D-Block, in accordance with congressional mandate, was put up for commercial auction. In accordance with Federal Communications Commission ("FCC") rules the D-Block was to be paired with an adjacent block of broadband spectrum allocated to Public Safety to create a shared wireless broadband network that would be used by public safety users as well as commercial users. The winning bidder of the commercial license in the D-block would be obligated to enter into a public/private partnership with the nationwide licensee of the public safety broadband spectrum to enable construction of this interoperable broadband network. Unfortunately, the D-Block auction was a failure and did not produce a D-Block commercial licensee. Today, even following the completion of the digital television transition, both the D-Block and public safety broadband spectrum lay fallow.

Along with the public safety community, Harris has publicly stated its support of and made numerous recommendations addressing how to establish a nationwide, interoperable broadband public safety network in both comments filed with the FCC and through invited participation in FCC hearings. Although 10 MHz may be useful, Harris believes that a full <u>20 MHz</u> of dedicated public safety broadband spectrum is necessary to fully accommodate the bandwidth intensive broadband applications required by public safety users and first responders.

The FCC envisioned the 700 MHz public safety broadband network as a wide-area, mobile broadband data solution.[i] While the 10 MHz of spectrum currently allocated to public safety will satisfy many public safety mobile broadband needs,[ii] this spectrum allocation may be insufficient to accommodate some of the envisioned uses for the network. For example, as outlined in the SAFECOM Statement of Requirements for Public Safety Wireless Communications and Interoperability, broadband networks are expected to carry surveillance video from fixed surveillance cameras throughout a city to public safety vehicles in the field.[iii] Today, "the available 5 MHz of public safety uplink spectrum can accommodate only a limited number of cameras per cell before these fixed wireless video applications exhaust the spectrum" (typical IP surveillance video operates at 500 kbps–1.5 Mbps).[iv]

A shared network concept (10MHz + 10MHz) governed through a national public/private partnership between commercial and public safety at first appeared to be the most logical path to fund a nationwide, interoperable broadband public safety network. However, the failure of the D-Block auction and resulting uncertainty surrounding the future of the shared wireless broadband network has prevented the deployment of critically needed public safety broadband systems. Nevertheless, in recent months the public safety community has started to take action on the local and regional level to develop and deploy public safety broadband systems. There are currently 16 outstanding waiver requests from local jurisdictions before the FCC requesting immediate access to the 700 MHz public safety broadband spectrum to deploy broadband systems. In addition, a handful of public safety entities are looking to the future by including broadband capabilities in their planning for new public safety communications systems.

Although Harris continues to support the creation of a nationwide, interoperable broadband public safety network, it is becoming increasingly clear that a regional, network of networks approach, will best serve to accelerate the general deployment of public safety broadband. The call for regional flexibility for the use and deployment of public safety broadband systems has been endorsed by many public safety organizations including the Public Safety Spectrum Trust Corp ("PSST") and the National Public Safety Telecommunications Council ("NPSTC"). However, achieving the goal of a nationwide broadband interoperable network for public safety will be ultimately dependent upon funding available for all public safety entities, including those serving rural areas, to access spectrum, deploy technology and connect to the network.

Furthermore, Harris agrees with NPSTC's recommendations set forth in the Broadband Task Force Report ("BBTF") urging Congress and the FCC to "explicitly allow use of the national interoperable broadband wireless network in spectrum allocated to public safety by not only first responders, but also by emergency response support agencies (such as utilities, transportation, certain Federal government agencies, and general government)."[v] Not only do these public service agencies provide critical emergency response during local, regional and national disasters, they represent the very real potential for public and private partners in rural areas to realize cost and coverage benefits through shared systems.

The nation's goal for wide scale use of broadband and national communications interoperability rests in the wise use of spectrum and the creation of a 700 MHz nationwide interoperable wireless broadband public safety network. Congress has the ability, and the responsibility, to take the action to assign the D-Block to our nation's first responders so that they can better serve the citizens they protect.

About Harris Corporation

Harris is an international communications and information technology company serving government and commercial markets in more than 150 countries. Headquartered in Melbourne, Florida, the company has approximately $5 billion of annual revenue and more than 15,000 employees — including nearly 7,000 engineers and scientists. Harris is dedicated to developing best-in-class *assured communications*® products, systems, and services. Additional information about Harris Corporation is available at www.harris.com.

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[i] *See* Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, *Second Further Notice of Proposed Rulemaking*, WT Docket No. 06-150 and PS Docket No. 06-229, 23 FCC Rcd 8047, 8070-8071, ¶ 59 (2008) (mandating "[s]pecifications for a broadband technology platform that provides *mobile* voice, video, and data capability that is seamlessly interoperable across agencies, jurisdictions, and geographic areas") (emphasis added).

[ii] *See Service* Rules for the 698-746, 747-762 and 777-792 MHz Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, *Third Further Notice of Proposed Rulemaking*, WT Docket No. 06-150 and PS Docket No. 06-229 FCC Rcd. 14301, 14333-14334, ¶¶ 86-87 (2008).

[iii] *See* The SAFECOM Program, Department of Homeland Security, *Statement of Requirements for Public Safety Wireless Communications & Interoperability*, p. 48 (2004) (explaining that an incident commander should be able to "access video from private, non-public safety sources, such as schools, banks, area surveillance cameras, news cameras, traffic cameras").

[iv] Public Safety Interoperable Communications—The 700 MHz Proceeding, Before the Federal Communications Commission, p. 6 (2008) (statement of Richard Taylor, Senior Technologist, Tyco Electronics M/A-COM).

[v] National Public Safety Telecommunications Council, *700 MHz Public Safety Broadband Task Force Report and Recommendations*, Appendix G, p. 83 (2009).

JENNIFER M. GRANHOLM
GOVERNOR

State of Michigan
STATE 9-1-1 COMMITTEE
LANSING

SHERIFF DALE GRIBLER
CHAIR

September 22, 2010

The Honorable Carl Levin
United States Senator
269 Russell Senate Office Bldg
Washington, DC 20510

Dear Senator Levin:

As the state committee tasked by the Michigan Legislature to develop statewide standards and make recommendations on 9-1-1 service, we urge you to support S. 3756, the Public Safety Spectrum and Wireless Innovation Act of 2010, introduced by Senator John (Jay) Rockefeller, IV (D – WV), Chairman of the Senate Commerce, Science, and Transportation Committee. The Public Safety Spectrum and Wireless Innovation Act would:

- Establish a framework for the deployment of a nationwide interoperable wireless broadband network for public safety;
- Allocate 10 MHz of spectrum, known as the D Block, to public safety;
- Direct the Federal Communications Commission (FCC) to develop technical and operational standards to ensure nationwide interoperability and build-out (including in rural areas);
- Direct the FCC to establish standards that allow public safety officials, when not using the network, to lease capacity on a secondary, but preemptive basis to non-public safety entities, including other governmental users and commercial users; and
- Provide the FCC with incentive auction authority, which allows existing spectrum licensees to voluntarily relinquish their airwaves in exchange for a portion of the proceeds of the commercial auction of their spectrum. The funds from these incentive auctions, in conjunction with funds from the auction of other specified spectrum bands, and funds earned from leasing the public safety network on a secondary basis, will be used to fund the construction and maintenance of the nationwide interoperable wireless broadband public safety network.

This legislation builds on the growing support in Congress from Senators Joe Lieberman (I – Conn.) and John McCain (R – Ariz.) who introduced S. 3625 – The First Responders Protection Act of 2010; Representatives Peter King (3rd Dist., NY) and Yvette Clarke (11th Dist., NY), who introduced H.R. 5081 – Broadband for First Responders Act of 2010, which now has more than 68 cosponsors; and Representative Henry Waxman (30th Dist., CA), Chairman of the House Energy and Commerce Committee, whose draft language was the catalyst to identifying the necessary funding to build out and maintain a nationwide interoperable public safety broadband network.

Public safety officials, including 9-1-1 directors, police chiefs, sheriffs, fire chiefs, police officers, fire fighters, and emergency medical service officials in Michigan are strong in their support for the allocation of the D Block to public safety and the establishment of a funding program. Given the limited nature of radio spectrum, if the allocation of D Block does not occur now, it may be decades before another opportunity like this comes to public safety. The allocation of the D Block and the funding program to construct and maintain a nationwide interoperable wireless broadband network will improve our nation's homeland security and provide first responders throughout the country with the voice, video, and data communications technologies that are urgently needed.

Thank you for your support of our nation's first responders who put their lives on the line every day to protect and serve our communities. If you have any questions, or would like additional information on the D Block issue, please contact the State 9-1-1 Committee through the State 9-1-1 Administrator, Harriet Miller-Brown, at 517-241-0080 or millerhr@michigan.gov.

Sincerely,

Sheriff Dale Gribler, Chair
State 9-1-1 Committee

Association of Public Safety Communications Officials • Commercial Mobile Radio Service • Department of Energy, Labor and Economic Growth • Department of State Police • Deputy Sheriff's Association • Fraternal Order of Police • Michigan Association of Ambulance Services Michigan Association of Chiefs of Police • Michigan Association of Counties • Michigan Communications Directors Association Michigan Association of Fire Chiefs • Michigan Professional Firefighters Union • Michigan Public Service Commission • Michigan Sheriff's Association Michigan State Police Troopers Association • National Emergency Number Association • Telecommunications Association of Michigan • Upper Peninsula Emergency Medical Services • Members of the general public appointed by the Governor, Speaker of the House, and Majority Leader of the Senate

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JENNIFER M. GRANHOLM
GOVERNOR

State of Michigan
STATE 9-1-1 COMMITTEE
LANSING

SHERIFF DALE GRIBLER
CHAIR

September 22, 2010

The Honorable Debbie Stabenow
United States Senator
133 Hart Senate Office Bldg
Washington, DC 20510

Dear Senator Stabenow:

As the state committee tasked by the Michigan Legislature to develop statewide standards and make recommendations on 9-1-1 service, we urge you to support S. 3756, the Public Safety Spectrum and Wireless Innovation Act of 2010, introduced by Senator John (Jay) Rockefeller, IV (D – WV), Chairman of the Senate Commerce, Science, and Transportation Committee. The Public Safety Spectrum and Wireless Innovation Act would:

- Establish a framework for the deployment of a nationwide interoperable wireless broadband network for public safety;
- Allocate 10 MHz of spectrum, known as the D Block, to public safety;
- Direct the Federal Communications Commission (FCC) to develop technical and operational standards to ensure nationwide interoperability and build-out (including in rural areas);
- Direct the FCC to establish standards that allow public safety officials, when not using the network, to lease capacity on a secondary, but preemptive basis to non-public safety entities, including other governmental users and commercial users; and
- Provide the FCC with incentive auction authority, which allows existing spectrum licensees to voluntarily relinquish their airwaves in exchange for a portion of the proceeds of the commercial auction of their spectrum. The funds from these incentive auctions, in conjunction with funds from the auction of other specified spectrum bands, and funds earned from leasing the public safety network on a secondary basis, will be used to fund the construction and maintenance of the nationwide interoperable wireless broadband public safety network.

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Public safety officials, including 9-1-1 directors, police chiefs, sheriffs, fire chiefs, police officers, fire fighters, and emergency medical service officials in Michigan are strong in their support for the allocation of the D Block to public safety and the establishment of a funding program. Given the limited nature of radio spectrum, if the allocation of D Block does not occur now, it may be decades before another opportunity like this comes to public safety. The allocation of the D Block and the funding program to construct and maintain a nationwide interoperable wireless broadband network will improve our nation's homeland security and provide first responders throughout the country with the voice, video, and data communications technologies that are urgently needed.

Thank you for your support of our nation's first responders who put their lives on the line every day to protect and serve our communities. If you have any questions, or would like additional information on the D Block issue, please contact the State 9-1-1 Committee through the State 9-1-1 Administrator, Harriet Miller-Brown, at 517-241-0080 or millerhr@michigan.gov.

Sincerely,

Dale R. Gribler

Sheriff Dale Gribler, Chair
State 9-1-1 Committee

Association of Public Safety Communications Officials • Commercial Mobile Radio Service • Department of Energy, Labor and Economic Growth • Department of State Police • Deputy Sheriff's Association • Fraternal Order of Police • Michigan Association of Ambulance Services Michigan Association of Chiefs of Police • Michigan Association of Counties • Michigan Communications Directors Association Michigan Association of Fire Chiefs • Michigan Professional Firefighters Union • Michigan Public Service Commission • Michigan Sheriff's Association Michigan State Police Troopers Association • National Emergency Number Association • Telecommunications Association of Michigan • Upper Peninsula Emergency Medical Services • Members of the general public appointed by the Governor, Speaker of the House, and Majority Leader of the Senate

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November 15, 2010

InterAgency Board (IAB)
Position Statement on the "D" Block Public Safety Spectrum

The state and local first responders of the InterAgency Board for Equipment Standardization and Interoperability (IAB) formally support the efforts of the Public Safety Alliance (http://www.psafirst.org/) to secure the allocation of the 700 MHz "D" Block spectrum for public safety use.

The InterAgency Board is a voluntary collaborative panel of emergency preparedness and response practitioners from a wide array of professional disciplines that represent all levels of government and the volunteer sector. The IAB provides a structured forum for the exchange of ideas among operational, technical, and support organizations to improve national preparedness and promote interoperability and compatibility among local, state, tribal and federal response communities. Based on direct field experience, IAB members advocate for and assist the development and implementation of performance criteria, standards, test protocols, and technical, operating, and training requirements for all-hazards incident response equipment with a special emphasis on Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) issues.

The Interagency Board works hard everyday to promote interoperability across all fields within the first responder community; because of this the first responders of the IAB readily recognize that the allocation of the "D" block directly to public safety is an important national priority. First responders across this nation need a data network that has the ability to seamlessly roam across this great nation. The vision of a single interoperable national broadband public safety network is attainable within our lifetime if public safety is provided the appropriate resources. The key variable for this capability is the allocation of the "D" block. While the journey may be long, it begins with the establishment of a single national public safety broadband plan that all of public safety can build on, as resources become available. Public safety agencies need the 10MHz D block spectrum, in addition to the 10 MHz of broadband spectrum already allocated and licensed to public safety, to meet their critical requirements.

The first responders on the InterAgency Board commend the Public Safety Alliance for their leadership and efforts in securing the "D" Block for the first responder community.

International Association of Chiefs of Police

515 North Washington Street
Alexandria, VA 22314-2357
Phone:703-836-6767; 1-800-THE IACP
Fax: 703-836-4543
Web: www.theiacp.org

July 13, 2011

The Honorable John D. Dingell
United States House of Representatives
Washington, DC 20510

The Honorable Gene Green
United States House of Representatives
Washington, DC 20510

Dear Congressmen Dingell and Green:

On behalf of the International Association of Chiefs of Police (IACP), I am writing to express our strong support of H.R. 2482, the Public Safety Spectrum and Wireless Innovation Act.

H.R. 2482 would provide law enforcement and other public safety agencies with an additional 10 megahertz (MHz) of spectrum that is necessary to support a nationwide, interoperable, wireless broadband network that will help them fulfill their mission of protecting lives in communities throughout the United States.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial broadband systems. The D-Block allocation to public safety and federal funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

The IACP stands ready to assist you in any way possible. Our representative in this matter is Chief Harlin R. McEwen, Chairman of the IACP Communications & Technology Committee, and he can be contacted at chiefhrm@pubsaf.com or (607) 227-1224.

Thank you for your leadership in this matter.

Respectfully,

Mark A. Marshall
President

APCO International

Association of Public-Safety Communications Officials-International, Inc.

INTERIM EXECUTIVE DIRECTOR
Mark Cannon
cannonm@apcointl.org

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1426 Prince Street
Alexandria, VA 22314
Phone: 571-312-4400

July 8, 2011

The Honorable John D. Dingell
2328 Rayburn House Office Building
U.S. House of Representatives
Washington, D.C. 20515-2215

Dear Congressman Dingell:

On behalf of the more than 14,000 members of the Association of Public-Safety Communications Officials (APCO) International and the 200,000 public safety professionals we serve each year, we strongly support your introduction of companion legislation to the bipartisan Senate bill, S. 911 – the *Public Safety Spectrum and Wireless Innovation Act of 2011*, which was recently favorably voted out of the Senate Commerce Committee on a 21-4 vote with overwhelming bipartisan support.

As a senior member and former Chairman of the House Committee on Energy and Commerce, your introduction of this companion bill includes key legislative principles that the public safety, first responder and state and local government communities have championed as a top priority issue for Congress to enact this year ahead of the the 10th Anniversary of the tragic events of 9/11. Specifically, your legislation would: (1) allocate the entire 10 MHz D Block within the 700 band to public safety, (2) reauthorize the Federal Communications Commission to conduct spectrum auctions in the future to boost the economy and raise revenue to pay down the debt and fund other programs, and (3) authorize voluntary incentive auctions to generate tens of billions in new revenue, including up to $10 billion for debt reduction and $11 billion to help fund the nationwide interoperable public safety broadband network. Much like S.911, your legislation meets an outstanding recommendation of the bipartisan 9/11 Commission, as recently reiterated in testimony before Congress.

We thank you for your leadership in sponsoring this critical legislation. We urge the House Energy and Commerce Committee to move swiftly to co-sponsor and pass this legislation in order to bring it to the House floor immediately. We look forward to working with you on this top priority public safety issue in the coming days and weeks toward final enactment ahead of the 10th Anniversary of 9/11.

Sincerely,

William D. Carrow
President

Gregory T. Riddle
First Vice President

D. Terry Hall
Second Vice President

Richard A. Mirgon
Immediate Past President

KENWOOD
Listen to the Future

Kenwood USA Corporation supports the allocation of the D Block to public safety to improve our nation's homeland security and provide first responders with new voice, video, and data communications technologies that are urgently needed. Senate Commerce Committee Chairman John "Jay" Rockefeller, IV of West Virginia recently introduced legislation, **S. 3756: The Public Safety Spectrum and Wireless Innovation Act of 2010**, which provides the basis for implementing this unmet 9/11 Commission recommendation.

Our country's local, State, Tribal, and Federal law enforcement, fire, medical, and other emergency professionals must have access to the most modern and reliable wireless broadband technologies and spectrum to communicate with each other during emergencies. The ability for public safety to have seamless -roaming capability on a wireless broadband network that is hardened to public safety requirements is achievable and essential for public safety to meet its ever increasing responsibilities.

The Federal Communications Commission (FCC) is planning to address this issue again by the disposition of the D Block via auction. The first attempt by the FCC to auction the spectrum was unsuccessful. Public safety officials, service providers and infrastructure vendors agree that a more effective method would be to allocate the D Block directly to public safety organizations to meet the critical needs of first responders.

If allocated this additional 10 MHz of spectrum, the D block will be combined with the current 10 MHz of spectrum already allocated to public safety to create a 20 MHz block, enough to build public safety broadband network(s). When built, the network will be able to support a broad range of public safety, government, critical infrastructure and voice, video, and data services. The envisioned public/private partnership will also provide much needed public safety service, as well as broadband service, to rural America.

One of the top recommendations of the "9/11 Commission Report" was for Congress to "support pending legislation which provides for the expedited and increased assignment of radio spectrum for public safety purposes." We believe Congress must quickly pass legislation to allocate the D block spectrum to public safety, as first proposed in bipartisan legislation introduced by Congressman Peter King (R-NY) and Congresswoman Yvette Clarke (D-NY) as **H.R. 5081: Broadband for First Responders Act of 2010.** S. 3756 builds upon H.R. 5081, as well as **S. 3625: The First Responders Protection Act of 2010,** as introduced by Senate Homeland Security Committee Chairman Senator Joe Lieberman and former Senate Commerce Chairman John McCain.

Our nation cannot afford to miss this one-time-only opportunity and we call on Congress to support our first responders who put their lives on the line every day to protect and serve their communities.

Sincerely,

Kenwood U.S.A. Corporation
Communications Sector

THE CITY OF NEW YORK
OFFICE OF THE MAYOR
NEW YORK, NY 10007

June 7, 2011

The Honorable John D. Rockefeller
Chairman
Committee on Commerce, Science, and Technology
United States Senate
Washington, DC 20510

The Honorable Kay Bailey Hutchison
Ranking Member
Committee on Commerce, Science, and Technology
United States Senate
Washington, DC 20510

Dear Chairman Rockefeller and Ranking Member Hutchison:

I am writing in strong support of S. 911, the Strengthening Public-Safety and Enhancing Communications Through Reform, Utilization, and Modernization (SPECTRUM) Act, a bipartisan initiative crucial to the future of public safety in the United States.

In the aftermath of the attacks on September 11, 2001, Americans came to understand that a commitment to comprehensive improvement in our system of emergency communications is an essential element of our national security. New York City has worked tirelessly to make interoperability of emergency communications a reality, and we have made significant progress on that goal, but our efforts are necessarily limited to a local level. As we approach the 10th anniversary of 9/11, we can no longer afford to leave this issue—one of the key areas of focus of the 9/11 Commission—unaddressed. Legislation setting aside a dedicated portion of the 700 MHz spectrum for public safety officials for a nationwide interoperable network—known as the D Block—must be passed immediately to aid first responders across the country and at every level in saving countless lives and ensuring homeland security.

Building a nationwide broadband public safety network would allow cities across the country to transmit critical, real-time information during emergencies. In New York City, we have achieved interoperability for emergency voice communications, ensuring that all of our emergency responders can communicate in real time over our local radio systems. But that same interoperability needs to be able to function beyond individual localities, to provide seamless communication nationwide, which can only be accomplished with adequate public safety spectrum.

The SPECTRUM Act would not only provide interoperable voice communication, but also bring the technology used by public safety agencies into the twenty-first century, allowing for critical data of all types to be shared among those who need it while responding to emergencies. The additional spectrum would allow our police officers, firefighters, and emergency medical teams to instantly access relevant floor plans, maps, and photos to aid in search efforts for survivors, and our EMS workers would be able to wirelessly relay patient information to hospitals while en route. Rather than relying on bits and pieces of scattered spectrum that would prevent large data transmissions, every local, state, and federal first responder would be linked seamlessly on the D Block. Establishing this coast-to-coast communications network is a crucial tool in continuing efforts to combat all of the challenges that our public safety professionals face, from international terrorism to local weather emergencies.

Allocating the D Block spectrum for the exclusive use of the nation's emergency responders benefits not only the public safety officers who risk their lives while performing their duties, but helps every American who they serve in time of need. I look forward to working with you and your colleagues to ensure passage of legislation establishing a public safety broadband network this year.

Thank you for your consideration of this critically important issue.

Sincerely,

Michael R. Bloomberg

Michael R. Bloomberg
Mayor

Motorola Supports Public Safety Coalition and Offers Six Point Plan to Make Public Safety Broadband a Reality

Background

The need for additional spectrum for public safety data and video communications has long been recognized. From the Public Safety Wireless Advisory Committee Report released on September 11, 1996, to the 9/11 Commission report in 2005, to a failed D block auction nearly two years ago, there has been broad public and private sector support for providing public safety with the resources necessary to meet its communications requirements. The right combination of rules, spectrum and funding to bring the public safety broadband network to reality is long overdue. Motorola supports the coalition of major public safety organizations encouraging such action.

Motorola's Position

Motorola recommends the following six point plan to enable the implementation of public safety broadband communications that meet both operability and interoperability requirements:

1. Legislation: Pass legislation reallocating the 700 MHz D block for public safety use and add that spectrum to the nationwide Public Safety Broadband License (PSBL) held by the Public Safety Spectrum Trust (PSST).

2. Funding: Identify sources of funding, including multi-year Federal appropriations as needed, to enable deployment and maintenance of the public safety broadband network, as well as implementation of the nationwide framework for interoperability.

3. Regulatory Structure: Adopt a regulatory structure that enables deployment by public safety host agencies that need to control their own regional system. This structure should also include third parties serving agencies who are unable to deploy, operate or maintain their own system. These host agencies or designated third parties would serve all public safety agencies in their respective region who want access to the broadband network under spectrum use agreements with the PSST.

4. Interoperability Framework: Establish a national framework for interoperability that the PSST would administer through spectrum use agreements with public safety host agencies that want to deploy regional networks. This framework would include designation of Long Term Evolution (LTE) as a common radio access network technology nationwide and a basic set of broadband software applications all agencies would have for interoperability.

5. User Choice: Provide all agencies using the network the right to choose and deploy their own interoperable portable/mobile devices and software applications in addition to those designated for interoperability.

6. Inclusion and Prioritization: Permit Federal, state/local public service functions, and critical infrastructure entities as users on the public safety broadband network to enhance interoperability. Allow host agencies, in coordination with these users and the PSST, to set prioritization among the various users as required, a capability LTE technology can provide.

Benefits of the Plan

Reallocating the D block and adding it to the PSST's license provides 20 MHz of spectrum for public safety broadband communications to support the delivery of high speed data and video information. When added to the continued use and deployment of mission critical voice systems, public safety can have the full range of communications tools needed, all designed with the security and reliability essential to meet operational requirements. While this is a modest amount of spectrum in the context of broadband, the D block will provide public safety the capacity needed in urban areas and will enable broadband speeds in rural areas with fewer transmit sites, resulting in lower costs. Adding the D block also helps provide the capacity needed to enable improved interoperability across multiple levels of government – local, state and Federal – especially in times of crises events when all networks are typically stressed to their peak capacity.

Motorola joins public safety representatives in their call for Congress to identify sources of funding to deploy and maintain the public safety broadband network. Throughout history, making major infrastructure deployments a reality has necessitated Federal funding support in some form.

This six point plan sets forth the framework to adopt rules providing public safety with the control and flexibility required to deploy broadband systems that meet unique regional operability needs, while maintaining the degree of commonality for nationwide interoperability.

As this Administration and Congress take action to enable broadband to the general public, it should also act now to enable broadband systems for the unique needs of the public safety community.

For more information visit: http://www.motorola.com/governmentaffairs

Media Contacts

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Mobile: 858-24309406
Email: christasmith@motorola.com

MOTOROLA

October 7, 2010

The Honorable John D. Rockefeller
Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Chairman Rockefeller:

Motorola fully supports reallocation of the D-Block to Public Safety and asks Congress to pass legislation to give Public Safety this additional spectrum.

This is a unique moment in time where the FCC has made a commitment to the funding and building of a nationwide, interoperable Public Safety wireless broadband network to advance the services available to Public Safety. Losing the D Block by auctioning it to a private carrier will make Public Safety vulnerable because Public Safety won't be able to implement the much needed next generation technologies. It will restrict the ability to keep communities safe and it will increase the vulnerability of law enforcement, fire and EMS personnel across the country.

Our law enforcement officers, fire fighter and EMS personnel deserve the latest technology available to help them do their jobs. Thorough evaluation by industry leading suppliers, experts, carriers and Public Safety agencies has clearly established that the D Block should be rejoined with the Public Safety Spectrum Trust (PSST) and dedicated to law enforcement, fire and EMS to enable capacity for 21st century Public Safety broadband applications.

Furthermore, studies have established that reallocation will ensure that interference and the resulting service holes are mitigated and that full control and prioritization of broadband resources are necessary for optimal Public Safety response. But these studies have been rejected by the FCC and they have directed Public Safety to roam on commercial carriers for additional spectrum. Accountability without control endangers lives. This cannot be allowed to happen.

Public Safety has demonstrated the need for additional spectrum and without control and priority of that spectrum during day-to-day and emergency incidents; commercial interests are put above that of Public Safety.

We are proud to partner with our public safety customers and look forward to continuing to provide them with the next generation tools they need to serve and protect their communities.

Regards,

Mark

Mark F. Moon
Senior Vice President
Motorola Solutions
Sales & Field Operations

National Association of Attorneys General

PRESIDENT
Rob McKenna
Washington Attorney General

PRESIDENT-ELECT
Doug Gansler
Maryland Attorney General

VICE PRESIDENT
J.B. Van Hollen
Wisconsin Attorney General

IMMEDIATE PAST PRESIDENT
Roy Cooper
North Carolina Attorney General

EXECUTIVE DIRECTOR
James McPherson

2030 M Street, NW
Eighth Floor
Washington, DC 20036
Phone: (202) 326-6000
http://www.naag.org/

August 26, 2011

The Honorable Harry Reid
Senate Majority Leader

The Honorable Mitch McConnell
Senate Republican Leader

The Honorable John Boehner
Speaker of the House of Representatives

The Honorable Nancy Pelosi
House Democratic Leader

Sent via email

Dear Majority Leader Reid, Senator McConnell, Speaker Boehner and Leader Pelosi:

The 112th Congress is considering the passage of several bills on D-Block wireless communication that would allocate a specific broadband spectrum to public safety, designating this bandwidth for law enforcement use - and finally creating the truly interoperable communications network that law enforcement and emergency responders have needed for decades.

We understand that Congress may take action on this important legislation prior to the 10th anniversary of the September 11 terrorist attacks. Nothing could be more appropriate than marking this solemn anniversary by making a genuine commitment to public safety communication, for this and future generations.

Rather than endorsing any one proposal now under consideration, in the spirit of bi-partisanship the nation's attorneys general urge you to protect citizens across all our states - by ensuring that the public safety professionals who have committed to serve and protect can effectively communicate with one another in the face of a dire emergency or attack.

Even without the constant threat of terrorist acts, repeated natural disasters in recent years have driven home the need in state after state. In Mississippi, Attorney General Jim Hood has seen his state endure Hurricanes Katrina and Ike, flooding of the Mississippi River Delta and a class 5 tornado that obliterated the town of Smithville. Immediately after Katrina, communications between Jackson, the capital city in the middle of the state, and the Mississippi Gulf Coast were minimal with no electricity and few cell phones. Gasoline was in high demand, and his office sent truck loads to the Coast along with satellite phones.

In more sparsely populated rural states like Montana, communication among law enforcement agencies is further complicated by the number of jurisdictions involved. Floods like those the Western states experienced this spring and the raging forest fires we face each summer have no regard for the patchwork of private, state, federal and tribal lands they devastate.

By providing the resources to develop a reliable, rapid and comprehensive law enforcement wireless communications system, the D-block designation would serve all our citizens well.

On April 12, 2011, the House Committee on Energy and Commerce held a hearing to find uses for the spectrum that would advance public safety, promote broadband, create jobs and reduce the deficit. Speakers before the House Committee recommended that part of the spectrum freed when media companies changed to digital, 768-763 megahertz and 788-793 megahertz, be designated for first responders and public safety. Officials told Congress that, were the FCC to auction the remainder of the broadband to Internet providers, the monies realized could be allocated to infrastructure and made available for sorely needed law enforcement support.

According to the FCC, the need to designate the spectrum for law enforcement purposes is made more urgent by an already burgeoning information flow. Communication devices like cell phones, netbooks and smart phones are increasing by an astonishing growth rate of over 250 percent each year. For example, over 13 billion new smart-phone applications have been downloaded. By freeing increased, unlicensed spectrum, D-Block legislation will create innovation and growth, encourage the development of new media, and increase wireless networks in rural areas by private industry.

Ultimately, reallocation of the spectrum use should benefit consumers by lowering transaction costs and increasing communication industries, all while supporting law enforcement and increasing public safety. The importance of designating the D-Block spectrum for law enforcement simply cannot be overstated.

The result for the greater good of national safety trumps any partisanship. For that reason, 42 of our nation's attorneys general urge your strong support of legislation that will give our law enforcement officers and emergency responders the reliable wireless communication our nation has long needed.

Thank you for your consideration.

Sincerely yours,

Jim Hood
Mississippi Attorney General

Steve Bullock
Montana Attorney General

Marty J. Jackley
South Dakota Attorney General

Rob McKenna
Washington Attorney General

Luther Strange
Alabama Attorney General

Tom Horne
Arizona Attorney General

Kamala Harris
California Attorney General

George Jepsen
Connecticut Attorney General

Sam Olens
Georgia Attorney General

David Louie
Hawaii Attorney General

Greg Zoeller
Indiana Attorney General

Jack Conway
Kentucky Attorney General

William J. Schneider
Maine Attorney General

Martha Coakley
Massachusetts Attorney General

Chris Koster
Missouri Attorney General

John J. Burns
Alaska Attorney General

Dustin McDaniel
Arkansas Attorney General

John W. Suthers
Colorado Attorney General

Pam Bondi
Florida Attorney General

Lenny Rapadas
Guam Attorney General

Lawrence Wasden
Idaho Attorney General

Tom Miller
Iowa Attorney General

James "Buddy" Caldwell
Louisiana Attorney General

Douglas F. Gansler
Maryland Attorney General

Bill Schuette
Michigan Attorney General

Catherine Cortez Masto
Nevada Attorney General

Michael Delaney
New Hampshire Attorney General

Gary King
New Mexico Attorney General

Wayne Stenehjem
North Dakota Attorney General

Edward T. Buckingham
Northern Mariana Islands Attorney General

Linda L. Kelly
Pennsylvania Attorney General

Guillermo Somoza-Colombani
Puerto Rico Attorney General

Peter Kilmartin
Rhode Island Attorney General

Alan Wilson
South Carolina Attorney General

Robert E. Cooper, JR.
Tennessee Attorney General

Greg Abbott
Texas Attorney General

Mark Shurtleff
Utah Attorney General

William H. Sorrell
Vermont Attorney General

Vincent Frazer
Virgin Islands Attorney General

Darrell V. McGraw, JR.
West Virginia Attorney General

J.B. Van Hollen
Wisconsin Attorney General

Greg Phillips
Wyoming Attorney General

NORTHROP GRUMMAN

Northrop Grumman Supports the Reallocation of the 700 MHz D Block Spectrum to Public Safety

The role of first responders has changed dramatically since the tragic events of September 11, 2001, and yet very little progress has been made toward placing advanced mobile technology into the hands of the nation's emergency services personnel. Public safety applications and technologies are advancing rapidly, and yet the ability to apply this technology to a highly mobile workforce has been hampered by the lack of spectrum in which to build a nationwide network. The need for spectrum has never been greater for data, voice and incident video for the short term and the future. Sufficient spectrum needs to be allocated to allow for manufacturers to develop secure wireless systems that will not be obsolete before they are fully deployed.

Congress and the Federal Communications Commission (FCC) have a unique opportunity to provide public safety with the right amount of spectrum to foster development of new technologies to enhance the safety of our first responders and provide them with the tools to carry out their mission effectively and efficiently. Northrop Grumman supports the reallocation of the D Block to public safety and the establishment of regulatory process and structure that will allow fully interoperable networks to be constructed by regions, states and government entities that will commit to building and managing such systems. We support the public safety coalition's efforts to request Congressional action to reallocate the D Block to public safety creating spectrum foundation for the future.

Northrop Grumman further supports the licensing of the full 20 MHz of spectrum to individual entities that are capable of implementing and managing the network as a sub-licensee to the already established Public Safety Spectrum Trust. The FCC should adopt regulatory policy that enables early deployment of secure broadband networks provided the managing agency conforms to the national standards allowing full compatibility with devices and interoperability with supporting agencies. The regulatory structure of the nationwide network must be flexible enough to allow for public/private partnerships where practical, and options that allow first responders to have access to a broadband network built to public safety standards for reliability and redundancy. Additionally the region or entity constructing the network should have the option to include other governmental users as practical to take advantage of the networks' capabilities. The widely adopted Long Term Evolution (LTE) standard includes priority access and a quality of service (QoS) hierarchy that will ensure that public safety standards for access are met.

The federal government also needs to identify funding sources to enable the construction and management of the nationwide network, and the adoption and compliance of a national standard for interoperability. We also support the establishment of a governing body that maintains and manages the interoperability components of the network such as authentication and priority access to ensure that the true purpose of the network is upheld. The rules must permit the participation of both federal and local public safety first responders, public service / governmental agencies, and critical infrastructure partners to allow for true interoperability and cost sharing among high priority and low priority users.

Northrop Grumman stands with the public safety community in asking Congress to immediately begin identifying funding mechanisms to ensure that construction of the nationwide network is commenced as soon as practicable. As the country focuses on strengthening the economy and securing our nation from further attacks we need to place emphasis on improving the capabilities of our first responders through technology. The Administration has a unique opportunity to set a precedent for public safety by allocating the right amount of spectrum for the near term and the future of public safety communications.

For additional information please contact:
Christy Whitman
(571) 213-5302
christine.whitman@ngc.com

NORTHROP GRUMMAN

Northrop Grumman Information Systems
Washington Operations
1000 Wilson Blvd.
Suite 2300
Arlington, Virginia 22209

October 1, 2010

The Honorable John D. Rockefeller
Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Chairman Rockefeller:

Northrop Grumman supports Senate Bill S.3756 -- Public Safety Spectrum and Wireless Innovation Act. The bill seeks to amend the Communications Act of 1934 to provide public safety officials an additional 10 megahertz of spectrum to support a national, interoperable wireless broadband network and authorize the Federal Communications Commission to hold incentive auctions to provide funding to support such a network, and for other purposes.

Northrop Grumman believes strongly that the actions called for in the bill, to provide additional broadband spectrum to Public Safety contiguous to their existing spectrum allocation and to provide funding for a national broadband network for Public Safety, are vital steps to provide first responders across the United States with the tools they need. The development and deployment of new mobile broadband technologies for the commercial wireless marketplace provides the possibility for Public Safety to leverage a vast array of technology to improve safety and efficiency of our entire Homeland Security infrastructure. The U.S. government is wise to leverage this opportunity in time to provide consistent, contiguous broadband spectrum to Public Safety. If the "D" block spectrum is auctioned to the private sector it cannot be recovered, and as critical application requirements of those who protect us increase it will be impossible to provide a cost effective solution to future mission requirements.

Northrop Grumman encourages the Congress and the Administration to enthusiastically support this important transformation of the future Public Safety communications system.

Sincerely,

Hugh E. Taylor
Sector Vice President, Washington Operations
Northrop Grumman Information Systems

NATIONAL SHERIFFS' ASSOCIATION

July 10, 2011

The Honorable John D. Dingell
U.S. House of Representatives
Washington, D.C. 20515

Dear Congressman Dingell:

On behalf of the National Sheriffs' Association (NSA) and the 3,083 elected sheriffs nationwide, we are writing to express our strong support for your introduction of the Public Safety Spectrum and Wireless Innovation Act in the U.S. House of Representatives. This legislation serves as a companion bill to S. 911 – SPECTRUM Act, introduced by Senator Jay Rockefeller (D-WV) and Senator Kay Bailey Hutchison (R-TX) in the Senate.

The Public Safety Spectrum and Wireless Innovation Act includes key legislative principles that both the public safety; and state and local government communities have requested as a top priority issue for Congress to enact this year, ahead of the 10th Anniversary of the tragic events of 9/11.

Specifically, your legislation would: allocate the D Block to public safety for the creation and implementation of a nationwide public safety interoperable mobile broadband network; reauthorize the Federal Communications Commission (FCC) to conduct spectrum auctions in the future to boost the economy and raise revenue to pay down the debt and fund other programs; and authorize voluntary incentive auctions to generate tens of billions in new revenue for not only debt reduction, but to fund the nationwide interoperable public safety broadband network.

Congressman Dingell, like S. 911, your legislation meets a still outstanding recommendation of the bipartisan 9/11 Commission. The nation's sheriffs thank you for your leadership in sponsoring this critical legislation, and we stand ready to assist you in enacting this vital legislation before the 10th Anniversary of 9/11.

Sincerely,

Paul H. Fitzgerald

Sheriff Paul H. Fitzgerald
President

Aaron D. Kennard
Executive Director

1450 Duke St. • Alexandria, VA 22314 • 703.836.7827 phone • 703.683.6541 fax • www.sheriffs.org • nsamail@sheriffs.org

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Senator Maria Cantwell
311 Hart Senate Office Building
Washington, D.C. 20510

Dear Senator Cantwell:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Public Safety Spectrum and Wireless Innovation Act (S. 28), sponsored by Senator Jay Rockefeller (D-WV). The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support S. 28, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA

900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Senator Patty Murray
448 Russell Senate Office Building
Washington, D.C. 20510

Dear Senator Murray:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Public Safety Spectrum and Wireless Innovation Act (S. 28), sponsored by Senator Jay Rockefeller (D-WV). The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support S. 28, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA

900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Adam Smith
2402 Rayburn HOB
Washington, D.C. 20515

Dear Representative Smith:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative David G. Reichert
1730 Longworth HOB
Washington, D.C. 20515

Dear Representative Reichert:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

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I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Jim McDermott
1035 Longworth HOB
Washington, D.C. 20515

Dear Representative McDermott:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA

900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Norman D. Dicks
2467 Rayburn HOB
Washington, D.C. 20515

Dear Representative Dicks:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Cathy McMorris Rodgers
2421 Rayburn HOB
Washington, D.C. 20515

Dear Representative McMorris Rodgers:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City Council	(360) 753-8447	Community Planning & Development	(360) 753-8314	Police	(360) 753-8300
City Manager	(360) 753-8447	Fire	(360) 753-8348	Public Works	(360) 753-8362
City Attorney	(360) 753-8449	Human Resources	(360) 753-8442		
Administrative Services	(360) 753-8325	Parks, Arts & Recreation	(360) 753-8380		

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Doc Hastings
1203 Longworth HOB
Washington, D.C. 20515

Dear Representative Hastings:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City Council (360) 753-8447 | Community Planning & Development (360) 753-8314 | Police (360) 753-8300
City Manager (360) 753-8447 | Fire (360) 753-8348 | Public Works (360) 753-8361
City Attorney (360) 753-8449 | Human Resources (360) 753-8442
Administrative Services (360) 753-8325 | Parks, Arts & Recreation (360) 753-8380

City of
OLYMPIA

900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Jaime Herrera Beutler
1130 Longworth HOB
Washington, D.C. 20515

Dear Representative Herrera Beutler:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Jay Inslee
2329 Rayburn HOB
Washington, D.C. 20510-4701

Dear Representative Inslee:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City Council	(360) 753-8447	Community Planning & Development	(360) 753-8314	Police	(360) 753-8300
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Administrative Services	(360) 753-8325	Parks, Arts & Recreation	(360) 753-8380		

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

May 4, 2011

Representative Rick Larsen
108 Cannon HOB
Washington, D.C. 20515

Dear Representative Larsen:

As the Chief of the Olympia Police Department, I am writing to advise you of my strong support of the Broadband for First Responders Act (H.R. 607), sponsored by Reps. Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support H.R. 607, and I urge you to support our efforts as well.

Best Regards,

Ronnie Roberts, Chief
Olympia Police Department

Cc: Meredith Ward, IACP Manager, Legislative and Media Affairs

RR:mmw

City Council	(360) 753-8447	Community Planning & Development	(360) 753-8314	Police	(360) 753-8300
City Manager	(360) 753-8447	Fire	(360) 753-8348	Public Works	(360) 753-8362
City Attorney	(360) 753-8449	Human Resources	(360) 753-8442		
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INTERNATIONAL ASSOCIATION OF FIRE CHIEFS

Providing leadership for the fire and emergency services since 1873

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July 11, 2011

The Honorable John D. Dingell
2328 Rayburn House Office Building
U.S. House of Representatives
Washington, DC 20515

Dear Congressman Dingell:

On behalf of the nearly 13,000 chief fire and emergency officers of the International Association of Fire Chiefs (IAFC), I am writing to express our strong support for your introduction of H.R. 2482, the Public Safety Spectrum and Wireless Innovation Act, as a companion to S. 911, the Strengthening Public-safety and Enhancing Communications Through Reform, Utilization, and Modernization Act. This legislation would fulfill one of the outstanding recommendations of the 9/11 Commission, and improve the nation's response to future national disasters, both natural and man-made.

Your legislation includes key legislative principles that the first responders and state and local governments have designated as a top priority for passage before the tenth anniversary of the tragic events of September 11, 2001. Specifically, it would allocate the 10 MHz of the D Block in the 700 MHz band to public safety for the creation and implementation of a nationwide public safety wireless broadband network and authorize the Federal Communications Commission (FCC) to conduct voluntary incentive spectrum auctions to fund the construction, operation and maintenance of the public safety wireless broadband network and reduce the federal deficit.

The IAFC thanks you for your leadership in sponsoring this critical legislation. We look forward to working with you and the other members of the House Energy and Commerce Committee to pass H.R. 2482 in order to bring it to the House Floor. It is vitally important that Congress address this remaining recommendation of the 9/11 Commission before September 11, 2011.

Sincerely,

John E. Parow

Chief Jack Parow, MA, EFO, CFO
President and Chairman of the Board

Public Safety Alliance
Dedicated to First Responders...First

July 8, 2011

The Honorable John D. Dingell
2328 Rayburn House Office Building
U.S. House of Representatives
Washington, D.C. 20515-2215

Dear Congressman Dingell:

On behalf of the more than 2 million first responders nationwide, the Public Safety Alliance strongly supports your introduction of companion legislation to Senate bill S. 911 – the *Public Safety Spectrum and Wireless Innovation Act of 2011*, which was recently favorably voted out of the Senate Commerce, Science and Transportation Committee on a 21-4 vote with overwhelming bipartisan support.

As a senior Member and former Chairman of the House Committee on Energy and Commerce, your introduction of this companion bill includes key legislative principles that the public safety, first responder and state and local government communities have requested as a top priority issue for Congress to enact this year ahead of the the 10th Anniversary of the tragic events of 9/11. Specifically, your legislation would: (l) allocate the entire 10 MHz D Block within the 700 band to public safety and allow it to be combined with 10 MHz already allocated to public safety for broadband, (2) reauthorize the Federal Communications Commission to conduct spectrum auctions in the future to boost the economy and raise revenue to pay down the debt and fund other programs, (3) authorize voluntary incentive auctions to generate tens of billions in new revenue of up $10 billion for debt reduction and $11 billion to help fund the nationwide interoperable public safety broadband network. Like S.911, your legislation meets a still outstanding recommendation of the bipartisan 9/11 Commission, as recently reiterated in testimony before Congress by their bipartisan co-chairs.

We thank you for your leadership in sponsoring this critical legislation. We urge the House Energy and Commerce Committee to swiftly co-sponsor and pass this legislation in order to bring it to the House floor immediately. We look forward to working with you on this top priority public safety issue in the coming days and weeks toward final enactment ahead of the 10th Anniversary.

Sincerely,

The Public Safety Alliance Leadership

August 5, 2011

The Honorable Harry Reid
United States Senate
522 Hart Senate Office Bldg
Washington, DC 20510

Dear Senator Reid,

On behalf of the Nevada Fire Chiefs Association and the Nevada fire service, we want to express our gratitude for your continued support of S. 911, the Strengthening Public-safety and Enhancing Communications Through Reform, Utilization, and Modernization Act (SPECTRUM) Act. This bill, introduced by Senators John D. "Jay" Rockefeller, IV and Kay Bailey Hutchison, will ensure that public safety organizations have the necessary spectrum to develop a nationwide public safety interoperable wireless broadband network.

The broadband revolution presents America's fire service with the opportunity to take advantage of new technology to greatly enhance public safety communications. For example, wireless broadband access will enable the development and widespread adoption of devices to track firefighters inside burning buildings; allow smart buildings to broadcast information about a fire to a fire chief's cell phone; allow paramedics to share a patient's vitals remotely with medical staff at a hospital; and much more. In order to access this new technology across the country, the federal government must support the development of a nationwide public safety interoperable wireless broadband network.

Currently, public safety has been licensed 10 MHz of spectrum to develop a nationwide public safety wireless broadband system. There is another block of 10 MHz of spectrum (the "D Block") adjacent to public safety's broadband spectrum. S. 911 would allocate the D Block to public safety which could then work with the private sector to develop a nationwide public safety interoperable wireless broadband network using 20 MHz of spectrum. Unfortunately, current law directs the Federal Communications Commission to auction the D Block to a commercial bidder.

S. 911 will prevent the auction of the D Block, and instead allocate it directly to public safety to build out its nationwide wireless broadband network. Considering that there is a shortage of spectrum, S. 911 presents public safety with its only opportunity to obtain the critical spectrum that it needs to bring cutting-edge technology to America's firefighters, police officers, and emergency medical personnel.

I urge you to continue your support of S. 911, so that public safety can develop a nationwide public safety interoperable wireless broadband network to more effectively protect the American public. This is a one-time only opportunity to get it right. Your help is essential.

Sincerely,

Robert S. Giomi

Stacey Giomi, Fire Chief
NFCA President

Rivada Networks

STATEMENT OF RIVADA NETWORKS
September 16, 2010

Rivada Networks strongly supports the urgent call by the Public Safety Alliance to secure legislation (HR5081, S2365 and S3756) that would allocate use and control of the 700Mhz D Block spectrum to the public safety community and provide funding for build out and sustainment, rejecting earlier plans for a public auction of the D Block spectrum.

Public safety officials, including state and local law enforcement, fire departments, emergency medical officials and other first responders have an essential need for expanded access to broadband spectrum for routine operations and for emergency response to catastrophic events. Delivering this additional spectrum capacity to the purpose of ensuring public safety is a national imperative. Allocating the 700Mhz D Block Spectrum will allow for America's first responders to meet current and future communications needs and enable a truly nationwide build-out of interoperable public sector communications networks and protocols, to include rural areas. With the D Block allocated to public safety, our federal, state and local authorities can have access to a broadband network that is flexible and powerful enough to give our first responder community the essential communication tools needed to operate effectively in protecting our nation and its citizens.

Some have argued that 10Mhz is sufficient for public safety. Rivada does not concur with this view. The facts are clear: when communities need critical public safety most urgently, supporting bandwidth and communications infrastructure will be under the most intense strain. Providing the public safety community the communications capacity it needs ensures its ability to save lives during the critical moments of any crisis. The only practical way to ensure that they have adequate capacity is to allocate the entire 20 MHz spectrum to them. During periods when the public safety community is not fully using the network's capacity, it would be able to make capacity dynamically available on a secondary but pre-emptive basis to other governmental and private users. This will also make it possible for public safety users to leverage widely available commercial off-the-shelf products and LTE technology, and it can significantly reduce the burden on taxpayers to pay for ongoing network sustainment costs.

The employees and directors of Rivada Networks have many years of experience dealing with the technical, operational and public policy challenges of public safety communications. Rivada provides emergency communications capabilities to the public sector public safety community at the federal, state and local levels (www.Rivada.com). We see on a first-hand basis each day what access to the D Block as proposed by the Public Safety Alliance can do to strengthen public safety capabilities.

Today, our customers and the nation stand at a fateful intersection regarding this vital public policy debate. Rivada Networks strongly endorses the work of the Public Safety Alliance to help forge a national consensus to allocate the D Block to public safety.

Sincerely,

Declan J. Ganley Chairman & CEO	**Gen. Richard B. Myers (USAF Ret.)** Member of the Board	**The Hon Michael Jackson** Member of the Board	**Adm. James Loy (USCG Ret.)** Member of the Board
The Hon. George Foresman Member of the Board	**Gen (Ret.) The Lord Charles Guthrie** Member of the Board	**Kenneth A. Fields** Member of the Board	**Donald N. De Marino** Member of the Board

7890 Lexington Drive
Colorado Springs
CO 80920

2231 Crystal Drive, Suite 1101
Arlington
VA 22202

April 25, 2011

The Honorable Barbara A. Mikulski
United States Senator
509 Hart Senate Office Building
Washington, D. C. 20510

Dear Senator Mikulski:

As Chief of the Rockville City Police Department, I am writing to advise you of my strong support of the *Public Safety Spectrum and Wireless Innovation Act (S.28),* sponsored by Senator Jay Rockefeller (D-WV) and *Broadband for First Responders Act* (H.R. 607), sponsored by Representatives Peter King and Bennie Thompson. The legislation will allocate D-Block spectrum to public safety for the development of a nationwide interoperable public safety broadband network and designate significant funds to build out and operate the nationwide network.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-block allocation and funding is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

I am proud to support S.28/H.R. 607, and I urge you to support our efforts as well.

Yours truly,

T. N. Treschuk
Chief of Police

TNT:mer

The Digital Decision

7579 Venture Drive
Alexandria, VA 22315

2 February 2011

Yucel Ors
APCO International
Director of Legislative and Government Relations

Re: Support of the PSA's D-Block reallocation and funding for Public Safety broadband networks nationally

Dear Mr. Ors,

As you know my firm has long supported the PSA's efforts to acquire additional radio frequency spectrum and funding for public safety broadband networks nationally. We are honored that APCO has leveraged our experience to provide valuable technical and operational information to your team and the PSA. We have successfully debated the FCC's technical experts and when asked, provided critical information to Legislators and members of the Administration. Recent changes in positions on the Hill and The Administration are as a result of your steadfast positioning, the PSA's extraordinary influence and our tireless input to the process. We are proud to work with you, your organization and the PSA and we are committed to continuing our support until we reach a successful conclusion. Rest assured that we will not falter in our commitment to APCO and the PSA. Please continue to call when needed and we will continue to be there for one of America's most valuable natural resources; our First Responders.

Respectfully submitted,

Robert LeGrande, II

Robert LeGrande, II
Founder
The Digital Decision, LLC
www.thedigitaldecision.com
(703)344-1819

November 19, 2010

The Honorable Marco Rubio
Senator-Elect
United States Senate
Washington, D.C. 20510

Dear Senator-Elect Rubio,

USA Software, Inc. supports the allocation of the D Block to public safety and the establishment of a regulatory process and structure to construct a nationwide, interoperable mobile wireless broadband network. The move will improve our nation's homeland security and provide first responders with new voice, video and data communications technologies that are urgently needed. Senate Commerce Committee Chairman John "Jay" Rockefeller, IV of West Virginia recently introduced legislation, **S. 3756: The Public Safety Spectrum and Wireless Innovation Act of 2010**, which provides the basis for implementing this unmet 9/11 Commission recommendation. We would ask that you to consider supporting this legislation.

USA Software, Inc. provides Mobile Data solutions to numerous clients throughout the Southeast United States. Some of the more frequent concerns raised by our customers relating to the current wireless technologies is speed, quality of the connection and, in our rural areas, the simple availability of a wireless network. Our country's local, State, Tribal and Federal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies to communicate with each other and with federal officials across various agencies and jurisdictions during emergencies. The ability for public safety to have seamless nationwide roaming capability on a wireless broadband network that is hardened to public safety requirements is both achievable and essential for public safety to meet its ever increasing responsibilities.

The Federal Communications Commission (FCC) is planning to address this issue again by the disposition of the D Block via auction. We understand the first attempt by the FCC to auction the spectrum failed miserably. Public safety officials, service providers and infrastructure vendors agree that a more effective method would be to allocate the D Block directly to public safety organizations in order to create a national broadband network that would meet the mission critical needs of first responders.

If allocated, this 10 MHz sliver of spectrum known as the D Block will be combined with the current 10 MHz of spectrum already allocated to public safety to create a 20 MHz block necessary to build out a nationwide public safety broadband network. When built, the new network will be able to support a wide range of public safety, government, critical infrastructure and consumer applications, including voice, video and data services. The wireless broadband network will also enable State, local and Tribal governments to provide more cost effective services to their communities, while saving local and State governments millions of dollars in administering programs such as reading water meters and deploying smart grid technologies. The envisioned public/private partnership will also provide much needed public safety service, as well as commercial broadband service, to rural America.

Corporate Headquarters
9900 Stirling Road, Suite 302 ■ Cooper City, Florida 33024
Telephone: (954) 436-3911 Fax: (954) 431-2641 eMail: sales@usa-software.com Web: www.usa-software.com

One of the top recommendations of the "9/11 Commission Report" was for Congress to "support pending legislation which provides for the expedited and increased assignment of radio spectrum for public safety purposes." We believe Congress must quickly pass legislation to allocate the D Block spectrum to public safety, first proposed in bipartisan legislation introduced by Congressman Peter King (R-NY) and Congresswoman Yvette Clarke (D-NY) as **H.R. 5081: Broadband for First Responders Act of 2010.** The legislation must also provide an annually recurring and dedicated funding source to build and maintain the nationwide public safety wireless broadband network. Senator Rockefeller's bill, S. 3756, which builds upon H.R. 5081, as well as **S. 3625: The First Responders Protection Act of 2010,** as introduced by Senate Homeland Security Committee Chairman Senator Joe Lieberman and former Senate Commerce Chairman John McCain, provides the framework to create a world-class nationwide interoperable public safety broadband network by aligning three crucial components for the welfare of emergency first responders: spectrum, infrastructure and funding.

Our nation cannot afford to miss this one-time-only opportunity to help public safety. We call on Congress pass legislation which will support our first responders who put their lives on the line every day to protect and serve their communities.

Sincerely,

F.A. "Woody" Spencer, Jr.
President/CEO

www.usa-software.com

cc: The Honorable John D. Rockefeller IV
Chairman
Senate Committee on Commerce, Science and Transportation

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WESTERN WAYNE COUNTY ASSOCIATION OF CHIEFS OF POLICE

41600 W. SIX MILE RD • NORTHVILLE, MI 48168
(248) 449-5198 • (248) 348-5813

PARTICIPATING MEMBERS

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WAYNE COUNTY AIRPORT
WAYNE COUNTY SHERIFF
WAYNE P.D.
WESTLAND P.D.

SECRETARY
JANET LUCAS
DEARBORN HEIGHTS P.D.

May 25, 2011

The Honorable John D. Dingell
United States House of Representatives
2328 Rayburn House Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Congressman Dingell:

The Western Wayne County Association of Chiefs of Polices is an organization of 18 Police departments, and other law enforcement agencies that are responsible for protecting over one million Michigan residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructura and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The Western Wayne County Association of Chiefs of Police is confident in your leadership.

Sincerely,

Police Chief Ronald Haddad
Dearborn Police Department

WESTERN WAYNE COUNTY ASSOCIATION OF CHIEFS OF POLICE

41600 W. SIX MILE RD • NORTHVILLE, MI 48168
(248) 449-5198 • (248) 348-5813

May 25, 2011

The Honorable John D. Dingell
United States House of Representatives
2328 Rayburn House Office Building
Washington, DC 20510

Re: Support for D Block Spectrum to Public Safety Community

Dear Representative Dingell:

The Western Wayne County Association of Chiefs of Polices is an organization of 18 Police departments, and other law enforcement agencies that are responsible for protecting over one million Michigan residents.

For the safety of our citizens and to protect critical businesses in the Southeast Michigan area, we urge you to work with your colleagues to support the legislation that will allocate the D Block Spectrum to the public safety community.

We believe that our State, local and Tribal first responders, including law enforcement, fire, medical and emergency professionals, must have access to the most modern and reliable wireless broadband technologies. The additional 10 MHz of spectrum that the D Block provides would be leveraged with 10 MHz of adjacent spectrum that the public safety community has at its disposal in order to create a 20 MHz network that is essential to supporting a wide range of public safety, government, critical infrastructure and consumer needs for voice, video and data services.

Your support for legislation that would allocate D Block for public safety would send a clear message to your colleagues and to members of the Federal Communications Commission. The D block spectrum wireless designation for public safety is needed as an essential element of national security.

We look forward to receiving your commitment of support for D Block legislation. The Western Wayne County Association of Chiefs of Police is confident in your leader ship.

Sincerely,

Police Chief Lee Gavin, Dearborn Heights Police Department

ZETRON
MISSION-CRITICAL COMMUNICATION SYSTEMS

September 30, 2010

The Honorable John D. Rockefeller, Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Chairman Rockefeller:

I am writing to express Zetron's enthusiastic support for your legislation, S. 3756—the *Public Safety Spectrum and Wireless Innovation Act of 2010*.

As a manufacturer of public safety communications systems for over 30 years, we understand the significant benefits to public health and safety the legislation offers.

It would establish the funding necessary to construct and maintain a nationwide interoperable wireless broadband network. The network is a critical step toward achieving the interoperability public safety agencies and first responders need in order to communicate with each other during disasters and events that span jurisdictions and agencies. It will also strengthen our nation's homeland security and provide first responders with voice, video, and data communications technologies that will improve their ability to protect our communities and save lives.

The *Public Safety Spectrum and Wireless Innovation Act* would:

- Establish a framework for the deployment of a nationwide interoperable wireless broadband network for public safety.
- Allocate 10 MHz of spectrum—the D Block—to public safety.
- Direct the Federal Communications Commission (FCC) to develop the standards necessary to ensure nationwide interoperability and build-out (including in rural areas).
- Direct the FCC to establish standards that allow public safety officials, when not using the network, to lease capacity on a secondary but preemptive basis to non-public safety entities.
- Provide the FCC with incentive auction authority, allowing existing spectrum licensees to relinquish their airwaves in exchange for a portion of the proceeds of the commercial auction of their spectrum. The funds from these auctions, in conjunction with funds from the auction of other spectrum bands and funds earned from leasing the public safety network on a secondary basis, would be used to fund the construction and maintenance of the nationwide interoperable wireless broadband public safety network.

Again, you have our fullest support and encouragement as you seek to pass this legislation.

Best Regards,

Ellen O. O'Hara

Ellen O. O'Hara

President and CEO
Zetron, Inc.

ZETRON, INC. MAIL TO PO Box 97004 Redmond, WA 98073-9704 USA SHIP TO 12034 134th Ct. NE Redmond, WA 98052 USA TEL 425 820 6363 FAX 425 820 7031 WEB www.zetron.com EMAIL zetron@zetron.com

Appendix C – Public Safety Spectrum Holdings

APCO INTERNATIONAL

Spectrum Analysis Report

This report contains…

- Chart of the current public safety spectrum holdings.
- Map of 700 / 800 MHz transmitters in the United States
- Table of the number of mixed licenses in the 470-512 MHz Band. This includes public safety and business/industrial.
- Table of the number of narrowband licenses in the 700 MHz Band. NOTE: Many of these licenses are issued at the regional and state level and they could cover a large geographic area.
- Table of the number of mixed licenses in the 800 MHz band. This includes public safety and business/industrial.
- Table of the number of licenses issued in the 4.9 GHz band.

The data for spectrum tables contained in this report was obtained from the FCC web site at http://fjallfoss.fcc.gov/General_Menu_Reports/engineering_search.cfm?accessible=NO.

Public Safety Narrowband Land Mobile Radio (LMR) Spectrum

29 - 50 MHz (VHF Low Band): The spectrum is non contagious and it interleaved with other uses. Total spectrum allocation in the block is 7 MHz.

Frequencies	Amount of Spectrum (MHz)
30.98 - 31.98	1
33.02 - 33.98	0.96
35.02, 35.64, 35.68	0.06
37.02 - 37.42	0.4

Frequencies	Amount of Spectrum (MHz)
37.90 - 37.98	0.08
39.02 - 39.98	0.96
42.02 - 42.94	0.92
43.64, 43.68	0.04

Frequencies	Amount of Spectrum (MHz)
44.62 - 46.58	1.96
47.02 - 47.66	0.64
Total	7.2

150-174 MHz: The spectrum allocation is non-contiguous and it s interleaved with other uses. Total spectrum allocation in the block is 3.8 MHz

Frequencies	Amount of Spectrum (MHz)
150.7750 - 150.8050	0.03
150.9950 - 151.4975	0.5025
152.0075	0.02
153.7400 - 154.47875	0.73875
154.6500 - 156.2400	1.59
157.45	0.02
158.7225 - 159.4725	0.75
163.25	0.01125
166.25	0.01125
170.15	0.01125
170.425	0.006

Frequencies	Amount of Spectrum (MHz)
170.475	0.006
170.575	0.006
171.425	0.006
171.475	0.006
171.575	0.006
172.225	0.006
172.275	0.006
172.375	0.006
173.075	0.006
173.20375	0.006
173.21	0.006

Frequencies	Amount of Spectrum (MHz)
173.2375	0.006
173.2625	0.006
173.2875	0.006
173.3125	0.006
173.3375	0.006
173.3625	0.006
173.39	0.006
173.39625	0.006
Total	3.805

450-470 MHz: The spectrum allocation is non-contiguous and it s interleaved with other uses. Total spectrum allocation is 3.7

Frequencies	Amount of Spectrum (MHz)	Number of Public Safety Licenses	Use
453.0125 - 453.99375	0.98125	16,914	Nationwide
458.0125 - 458.99375	0.98125	15,105	Nationwide
460.0125 - 460.64375	0.63125	7,148	Nationwide
462.9375 - 463.19375	0.25625	1,649	Nationwide (EMS)
465.0125 - 460.64375	0.63125	6,513	Nationwide
467.9375 - 468.19375	0.25625	2,035	Nationwide (EMS)
Total	3.7375	49,364	

470-512 MHz: The spectrum allocation is made up of 6 MHz contiguous blocks and it is interleaved with other licensees including business/industrial. Total spectrum allocation varies by geographic area from 6 MHz to 18 MHz.

6 MHz Spectrum Block	Number of Licenses Issued	Major Metro Areas
470 to 476	1,133	Boston, Chicago, Miami, Los Angeles, New York City, Cleveland, Pittsburgh
476 to 482	376	Chicago, Detroit, New York City, Cleveland
482 to 488	1,133	San Francisco, Los Angeles, Detroit, Boston, Dallas-Fort Worth, New York City
488 to 494	140	San Francisco, Houston, Washington, DC
494 to 500	41	Washington, DC, Pittsburgh
500 to 506	278	Philadelphia, Southern NJ, Northeastern NJ, Nassau County, NY
506 to 512	171	Los Angeles, Philadelphia, Southern NJ

768-775/798-805: The spectrum allocation is contiguous. Total spectrum allocation is 14 MHz (includes 2 MHz for Guard Band).

806-809/851-854 MHz: The spectrum allocation is contiguous. Total spectrum allocation is 6 MHz.

809-815/854-860 MHz: The spectrum allocation is non-contiguous and it s interleaved with other uses. The total spectrum allocation is 3.5 MHz

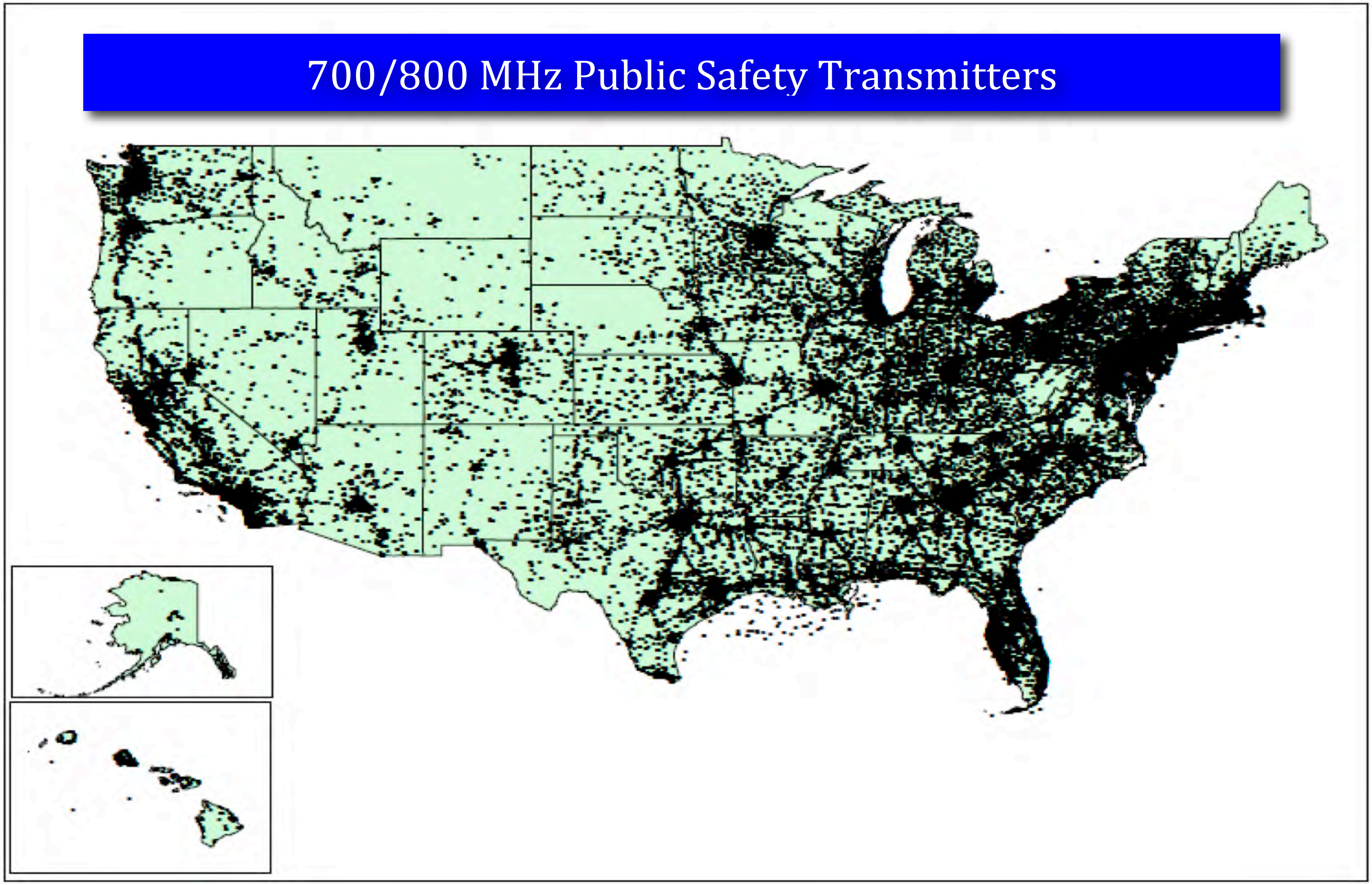
Public Safety Broadband Spectrum

763-768/793-798 MHz: The spectrum allocation is contiguous. The spectrum is designated for deployment of LTE wireless broadband network. Total spectrum allocation is 10 MHz.

4940-4990 GHz: The spectrum allocation is contiguous. The propagation characteristic of the spectrum block limits the use of the spectrum to either hot spot or local area broadband networks, mesh networks, or microwave services. Total spectrum allocation is 50 MHz.

NOTES

- *The 470-512 MHz (a.k.a. T-band) is shared with business/industrial licensees*
- *470-512 MHz, 450-470 MHz, and 851-854, 854-860 MHz bands the total allocation includes paired spectrum for mobile/portable operations.*
- *Assignment of channels in 800 MHz band must be in pairs.*



State and local public safety agencies have put up approximately 79,903 towers across to country for 700/800 MHz land mobile radio systems (there are actually lot more towers for UHF and VHF bands that can also be used for broadband, which are not shown in the map). By utilizing existing public safety tower infrastructure and backhaul, including an extensive array of microwave transmitters and fiber optic networks, the cost of deploying a national public safety wireless broadband network will greatly reduced. This infrastructure combined with commercial networks would ensure greater geographic and populations coverage.

470-512 MHz Mixed Use Linceses

Count of Assigned Frequency			
Location State	Location County	Radio Service	Total
AK	(blank)	TT TV Translator Relay	1
AK Total			1
AL	JACKSON	TI TV Intercity Relay	1
	JEFFERSON	LP Broadcast Auxiliary Low Power	3
	MONTGOMERY	LP Broadcast Auxiliary Low Power	3
AL Total			7
AR	CRAIGHEAD	LP Broadcast Auxiliary Low Power	3
	PULASKI	LP Broadcast Auxiliary Low Power	1
	SEBASTIAN	LP Broadcast Auxiliary Low Power	1
AR Total			5
AZ	MARICOPA	LP Broadcast Auxiliary Low Power	7
	PIMA	LP Broadcast Auxiliary Low Power	4
	(blank)	LP Broadcast Auxiliary Low Power	2
AZ Total			13
CA	ALAMEDA	CD Paging and Radiotelephone	6
		IG Industrial/Business Pool, Conventional	219
		IK Industrial/Business Pool - Commercial, Conventional	10
		LP Broadcast Auxiliary Low Power	1
		PW Public Safety Pool, Conventional	96
		YG Industrial/Business Pool, Trunked	57
		YK Industrial/Business Pool - Commercial, Trunked	42
		YW Public Safety Pool, Trunked	29
	CONTRA COSTA	CD Paging and Radiotelephone	3
		IG Industrial/Business Pool, Conventional	130
		PW Public Safety Pool, Conventional	105
		YG Industrial/Business Pool, Trunked	298
		YK Industrial/Business Pool - Commercial, Trunked	2
		YW Public Safety Pool, Trunked	17
	KERN	LP Broadcast Auxiliary Low Power	1
	LOS ANGELES	CD Paging and Radiotelephone	6
		IG Industrial/Business Pool, Conventional	1406
		IK Industrial/Business Pool - Commercial, Conventional	1103
		LP Broadcast Auxiliary Low Power	30
		PW Public Safety Pool, Conventional	29754
		YG Industrial/Business Pool, Trunked	3688
		YK Industrial/Business Pool - Commercial, Trunked	581
		YW Public Safety Pool, Trunked	709
	MARIN	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	167
		PW Public Safety Pool, Conventional	68
		YG Industrial/Business Pool, Trunked	282

	YW Public Safety Pool, Trunked	292
MONTEREY	LP Broadcast Auxiliary Low Power	1
NAPA	IG Industrial/Business Pool, Conventional	74
	PW Public Safety Pool, Conventional	5
	YG Industrial/Business Pool, Trunked	48
ORANGE	CD Paging and Radiotelephone	1
	IG Industrial/Business Pool, Conventional	339
	IK Industrial/Business Pool - Commercial, Conventional	48
	LP Broadcast Auxiliary Low Power	2
	PW Public Safety Pool, Conventional	53
	YG Industrial/Business Pool, Trunked	357
	YW Public Safety Pool, Trunked	44
RIVERSIDE	IG Industrial/Business Pool, Conventional	123
	IK Industrial/Business Pool - Commercial, Conventional	4
	PW Public Safety Pool, Conventional	7
	YG Industrial/Business Pool, Trunked	364
SACRAMENTO	LP Broadcast Auxiliary Low Power	2
SAN BERNARDINO	IG Industrial/Business Pool, Conventional	12
	LP Broadcast Auxiliary Low Power	2
	PW Public Safety Pool, Conventional	51
	TS TV Studio Transmitter Link	1
	YG Industrial/Business Pool, Trunked	94
	YW Public Safety Pool, Trunked	6
SAN DIEGO	LP Broadcast Auxiliary Low Power	8
SAN FRANCISCO	IG Industrial/Business Pool, Conventional	222
	IK Industrial/Business Pool - Commercial, Conventional	2
	LP Broadcast Auxiliary Low Power	5
	PW Public Safety Pool, Conventional	76
	YG Industrial/Business Pool, Trunked	62
	YK Industrial/Business Pool - Commercial, Trunked	3
SAN MATEO	CD Paging and Radiotelephone	89
	IG Industrial/Business Pool, Conventional	83
	IK Industrial/Business Pool - Commercial, Conventional	3
	PW Public Safety Pool, Conventional	402
	YG Industrial/Business Pool, Trunked	251
	YK Industrial/Business Pool - Commercial, Trunked	22
	YW Public Safety Pool, Trunked	230
SANTA CLARA	CD Paging and Radiotelephone	2
	IG Industrial/Business Pool, Conventional	294
	IK Industrial/Business Pool - Commercial, Conventional	27
	LP Broadcast Auxiliary Low Power	1
	PW Public Safety Pool, Conventional	161
	YG Industrial/Business Pool, Trunked	384
	YK Industrial/Business Pool - Commercial, Trunked	56
	YW Public Safety Pool, Trunked	135
SANTA CRUZ	CD Paging and Radiotelephone	5

	SOLANO	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	136
		IK Industrial/Business Pool - Commercial, Conventional	4
		PW Public Safety Pool, Conventional	134
		YG Industrial/Business Pool, Trunked	51
	SONOMA	IG Industrial/Business Pool, Conventional	43
		IK Industrial/Business Pool - Commercial, Conventional	2
		PW Public Safety Pool, Conventional	17
		YG Industrial/Business Pool, Trunked	27
		YK Industrial/Business Pool - Commercial, Trunked	18
		YW Public Safety Pool, Trunked	18
	TEHAMA	TT TV Translator Relay	1
	VENTURA	IG Industrial/Business Pool, Conventional	80
		IK Industrial/Business Pool - Commercial, Conventional	31
		PW Public Safety Pool, Conventional	90
		YG Industrial/Business Pool, Trunked	231
	YOLO	IG Industrial/Business Pool, Conventional	2
	(blank)	IG Industrial/Business Pool, Conventional	31
		IK Industrial/Business Pool - Commercial, Conventional	1
		LP Broadcast Auxiliary Low Power	1
CA Total			44183
CO	DENVER	LP Broadcast Auxiliary Low Power	4
	LAS ANIMAS	TT TV Translator Relay	1
CO Total			5
CT	FAIRFIELD	IG Industrial/Business Pool, Conventional	13
		PW Public Safety Pool, Conventional	62
		TS TV Studio Transmitter Link	1
		YG Industrial/Business Pool, Trunked	42
	HARTFORD	LP Broadcast Auxiliary Low Power	9
	NEW HAVEN	IG Industrial/Business Pool, Conventional	1
		LP Broadcast Auxiliary Low Power	4
CT Total			132
DC	WASHINGTON	IG Industrial/Business Pool, Conventional	6
		LP Broadcast Auxiliary Low Power	3
		YG Industrial/Business Pool, Trunked	132
	(blank)	IG Industrial/Business Pool, Conventional	30
		LP Broadcast Auxiliary Low Power	6
		PW Public Safety Pool, Conventional	5
DC Total			182
DE	NEW CASTLE	IG Industrial/Business Pool, Conventional	10
		PW Public Safety Pool, Conventional	14
		YG Industrial/Business Pool, Trunked	25
	(blank)	YG Industrial/Business Pool, Trunked	8
DE Total			57
FL	BAY	LP Broadcast Auxiliary Low Power	3
	BROWARD	CD Paging and Radiotelephone	2

		IG Industrial/Business Pool, Conventional	14
		LP Broadcast Auxiliary Low Power	1
		PW Public Safety Pool, Conventional	102
		YG Industrial/Business Pool, Trunked	222
	DUVAL	LP Broadcast Auxiliary Low Power	6
	HILLSBOROUGH	LP Broadcast Auxiliary Low Power	3
	LEE	LP Broadcast Auxiliary Low Power	1
	MANATEE	TS TV Studio Transmitter Link	1
	MIAMI-DADE	IG Industrial/Business Pool, Conventional	157
		IK Industrial/Business Pool - Commercial, Conventional	16
		LP Broadcast Auxiliary Low Power	6
		PW Public Safety Pool, Conventional	87
		YG Industrial/Business Pool, Trunked	491
	ORANGE	LP Broadcast Auxiliary Low Power	9
	PALM BEACH	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	38
		LP Broadcast Auxiliary Low Power	7
		PW Public Safety Pool, Conventional	3
		YG Industrial/Business Pool, Trunked	138
	PINELLAS	LP Broadcast Auxiliary Low Power	2
	ST. LUCIE	TI TV Intercity Relay	1
	(blank)	IG Industrial/Business Pool, Conventional	4
		LP Broadcast Auxiliary Low Power	1
FL Total			1316
GA	CHATHAM	LP Broadcast Auxiliary Low Power	3
	CHATTOOGA	TS TV Studio Transmitter Link	1
	DEKALB	LP Broadcast Auxiliary Low Power	3
	DOUGHERTY	LP Broadcast Auxiliary Low Power	3
	FULTON	LP Broadcast Auxiliary Low Power	5
	MUSCOGEE	LP Broadcast Auxiliary Low Power	3
GA Total			18
GM	(blank)	IG Industrial/Business Pool, Conventional	39
GM Total			39
HI	HONOLULU	LP Broadcast Auxiliary Low Power	3
	KAUAI	TS TV Studio Transmitter Link	1
	(blank)	TS TV Studio Transmitter Link	1
HI Total			5
IA	POLK	LP Broadcast Auxiliary Low Power	4
	SCOTT	LP Broadcast Auxiliary Low Power	1
	TAMA	LP Broadcast Auxiliary Low Power	1
IA Total			6
ID	BEAR LAKE	TI TV Intercity Relay	2
	LEMHI	TT TV Translator Relay	1
	ONEIDA	TT TV Translator Relay	1
ID Total			4
IL	COOK	CD Paging and Radiotelephone	6

		IG Industrial/Business Pool, Conventional	298
		IK Industrial/Business Pool - Commercial, Conventional	4
		LP Broadcast Auxiliary Low Power	7
		PW Public Safety Pool, Conventional	716
		YG Industrial/Business Pool, Trunked	418
		YW Public Safety Pool, Trunked	281
	DUPAGE	IG Industrial/Business Pool, Conventional	143
		PW Public Safety Pool, Conventional	168
		YG Industrial/Business Pool, Trunked	46
	GRUNDY	YG Industrial/Business Pool, Trunked	10
	KANE	IG Industrial/Business Pool, Conventional	29
		PW Public Safety Pool, Conventional	32
		YG Industrial/Business Pool, Trunked	26
	KENDALL	IG Industrial/Business Pool, Conventional	2
	LAKE	IG Industrial/Business Pool, Conventional	67
		PW Public Safety Pool, Conventional	91
		YG Industrial/Business Pool, Trunked	55
	MCHENRY	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	2
		PW Public Safety Pool, Conventional	9
	OGLE	PW Public Safety Pool, Conventional	3
	PIKE	IG Industrial/Business Pool, Conventional	2
	WILL	IG Industrial/Business Pool, Conventional	78
		PW Public Safety Pool, Conventional	14
		YG Industrial/Business Pool, Trunked	61
	(blank)	IG Industrial/Business Pool, Conventional	10
		PW Public Safety Pool, Conventional	4
IL Total			2583
IN	LA PORTE	CD Paging and Radiotelephone	4
		IG Industrial/Business Pool, Conventional	34
		YG Industrial/Business Pool, Trunked	4
	LAKE	CD Paging and Radiotelephone	5
		IG Industrial/Business Pool, Conventional	25
		IK Industrial/Business Pool - Commercial, Conventional	4
		PW Public Safety Pool, Conventional	18
		YG Industrial/Business Pool, Trunked	35
		YW Public Safety Pool, Trunked	9
	MARION	LP Broadcast Auxiliary Low Power	1
	PORTER	CD Paging and Radiotelephone	2
		IG Industrial/Business Pool, Conventional	55
		YG Industrial/Business Pool, Trunked	22
		YK Industrial/Business Pool - Commercial, Trunked	12
	ST. JOSEPH	LP Broadcast Auxiliary Low Power	3
	VANDERBURGH	LP Broadcast Auxiliary Low Power	3
IN Total			236
KS	SEDGWICK	LP Broadcast Auxiliary Low Power	1

KS Total			1
KY	JEFFERSON	LP Broadcast Auxiliary Low Power	3
KY Total			3
LA	CADDO	LP Broadcast Auxiliary Low Power	3
	CALCASIEU	LP Broadcast Auxiliary Low Power	3
	EAST BATON ROUGE	LP Broadcast Auxiliary Low Power	6
		TS TV Studio Transmitter Link	1
	JEFFERSON	IG Industrial/Business Pool, Conventional	1
	LAFOURCHE	IG Industrial/Business Pool, Conventional	2
	ORLEANS	LP Broadcast Auxiliary Low Power	1
	PLAQUEMINES	IG Industrial/Business Pool, Conventional	5
	(blank)	LP Broadcast Auxiliary Low Power	1
LA Total			23
MA	BARNSTABLE	IG Industrial/Business Pool, Conventional	11
		PW Public Safety Pool, Conventional	5
		YG Industrial/Business Pool, Trunked	1
	BRISTOL	IG Industrial/Business Pool, Conventional	51
		PW Public Safety Pool, Conventional	308
		YG Industrial/Business Pool, Trunked	45
	ESSEX	IG Industrial/Business Pool, Conventional	101
		PW Public Safety Pool, Conventional	466
		YG Industrial/Business Pool, Trunked	67
		YK Industrial/Business Pool - Commercial, Trunked	2
	MIDDLESEX	IG Industrial/Business Pool, Conventional	177
		PW Public Safety Pool, Conventional	827
		YG Industrial/Business Pool, Trunked	61
		YK Industrial/Business Pool - Commercial, Trunked	2
	NORFOLK	IG Industrial/Business Pool, Conventional	46
		IK Industrial/Business Pool - Commercial, Conventional	15
		LP Broadcast Auxiliary Low Power	5
		PW Public Safety Pool, Conventional	328
		YG Industrial/Business Pool, Trunked	4
	PLYMOUTH	IG Industrial/Business Pool, Conventional	55
		IK Industrial/Business Pool - Commercial, Conventional	18
		PW Public Safety Pool, Conventional	522
		YG Industrial/Business Pool, Trunked	4
		YK Industrial/Business Pool - Commercial, Trunked	4
	SUFFOLK	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	105
		IK Industrial/Business Pool - Commercial, Conventional	3
		LP Broadcast Auxiliary Low Power	3
		PW Public Safety Pool, Conventional	409
		YG Industrial/Business Pool, Trunked	210
	WORCESTER	IG Industrial/Business Pool, Conventional	37
		IK Industrial/Business Pool - Commercial, Conventional	13
		PW Public Safety Pool, Conventional	122

		YG Industrial/Business Pool, Trunked	20
		YK Industrial/Business Pool - Commercial, Trunked	3
	(blank)	IG Industrial/Business Pool, Conventional	3
		PW Public Safety Pool, Conventional	15
MA Total			4069
MD	ALLEGANY	YW Public Safety Pool, Trunked	5
	ANNE ARUNDEL	IG Industrial/Business Pool, Conventional	44
		PW Public Safety Pool, Conventional	3
		YW Public Safety Pool, Trunked	24
	BALTIMORE	IG Industrial/Business Pool, Conventional	56
		LP Broadcast Auxiliary Low Power	4
		PW Public Safety Pool, Conventional	12
		YG Industrial/Business Pool, Trunked	40
		YW Public Safety Pool, Trunked	120
	BALTIMORE CITY	CD Paging and Radiotelephone	2
		IG Industrial/Business Pool, Conventional	8
		YG Industrial/Business Pool, Trunked	32
	CARROLL	IG Industrial/Business Pool, Conventional	11
		PW Public Safety Pool, Conventional	58
	CHARLES	IG Industrial/Business Pool, Conventional	54
		YG Industrial/Business Pool, Trunked	44
	FREDERICK	IG Industrial/Business Pool, Conventional	69
		PW Public Safety Pool, Conventional	48
		YG Industrial/Business Pool, Trunked	50
	HOWARD	IG Industrial/Business Pool, Conventional	2
		YG Industrial/Business Pool, Trunked	66
	MONTGOMERY	IG Industrial/Business Pool, Conventional	43
		PW Public Safety Pool, Conventional	101
		YG Industrial/Business Pool, Trunked	246
	PRINCE GEORGE'S	IG Industrial/Business Pool, Conventional	21
		PW Public Safety Pool, Conventional	96
		YG Industrial/Business Pool, Trunked	144
	WASHINGTON	YW Public Safety Pool, Trunked	6
	(blank)	IG Industrial/Business Pool, Conventional	42
		LP Broadcast Auxiliary Low Power	1
		PW Public Safety Pool, Conventional	29
MD Total			1481
ME	CUMBERLAND	LP Broadcast Auxiliary Low Power	3
	KENNEBEC	TS TV Studio Transmitter Link	1
ME Total			4
MI	GENESEE	LP Broadcast Auxiliary Low Power	3
	INGHAM	LP Broadcast Auxiliary Low Power	1
	MUSKEGON	TS TV Studio Transmitter Link	1
	OAKLAND	LP Broadcast Auxiliary Low Power	2
MI Total			7
MO	CAPE GIRARDEAU	LP Broadcast Auxiliary Low Power	3

	CLAY	LP Broadcast Auxiliary Low Power	1
	JACKSON	LP Broadcast Auxiliary Low Power	12
	ST. LOUIS	LP Broadcast Auxiliary Low Power	1
MO Total			17
MS	HARRISON	LP Broadcast Auxiliary Low Power	3
	HINDS	LP Broadcast Auxiliary Low Power	4
		TS TV Studio Transmitter Link	1
	JONES	LP Broadcast Auxiliary Low Power	3
MS Total			11
NC	DURHAM	LP Broadcast Auxiliary Low Power	1
	FORSYTH	LP Broadcast Auxiliary Low Power	3
	MECKLENBURG	LP Broadcast Auxiliary Low Power	4
	NASH	TS TV Studio Transmitter Link	1
	NEW HANOVER	LP Broadcast Auxiliary Low Power	3
	WAKE	LP Broadcast Auxiliary Low Power	4
NC Total			16
NE	DOUGLAS	LP Broadcast Auxiliary Low Power	1
NE Total			1
NH	HILLSBOROUGH	IG Industrial/Business Pool, Conventional	13
		IK Industrial/Business Pool - Commercial, Conventional	4
		YG Industrial/Business Pool, Trunked	5
	ROCKINGHAM	IG Industrial/Business Pool, Conventional	41
		YG Industrial/Business Pool, Trunked	6
NH Total			69
NJ	ATLANTIC	IG Industrial/Business Pool, Conventional	13
		YG Industrial/Business Pool, Trunked	24
		YK Industrial/Business Pool - Commercial, Trunked	32
	BERGEN	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	17
		PW Public Safety Pool, Conventional	248
		YG Industrial/Business Pool, Trunked	29
		YW Public Safety Pool, Trunked	109
	BURLINGTON	CD Paging and Radiotelephone	120
		IG Industrial/Business Pool, Conventional	11
		PW Public Safety Pool, Conventional	267
		YG Industrial/Business Pool, Trunked	54
		YW Public Safety Pool, Trunked	240
	CAMDEN	IG Industrial/Business Pool, Conventional	7
		PW Public Safety Pool, Conventional	147
		YG Industrial/Business Pool, Trunked	35
		YK Industrial/Business Pool - Commercial, Trunked	68
	CUMBERLAND	PW Public Safety Pool, Conventional	43
	ESSEX	IG Industrial/Business Pool, Conventional	69
		PW Public Safety Pool, Conventional	153
		TS TV Studio Transmitter Link	1
		YG Industrial/Business Pool, Trunked	2

	YW Public Safety Pool, Trunked	38
GLOUCESTER	IG Industrial/Business Pool, Conventional	12
	IK Industrial/Business Pool - Commercial, Conventional	2
	PW Public Safety Pool, Conventional	156
	YG Industrial/Business Pool, Trunked	13
HUDSON	CD Paging and Radiotelephone	5
	IG Industrial/Business Pool, Conventional	2
	PW Public Safety Pool, Conventional	117
	YW Public Safety Pool, Trunked	142
HUNTERDON	IG Industrial/Business Pool, Conventional	6
	IK Industrial/Business Pool - Commercial, Conventional	4
	PW Public Safety Pool, Conventional	136
MERCER	IG Industrial/Business Pool, Conventional	21
	PW Public Safety Pool, Conventional	17
	YG Industrial/Business Pool, Trunked	77
	YW Public Safety Pool, Trunked	62
MIDDLESEX	IG Industrial/Business Pool, Conventional	26
	PW Public Safety Pool, Conventional	294
	YG Industrial/Business Pool, Trunked	14
	YW Public Safety Pool, Trunked	382
MONMOUTH	IG Industrial/Business Pool, Conventional	114
	PW Public Safety Pool, Conventional	94
	YG Industrial/Business Pool, Trunked	68
	YK Industrial/Business Pool - Commercial, Trunked	49
	YW Public Safety Pool, Trunked	126
MORRIS	IG Industrial/Business Pool, Conventional	38
	PW Public Safety Pool, Conventional	217
	YG Industrial/Business Pool, Trunked	23
	YW Public Safety Pool, Trunked	1518
OCEAN	IG Industrial/Business Pool, Conventional	15
	IK Industrial/Business Pool - Commercial, Conventional	2
	PW Public Safety Pool, Conventional	171
	YG Industrial/Business Pool, Trunked	82
	YK Industrial/Business Pool - Commercial, Trunked	3
	YW Public Safety Pool, Trunked	345
PASSAIC	IG Industrial/Business Pool, Conventional	17
	PW Public Safety Pool, Conventional	202
	YW Public Safety Pool, Trunked	42
SALEM	PW Public Safety Pool, Conventional	6
	YW Public Safety Pool, Trunked	55
SOMERSET	IG Industrial/Business Pool, Conventional	51
	PW Public Safety Pool, Conventional	224
	YG Industrial/Business Pool, Trunked	1
	YW Public Safety Pool, Trunked	418
SUSSEX	IG Industrial/Business Pool, Conventional	8
	PW Public Safety Pool, Conventional	14

	UNION	IG Industrial/Business Pool, Conventional	19
		PW Public Safety Pool, Conventional	117
		YG Industrial/Business Pool, Trunked	14
		YW Public Safety Pool, Trunked	73
	WARREN	PW Public Safety Pool, Conventional	16
		TS TV Studio Transmitter Link	1
	(blank)	IG Industrial/Business Pool, Conventional	6
		PW Public Safety Pool, Conventional	8
NJ Total			7373
NM	BERNALILLO	LP Broadcast Auxiliary Low Power	1
	LINCOLN	TT TV Translator Relay	1
	SOCORRO	TT TV Translator Relay	1
NM Total			3
NV	CLARK	LP Broadcast Auxiliary Low Power	1
		TI TV Intercity Relay	1
		TS TV Studio Transmitter Link	1
NV Total			3
NY	ALBANY	LP Broadcast Auxiliary Low Power	1
	BRONX	IG Industrial/Business Pool, Conventional	7
		PW Public Safety Pool, Conventional	241
		YG Industrial/Business Pool, Trunked	1
		YW Public Safety Pool, Trunked	85
	CHAUTAUQUA	IG Industrial/Business Pool, Conventional	1
	DUTCHESS	YG Industrial/Business Pool, Trunked	10
	KINGS	IG Industrial/Business Pool, Conventional	53
		PW Public Safety Pool, Conventional	447
		YG Industrial/Business Pool, Trunked	39
		YW Public Safety Pool, Trunked	88
	NASSAU	IG Industrial/Business Pool, Conventional	110
		LP Broadcast Auxiliary Low Power	2
		PW Public Safety Pool, Conventional	307
		YG Industrial/Business Pool, Trunked	45
		YK Industrial/Business Pool - Commercial, Trunked	28
		YW Public Safety Pool, Trunked	570
	NEW YORK	IG Industrial/Business Pool, Conventional	396
		IK Industrial/Business Pool - Commercial, Conventional	3
		LP Broadcast Auxiliary Low Power	20
		PW Public Safety Pool, Conventional	795
		YG Industrial/Business Pool, Trunked	144
		YW Public Safety Pool, Trunked	171
	ORANGE	IG Industrial/Business Pool, Conventional	75
		IK Industrial/Business Pool - Commercial, Conventional	2
		PW Public Safety Pool, Conventional	38
		YG Industrial/Business Pool, Trunked	124
	PUTNAM	IG Industrial/Business Pool, Conventional	8
		PW Public Safety Pool, Conventional	16

		YG Industrial/Business Pool, Trunked	15
		YW Public Safety Pool, Trunked	12
	QUEENS	CD Paging and Radiotelephone	2
		IG Industrial/Business Pool, Conventional	69
		PW Public Safety Pool, Conventional	419
		YG Industrial/Business Pool, Trunked	28
		YW Public Safety Pool, Trunked	312
	RICHMOND	IG Industrial/Business Pool, Conventional	30
		PW Public Safety Pool, Conventional	218
		YG Industrial/Business Pool, Trunked	25
		YW Public Safety Pool, Trunked	84
	ROCKLAND	IG Industrial/Business Pool, Conventional	12
		PW Public Safety Pool, Conventional	12
		YG Industrial/Business Pool, Trunked	20
		YK Industrial/Business Pool - Commercial, Trunked	10
		YW Public Safety Pool, Trunked	143
	SUFFOLK	IG Industrial/Business Pool, Conventional	114
		LP Broadcast Auxiliary Low Power	1
		PW Public Safety Pool, Conventional	519
		YG Industrial/Business Pool, Trunked	16
		YW Public Safety Pool, Trunked	12
	WESTCHESTER	IG Industrial/Business Pool, Conventional	20
		PW Public Safety Pool, Conventional	266
		YG Industrial/Business Pool, Trunked	26
		YW Public Safety Pool, Trunked	933
	(blank)	IG Industrial/Business Pool, Conventional	2
		PW Public Safety Pool, Conventional	18
NY Total			7165
OH	ALLEN	LP Broadcast Auxiliary Low Power	1
	CUYAHOGA	LP Broadcast Auxiliary Low Power	5
	ERIE	LP Broadcast Auxiliary Low Power	3
	FRANKLIN	LP Broadcast Auxiliary Low Power	3
	HAMILTON	LP Broadcast Auxiliary Low Power	3
	HANCOCK	LP Broadcast Auxiliary Low Power	1
	JEFFERSON	LP Broadcast Auxiliary Low Power	2
	LUCAS	LP Broadcast Auxiliary Low Power	4
OH Total			22
OK	CUSTER	TS TV Studio Transmitter Link	2
	LE FLORE	TI TV Intercity Relay	1
	OKLAHOMA	LP Broadcast Auxiliary Low Power	1
	TULSA	LP Broadcast Auxiliary Low Power	2
OK Total			6
OR	CROOK	TI TV Intercity Relay	2
	LANE	TI TV Intercity Relay	2
	MULTNOMAH	LP Broadcast Auxiliary Low Power	3
	UNION	TT TV Translator Relay	1

OR Total			8
PA	ADAMS	PW Public Safety Pool, Conventional	58
	ALLEGHENY	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	92
		IK Industrial/Business Pool - Commercial, Conventional	3
		LP Broadcast Auxiliary Low Power	12
		PW Public Safety Pool, Conventional	595
		YK Industrial/Business Pool - Commercial, Trunked	6
	ARMSTRONG	IG Industrial/Business Pool, Conventional	3
	BEAVER	IG Industrial/Business Pool, Conventional	21
		PW Public Safety Pool, Conventional	31
	BEDFORD	YW Public Safety Pool, Trunked	90
	BERKS	IG Industrial/Business Pool, Conventional	16
		YG Industrial/Business Pool, Trunked	33
	BUCKS	IG Industrial/Business Pool, Conventional	26
		PW Public Safety Pool, Conventional	249
		YG Industrial/Business Pool, Trunked	9
		YW Public Safety Pool, Trunked	251
	BUTLER	IG Industrial/Business Pool, Conventional	14
		PW Public Safety Pool, Conventional	294
	CAMBRIA	LP Broadcast Auxiliary Low Power	1
	CARBON	PW Public Safety Pool, Conventional	158
	CENTRE	LP Broadcast Auxiliary Low Power	1
	CHESTER	IG Industrial/Business Pool, Conventional	30
		LP Broadcast Auxiliary Low Power	1
		PW Public Safety Pool, Conventional	61
		YG Industrial/Business Pool, Trunked	7
		YW Public Safety Pool, Trunked	16
	DAUPHIN	LP Broadcast Auxiliary Low Power	3
		YW Public Safety Pool, Trunked	104
	DELAWARE	IG Industrial/Business Pool, Conventional	6
		PW Public Safety Pool, Conventional	352
		YG Industrial/Business Pool, Trunked	8
		YW Public Safety Pool, Trunked	16
	FAYETTE	IG Industrial/Business Pool, Conventional	3
	FRANKLIN	YW Public Safety Pool, Trunked	54
	FULTON	YW Public Safety Pool, Trunked	6
	INDIANA	YW Public Safety Pool, Trunked	45
	LANCASTER	IG Industrial/Business Pool, Conventional	7
		YG Industrial/Business Pool, Trunked	2
		YW Public Safety Pool, Trunked	454
	LAWRENCE	IG Industrial/Business Pool, Conventional	3
	LEHIGH	IG Industrial/Business Pool, Conventional	36
		PW Public Safety Pool, Conventional	14
		YG Industrial/Business Pool, Trunked	21
	MONROE	PW Public Safety Pool, Conventional	186

	MONTGOMERY	CD Paging and Radiotelephone	2
		IG Industrial/Business Pool, Conventional	41
		PW Public Safety Pool, Conventional	165
		YW Public Safety Pool, Trunked	105
	NORTHAMPTON	IG Industrial/Business Pool, Conventional	5
		PW Public Safety Pool, Conventional	436
		YG Industrial/Business Pool, Trunked	9
	PHILADELPHIA	IG Industrial/Business Pool, Conventional	239
		LP Broadcast Auxiliary Low Power	8
		PW Public Safety Pool, Conventional	107
		YG Industrial/Business Pool, Trunked	191
		YK Industrial/Business Pool - Commercial, Trunked	28
		YW Public Safety Pool, Trunked	53
	PIKE	TS TV Studio Transmitter Link	1
	WASHINGTON	IG Industrial/Business Pool, Conventional	7
		PW Public Safety Pool, Conventional	18
	WESTMORELAND	IG Industrial/Business Pool, Conventional	33
		PW Public Safety Pool, Conventional	7
		YW Public Safety Pool, Trunked	9
	YORK	PW Public Safety Pool, Conventional	6913
		YW Public Safety Pool, Trunked	464
	(blank)	IG Industrial/Business Pool, Conventional	4
		PW Public Safety Pool, Conventional	1
		YG Industrial/Business Pool, Trunked	5
PA Total			12250
PR	(blank)	TI TV Intercity Relay	1
PR Total			1
RI	BRISTOL	PW Public Safety Pool, Conventional	6
	NEWPORT	IG Industrial/Business Pool, Conventional	4
		PW Public Safety Pool, Conventional	6
	PROVIDENCE	IG Industrial/Business Pool, Conventional	23
		IK Industrial/Business Pool - Commercial, Conventional	3
		LP Broadcast Auxiliary Low Power	3
		PW Public Safety Pool, Conventional	104
		YG Industrial/Business Pool, Trunked	59
		YK Industrial/Business Pool - Commercial, Trunked	23
RI Total			231
SC	AIKEN	LP Broadcast Auxiliary Low Power	1
	CHARLESTON	LP Broadcast Auxiliary Low Power	3
	HORRY	LP Broadcast Auxiliary Low Power	1
	RICHLAND	LP Broadcast Auxiliary Low Power	3
SC Total			8
SD	MINNEHAHA	LP Broadcast Auxiliary Low Power	1
	PENNINGTON	LP Broadcast Auxiliary Low Power	1
SD Total			2
TN	DAVIDSON	LP Broadcast Auxiliary Low Power	3

	KNOX	LP Broadcast Auxiliary Low Power	7
	SHELBY	LP Broadcast Auxiliary Low Power	3
	WASHINGTON	LP Broadcast Auxiliary Low Power	3
TN Total			16
TX	ANGELINA	LP Broadcast Auxiliary Low Power	3
	AUSTIN	IG Industrial/Business Pool, Conventional	7
	BEXAR	LP Broadcast Auxiliary Low Power	1
	BRAZORIA	IG Industrial/Business Pool, Conventional	33
		PW Public Safety Pool, Conventional	1
		YG Industrial/Business Pool, Trunked	22
	CHAMBERS	IG Industrial/Business Pool, Conventional	16
	COCHRAN	TT TV Translator Relay	1
	COLLIN	IG Industrial/Business Pool, Conventional	125
		PW Public Safety Pool, Conventional	7
		YG Industrial/Business Pool, Trunked	163
		YW Public Safety Pool, Trunked	14
	DALLAS	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	117
		IK Industrial/Business Pool - Commercial, Conventional	2
		LP Broadcast Auxiliary Low Power	14
		PW Public Safety Pool, Conventional	198
		YG Industrial/Business Pool, Trunked	354
	DENTON	IG Industrial/Business Pool, Conventional	27
		PW Public Safety Pool, Conventional	6
		YG Industrial/Business Pool, Trunked	76
	EL PASO	LP Broadcast Auxiliary Low Power	4
	ELLIS	IG Industrial/Business Pool, Conventional	107
		PW Public Safety Pool, Conventional	6
		YG Industrial/Business Pool, Trunked	81
	FORT BEND	CD Paging and Radiotelephone	12
		IG Industrial/Business Pool, Conventional	85
		YG Industrial/Business Pool, Trunked	26
		YK Industrial/Business Pool - Commercial, Trunked	12
	GALVESTON	IG Industrial/Business Pool, Conventional	25
		YG Industrial/Business Pool, Trunked	60
	GRAYSON	IG Industrial/Business Pool, Conventional	12
	HARRIS	CD Paging and Radiotelephone	2
		IG Industrial/Business Pool, Conventional	631
		LP Broadcast Auxiliary Low Power	6
		PW Public Safety Pool, Conventional	22
		YG Industrial/Business Pool, Trunked	512
		YK Industrial/Business Pool - Commercial, Trunked	14
	HARRISON	CD Paging and Radiotelephone	12
	HILL	YG Industrial/Business Pool, Trunked	14
	HUNT	IG Industrial/Business Pool, Conventional	23
		YG Industrial/Business Pool, Trunked	28

		YK Industrial/Business Pool - Commercial, Trunked	6
	JOHNSON	IG Industrial/Business Pool, Conventional	42
		YG Industrial/Business Pool, Trunked	87
	KAUFMAN	IG Industrial/Business Pool, Conventional	17
	LUBBOCK	LP Broadcast Auxiliary Low Power	3
	MONTGOMERY	CD Paging and Radiotelephone	8
		IG Industrial/Business Pool, Conventional	71
		YG Industrial/Business Pool, Trunked	111
	NUECES	TS TV Studio Transmitter Link	1
	ROCKWALL	PW Public Safety Pool, Conventional	3
		YG Industrial/Business Pool, Trunked	42
	SMITH	LP Broadcast Auxiliary Low Power	3
	TARRANT	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	154
		IK Industrial/Business Pool - Commercial, Conventional	18
		PW Public Safety Pool, Conventional	48
		YG Industrial/Business Pool, Trunked	221
		YK Industrial/Business Pool - Commercial, Trunked	10
		YW Public Safety Pool, Trunked	30
	TRAVIS	LP Broadcast Auxiliary Low Power	3
	VAN ZANDT	IG Industrial/Business Pool, Conventional	13
		YG Industrial/Business Pool, Trunked	29
	WISE	YG Industrial/Business Pool, Trunked	32
		YK Industrial/Business Pool - Commercial, Trunked	15
	(blank)	IG Industrial/Business Pool, Conventional	17
		PW Public Safety Pool, Conventional	31
		YG Industrial/Business Pool, Trunked	1
TX Total			3899
US	(blank)	IG Industrial/Business Pool, Conventional	2
		LP Broadcast Auxiliary Low Power	19
US Total			21
UT	CARBON	TT TV Translator Relay	1
	JUAB	TT TV Translator Relay	1
	MORGAN	TT TV Translator Relay	1
	SUMMIT	TT TV Translator Relay	2
	WASATCH	TT TV Translator Relay	1
UT Total			6
VA	ARLINGTON	IG Industrial/Business Pool, Conventional	12
		LP Broadcast Auxiliary Low Power	2
	CLARKE	IG Industrial/Business Pool, Conventional	8
		YG Industrial/Business Pool, Trunked	3
	FAIRFAX	IG Industrial/Business Pool, Conventional	29
		PW Public Safety Pool, Conventional	8
		YG Industrial/Business Pool, Trunked	135
	FAIRFAX CITY	IG Industrial/Business Pool, Conventional	19
		YG Industrial/Business Pool, Trunked	356

	FAUQUIER	IG Industrial/Business Pool, Conventional	1
		PW Public Safety Pool, Conventional	6
		YG Industrial/Business Pool, Trunked	18
	LOUDOUN	CD Paging and Radiotelephone	1
		IG Industrial/Business Pool, Conventional	5
		PW Public Safety Pool, Conventional	15
		YG Industrial/Business Pool, Trunked	15
	NORFOLK CITY	LP Broadcast Auxiliary Low Power	1
	PRINCE WILLIAM	IG Industrial/Business Pool, Conventional	93
		PW Public Safety Pool, Conventional	3
		YG Industrial/Business Pool, Trunked	88
		YK Industrial/Business Pool - Commercial, Trunked	12
	ROANOKE	LP Broadcast Auxiliary Low Power	5
	STAFFORD	IG Industrial/Business Pool, Conventional	3
		PW Public Safety Pool, Conventional	204
		YG Industrial/Business Pool, Trunked	21
	VIRGINIA BEACH CITY	LV Low Power Wireless Assist Video Devices	1
	(blank)	IG Industrial/Business Pool, Conventional	64
		LP Broadcast Auxiliary Low Power	5
		PW Public Safety Pool, Conventional	18
		YG Industrial/Business Pool, Trunked	32
VA Total			1183
WA	KING	LP Broadcast Auxiliary Low Power	4
		PW Public Safety Pool, Conventional	2
	SPOKANE	LP Broadcast Auxiliary Low Power	3
WA Total			9
WI	DANE	LP Broadcast Auxiliary Low Power	5
	MILWAUKEE	LP Broadcast Auxiliary Low Power	4
	SAUK	TS TV Studio Transmitter Link	1
WI Total			10
WV	HARDY	TS TV Studio Transmitter Link	1
	KANAWHA	PW Public Safety Pool, Conventional	2
WV Total			3
WY	FREMONT	TI TV Intercity Relay	1
		TT TV Translator Relay	2
	GOSHEN	TI TV Intercity Relay	1
	(blank)	LP Broadcast Auxiliary Low Power	1
WY Total			5
(blank)	(blank)	CO Offshore Radiotelephone	40
		IG Industrial/Business Pool, Conventional	580
		IK Industrial/Business Pool - Commercial, Conventional	35
		LP Broadcast Auxiliary Low Power	169
		LV Low Power Wireless Assist Video Devices	3
		PW Public Safety Pool, Conventional	435
		TI TV Intercity Relay	13
		TS TV Studio Transmitter Link	18

		TT TV Translator Relay	17
		YG Industrial/Business Pool, Trunked	50
		YK Industrial/Business Pool - Commercial, Trunked	40
		YW Public Safety Pool, Trunked	12
(blank) Total			1412
Grand Total			88130

700 MHz Narrowband

Count of Assigned Frequency			
Location State	Location Coun	Radio Service	Total
AK	ANCHORAGE	SY Trunked Public Safety 700 MHz	117
	KENAI PENINS	SY Trunked Public Safety 700 MHz	4
	MATANUSKA-S	SG Conventional Public Safety 700 MHz	2
		SY Trunked Public Safety 700 MHz	4
	(blank)	SY Trunked Public Safety 700 MHz	41
AK Total			168
AL	BALDWIN	SG Conventional Public Safety 700 MHz	10
	ETOWAH	SY Trunked Public Safety 700 MHz	18
AL Total			28
AZ	LA PAZ	SG Conventional Public Safety 700 MHz	1
	MARICOPA	SY Trunked Public Safety 700 MHz	191
	MOHAVE	SY Trunked Public Safety 700 MHz	2
	PINAL	SY Trunked Public Safety 700 MHz	10
	YAVAPAI	SY Trunked Public Safety 700 MHz	10
	(blank)	SG Conventional Public Safety 700 MHz	26
		SY Trunked Public Safety 700 MHz	56
AZ Total			296
CA	ALAMEDA	SY Trunked Public Safety 700 MHz	38
	CONTRA COST	SY Trunked Public Safety 700 MHz	25
	LOS ANGELES	SY Trunked Public Safety 700 MHz	18
	ORANGE	SY Trunked Public Safety 700 MHz	4
	RIVERSIDE	SG Conventional Public Safety 700 MHz	44
		SY Trunked Public Safety 700 MHz	599
	SAN BERNARD	SG Conventional Public Safety 700 MHz	3
		SY Trunked Public Safety 700 MHz	38
	SAN DIEGO	SY Trunked Public Safety 700 MHz	17
	SAN FRANCISC	SY Trunked Public Safety 700 MHz	63
	SAN MATEO	SY Trunked Public Safety 700 MHz	210
	(blank)	SG Conventional Public Safety 700 MHz	5
		SY Trunked Public Safety 700 MHz	93
CA Total			1157
CO	ADAMS	SY Trunked Public Safety 700 MHz	33
	ARAPAHOE	SY Trunked Public Safety 700 MHz	33
	BACA	SG Conventional Public Safety 700 MHz	3
	BOULDER	SY Trunked Public Safety 700 MHz	16
		TT TV Translator Relay	1
	DENVER	SY Trunked Public Safety 700 MHz	3
	DOUGLAS	SY Trunked Public Safety 700 MHz	2
	ELBERT	SY Trunked Public Safety 700 MHz	12
	GARFIELD	SG Conventional Public Safety 700 MHz	2
	KIOWA	SG Conventional Public Safety 700 MHz	3
	MESA	LP Broadcast Auxiliary Low Power	3

	PUEBLO	SY Trunked Public Safety 700 MHz	16
	WELD	SY Trunked Public Safety 700 MHz	6
	(blank)	SG Conventional Public Safety 700 MHz	11
		SY Trunked Public Safety 700 MHz	110
CO Total			254
CT	FAIRFIELD	SY Trunked Public Safety 700 MHz	60
	(blank)	SG Conventional Public Safety 700 MHz	8
CT Total			68
DE	KENT	SY Trunked Public Safety 700 MHz	16
	NEW CASTLE	SY Trunked Public Safety 700 MHz	32
	SUSSEX	SY Trunked Public Safety 700 MHz	16
DE Total			64
FL	CITRUS	SG Conventional Public Safety 700 MHz	3
	HILLSBOROUG	SY Trunked Public Safety 700 MHz	20
	LAKE	SY Trunked Public Safety 700 MHz	31
	MARTIN	SY Trunked Public Safety 700 MHz	15
	MIAMI-DADE	SG Conventional Public Safety 700 MHz	3
		SY Trunked Public Safety 700 MHz	38
	ORANGE	SG Conventional Public Safety 700 MHz	12
		SY Trunked Public Safety 700 MHz	27
	PALM BEACH	SY Trunked Public Safety 700 MHz	16
	PINELLAS	SY Trunked Public Safety 700 MHz	11
	POLK	SY Trunked Public Safety 700 MHz	20
	SEMINOLE	SY Trunked Public Safety 700 MHz	6
	ST. LUCIE	SY Trunked Public Safety 700 MHz	3
	(blank)	SG Conventional Public Safety 700 MHz	3
		SY Trunked Public Safety 700 MHz	110
FL Total			318
GA	BULLOCH	SY Trunked Public Safety 700 MHz	14
	CHATHAM	SY Trunked Public Safety 700 MHz	21
	COWETA	SG Conventional Public Safety 700 MHz	1
		SY Trunked Public Safety 700 MHz	10
	DADE	SG Conventional Public Safety 700 MHz	10
	GLYNN	SY Trunked Public Safety 700 MHz	8
	(blank)	SG Conventional Public Safety 700 MHz	9
		SY Trunked Public Safety 700 MHz	31
GA Total			104
IA	POTTAWATTAI	SG Conventional Public Safety 700 MHz	4
IA Total			4
ID	ADA	SG Conventional Public Safety 700 MHz	6
		SY Trunked Public Safety 700 MHz	29
	BANNOCK	SY Trunked Public Safety 700 MHz	23
	BINGHAM	SY Trunked Public Safety 700 MHz	21
	BLAINE	SY Trunked Public Safety 700 MHz	15
	BONNER	SY Trunked Public Safety 700 MHz	4
	BONNEVILLE	SY Trunked Public Safety 700 MHz	27

	BUTTE	SG Conventional Public Safety 700 MHz	2
	CANYON	SY Trunked Public Safety 700 MHz	74
	CARIBOU	SY Trunked Public Safety 700 MHz	5
	CASSIA	SY Trunked Public Safety 700 MHz	6
	CLARK	SY Trunked Public Safety 700 MHz	12
	CUSTER	SG Conventional Public Safety 700 MHz	1
	FREMONT	SY Trunked Public Safety 700 MHz	9
	JEFFERSON	SY Trunked Public Safety 700 MHz	4
	JEROME	SY Trunked Public Safety 700 MHz	6
	KOOTENAI	SG Conventional Public Safety 700 MHz	5
		SY Trunked Public Safety 700 MHz	68
	MADISON	SY Trunked Public Safety 700 MHz	16
	POWER	SY Trunked Public Safety 700 MHz	6
	TETON	SY Trunked Public Safety 700 MHz	3
	(blank)	SG Conventional Public Safety 700 MHz	3
		SY Trunked Public Safety 700 MHz	139
ID Total			484
IL	BOND	SG Conventional Public Safety 700 MHz	3
	COOK	SG Conventional Public Safety 700 MHz	14
		SY Trunked Public Safety 700 MHz	13
	DUPAGE	SG Conventional Public Safety 700 MHz	2
		SY Trunked Public Safety 700 MHz	149
	GRUNDY	SG Conventional Public Safety 700 MHz	9
	KANE	SG Conventional Public Safety 700 MHz	2
	MADISON	SG Conventional Public Safety 700 MHz	1
	ST. CLAIR	SG Conventional Public Safety 700 MHz	2
	STEPHENSON	SG Conventional Public Safety 700 MHz	1
	WILL	SY Trunked Public Safety 700 MHz	6
IL Total			202
KS	COFFEY	SG Conventional Public Safety 700 MHz	2
	JOHNSON	SY Trunked Public Safety 700 MHz	48
KS Total			50
KY	DAVIESS	TS TV Studio Transmitter Link	2
	MADISON	SG Conventional Public Safety 700 MHz	7
KY Total			9
LA	ACADIA	SY Trunked Public Safety 700 MHz	42
	ALLEN	SY Trunked Public Safety 700 MHz	28
	ASCENSION	SG Conventional Public Safety 700 MHz	10
		SY Trunked Public Safety 700 MHz	79
	ASSUMPTION	SY Trunked Public Safety 700 MHz	6
	AVOYELLES	SY Trunked Public Safety 700 MHz	43
	BEAUREGARD	SY Trunked Public Safety 700 MHz	28
	BIENVILLE	SY Trunked Public Safety 700 MHz	6
	BOSSIER	SY Trunked Public Safety 700 MHz	8
	CADDO	SY Trunked Public Safety 700 MHz	26
	CALCASIEU	SY Trunked Public Safety 700 MHz	52

CALDWELL	SY Trunked Public Safety 700 MHz	8
CAMERON	SY Trunked Public Safety 700 MHz	2
CLAIBORNE	SY Trunked Public Safety 700 MHz	6
CONCORDIA	SY Trunked Public Safety 700 MHz	8
EAST BATON R	SY Trunked Public Safety 700 MHz	42
EAST CARROLL	SY Trunked Public Safety 700 MHz	8
EAST FELICIAN	SY Trunked Public Safety 700 MHz	8
EVANGELINE	SY Trunked Public Safety 700 MHz	40
IBERIA	SY Trunked Public Safety 700 MHz	6
IBERVILLE	SY Trunked Public Safety 700 MHz	42
JACKSON	SY Trunked Public Safety 700 MHz	7
JEFFERSON	SG Conventional Public Safety 700 MHz	10
	SY Trunked Public Safety 700 MHz	88
JEFFERSON DA	SY Trunked Public Safety 700 MHz	22
LA SALLE	SY Trunked Public Safety 700 MHz	33
LAFAYETTE	SY Trunked Public Safety 700 MHz	82
LAFOURCHE	SY Trunked Public Safety 700 MHz	65
LINCOLN	SY Trunked Public Safety 700 MHz	14
LIVINGSTON	SY Trunked Public Safety 700 MHz	59
MADISON	SY Trunked Public Safety 700 MHz	21
MOREHOUSE	SY Trunked Public Safety 700 MHz	8
NATCHITOCHE	SY Trunked Public Safety 700 MHz	10
ORLEANS	SG Conventional Public Safety 700 MHz	5
	SY Trunked Public Safety 700 MHz	44
OUACHITA	SY Trunked Public Safety 700 MHz	35
PLAQUEMINES	SY Trunked Public Safety 700 MHz	59
POINTE COUP	SY Trunked Public Safety 700 MHz	42
RAPIDES	SY Trunked Public Safety 700 MHz	98
RICHLAND	SY Trunked Public Safety 700 MHz	8
SABINE	SY Trunked Public Safety 700 MHz	21
ST. BERNARD	SG Conventional Public Safety 700 MHz	7
	SY Trunked Public Safety 700 MHz	47
ST. CHARLES	SY Trunked Public Safety 700 MHz	24
ST. HELENA	SY Trunked Public Safety 700 MHz	38
ST. JAMES	SY Trunked Public Safety 700 MHz	28
ST. JOHN THE	SY Trunked Public Safety 700 MHz	40
ST. LANDRY	SY Trunked Public Safety 700 MHz	43
ST. MARTIN	SY Trunked Public Safety 700 MHz	35
ST. MARY	SY Trunked Public Safety 700 MHz	35
ST. TAMMANY	SY Trunked Public Safety 700 MHz	84
TANGIPAHOA	SY Trunked Public Safety 700 MHz	85
TENSAS	SY Trunked Public Safety 700 MHz	35
TERREBONNE	SY Trunked Public Safety 700 MHz	80
UNION	SY Trunked Public Safety 700 MHz	42
VERMILION	SY Trunked Public Safety 700 MHz	12
VERNON	SY Trunked Public Safety 700 MHz	49

	WASHINGTON	SY Trunked Public Safety 700 MHz	42
	WEBSTER	SY Trunked Public Safety 700 MHz	8
	WEST BATON	SY Trunked Public Safety 700 MHz	28
	WEST CARROL	SY Trunked Public Safety 700 MHz	21
	WEST FELICIAI	SY Trunked Public Safety 700 MHz	45
	WINN	SY Trunked Public Safety 700 MHz	28
	(blank)	SY Trunked Public Safety 700 MHz	30
LA Total			2115
MA	(blank)	SG Conventional Public Safety 700 MHz	31
MA Total			31
MD	ANNE ARUND	SY Trunked Public Safety 700 MHz	4
	BALTIMORE	SY Trunked Public Safety 700 MHz	10
	CARROLL	SY Trunked Public Safety 700 MHz	3
	HARFORD	SY Trunked Public Safety 700 MHz	24
	MONTGOMER	SG Conventional Public Safety 700 MHz	3
	PRINCE GEOR	SY Trunked Public Safety 700 MHz	25
	(blank)	SG Conventional Public Safety 700 MHz	12
		SY Trunked Public Safety 700 MHz	42
MD Total			123
ME	HANCOCK	SG Conventional Public Safety 700 MHz	28
ME Total			28
MI	DELTA	SG Conventional Public Safety 700 MHz	2
	OAKLAND	SG Conventional Public Safety 700 MHz	14
		SY Trunked Public Safety 700 MHz	6
	(blank)	SG Conventional Public Safety 700 MHz	8
MI Total			30
MN	ANOKA	SG Conventional Public Safety 700 MHz	1
	CARVER	SG Conventional Public Safety 700 MHz	1
	CHISAGO	SG Conventional Public Safety 700 MHz	1
	DAKOTA	SG Conventional Public Safety 700 MHz	2
	HENNEPIN	SG Conventional Public Safety 700 MHz	16
	RAMSEY	SG Conventional Public Safety 700 MHz	12
	WASHINGTON	SG Conventional Public Safety 700 MHz	1
MN Total			34
MO	JACKSON	SY Trunked Public Safety 700 MHz	5
	ST. CHARLES	SY Trunked Public Safety 700 MHz	6
	(blank)	SG Conventional Public Safety 700 MHz	27
		SY Trunked Public Safety 700 MHz	6
MO Total			44
MT	SANDERS	TS TV Studio Transmitter Link	2
MT Total			2
NV	CHURCHILL	SY Trunked Public Safety 700 MHz	1
	CLARK	SY Trunked Public Safety 700 MHz	49
NV Total			50
NY	BRONX	SG Conventional Public Safety 700 MHz	1
	KINGS	SG Conventional Public Safety 700 MHz	24

	NEW YORK	SG Conventional Public Safety 700 MHz	12
	QUEENS	SG Conventional Public Safety 700 MHz	1
	RICHMOND	SG Conventional Public Safety 700 MHz	1
	(blank)	SG Conventional Public Safety 700 MHz	23
NY Total			62
OH	ALLEN	SG Conventional Public Safety 700 MHz	2
	FULTON	SY Trunked Public Safety 700 MHz	18
	MIAMI	SG Conventional Public Safety 700 MHz	1
	MONROE	SG Conventional Public Safety 700 MHz	1
	STARK	SG Conventional Public Safety 700 MHz	9
	SUMMIT	SG Conventional Public Safety 700 MHz	1
	VAN WERT	TI TV Intercity Relay	1
	(blank)	SY Trunked Public Safety 700 MHz	30
OH Total			63
OR	BENTON	SY Trunked Public Safety 700 MHz	28
	CLACKAMAS	SY Trunked Public Safety 700 MHz	24
	JOSEPHINE	TS TV Studio Transmitter Link	1
	LINN	SY Trunked Public Safety 700 MHz	37
	MULTNOMAH	SY Trunked Public Safety 700 MHz	24
	(blank)	SY Trunked Public Safety 700 MHz	30
OR Total			144
TN	ANDERSON	SY Trunked Public Safety 700 MHz	5
	BRADLEY	SY Trunked Public Safety 700 MHz	10
		TS TV Studio Transmitter Link	1
	CAMPBELL	SY Trunked Public Safety 700 MHz	5
	CARTER	SG Conventional Public Safety 700 MHz	1
	HAMILTON	SY Trunked Public Safety 700 MHz	5
	KNOX	SY Trunked Public Safety 700 MHz	43
	LOUDON	SY Trunked Public Safety 700 MHz	23
	MCMINN	SY Trunked Public Safety 700 MHz	5
	MEIGS	SY Trunked Public Safety 700 MHz	5
	MONROE	SY Trunked Public Safety 700 MHz	5
	POLK	SY Trunked Public Safety 700 MHz	5
	RHEA	SY Trunked Public Safety 700 MHz	5
	ROANE	SY Trunked Public Safety 700 MHz	10
	SEVIER	SY Trunked Public Safety 700 MHz	35
	WASHINGTON	SG Conventional Public Safety 700 MHz	3
	WAYNE	SG Conventional Public Safety 700 MHz	3
	(blank)	SY Trunked Public Safety 700 MHz	116
TN Total			285
TX	BEXAR	SY Trunked Public Safety 700 MHz	40
	BRAZORIA	SY Trunked Public Safety 700 MHz	18
	COLLIN	SG Conventional Public Safety 700 MHz	5
		SY Trunked Public Safety 700 MHz	4
	DALLAS	SG Conventional Public Safety 700 MHz	9
		SY Trunked Public Safety 700 MHz	24

	DENTON	SY Trunked Public Safety 700 MHz	4
	GALVESTON	SY Trunked Public Safety 700 MHz	6
	HARRIS	SY Trunked Public Safety 700 MHz	84
	HOUSTON	SY Trunked Public Safety 700 MHz	6
	KAUFMAN	SY Trunked Public Safety 700 MHz	6
	LIBERTY	SY Trunked Public Safety 700 MHz	6
	PANOLA	SY Trunked Public Safety 700 MHz	6
	SMITH	SY Trunked Public Safety 700 MHz	8
	TARRANT	SG Conventional Public Safety 700 MHz	20
		SY Trunked Public Safety 700 MHz	9
	TRINITY	SY Trunked Public Safety 700 MHz	6
	UPSHUR	SY Trunked Public Safety 700 MHz	6
	WHARTON	SY Trunked Public Safety 700 MHz	5
	(blank)	SG Conventional Public Safety 700 MHz	3
		SY Trunked Public Safety 700 MHz	272
TX Total			547
VA	ARLINGTON	SY Trunked Public Safety 700 MHz	6
	FAIRFAX	SY Trunked Public Safety 700 MHz	6
	LOUDOUN	SG Conventional Public Safety 700 MHz	4
		SY Trunked Public Safety 700 MHz	6
	PRINCE WILLIA	SG Conventional Public Safety 700 MHz	14
	ROCKINGHAM	SG Conventional Public Safety 700 MHz	1
	STAFFORD	SY Trunked Public Safety 700 MHz	10
	(blank)	SY Trunked Public Safety 700 MHz	10
VA Total			57
WA	KING	SY Trunked Public Safety 700 MHz	60
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	PEND OREILLE	SG Conventional Public Safety 700 MHz	3
	PIERCE	SY Trunked Public Safety 700 MHz	66
	SNOHOMISH	SY Trunked Public Safety 700 MHz	2
	(blank)	SY Trunked Public Safety 700 MHz	34
WA Total			166
WI	MILWAUKEE	SG Conventional Public Safety 700 MHz	4
WI Total			4
(blank)	(blank)	SG Conventional Public Safety 700 MHz	95
		SY Trunked Public Safety 700 MHz	153
		TI TV Intercity Relay	1
		TS TV Studio Transmitter Link	2
		TT TV Translator Relay	1
		YG Industrial/Business Pool, Trunked	1
(blank) Total			253
Grand Total			7244

800 Public Safety and Business/Industrial Liceneses

Location State	Location Coun	Radio Service	Total
AK	ANCHORAGE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	12
	FAIRBANKS N(	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
	KENAI PENINS	GB Business, 806-821/851-866 MHz, Conventional	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MATANUSKA-S	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
	NORTH SLOPE	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	16
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	33
	(blank)	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
AK Total			135
AL	BALDWIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	BLOUNT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	CALHOUN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CLARKE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	CLEBURNE	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	COLBERT	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	COOSA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	ETOWAH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	27
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	FRANKLIN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HOUSTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	23
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	23
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	32

	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
LAUDERDALE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
LAWRENCE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
LEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
MARSHALL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MOBILE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	20
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
	GB Business, 806-821/851-866 MHz, Conventional	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MORGAN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
RUSSELL	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SHELBY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
TALLADEGA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
TALLAPOOSA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
TUSCALOOSA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
WASHINGTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3

		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	29
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	9
	COVINGTON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
AL Total			532
AR	ARKANSAS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	ASHLEY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	BAXTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BENTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	BOONE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	BRADLEY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CARROLL	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CLARK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	CLAY	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	CLEBURNE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CLEVELAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	COLUMBIA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	CRAIGHEAD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CRAWFORD	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CRITTENDEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	CROSS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	DALLAS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	DREW	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	FAULKNER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	FRANKLIN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	FULTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GARLAND	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GRANT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GREENE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HEMPSTEAD	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	HOT SPRING	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	INDEPENDENC	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1

	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
JACKSON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
JOHNSON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
LAFAYETTE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
LAWRENCE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
LEE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
LINCOLN	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
LITTLE RIVER	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LOGAN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LONOKE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
MADISON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
MARION	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
MILLER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
MISSISSIPPI	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MONROE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
MONTGOMERY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
NEVADA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NEWTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	OUACHITA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	PERRY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	PHILLIPS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	PIKE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	POLK	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	POPE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	PRAIRIE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	PULASKI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	RANDOLPH	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SALINE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	SCOTT	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	SEARCY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	SEBASTIAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	SEVIER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	STONE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	UNION	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	VAN BUREN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	WASHINGTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WHITE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YELL	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	15
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	14
		GB Business, 806-821/851-866 MHz, Conventional	9
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	DESHA	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CHICOT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	ST. FRANCIS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	POINSETT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	SHARP	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
AR Total			653
AZ	APACHE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	4

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	COCHISE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
	COCONINO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	8
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	22
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	24
	GILA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	GRAHAM	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		GB Business, 806-821/851-866 MHz, Conventional	8
	LA PAZ	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MARICOPA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	33
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	53
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	39
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	103
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	26
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	58
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	18
	MOHAVE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	16
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
	NAVAJO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	PIMA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	8
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	64
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	9
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
		GB Business, 806-821/851-866 MHz, Conventional	18
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	11

		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
	PINAL	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	SANTA CRUZ	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	YAVAPAI	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	20
	YUMA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	19
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	15
		YB Business, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	27
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	65
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	22
	GREENLEE	GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
AZ Total			971
CA	ALAMEDA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	20
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	36
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	38
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
		YB Business, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	ALPINE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	AMADOR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3

BUTTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
	YB Business, 806-821/851-866 MHz, Trunked	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CALAVERAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	24
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
COLUSA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
CONTRA COST	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	34
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	58
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	9
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	12
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	9
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
DEL NORTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
EL DORADO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	23
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	12
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
FRESNO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	19
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	33
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	8
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	54
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	20
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	15
GLENN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
HUMBOLDT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
IMPERIAL	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	45
	YB Business, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	14
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	17
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
INYO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5

KERN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	14
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	51
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YB Business, 806-821/851-866 MHz, Trunked	9
	GB Business, 806-821/851-866 MHz, Conventional	41
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	20
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	28
KINGS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LAKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
LASSEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
LOS ANGELES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	64
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	155
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	34
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	16
	YB Business, 806-821/851-866 MHz, Trunked	14
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	69
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	9
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	28
MADERA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MARIN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	31
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
MARIPOSA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	7
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
MENDOCINO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2

	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
MERCED	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
MODOC	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YB Business, 806-821/851-866 MHz, Trunked	2
MONO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
MONTEREY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	23
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	37
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	13
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	11
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	27
NAPA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
NEVADA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	17
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ORANGE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	53
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	95
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	36
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	17
	YB Business, 806-821/851-866 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	33
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	14
PLACER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	25
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
PLUMAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
RIVERSIDE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	63
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	93
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	35
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	YB Business, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	85

	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	33
SACRAMENTO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	16
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	84
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	18
	GB Business, 806-821/851-866 MHz, Conventional	25
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SAN BENITO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
SAN BERNARD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	88
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	51
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	36
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	33
	YB Business, 806-821/851-866 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	46
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	56
SAN DIEGO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	74
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	124
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	125
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	58
	GB Business, 806-821/851-866 MHz, Conventional	16
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	36
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
SAN FRANCIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	33
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	14
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	15
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	15
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SAN JOAQUIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	23
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	9
SAN LUIS OBI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	20
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	6

	GB Business, 806-821/851-866 MHz, Conventional	16
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SAN MATEO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	41
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	12
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	11
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
SANTA BARBA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	38
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	11
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	24
SANTA CLARA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	46
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	48
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	12
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	10
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
SANTA CRUZ	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	47
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
SHASTA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	29
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
SIERRA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
SISKIYOU	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	GB Business, 806-821/851-866 MHz, Conventional	1
SOLANO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
SONOMA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	18
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	66
	GB Business, 806-821/851-866 MHz, Conventional	7

	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
STANISLAUS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	10
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SUTTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YB Business, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
TEHAMA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TRINITY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
TULARE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	23
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	36
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
TUOLUMNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
VENTURA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	19
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	12
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	17
YOLO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	10
YUBA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	90
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	66

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	254
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	32
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	44
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	40
		YB Business, 806-821/851-866 MHz, Trunked	12
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	9
		GB Business, 806-821/851-866 MHz, Conventional	77
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	45
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	35
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	39
CA Total			5142
CO	ADAMS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	ALAMOSA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	ARAPAHOE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	1
	ARCHULETA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	BACA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
	BENT	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	BOULDER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHAFFEE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	CHEYENNE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CLEAR CREEK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YB Business, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COSTILLA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	CROWLEY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	CUSTER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	DELTA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	DENVER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	34
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	14

		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	DOLORES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	DOUGLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	EAGLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	27
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	EL PASO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	38
		YB Business, 806-821/851-866 MHz, Trunked	7
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	10
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	18
	ELBERT	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	FREMONT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GARFIELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	GILPIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GRAND	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		YB Business, 806-821/851-866 MHz, Trunked	2
	GUNNISON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HINSDALE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	HUERFANO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	25
		GB Business, 806-821/851-866 MHz, Conventional	32
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	12
	KIOWA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	KIT CARSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	LA PLATA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4

LAKE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
LARIMER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
LAS ANIMAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
LINCOLN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
LOGAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	6
MESA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YB Business, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
MINERAL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MOFFAT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
MONTEZUMA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
MONTROSE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
MORGAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
OTERO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
OURAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
PARK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
PHILLIPS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
PITKIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
PROWERS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
PUEBLO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
RIO BLANCO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
RIO GRANDE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
ROUTT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		GB Business, 806-821/851-866 MHz, Conventional	10
	SAGUACHE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	SAN JUAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	SAN MIGUEL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	SEDGWICK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	6
	SUMMIT	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	2
	TELLER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	WASHINGTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	WELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
		GB Business, 806-821/851-866 MHz, Conventional	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	YUMA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	12
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	22
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	32
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YB Business, 806-821/851-866 MHz, Trunked	8
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	31
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
CO Total			1168
CT	FAIRFIELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	15
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	22
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HARTFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	27
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	37
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	35
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	12
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	12
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	LITCHFIELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	MIDDLESEX	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3

	NEW HAVEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	39
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	NEW LONDON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	TOLLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	WINDHAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CT Total			440
DC	WASHINGTON	GB Business, 806-821/851-866 MHz, Conventional	10
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	(blank)	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	32
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DC Total			57
DE	KENT	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	NEW CASTLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	20
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SUSSEX	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	14

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	(blank)	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DE Total			114
FL	ALACHUA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	19
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	27
	BAKER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	BAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	19
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	26
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	BRADFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	20
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	BREVARD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	24
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BROWARD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	29
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	27
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	14
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CALHOUN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	CHARLOTTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	24
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CITRUS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	CLAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	COLLIER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	25
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	16
		YB Business, 806-821/851-866 MHz, Trunked	2

COLUMBIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
DESOTO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
DIXIE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
DUVAL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	24
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	27
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ESCAMBIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
FLAGLER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
FRANKLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
GADSDEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
GILCHRIST	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
GLADES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
GULF	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
HAMILTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
HARDEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HENDRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
HERNANDO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
HIGHLANDS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HILLSBOROUG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	31
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
	GB Business, 806-821/851-866 MHz, Conventional	15
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	11
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
HOLMES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
INDIAN RIVER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
JACKSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	14
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	2
LAFAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
LAKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	33
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
LEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	27
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	44
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LEON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	18
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	39
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LEVY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
LIBERTY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
MANATEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
MARION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	31
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	23
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MARTIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	MIAMI-DADE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	48
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	36
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	16
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	10
	MONROE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	26
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	26
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	4
	NASSAU	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	OKALOOSA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	22
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	OKEECHOBEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	ORANGE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	49
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	55
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	13
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	13
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	OSCEOLA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	PALM BEACH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	63
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	22
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	47
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PASCO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	18
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PINELLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	18
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	47
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3

POLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	28
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	24
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	13
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
PUTNAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
SANTA ROSA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	22
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
SARASOTA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	28
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	GB Business, 806-821/851-866 MHz, Conventional	2
SEMINOLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	17
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	GB Business, 806-821/851-866 MHz, Conventional	2
ST. JOHNS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
ST. LUCIE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
SUMTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
SUWANNEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
TAYLOR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
UNION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
VOLUSIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	20
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	18
	GB Business, 806-821/851-866 MHz, Conventional	4
WAKULLA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
WALTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	42
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	21

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	96
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	15
		YB Business, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	22
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	24
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
FL Total			2772
GA	BALDWIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BANKS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	BERRIEN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	BIBB	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BRYAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	BULLOCH	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	CARROLL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	CATOOSA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	CHATHAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CHEROKEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	CLARKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
	CLAYTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	COBB	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		GB Business, 806-821/851-866 MHz, Conventional	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	COWETA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	CRISP	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2

	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
DADE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
DEKALB	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
DOUGHERTY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	2
DOUGLAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
EFFINGHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
ELBERT	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
FANNIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	4
FAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
FLOYD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
FORSYTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
FRANKLIN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
FULTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	41
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	65
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	17
GLYNN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
GREENE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
GWINNETT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HALL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	4

	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HANCOCK	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HARALSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
HARRIS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
HART	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HEARD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
HENRY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	1
HOUSTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JACKSON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JASPER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
JOHNSON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JONES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
LOWNDES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
MARION	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MITCHELL	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MORGAN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MURRAY	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
MUSCOGEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
NEWTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
PAULDING	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
PEACH	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
PUTNAM	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
RICHMOND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ROCKDALE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
SPALDING	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	26
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
STEPHENS	GB Business, 806-821/851-866 MHz, Conventional	2

		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	STEWART	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	SUMTER	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	TAYLOR	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	TERRELL	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	THOMAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	TIFT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	TROUP	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	UNION	GB Business, 806-821/851-866 MHz, Conventional	2
	WALKER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
	WALTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	WARREN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	WASHINGTON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WHITE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	WHITFIELD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	25
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	55
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	18
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	BARTOW	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	TREUTLEN	GB Business, 806-821/851-866 MHz, Conventional	2
	WORTH	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HABERSHAM	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	SCREVEN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	EVANS	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BRANTLEY	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GA Total			1034
GU	GUAM	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	(blank)	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
GU Total			4
HI	HAWAII	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	3
	HONOLULU	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	20

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	20
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	54
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	16
		GB Business, 806-821/851-866 MHz, Conventional	39
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	10
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	9
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	KAUAI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	1
	MAUI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	59
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	30
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	16
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
HI Total			381
IA	BENTON	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BLACK HAWK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	12
	BOONE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BUCHANAN	YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	5
	CALHOUN	YB Business, 806-821/851-866 MHz, Trunked	2
	CARROLL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CASS	YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CEDAR	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CHEROKEE	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CLARKE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CLAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1

CLAYTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
CLINTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DALLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
DAVIS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DECATUR	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DELAWARE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DICKINSON	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DUBUQUE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
FAYETTE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
FLOYD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
FRANKLIN	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
GREENE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GRUNDY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HAMILTON	GB Business, 806-821/851-866 MHz, Conventional	2
HANCOCK	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HARDIN	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HENRY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HOWARD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HUMBOLDT	GB Business, 806-821/851-866 MHz, Conventional	2
IOWA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JACKSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JASPER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JEFFERSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JOHNSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	28
	GB Business, 806-821/851-866 MHz, Conventional	9

		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	JONES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	LEE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	LINN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	13
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	LOUISA	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	LUCAS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	LYON	GB Business, 806-821/851-866 MHz, Conventional	4
	MARION	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MARSHALL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MONROE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MONTGOMERY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MUSCATINE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	OSCEOLA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PAGE	YB Business, 806-821/851-866 MHz, Trunked	2
	PLYMOUTH	GB Business, 806-821/851-866 MHz, Conventional	2
	POLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	POTTAWATTAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SCOTT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	29
		YB Business, 806-821/851-866 MHz, Trunked	38
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3

SIOUX	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	6
STORY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
UNION	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
VAN BUREN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
WASHINGTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
WAYNE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
WEBSTER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
WINNEBAGO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
WOODBURY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	8
WRIGHT	GB Business, 806-821/851-866 MHz, Conventional	2
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
	YB Business, 806-821/851-866 MHz, Trunked	5
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	24
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	12
POCAHONTAS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
IDA	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ALLAMAKEE	GB Business, 806-821/851-866 MHz, Conventional	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
DES MOINES	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
POWESHIEK	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
O'BRIEN	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WORTH	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TAMA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
KOSSUTH	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
BUENA VISTA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GUTHRIE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1

	WINNESHIEK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BREMER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CHICKASAW	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CERRO GORDO	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WAPELLO	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	APPANOOSE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	RINGGOLD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	KEOKUK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MAHASKA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	MONONA	GB Business, 806-821/851-866 MHz, Conventional	2
IA Total			688
ID	ADA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
		YB Business, 806-821/851-866 MHz, Trunked	92
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	14
	BANNOCK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	BINGHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	BLAINE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YB Business, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BONNEVILLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	BUTTE	YB Business, 806-821/851-866 MHz, Trunked	2
	CANYON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CASSIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YB Business, 806-821/851-866 MHz, Trunked	82
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	37
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
CLEARWATER	YB Business, 806-821/851-866 MHz, Trunked	186
CUSTER	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
FREMONT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GB Business, 806-821/851-866 MHz, Conventional	2
JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
JEROME	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YB Business, 806-821/851-866 MHz, Trunked	21
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
KOOTENAI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YB Business, 806-821/851-866 MHz, Trunked	33
	GB Business, 806-821/851-866 MHz, Conventional	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LATAH	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	116
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LINCOLN	GB Business, 806-821/851-866 MHz, Conventional	2
MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
SHOSHONE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
TETON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
TWIN FALLS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
VALLEY	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	16
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	10
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	25
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
IDAHO	YB Business, 806-821/851-866 MHz, Trunked	186
ELMORE	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
PAYETTE	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
BONNER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
POWER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
NEZ PERCE	GB Business, 806-821/851-866 MHz, Conventional	2
GOODING	GB Business, 806-821/851-866 MHz, Conventional	2
BOISE	GB Business, 806-821/851-866 MHz, Conventional	2

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BEAR LAKE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	GEM	GB Business, 806-821/851-866 MHz, Conventional	1
	OWYHEE	GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ID Total			1128
IL	ADAMS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	ALEXANDER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BOND	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	BOONE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BROWN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BUREAU	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CALHOUN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CARROLL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CASS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CHAMPAIGN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CHRISTIAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CLARK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	CLAY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CLINTON	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2

COLES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
COOK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	128
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	50
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	74
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	85
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
	YB Business, 806-821/851-866 MHz, Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	27
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	15
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
CRAWFORD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	4
CUMBERLAND	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
DEKALB	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	6
DUPAGE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	32
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	13
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
EDGAR	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
EFFINGHAM	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
FAYETTE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
FORD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
FRANKLIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
FULTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
GALLATIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
GREENE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
GRUNDY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
HANCOCK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
HARDIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1

HENRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
IROQUOIS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JACKSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
JASPER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
JEFFERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
JO DAVIESS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	9
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
JOHNSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
KANE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	15
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
KANKAKEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
KENDALL	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
KNOX	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
LA SALLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
LAKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	38
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
LAWRENCE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
LIVINGSTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LOGAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
MACON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
	YB Business, 806-821/851-866 MHz, Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	8
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
MACOUPIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MADISON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
MARION	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
MARSHALL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
MASON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MASSAC	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
MCDONOUGH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MCHENRY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	16
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	MCLEAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
		YB Business, 806-821/851-866 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MENARD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MERCER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	MONROE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	MONTGOMERY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	4
	MORGAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	OGLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	PEORIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	12
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	PERRY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	PIKE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	POPE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	PULASKI	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	RANDOLPH	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	RICHLAND	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	ROCK ISLAND	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	26
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SALINE	YB Business, 806-821/851-866 MHz, Trunked	2

SANGAMON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SCHUYLER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
SHELBY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	6
ST. CLAIR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	42
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
STEPHENSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	4
TAZEWELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
UNION	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	2
VERMILION	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WABASH	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
WARREN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
WASHINGTON	GB Business, 806-821/851-866 MHz, Conventional	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
WAYNE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
WHITE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	2
WHITESIDE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2

		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WILL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WILLIAMSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	WINNEBAGO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	6
	WOODFORD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	15
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	14
		YB Business, 806-821/851-866 MHz, Trunked	30
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	48
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	11
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	11
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
	PIATT	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	DE WITT	GB Business, 806-821/851-866 MHz, Conventional	2
	JERSEY	GB Business, 806-821/851-866 MHz, Conventional	2
IL Total			2000
IN	ADAMS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ALLEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	16
		GB Business, 806-821/851-866 MHz, Conventional	11
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BARTHOLOME	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8

BENTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
BLACKFORD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
BOONE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	21
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
BROWN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CARROLL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
CASS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
CLAY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
CLINTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
CRAWFORD	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
DAVIESS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GB Business, 806-821/851-866 MHz, Conventional	2
DE KALB	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
DEARBORN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	DECATUR	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	DELAWARE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	DUBOIS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	ELKHART	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	FAYETTE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	FLOYD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	FOUNTAIN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	FRANKLIN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	FULTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GIBSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	GRANT	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	7
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	GREENE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	HAMILTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	10
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1

	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
HANCOCK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
HARRISON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HENDRICKS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HENRY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
HOWARD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
HUNTINGTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
JACKSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
JASPER	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JAY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JEFFERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
JENNINGS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
JOHNSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2

		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	KNOX	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	KOSCIUSKO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	6
	LA PORTE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	LAGRANGE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	LAKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	LAWRENCE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	MARION	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	14
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	21
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	17
	MARSHALL	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	MARTIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4

	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
MIAMI	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MONROE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MONTGOMERY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
MORGAN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
NEWTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
NOBLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
OHIO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
ORANGE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
OWEN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
PARKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
PERRY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
PIKE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
PORTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
POSEY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	4

PULASKI	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
PUTNAM	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
RANDOLPH	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
RIPLEY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
RUSH	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
SCOTT	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
SHELBY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
SPENCER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ST. JOSEPH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
STARKE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
STEUBEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
SULLIVAN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
SWITZERLAND	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
TIPPECANOE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	9
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
TIPTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
UNION	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1

	VANDERBURG	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	8
	VERMILLION	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	VIGO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WABASH	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	WARRICK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	WASHINGTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	9
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	WAYNE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WELLS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	WHITE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WHITLEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	38
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	50
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	25
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	37
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	44
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	58
IN Total			1539
KS	ALLEN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	3
	ANDERSON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	ATCHISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2

	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
BARBER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
BARTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
BOURBON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	3
BUTLER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	27
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
CHASE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
CHAUTAUQUA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
CHEROKEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
CHEYENNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
CLAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
CLOUD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
COFFEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
COMANCHE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
COWLEY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
CRAWFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DECATUR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
DICKINSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
DONIPHAN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
DOUGLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2

EDWARDS	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2 6
ELLIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2 6 3 4
ELLSWORTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 4 4
FINNEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked GB Business, 806-821/851-866 MHz, Conventional GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2 4 3 4 1 3
FORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 10 3
GEARY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 1 1
GOVE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2 4
GRAHAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 7 3
GRANT	GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4 2 4
GRAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked GB Business, 806-821/851-866 MHz, Conventional GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2 7 3 1 2
GREELEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2 4
GREENWOOD	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4 7
HAMILTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked GB Business, 806-821/851-866 MHz, Conventional	2 6 4 1
HARVEY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
HODGEMAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2 4
JACKSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
JEWELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 4
JOHNSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv. GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked GB Business, 806-821/851-866 MHz, Conventional	1 21 3 18 21 7 11
KEARNY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2

	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
LANE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
LEAVENWORTI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
LINN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
LOGAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LYON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
MARION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
MARSHALL	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
MCPHERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
MEADE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
MIAMI	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
MITCHELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MONTGOMERY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MORRIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MORTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
NEMAHA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
NEOSHO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
NESS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
NORTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
OSBORNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5

	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
OTTAWA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
PAWNEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
PHILLIPS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
POTTAWATOMI	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
PRATT	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
RAWLINS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
RENO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
REPUBLIC	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
RICE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
RILEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
ROOKS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
RUSH	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
RUSSELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
SALINE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
SCOTT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
SEDGWICK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SEWARD	GB Business, 806-821/851-866 MHz, Conventional	2
SHAWNEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	16

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	SHERMAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	SMITH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	STEVENS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	SUMNER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	THOMAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	WABAUNSEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	WALLACE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	WILSON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	9
	WYANDOTTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	78
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	23
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	11
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	HASKELL	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	KINGMAN	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
KS Total			1165
KY	ADAIR	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	ALLEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	ANDERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	BALLARD	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	BARREN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BATH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4

BELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YB Business, 806-821/851-866 MHz, Trunked	2
BOONE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
BOURBON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
BOYD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
BREATHITT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
BRECKINRIDG	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
BULLITT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
BUTLER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CALDWELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CALLOWAY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CAMPBELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CARROLL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CARTER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
CASEY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CHRISTIAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CLAY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YB Business, 806-821/851-866 MHz, Trunked	2
CLINTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
CRITTENDEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CUMBERLAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
DAVIESS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
EDMONSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
ESTILL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
FAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	92
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
FLEMING	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
FLOYD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
FRANKLIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4

FULTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
GALLATIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
GARRARD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
GRANT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
GRAVES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
GRAYSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
GREEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
GREENUP	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HANCOCK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HARDIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
HARLAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
HARRISON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HART	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HENDERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HENRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HICKMAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	2
HOPKINS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	2
JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	17
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	34
	YB Business, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	12
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JESSAMINE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JOHNSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
KENTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
KNOTT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
KNOX	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2

	YB Business, 806-821/851-866 MHz, Trunked	2
LAUREL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
LAWRENCE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
LESLIE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LETCHER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LEWIS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
LIVINGSTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	2
LOGAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	2
LYON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
MAGOFFIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
MARION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
MARSHALL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	3
MARTIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MCCRACKEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
MCCREARY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MCLEAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MEADE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MENIFEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MERCER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
METCALFE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MONROE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MORGAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MUHLENBERG	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
NELSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GB Business, 806-821/851-866 MHz, Conventional	2
OHIO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GB Business, 806-821/851-866 MHz, Conventional	1
OLDHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
OWEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
OWSLEY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
PENDLETON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
PERRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
PIKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	POWELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	PULASKI	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	ROCKCASTLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	ROWAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	SCOTT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SHELBY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	TAYLOR	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	TODD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	UNION	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WARREN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	WASHINGTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	WAYNE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	WHITLEY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	WOLFE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	WOODFORD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	13
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	13
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	CARLISLE	GB Business, 806-821/851-866 MHz, Conventional	2
KY Total			823
LA	ACADIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ALLEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ASCENSION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	AVOYELLES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1

	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
BEAUREGARD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
BIENVILLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
BOSSIER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CADDO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	14
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	21
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CALCASIEU	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
CALDWELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
CAMERON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CATAHOULA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
CLAIBORNE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
CONCORDIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
DE SOTO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
EAST BATON R	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YB Business, 806-821/851-866 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
EAST FELICIAI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
FRANKLIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
GRANT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
IBERIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
IBERVILLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	14
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	32
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JEFFERSON D/	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
LA SALLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
LAFAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
LAFOURCHE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
LINCOLN	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
LIVINGSTON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1

MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
ORLEANS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	16
	YB Business, 806-821/851-866 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
OUACHITA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
PLAQUEMINES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	9
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
POINTE COUP	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
RAPIDES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
RICHLAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
SABINE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ST. BERNARD	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	13
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
ST. CHARLES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	32
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ST. HELENA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
ST. JAMES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
ST. JOHN THE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	ST. LANDRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ST. MARTIN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ST. MARY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	ST. TAMMANY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	TANGIPAHOA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	TERREBONNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	UNION	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	VERMILION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	VERNON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	WEBSTER	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WEST BATON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WEST CARROL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	WEST FELICIA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	WINN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	35
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	32
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	33
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	21
		YB Business, 806-821/851-866 MHz, Trunked	6
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	12
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	ASSUMPTION	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MOREHOUSE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
LA Total			1075
MA	BARNSTABLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	28
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	BERKSHIRE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	18
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	3
	BRISTOL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	17
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	DUKES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	ESSEX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	21
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	FRANKLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	HAMPDEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	23
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	2
	HAMPSHIRE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	MIDDLESEX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	24
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	19
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YB Business, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	NANTUCKET	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	NORFOLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	8
	PLYMOUTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	SUFFOLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	45
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	13
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	17
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	WORCESTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	17
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	23

		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	22
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
MA Total			679
MD	ALLEGANY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
	ANNE ARUNDE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	BALTIMORE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	39
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	9
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	15
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BALTIMORE CI	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CALVERT	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	CAROLINE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	CARROLL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	CECIL	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
CHARLES	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	32
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DORCHESTER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
FREDERICK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GARRETT	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
HARFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
HOWARD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
KENT	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	12
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	11
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
PRINCE GEOR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	27
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
QUEEN ANNE'S	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
SOMERSET	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1

		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ST. MARY'S	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	TALBOT	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WASHINGTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	WICOMICO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WORCESTER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
MD Total			633
ME	AROOSTOOK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CUMBERLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	9
	FRANKLIN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HANCOCK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	KENNEBEC	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	KNOX	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	LINCOLN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	PISCATAQUIS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2

	SAGADAHOC	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SOMERSET	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	WASHINGTON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	YORK	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	(blank)	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	11
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	OXFORD	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	7
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	PENOBSCOT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WALDO	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	ANDROSCOGG	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
ME Total			140
MI	ALCONA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ALGER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	ALLEGAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ALPENA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	ANTRIM	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	ARENAC	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	BARAGA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	BARRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	6
	BENZIE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BERRIEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BRANCH	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	CALHOUN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	2

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CASS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHARLEVOIX	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CHEBOYGAN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CHIPPEWA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	CLARE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CLINTON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	CRAWFORD	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	DELTA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	DICKINSON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	EATON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	EMMET	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	GENESEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GOGEBIC	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	GRAND TRAVE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GRATIOT	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HILLSDALE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HOUGHTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	HURON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	INGHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	IONIA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2

IOSCO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
IRON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
ISABELLA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
JACKSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
KALAMAZOO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
KALKASKA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
KENT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
KEWEENAW	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
LAKE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LAPEER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LEELANAU	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LENAWEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
LIVINGSTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
LUCE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	3

MACKINAC	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
MACOMB	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	41
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
MANISTEE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MARQUETTE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MASON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MECOSTA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MENOMINEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
MIDLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MISSAUKEE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MONROE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MONTCALM	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MONTMORENC	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
MUSKEGON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
NEWAYGO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
OAKLAND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	54
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
OCEANA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
OGEMAW	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
ONTONAGON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4

	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
OSCEOLA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
OSCODA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
OTSEGO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
OTTAWA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
PRESQUE ISLE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ROSCOMMON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SAGINAW	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
SANILAC	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
SCHOOLCRAFT	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
SHIAWASSEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ST. CLAIR	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
ST. JOSEPH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
TUSCOLA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
VAN BUREN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
WASHTENAW	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	17
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WAYNE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	41
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WEXFORD	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	16
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	11
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
	GLADWIN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MI Total			1036
MN	AITKIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	ANOKA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BECKER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	BELTRAMI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BENTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
		GB Business, 806-821/851-866 MHz, Conventional	1
	BIG STONE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BLUE EARTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	16
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	BROWN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	CARLTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	CARVER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CASS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHIPPEWA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHISAGO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CLAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	CLEARWATER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	COOK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	36
	COTTONWOOD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	CROW WING	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	DAKOTA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	27
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	DODGE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	DOUGLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	FARIBAULT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	FILLMORE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	FREEBORN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		GB Business, 806-821/851-866 MHz, Conventional	4

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
GOODHUE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	41
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
GRANT	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
HENNEPIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	60
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	10
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	17
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	16
HOUSTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HUBBARD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
ISANTI	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
ITASCA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	13
JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YB Business, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
KANABEC	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
KANDIYOHI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
KITTSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	10
KOOCHICHIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
LAC QUI PARL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
LAKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	22
LAKE OF THE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
LE SUEUR	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
LINCOLN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	3

LYON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MAHNOMEN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
MARSHALL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	GB Business, 806-821/851-866 MHz, Conventional	2
MARTIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MCLEOD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MEEKER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
MILLE LACS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MORRISON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
MOWER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MURRAY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NICOLLET	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NOBLES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
NORMAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
OLMSTED	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
OTTER TAIL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
	GB Business, 806-821/851-866 MHz, Conventional	6
PENNINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4

PINE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
PIPESTONE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
POLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
POPE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
RAMSEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	19
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
RED LAKE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
REDWOOD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
RENVILLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
RICE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
ROCK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ROSEAU	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	2
SCOTT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
SHERBURNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
SIBLEY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ST. LOUIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	58
	GB Business, 806-821/851-866 MHz, Conventional	2
STEARNS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	19

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	36
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	4
	STEELE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	STEVENS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	SWIFT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	TODD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	TRAVERSE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	WABASHA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WADENA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	WASECA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	4
	WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	34
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WATONWAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WILKIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	WINONA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
	WRIGHT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	YELLOW MEDI	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	56
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	8
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	18

		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	14
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
MN Total			1813
MO	BOONE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	BUCHANAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	4
	BUTLER	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CAMDEN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CASS	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	CLAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COLE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	CRAWFORD	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	DADE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	DALLAS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	DAVIESS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	FRANKLIN	YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GREENE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HOWARD	GB Business, 806-821/851-866 MHz, Conventional	2
	IRON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	JACKSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	24
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	JASPER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2

	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
JEFFERSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JOHNSON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
KNOX	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
LAFAYETTE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
LAWRENCE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
LINCOLN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LINN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
LIVINGSTON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
MACON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
MADISON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MILLER	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
MISSISSIPPI	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
MONTGOMERY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
NEWTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
OSAGE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
PERRY	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
PHELPS	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
PIKE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
PLATTE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
POLK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
PULASKI	GB Business, 806-821/851-866 MHz, Conventional	2
RANDOLPH	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
RIPLEY	GB Business, 806-821/851-866 MHz, Conventional	2
SCHUYLER	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
SCOTT	YB Business, 806-821/851-866 MHz, Trunked	2
ST. CHARLES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ST. CLAIR	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
ST. LOUIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	41
	YB Business, 806-821/851-866 MHz, Trunked	9
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	26
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	15

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	ST. LOUIS CIT	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	STODDARD	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	TEXAS	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	WARREN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WASHINGTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WEBSTER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YB Business, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	19
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	ST. FRANCOIS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	STE. GENEVIE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	GASCONADE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CALLAWAY	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	AUDRAIN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	COOPER	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	PETTIS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	MONITEAU	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CAPE GIRARD	YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	PEMISCOT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	BOLLINGER	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	RALLS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MARIES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	REYNOLDS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	NEW MADRID	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	TANEY	GB Business, 806-821/851-866 MHz, Conventional	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	DUNKLIN	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	RAY	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
MO Total			566
MP	SAIPAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	(blank)	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6

		GB Business, 806-821/851-866 MHz, Conventional	2
MP Total			11
MS	ADAMS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	BOLIVAR	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CLAIBORNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	COPIAH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	DESOTO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	FORREST	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	FRANKLIN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GREENE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	HANCOCK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	HARRISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HINDS	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	15
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	HOLMES	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	JACKSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	JONES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	LAFAYETTE	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	LAMAR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	LAUDERDALE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4

		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	LAWRENCE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	LEE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	LINCOLN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	LOWNDES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	MADISON	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	MARION	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MARSHALL	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	MONTGOMERY	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	NOXUBEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	OKTIBBEHA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	PANOLA	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	PERRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	PIKE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PONTOTOC	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	RANKIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	SCOTT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	SIMPSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	SMITH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	SUNFLOWER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	TUNICA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	WARREN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	WASHINGTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YAZOO	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	AMITE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1

	ATTALA	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	LEAKE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	WALTHALL	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	TATE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GRENADA	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	LEFLORE	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	SHARKEY	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	QUITMAN	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	TALLAHATCHI	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	ALCORN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COAHOMA	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YALOBUSHA	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
MS Total			412
MT	CARBON	YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	CARTER	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CASCADE	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	FLATHEAD	YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	HILL	GB Business, 806-821/851-866 MHz, Conventional	3
	LIBERTY	GB Business, 806-821/851-866 MHz, Conventional	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PHILLIPS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	ROOSEVELT	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	ROSEBUD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SANDERS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	SILVER BOW	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	VALLEY	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	YELLOWSTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	23
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	(blank)	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WIBAUX	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	TOOLE	GB Business, 806-821/851-866 MHz, Conventional	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WHEATLAND	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MT Total			124
NC	ALAMANCE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	ALEXANDER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	ALLEGHANY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2

	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
ANSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
ASHE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
AVERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
BEAUFORT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
BERTIE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
BLADEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	28
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
BRUNSWICK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
BUNCOMBE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	4
BURKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CABARRUS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CALDWELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CAMDEN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
CARTERET	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8

	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
CASWELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
CATAWBA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
CHATHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
CHEROKEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
CHOWAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
CLAY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
CLEVELAND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
COLUMBUS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CRAVEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
CUMBERLAND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	20
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CURRITUCK	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DARE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DAVIDSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	DAVIE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	DUPLIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	10
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	DURHAM	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	EDGECOMBE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	FORSYTH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	20
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	FRANKLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	GASTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	GATES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GRAHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GRANVILLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	GREENE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2

GUILFORD	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	14
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	9
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HALIFAX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HARNETT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
HAYWOOD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
HENDERSON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
HERTFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HOKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
HYDE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
IREDELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JOHNSTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
JONES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
LEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
LENOIR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
LINCOLN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MACON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MADISON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
MARTIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
MCDOWELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MECKLENBUR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	20
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	29
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	21
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	12
MITCHELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
MOORE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
NASH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
NEW HANOVE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	10
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	NORTHAMPTO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	ONSLOW	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
	ORANGE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PAMLICO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
	PASQUOTANK	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	PENDER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	PERQUIMANS	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	PERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PITT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	POLK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	RANDOLPH	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
RICHMOND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
ROBESON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
ROCKINGHAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ROWAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
RUTHERFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SAMPSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
SCOTLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
STANLY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
STOKES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SURRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
SWAIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
TRANSYLVANI	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TYRRELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	UNION	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	VANCE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	WAKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	24
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	42
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	WARREN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	WATAUGA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	WAYNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	WILKES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	WILSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YADKIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	YANCEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	6
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	28
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	24
NC Total			2027
ND	ADAMS	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BURLEIGH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	CASS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	10
	DUNN	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	LOGAN	GB Business, 806-821/851-866 MHz, Conventional	2
	MERCER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	MORTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	RICHLAND	GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	STARK	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WILLIAMS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	PEMBINA	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	WARD	GB Business, 806-821/851-866 MHz, Conventional	2
	BARNES	GB Business, 806-821/851-866 MHz, Conventional	6
	BOWMAN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	HETTINGER	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SLOPE	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	GOLDEN VALL	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	GRIGGS	GB Business, 806-821/851-866 MHz, Conventional	8
	LAMOURE	GB Business, 806-821/851-866 MHz, Conventional	6
	MCINTOSH	GB Business, 806-821/851-866 MHz, Conventional	10
	RANSOM	GB Business, 806-821/851-866 MHz, Conventional	4
	SARGENT	GB Business, 806-821/851-866 MHz, Conventional	12
	BOTTINEAU	GB Business, 806-821/851-866 MHz, Conventional	2
	GRAND FORKS	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	KIDDER	GB Business, 806-821/851-866 MHz, Conventional	4
	STUTSMAN	GB Business, 806-821/851-866 MHz, Conventional	4
	WALSH	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	MCKENZIE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	EMMONS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
ND Total			164
NE	BANNER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	BUFFALO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GB Business, 806-821/851-866 MHz, Conventional	48
	CASS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4

	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
CEDAR	GB Business, 806-821/851-866 MHz, Conventional	2
CHASE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CHEYENNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DAKOTA	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
DAWSON	GB Business, 806-821/851-866 MHz, Conventional	20
DODGE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
DOUGLAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	10
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
FILLMORE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
FRANKLIN	GB Business, 806-821/851-866 MHz, Conventional	6
GAGE	GB Business, 806-821/851-866 MHz, Conventional	2
GARDEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HALL	GB Business, 806-821/851-866 MHz, Conventional	6
KNOX	GB Business, 806-821/851-866 MHz, Conventional	2
LANCASTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	26
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	20
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
MADISON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	GB Business, 806-821/851-866 MHz, Conventional	2
MORRILL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
NEMAHA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
OTOE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
PAWNEE	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
PERKINS	GB Business, 806-821/851-866 MHz, Conventional	6
PHELPS	GB Business, 806-821/851-866 MHz, Conventional	22
PIERCE	GB Business, 806-821/851-866 MHz, Conventional	2
RED WILLOW	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
RICHARDSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
SARPY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
SAUNDERS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	SCOTTS BLUFI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		GB Business, 806-821/851-866 MHz, Conventional	6
	SEWARD	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	THURSTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	WASHINGTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	WAYNE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	YORK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	17
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	DIXON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	22
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	BOX BUTTE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	GOSPER	GB Business, 806-821/851-866 MHz, Conventional	4
NE Total			458
NH	BELKNAP	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	CHESHIRE	GB Business, 806-821/851-866 MHz, Conventional	2
	HILLSBOROUG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	MERRIMACK	GB Business, 806-821/851-866 MHz, Conventional	2
	(blank)	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	STRAFFORD	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GRAFTON	GB Business, 806-821/851-866 MHz, Conventional	2
NH Total			28
NJ	ATLANTIC	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	37
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	10
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	BERGEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	37
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1

	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
BURLINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
CAMDEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
	GB Business, 806-821/851-866 MHz, Conventional	9
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CAPE MAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
CUMBERLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
ESSEX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	58
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	7
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GLOUCESTER	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
HUDSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	5
HUNTERDON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
MERCER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MIDDLESEX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
	GB Business, 806-821/851-866 MHz, Conventional	2
MONMOUTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	37

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	MORRIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	1
	OCEAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	48
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	PASSAIC	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	SALEM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	3
	SOMERSET	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3
	SUSSEX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	UNION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	WARREN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	19
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	9
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
NJ Total			702
NM	BERNALILLO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	11
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHAVES	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	DONA ANA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
	EDDY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	16
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	GRANT	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	12
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HARDING	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HIDALGO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	LEA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	10
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	12
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	16
	LINCOLN	GB Business, 806-821/851-866 MHz, Conventional	12
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	LOS ALAMOS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	OTERO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	ROOSEVELT	GB Business, 806-821/851-866 MHz, Conventional	16
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	SAN JUAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	17
	SAN MIGUEL	GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SANDOVAL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SANTA FE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	TAOS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	UNION	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	VALENCIA	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	16
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	17
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	12
	RIO ARRIBA	YB Business, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
	GUADALUPE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	DE BACA	GB Business, 806-821/851-866 MHz, Conventional	8
	QUAY	GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	MCKINLEY	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	MORA	GB Business, 806-821/851-866 MHz, Conventional	3
	LUNA	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CURRY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	TORRANCE	GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CIBOLA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CATRON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
NM Total			446
NV	CARSON CITY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	CHURCHILL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	37
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	17
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	71
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	24
		YB Business, 806-821/851-866 MHz, Trunked	12
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	13
		GB Business, 806-821/851-866 MHz, Conventional	46
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	20
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	16
	DOUGLAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	ELKO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	21
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	9
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	22
	ESMERALDA	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	EUREKA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	HUMBOLDT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		YB Business, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	LANDER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	LINCOLN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	LYON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	MINERAL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
		YB Business, 806-821/851-866 MHz, Trunked	2
	NYE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	PERSHING	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	STOREY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	WASHOE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	27
		YB Business, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	55
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WHITE PINE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	18
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5

		YB Business, 806-821/851-866 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	23
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	9
NV Total			770
NY	ALBANY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		GB Business, 806-821/851-866 MHz, Conventional	10
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BRONX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BROOME	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	CATTARAUGUS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	CAYUGA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	CHAUTAUQUA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	CHEMUNG	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	CLINTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
	COLUMBIA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	DELAWARE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	DUTCHESS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	ERIE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	14
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	ESSEX	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	FULTON	GB Business, 806-821/851-866 MHz, Conventional	3
	GENESEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GREENE	GB Business, 806-821/851-866 MHz, Conventional	3
	JEFFERSON	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	5
	KINGS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	MADISON	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	MONROE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	23
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	5
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	28
	NASSAU	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	NEW YORK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		YB Business, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	35
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	19
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	NIAGARA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	ONEIDA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	1
	ONONDAGA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	18
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	ORANGE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	ORLEANS	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	OSWEGO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	PUTNAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	QUEENS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4

	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
RENSSELAER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	9
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
RICHMOND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ROCKLAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
SARATOGA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	13
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
SCHENECTADY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
STEUBEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
SUFFOLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
	YB Business, 806-821/851-866 MHz, Trunked	22
	GB Business, 806-821/851-866 MHz, Conventional	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	9
TOMPKINS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
ULSTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
WARREN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
WASHINGTON	GB Business, 806-821/851-866 MHz, Conventional	6
WAYNE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
WESTCHESTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	35
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WYOMING	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	20
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11

		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	17
		YB Business, 806-821/851-866 MHz, Trunked	13
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	37
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	15
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	SCHOHARIE	GB Business, 806-821/851-866 MHz, Conventional	2
	ST. LAWRENCE	GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	HERKIMER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
NY Total			1000
OH	ADAMS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	11
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	ALLEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	ASHLAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ASHTABULA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	ATHENS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	AUGLAIZE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BELMONT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	BROWN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	9
	BUTLER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	40
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	6

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CARROLL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
CHAMPAIGN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CLERMONT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	9
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
CLINTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
COLUMBIANA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
COSHOCTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
CRAWFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
CUYAHOGA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	12
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	18
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	11
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	12
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
DARKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	DELAWARE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	18
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	ERIE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	FAIRFIELD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	FAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	FRANKLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	22
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
		YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	13
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	FULTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	GALLIA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GEAUGA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GREENE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	GUERNSEY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
HAMILTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	30
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	36
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	9
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	14
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
HANCOCK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
HARDIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HARRISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
HENRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HIGHLAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
HOCKING	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
HOLMES	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
HURON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
JEFFERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
KNOX	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LAKE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
LAWRENCE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
LICKING	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	11
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
LOGAN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
LORAIN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
LUCAS	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	33
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MADISON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
MAHONING	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
MARION	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MEDINA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MEIGS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
MERCER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1

		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	MIAMI	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	MONROE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	21
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	7
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	MORGAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MORROW	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MUSKINGUM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	NOBLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	OTTAWA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	PAULDING	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	PERRY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	PICKAWAY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2

	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
PIKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
PORTAGE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
PREBLE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	9
PUTNAM	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
RICHLAND	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ROSS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SANDUSKY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
SCIOTO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
SENECA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SHELBY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
STARK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	25
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	17
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
SUMMIT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2

		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	15
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	21
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	25
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	TRUMBULL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	TUSCARAWAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	23
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	UNION	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	VAN WERT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	VINTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	WARREN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WASHINGTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	WAYNE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	WILLIAMS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WOOD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WYANDOT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1

		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	19
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	96
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	81
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	46
		YB Business, 806-821/851-866 MHz, Trunked	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	30
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	12
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	20
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	34
	DEFIANCE	GB Business, 806-821/851-866 MHz, Conventional	2
OH Total			2155
OK	ALFALFA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	ATOKA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BEAVER	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
	BECKHAM	GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BLAINE	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	BRYAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CADDO	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
	CANADIAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CARTER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CHEROKEE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	CIMARRON	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CLEVELAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COMANCHE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10

		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COTTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CRAIG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CREEK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	CUSTER	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	DELAWARE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GARFIELD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	21
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	GRADY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	GREER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	HARPER	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	HUGHES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	JACKSON	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	JEFFERSON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	JOHNSTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	KAY	GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	KINGFISHER	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	KIOWA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	LINCOLN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	LOGAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	LOVE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	MAJOR	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2

MARSHALL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MAYES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MCCLAIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
MURRAY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MUSKOGEE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NOBLE	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
OKFUSKEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
OKLAHOMA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	24
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	12
OKMULGEE	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
OSAGE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
OTTAWA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
PAWNEE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
PAYNE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	21
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
PITTSBURG	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
PONTOTOC	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
POTTAWATOMI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2

	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ROGERS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
SEMINOLE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
SEQUOYAH	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
STEPHENS	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
TEXAS	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
TILLMAN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TULSA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	15
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
	GB Business, 806-821/851-866 MHz, Conventional	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	9
WAGONER	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
WASHINGTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
WOODS	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
WOODWARD	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	21
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	19
PUSHMATAHA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
CHOCTAW	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
MCCURTAIN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
LE FLORE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LATIMER	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
HASKELL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ROGER MILLS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NOWATA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1

	COAL	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
OK Total			719
OR	BAKER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	BENTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CLACKAMAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	17
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	CLATSOP	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COLUMBIA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	CROOK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	DESCHUTES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	14
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	DOUGLAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	HARNEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	HOOD RIVER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	JEFFERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	JOSEPHINE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	KLAMATH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		GB Business, 806-821/851-866 MHz, Conventional	4
	LAKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	LANE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	LINCOLN	GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	LINN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	MALHEUR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	MARION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	9
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	MORROW	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	MULTNOMAH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	11
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	POLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	SHERMAN	GB Business, 806-821/851-866 MHz, Conventional	1
	UMATILLA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	UNION	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	27
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
		YB Business, 806-821/851-866 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	YAMHILL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	19
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	COOS	GB Business, 806-821/851-866 MHz, Conventional	2
OR Total			513
PA	ADAMS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	ALLEGHENY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	56
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
		YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	5

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
ARMSTRONG	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
BEAVER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
BEDFORD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
	YB Business, 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
BERKS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
BLAIR	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	6
BRADFORD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
BUCKS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
BUTLER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	GB Business, 806-821/851-866 MHz, Conventional	2
CAMBRIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
CAMERON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	25
CARBON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
CENTRE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	3
CHESTER	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	24
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	62
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	91
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CLARION	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
CLEARFIELD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
CLINTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
COLUMBIA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
CRAWFORD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
CUMBERLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1

DAUPHIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	31
	GB Business, 806-821/851-866 MHz, Conventional	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DELAWARE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
ELK	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
ERIE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YB Business, 806-821/851-866 MHz, Trunked	2
FAYETTE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
FOREST	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
FRANKLIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
FULTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
GREENE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HUNTINGDON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	2
INDIANA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
JEFFERSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
JUNIATA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
LACKAWANNA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
LANCASTER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	79
	GB Business, 806-821/851-866 MHz, Conventional	5
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
LAWRENCE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
LEBANON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
LEHIGH	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	4
LUZERNE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	20
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
LYCOMING	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
MCKEAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	34
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MERCER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
MIFFLIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	GB Business, 806-821/851-866 MHz, Conventional	12
MONROE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4

		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	24
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	6
	MONTOUR	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	2
	NORTHAMPTO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	NORTHUMBER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	PERRY	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	2
	PHILADELPHIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	7
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	PIKE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	POTTER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	37
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	SCHUYLKILL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
		GB Business, 806-821/851-866 MHz, Conventional	2
	SNYDER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	SOMERSET	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	4
	SULLIVAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		GB Business, 806-821/851-866 MHz, Conventional	3
	SUSQUEHANN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	TIOGA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	UNION	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	VENANGO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	WARREN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	33
	WASHINGTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	WAYNE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	WESTMORELA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	17
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	25

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	27
	WYOMING	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	YORK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	30
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
PA Total			1813
PR	AGUADA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	BAYAMON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	CAROLINA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3
	CAYEY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	COROZAL	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	FAJARDO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	GUAYAMA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3
	GUAYNABO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	3
	GURABO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	JAYUYA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	LUQUILLO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MARICAO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	OROCOVIS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	PENUELAS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	QUEBRADILLA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	RINCON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	RIO GRANDE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	SAN JUAN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	TOA BAJA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	UTUADO	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1

		GB Business, 806-821/851-866 MHz, Conventional	2
	VIEQUES	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	VILLALBA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YABUCOA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YAUCO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	(blank)	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	39
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	14
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	18
	PONCE	GB Business, 806-821/851-866 MHz, Conventional	2
	CANOVANAS	GB Business, 806-821/851-866 MHz, Conventional	1
	TOA ALTA	GB Business, 806-821/851-866 MHz, Conventional	1
	ISABELA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
PR Total			190
RI	BRISTOL	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	KENT	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	NEWPORT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	PROVIDENCE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	WASHINGTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	(blank)	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	1
RI Total			71
SC	ABBEVILLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	AIKEN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	ALLENDALE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ANDERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2

		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BAMBERG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BARNWELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	BEAUFORT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	BERKELEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	CALHOUN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	3
	CHARLESTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	29
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	14
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	13
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	14
	CHEROKEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHESTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CHESTERFIELI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	CLARENDON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	COLLETON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	DARLINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	8
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1

DILLON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GB Business, 806-821/851-866 MHz, Conventional	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
DORCHESTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
EDGEFIELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
FAIRFIELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
FLORENCE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	24
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
GEORGETOWN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
GREENVILLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
GREENWOOD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
HAMPTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
HORRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	25
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
JASPER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2

	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
KERSHAW	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
LANCASTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LAURENS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
LEE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LEXINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	11
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
MARION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MARLBORO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
MCCORMICK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
NEWBERRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
OCONEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
ORANGEBURG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
PICKENS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2

		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	RICHLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	16
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
		GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
	SALUDA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	SPARTANBURG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	SUMTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	UNION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WILLIAMSBUR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	YORK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	25
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	85
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	45
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	18
		YB Business, 806-821/851-866 MHz, Trunked	3
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	11
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	22
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	38
SC Total			1226
SD	AURORA	YB Business, 806-821/851-866 MHz, Trunked	3

	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
BROWN	YB Business, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
BUFFALO	YB Business, 806-821/851-866 MHz, Trunked	3
CLARK	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
CLAY	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DAVISON	YB Business, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	8
DAY	YB Business, 806-821/851-866 MHz, Trunked	3
DEUEL	YB Business, 806-821/851-866 MHz, Trunked	6
DOUGLAS	GB Business, 806-821/851-866 MHz, Conventional	4
EDMUNDS	GB Business, 806-821/851-866 MHz, Conventional	2
GRANT	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
HARDING	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HUGHES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YB Business, 806-821/851-866 MHz, Trunked	6
HUTCHINSON	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
KINGSBURY	GB Business, 806-821/851-866 MHz, Conventional	2
LAKE	YB Business, 806-821/851-866 MHz, Trunked	3
LYMAN	GB Business, 806-821/851-866 MHz, Conventional	2
MARSHALL	YB Business, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MCPHERSON	YB Business, 806-821/851-866 MHz, Trunked	3
MINNEHAHA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	12
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
PENNINGTON	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
ROBERTS	YB Business, 806-821/851-866 MHz, Trunked	3
STANLEY	GB Business, 806-821/851-866 MHz, Conventional	2
UNION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YB Business, 806-821/851-866 MHz, Trunked	3
WALWORTH	GB Business, 806-821/851-866 MHz, Conventional	2
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YB Business, 806-821/851-866 MHz, Trunked	27
	GB Business, 806-821/851-866 MHz, Conventional	23
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
YANKTON	YB Business, 806-821/851-866 MHz, Trunked	5
FAULK	YB Business, 806-821/851-866 MHz, Trunked	3
CHARLES MIX	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
BEADLE	YB Business, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	5
BROOKINGS	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
CORSON	GB Business, 806-821/851-866 MHz, Conventional	1
MOODY	GB Business, 806-821/851-866 MHz, Conventional	2
CODINGTON	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2

	SPINK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	SANBORN	GB Business, 806-821/851-866 MHz, Conventional	3
SD Total			225
TN	ANDERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	22
	BEDFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	BLEDSOE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	BLOUNT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GB Business, 806-821/851-866 MHz, Conventional	5
	BRADLEY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	CAMPBELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	CANNON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CARTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		GB Business, 806-821/851-866 MHz, Conventional	8
	COCKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	CUMBERLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	DAVIDSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	34
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	24
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	35
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	13
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	DICKSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	5
	DYER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	FAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	FRANKLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GIBSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	GILES	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GREENE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	HAMBLEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	HAMILTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	15
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	17
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	HARDEMAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	HAWKINS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1

	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HAYWOOD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HENDERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HENRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
HICKMAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
HUMPHREYS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
JEFFERSON	GB Business, 806-821/851-866 MHz, Conventional	2
JOHNSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
KNOX	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	17
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	4
LAKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
LAUDERDALE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
LAWRENCE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MADISON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	9
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	2
MARSHALL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
MAURY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MCMINN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
MCNAIRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
MEIGS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MOORE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
MORGAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
OBION	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
OVERTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
PERRY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
POLK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2

	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
PUTNAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YB Business, 806-821/851-866 MHz, Trunked	2
RHEA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
ROANE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
RUTHERFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
SEQUATCHIE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
SEVIER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SHELBY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	14
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	30
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	YB Business, 806-821/851-866 MHz, Trunked	14
	GB Business, 806-821/851-866 MHz, Conventional	47
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SULLIVAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	24
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
SUMNER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
TIPTON	GB Business, 806-821/851-866 MHz, Conventional	2
UNICOI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
WAYNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
WEAKLEY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
WILLIAMSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
WILSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1

		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	41
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	22
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	36
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	6
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	27
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
TN Total			983
TX	ANDERSON	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	1
	AUSTIN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
	BASTROP	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	4
	BEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	BEXAR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	47
		YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	17
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	41
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	19
	BLANCO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BOWIE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	BRAZORIA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	BRAZOS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	12
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2

BREWSTER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
BURNET	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
CALDWELL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
CALHOUN	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
CALLAHAN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
CAMERON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	15
	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CASS	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
CHAMBERS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	15
CHEROKEE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
COLLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	28
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
COMAL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
COMANCHE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CORYELL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
CULBERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
DALLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	38
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	25
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	31
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	19
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DENTON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	25
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
DIMMIT	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
DUVAL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2

	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ECTOR	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	12
EDWARDS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
EL PASO	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	21
	GB Business, 806-821/851-866 MHz, Conventional	39
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
ELLIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
ERATH	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
FAYETTE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
FLOYD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
FORT BEND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
FRANKLIN	GB Business, 806-821/851-866 MHz, Conventional	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
GALVESTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GRAY	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
GRAYSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
GREGG	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	3

	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HALL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
HAMILTON	GB Business, 806-821/851-866 MHz, Conventional	2
HARDIN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
HARRIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	13
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	30
	YB Business, 806-821/851-866 MHz, Trunked	4
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	21
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	24
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	14
HARRISON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	10
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
HAYS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
HENDERSON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
HIDALGO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	21
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
HOUSTON	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HOWARD	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
HUDSPETH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
HUNT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HUTCHINSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
JACKSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JASPER	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1

JEFFERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	25
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	6
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	8
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
JIM HOGG	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JIM WELLS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
JOHNSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
JONES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
KAUFMAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	6
KENT	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
KINNEY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
KLEBERG	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
KNOX	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LA SALLE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
LEE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
LIBERTY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
LIVE OAK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LLANO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
LUBBOCK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	23
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MADISON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MARTIN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MASON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
MATAGORDA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
MAVERICK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MCLENNAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5

MEDINA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MENARD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
MIDLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	10
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	33
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
MOORE	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
MORRIS	YB Business, 806-821/851-866 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NACOGDOCHE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
NAVARRO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
NEWTON	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
NOLAN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
NUECES	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
OLDHAM	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ORANGE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
PANOLA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
PARKER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
PECOS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
POLK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
POTTER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
RANDALL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3

REFUGIO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
ROBERTSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
ROCKWALL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
SAN PATRICIO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
SHELBY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
SHERMAN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
SMITH	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	32
	GB Business, 806-821/851-866 MHz, Conventional	4
STARR	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TARRANT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	13
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	16
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	9
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	8
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
TAYLOR	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	8
TOM GREEN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
TRAVIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	21
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	51
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	13
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	22
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	27
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	7
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	11
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
TRINITY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TYLER	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
UPSHUR	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
UPTON	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	20
UVALDE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
VAL VERDE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
VICTORIA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3

	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WALKER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WALLER	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
WASHINGTON	GB Business, 806-821/851-866 MHz, Conventional	2
WEBB	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	10
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
WICHITA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2
WILLACY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
WILLIAMSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
WILSON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
WISE	YB Business, 806-821/851-866 MHz, Trunked	4
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
WOOD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
ZAPATA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
ZAVALA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	23
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	22
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	73
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	15
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	39
	YB Business, 806-821/851-866 MHz, Trunked	25
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	11
	GB Business, 806-821/851-866 MHz, Conventional	64
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	27
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	37
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	79
TITUS	YB Business, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
JACK	YB Business, 806-821/851-866 MHz, Trunked	8
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
VAN ZANDT	YB Business, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
ANDREWS	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	2

		GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
	HOOD	YB Business, 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	COKE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CROSBY	YB Business, 806-821/851-866 MHz, Trunked	2
	HALE	YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	1
	WARD	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	TERRY	YB Business, 806-821/851-866 MHz, Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	STONEWALL	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CHILDRESS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	SHACKELFORD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	FOARD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	SUTTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	THROCKMORT	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	KARNES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	COLEMAN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GONZALES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	PRESIDIO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	CROCKETT	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WILBARGER	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	STERLING	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	RUSK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
	COLORADO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BROOKS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ARANSAS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	FRIO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	JEFF DAVIS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	DICKENS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	WHEELER	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	DONLEY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	EASTLAND	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	REAGAN	GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ATASCOSA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	REEVES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	KIMBLE	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GOLIAD	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	YOAKUM	GB Business, 806-821/851-866 MHz, Conventional	3
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2

	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
WINKLER	GB Business, 806-821/851-866 MHz, Conventional	4
HOCKLEY	GB Business, 806-821/851-866 MHz, Conventional	3
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
BAILEY	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
GAINES	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
YOUNG	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
COOKE	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
PALO PINTO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
BAYLOR	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MONTAGUE	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
LIMESTONE	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
HEMPHILL	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
WHARTON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
CRANE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
MILAM	GB Business, 806-821/851-866 MHz, Conventional	2
SCHLEICHER	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
GILLESPIE	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
LAMB	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
BORDEN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
CARSON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
HANSFORD	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
OCHILTREE	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	13
GRIMES	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
FREESTONE	GB Business, 806-821/851-866 MHz, Conventional	2
BURLESON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
LIPSCOMB	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
PARMER	GB Business, 806-821/851-866 MHz, Conventional	2
SCURRY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	12
DEAF SMITH	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
CASTRO	GB Business, 806-821/851-866 MHz, Conventional	2
FALLS	GB Business, 806-821/851-866 MHz, Conventional	2
MCCULLOCH	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
KERR	GB Business, 806-821/851-866 MHz, Conventional	2
ANGELINA	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1

	GLASSCOCK	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	COCHRAN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	DALLAM	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GARZA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	SWISHER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TX Total			2916
US	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	22
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
US Total			36
UT	BEAVER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BOX ELDER	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	CACHE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CARBON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	DAGGETT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	DAVIS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	18
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	DUCHESNE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	EMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	GARFIELD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GRAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	IRON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	JUAB	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1

	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
KANE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
MILLARD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
MORGAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
RICH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
SALT LAKE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	54
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	53
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	31
	YB Business, 806-821/851-866 MHz, Trunked	7
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	7
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
SAN JUAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
SANPETE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SEVIER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	2
SUMMIT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
TOOELE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
UINTAH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GB Business, 806-821/851-866 MHz, Conventional	4
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
UTAH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	24
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	33
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	3
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
WASATCH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	12
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	WEBER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YB Business, 806-821/851-866 MHz, Trunked	5
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
UT Total			613
VA	ACCOMACK	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	ALBEMARLE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ALLEGHANY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
	AMHERST	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	APPOMATTOX	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	ARLINGTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	5
	AUGUSTA	GB Business, 806-821/851-866 MHz, Conventional	2
	BATH	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	BEDFORD	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BLAND	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	BUCHANAN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CAMPBELL	YB Business, 806-821/851-866 MHz, Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	CARROLL	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	CHESAPEAKE (	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	CHESTERFIEL	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	7

	YB Business, 806-821/851-866 MHz, Trunked	6
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
COLONIAL HE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
CULPEPER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
FAIRFAX	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	14
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	11
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	11
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
FAIRFAX CITY	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
FAUQUIER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	GB Business, 806-821/851-866 MHz, Conventional	1
FRANKLIN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
FREDERICK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YB Business, 806-821/851-866 MHz, Trunked	2
FREDERICKSB	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
GILES	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
GLOUCESTER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
GOOCHLAND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
GRAYSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
HAMPTON CIT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
HANOVER	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	56
HENRICO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	3
HENRY	GB Business, 806-821/851-866 MHz, Conventional	2
HOPEWELL CI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
LOUDOUN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	5
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	27
LOUISA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
MADISON	GB Business, 806-821/851-866 MHz, Conventional	4
MONTGOMERY	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
NELSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
NEWPORT NEV	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1

	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	GB Business, 806-821/851-866 MHz, Conventional	2
NORFOLK CIT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	GB Business, 806-821/851-866 MHz, Conventional	2
NORTHAMPTO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
PATRICK	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
PETERSBURG	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
PITTSYLVANIA	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
PORTSMOUTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
PRINCE WILLI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	13
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	10
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
PULASKI	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
RAPPAHANNO	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
RICHMOND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
RICHMOND CI	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
ROANOKE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YB Business, 806-821/851-866 MHz, Trunked	2
ROANOKE CIT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
ROCKINGHAM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	11
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
RUSSELL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
SMYTH	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SPOTSYLVANI	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
SUFFOLK CITY	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
SURRY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SUSSEX	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
TAZEWELL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
VIRGINIA BEA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
WARREN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WASHINGTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
WILLIAMSBUR	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
WYTHE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1

		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	YORK	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	53
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	16
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	34
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	68
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	20
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	41
		YB Business, 806-821/851-866 MHz, Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	28
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	11
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	18
	BOTETOURT	YB Business, 806-821/851-866 MHz, Trunked	2
	SHENANDOAH	YB Business, 806-821/851-866 MHz, Trunked	2
	NORTON CITY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	DICKENSON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	LYNCHBURG C	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ALEXANDRIA (	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
VA Total			891
VI	ST. CROIX	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	(blank)	GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	ST. THOMAS	GB Business, 806-821/851-866 MHz, Conventional	2
VI Total			13
VT	FRANKLIN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
VT Total			8
WA	ADAMS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
	ASOTIN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	BENTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	10
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	15
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		YB Business, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	10
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	CHELAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	27
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	CLALLAM	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	8
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2

CLARK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	7
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
COLUMBIA	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
COWLITZ	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
DOUGLAS	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
FERRY	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	20
FRANKLIN	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	2
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
GARFIELD	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	YB Business, 806-821/851-866 MHz, Trunked	46
GRANT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	12
	GB Business, 806-821/851-866 MHz, Conventional	4
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
GRAYS HARBO	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
ISLAND	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	GB Business, 806-821/851-866 MHz, Conventional	1
JEFFERSON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	5
	YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	8
KING	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	4
	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	13
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	42
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	76

		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	65
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	14
		GB Business, 806-821/851-866 MHz, Conventional	20
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	28
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	49
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	18
	KITSAP	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	14
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	KITTITAS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	KLICKITAT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	6
	LEWIS	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	2
	LINCOLN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	MASON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	12
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	OKANOGAN	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	2
	PACIFIC	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
	PEND OREILLE	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	4
	PIERCE	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	14
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	34
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	2
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	SAN JUAN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	8
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	SKAGIT	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2

		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	SKAMANIA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	SNOHOMISH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	19
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	18
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	25
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	13
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7
	SPOKANE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	14
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	7
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	18
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	STEVENS	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	THURSTON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	4
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	WALLA WALLA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	WHATCOM	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	7
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	WHITMAN	YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	5
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	162
	YAKIMA	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	4
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	6
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	7
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	20
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12

		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	21
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	70
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	77
		YB Business, 806-821/851-866 MHz, Trunked	8
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	19
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	21
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	13
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
WA Total			1689
WI	BROWN	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	12
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		YB Business, 806-821/851-866 MHz, Trunked	7
		GB Business, 806-821/851-866 MHz, Conventional	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
	BUFFALO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CALUMET	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	CHIPPEWA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
	COLUMBIA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	CRAWFORD	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	DANE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	15
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	16
		YB Business, 806-821/851-866 MHz, Trunked	8
		GB Business, 806-821/851-866 MHz, Conventional	38
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	15
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	DODGE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	DOUGLAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
	DUNN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		GB Business, 806-821/851-866 MHz, Conventional	1
	FOND DU LAC	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	6
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	GRANT	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	10
		GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
	GREEN	GB Business, 806-821/851-866 MHz, Conventional	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4

GREEN LAKE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4 2
IOWA	GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2 4
JACKSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 2
JEFFERSON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2 2 2
JUNEAU	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5 2 1
KENOSHA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. GB Business, 806-821/851-866 MHz, Conventional	3 2 4
KEWAUNEE	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	2
LA CROSSE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3 2 4
LAFAYETTE	GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2 2
LANGLADE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2 2
LINCOLN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2 2
MANITOWOC	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. GB Business, 806-821/851-866 MHz, Conventional	2 1
MARATHON	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4 2 2
MARINETTE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	5
MARQUETTE	GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2 2
MENOMINEE	GB Business, 806-821/851-866 MHz, Conventional	2
MILWAUKEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked GB Business, 806-821/851-866 MHz, Conventional GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	17 16 24 3 25 2
MONROE	GB Business, 806-821/851-866 MHz, Conventional YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4 3
ONEIDA	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
OUTAGAMIE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YB Business, 806-821/851-866 MHz, Trunked GB Business, 806-821/851-866 MHz, Conventional	7 2 3
OZAUKEE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4 3 4
PIERCE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
POLK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	7 2 4 2
PORTAGE	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv. GB Business, 806-821/851-866 MHz, Conventional	2 2

RACINE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	8
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
RICHLAND	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
ROCK	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	6
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
SAUK	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	7
	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	16
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
SAWYER	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
SHAWANO	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
SHEBOYGAN	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	4
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	9
	GB Business, 806-821/851-866 MHz, Conventional	6
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
ST. CROIX	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
VILAS	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
WALWORTH	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	11
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
WASHINGTON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	GB Business, 806-821/851-866 MHz, Conventional	9
WAUKESHA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	7
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	1
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	10
	GB Business, 806-821/851-866 MHz, Conventional	18
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
WAUPACA	GB Business, 806-821/851-866 MHz, Conventional	2
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
WAUSHARA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
WINNEBAGO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	8
	GB Business, 806-821/851-866 MHz, Conventional	5
WOOD	YB Business, 806-821/851-866 MHz, Trunked	2
	GB Business, 806-821/851-866 MHz, Conventional	4
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	9
	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	13
	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	19
	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	YB Business, 806-821/851-866 MHz, Trunked	7
	GB Business, 806-821/851-866 MHz, Conventional	42
	GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	1
	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1

		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
WI Total			812
WV	BERKELEY	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	BOONE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	BRAXTON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	BROOKE	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	CABELL	GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	CLAY	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	FAYETTE	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	GRANT	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	3
	GREENBRIER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	HAMPSHIRE	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	1
	HARDY	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	HARRISON	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	JACKSON	GB Business, 806-821/851-866 MHz, Conventional	3
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	JEFFERSON	GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	1
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	3
	KANAWHA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YB Business, 806-821/851-866 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	8
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	10
	LINCOLN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	LOGAN	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MARSHALL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	1
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MASON	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	MCDOWELL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
	MERCER	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	MINGO	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	6
	MONONGALIA	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	MORGAN	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	OHIO	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	5
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	2
	PLEASANTS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	PRESTON	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	PUTNAM	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	TAYLOR	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	TUCKER	YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	2
	UPSHUR	GB Business, 806-821/851-866 MHz, Conventional	2
	WAYNE	GB Business, 806-821/851-866 MHz, Conventional	2
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
	WOOD	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
	WYOMING	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4

	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	4
		YB Business, 806-821/851-866 MHz, Trunked	1
		GB Business, 806-821/851-866 MHz, Conventional	7
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	SUMMERS	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	WETZEL	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	1
	DODDRIDGE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
WV Total			160
WY	BIG HORN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CAMPBELL	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	10
	CARBON	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CONVERSE	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	CROOK	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	3
	FREMONT	YB Business, 806-821/851-866 MHz, Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	6
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	8
	GOSHEN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	JOHNSON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	LARAMIE	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	2
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	6
		GB Business, 806-821/851-866 MHz, Conventional	10
	LINCOLN	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	15
	NATRONA	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	5
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	4
	NIOBRARA	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	1
	PARK	GB Business, 806-821/851-866 MHz, Conventional	2
	PLATTE	GB Business, 806-821/851-866 MHz, Conventional	1
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	2
	SUBLETTE	GB Business, 806-821/851-866 MHz, Conventional	2
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	SWEETWATER	GB Business, 806-821/851-866 MHz, Conventional	8
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	4
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	11
	TETON	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	1
		GB Business, 806-821/851-866 MHz, Conventional	2
	UINTA	YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	2
		GB Business, 806-821/851-866 MHz, Conventional	4
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	7
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
	WESTON	GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	6
	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	3
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	3
		GB Business, 806-821/851-866 MHz, Conventional	6
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	3
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	5
WY Total			176
(blank)	(blank)	GE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Conv	94

		GF Public Safety Ntl Plan, 821-824/866-869 MHz, Conv.	29
		GP Public Safety/Spec Emerg, 806-821/851-866 MHz, Conv.	82
		YE PubSafty/SpecEmer/PubSaftyNtlPlan,806-817/851-862MHz,Trunked	240
		YF Public Safety Ntl Plan, 821-824/866-869 MHz, Trunked	25
		YP Public Safety/Spec Emerg, 806-821/851-866 MHz, Trunked	37
		YB Business, 806-821/851-866 MHz, Trunked	2
		YJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Trunked	4
		GB Business, 806-821/851-866 MHz, Conventional	108
		GJ Business/Industrial/Land Trans, 809-824/854-869 MHz, Conv.	67
		YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	26
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	83
(blank) Total			797
GM	(blank)	YO Other Indust/Land Transp. 806-821/851-866 MHz, Trunked	5
		GO Other Indust/Land Transp, 806-821/851-866 MHz, Conv.	30
GM Total			35
Grand Total			48871

4.9 Licenses

Location State	Location Coun	Radio Service	Total
AK	KENAI PENINS	PA Public Safety 4940-4990 MHz Band	6
	MATANUSKA-S	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	4
AK Total			12
AL	ETOWAH	PA Public Safety 4940-4990 MHz Band	2
	HOUSTON	PA Public Safety 4940-4990 MHz Band	1
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	4
	LAUDERDALE	PA Public Safety 4940-4990 MHz Band	2
	LIMESTONE	PA Public Safety 4940-4990 MHz Band	2
	MACON	PA Public Safety 4940-4990 MHz Band	2
	MADISON	PA Public Safety 4940-4990 MHz Band	6
	MOBILE	PA Public Safety 4940-4990 MHz Band	4
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	MORGAN	PA Public Safety 4940-4990 MHz Band	2
	SHELBY	PA Public Safety 4940-4990 MHz Band	
	TALLADEGA	PA Public Safety 4940-4990 MHz Band	4
	TUSCALOOSA	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	6
AL Total			41
AR	BENTON	PA Public Safety 4940-4990 MHz Band	2
	PIKE	PA Public Safety 4940-4990 MHz Band	3
	SALINE	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	2
AR Total			11
AZ	APACHE	PA Public Safety 4940-4990 MHz Band	
	COCHISE	PA Public Safety 4940-4990 MHz Band	15
	COCONINO	PA Public Safety 4940-4990 MHz Band	4
	GILA	PA Public Safety 4940-4990 MHz Band	3
	GRAHAM	PA Public Safety 4940-4990 MHz Band	2
	GREENLEE	PA Public Safety 4940-4990 MHz Band	4
	MARICOPA	PA Public Safety 4940-4990 MHz Band	22
	MOHAVE	PA Public Safety 4940-4990 MHz Band	16
	NAVAJO	PA Public Safety 4940-4990 MHz Band	2
	PIMA	PA Public Safety 4940-4990 MHz Band	8
	PINAL	PA Public Safety 4940-4990 MHz Band	14
	SANTA CRUZ	PA Public Safety 4940-4990 MHz Band	4
	YAVAPAI	PA Public Safety 4940-4990 MHz Band	25
	YUMA	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	4
AZ Total			127
CA	ALAMEDA	PA Public Safety 4940-4990 MHz Band	16
	ALPINE	PA Public Safety 4940-4990 MHz Band	1
	AMADOR	PA Public Safety 4940-4990 MHz Band	5

	BUTTE	PA Public Safety 4940-4990 MHz Band	2
	CALAVERAS	PA Public Safety 4940-4990 MHz Band	2
	CONTRA COST	PA Public Safety 4940-4990 MHz Band	8
	FRESNO	PA Public Safety 4940-4990 MHz Band	6
	IMPERIAL	PA Public Safety 4940-4990 MHz Band	2
	KERN	PA Public Safety 4940-4990 MHz Band	4
	LAKE	PA Public Safety 4940-4990 MHz Band	10
	LOS ANGELES	PA Public Safety 4940-4990 MHz Band	89
	MADERA	PA Public Safety 4940-4990 MHz Band	2
	MARIN	PA Public Safety 4940-4990 MHz Band	2
	MONTEREY	PA Public Safety 4940-4990 MHz Band	8
	ORANGE	PA Public Safety 4940-4990 MHz Band	8
	PLACER	PA Public Safety 4940-4990 MHz Band	2
	PLUMAS	PA Public Safety 4940-4990 MHz Band	2
	RIVERSIDE	PA Public Safety 4940-4990 MHz Band	16
	SACRAMENTO	PA Public Safety 4940-4990 MHz Band	8
	SAN BENITO	PA Public Safety 4940-4990 MHz Band	2
	SAN BERNARD	PA Public Safety 4940-4990 MHz Band	6
	SAN DIEGO	PA Public Safety 4940-4990 MHz Band	17
	SAN FRANCISC	PA Public Safety 4940-4990 MHz Band	6
	SAN JOAQUIN	PA Public Safety 4940-4990 MHz Band	12
	SAN LUIS OBI	PA Public Safety 4940-4990 MHz Band	1
	SAN MATEO	PA Public Safety 4940-4990 MHz Band	9
	SANTA CLARA	PA Public Safety 4940-4990 MHz Band	2
	SANTA CRUZ	PA Public Safety 4940-4990 MHz Band	4
	SHASTA	PA Public Safety 4940-4990 MHz Band	2
	SOLANO	PA Public Safety 4940-4990 MHz Band	4
	SONOMA	PA Public Safety 4940-4990 MHz Band	2
	STANISLAUS	PA Public Safety 4940-4990 MHz Band	2
	SUTTER	PA Public Safety 4940-4990 MHz Band	2
	TULARE	PA Public Safety 4940-4990 MHz Band	12
	VENTURA	PA Public Safety 4940-4990 MHz Band	8
	YOLO	PA Public Safety 4940-4990 MHz Band	24
	(blank)	PA Public Safety 4940-4990 MHz Band	10
CA Total			318
CO	ADAMS	PA Public Safety 4940-4990 MHz Band	8
	ALAMOSA	PA Public Safety 4940-4990 MHz Band	2
	ARAPAHOE	PA Public Safety 4940-4990 MHz Band	21
	BOULDER	PA Public Safety 4940-4990 MHz Band	6
	BROOMFIELD	PA Public Safety 4940-4990 MHz Band	2
	CLEAR CREEK	PA Public Safety 4940-4990 MHz Band	4
	DELTA	PA Public Safety 4940-4990 MHz Band	2
	DENVER	PA Public Safety 4940-4990 MHz Band	5
	DOUGLAS	PA Public Safety 4940-4990 MHz Band	21
	EAGLE	PA Public Safety 4940-4990 MHz Band	2
	EL PASO	PA Public Safety 4940-4990 MHz Band	4
	ELBERT	PA Public Safety 4940-4990 MHz Band	1
	FREMONT	PA Public Safety 4940-4990 MHz Band	7
	GARFIELD	PA Public Safety 4940-4990 MHz Band	2

	GUNNISON	PA Public Safety 4940-4990 MHz Band	2
	HINSDALE	PA Public Safety 4940-4990 MHz Band	2
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	13
	LA PLATA	PA Public Safety 4940-4990 MHz Band	2
	LARIMER	PA Public Safety 4940-4990 MHz Band	8
	LAS ANIMAS	PA Public Safety 4940-4990 MHz Band	4
	LOGAN	PA Public Safety 4940-4990 MHz Band	2
	MESA	PA Public Safety 4940-4990 MHz Band	2
	MONTROSE	PA Public Safety 4940-4990 MHz Band	4
	MORGAN	PA Public Safety 4940-4990 MHz Band	2
	OURAY	PA Public Safety 4940-4990 MHz Band	2
	PITKIN	PA Public Safety 4940-4990 MHz Band	2
	SAN MIGUEL	PA Public Safety 4940-4990 MHz Band	2
	TELLER	PA Public Safety 4940-4990 MHz Band	2
	WELD	PA Public Safety 4940-4990 MHz Band	4
	YUMA	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	6
CO Total			148
CT	HARTFORD	PA Public Safety 4940-4990 MHz Band	4
	MIDDLESEX	PA Public Safety 4940-4990 MHz Band	4
	NEW HAVEN	PA Public Safety 4940-4990 MHz Band	6
	NEW LONDON	PA Public Safety 4940-4990 MHz Band	9
	(blank)	PA Public Safety 4940-4990 MHz Band	8
CT Total			31
DC	(blank)	PA Public Safety 4940-4990 MHz Band	2
DC Total			2
DE	(blank)	PA Public Safety 4940-4990 MHz Band	2
DE Total			2
FL	ALACHUA	PA Public Safety 4940-4990 MHz Band	2
	BAY	PA Public Safety 4940-4990 MHz Band	2
	BRADFORD	PA Public Safety 4940-4990 MHz Band	7
	BREVARD	PA Public Safety 4940-4990 MHz Band	5
	BROWARD	PA Public Safety 4940-4990 MHz Band	6
	CHARLOTTE	PA Public Safety 4940-4990 MHz Band	2
	CITRUS	PA Public Safety 4940-4990 MHz Band	2
	COLLIER	PA Public Safety 4940-4990 MHz Band	2
	COLUMBIA	PA Public Safety 4940-4990 MHz Band	7
	DESOTO	PA Public Safety 4940-4990 MHz Band	2
	DUVAL	PA Public Safety 4940-4990 MHz Band	2
	ESCAMBIA	PA Public Safety 4940-4990 MHz Band	2
	GADSDEN	PA Public Safety 4940-4990 MHz Band	2
	GLADES	PA Public Safety 4940-4990 MHz Band	2
	HARDEE	PA Public Safety 4940-4990 MHz Band	2
	HILLSBOROUG	PA Public Safety 4940-4990 MHz Band	6
	INDIAN RIVER	PA Public Safety 4940-4990 MHz Band	2
	LAKE	PA Public Safety 4940-4990 MHz Band	2
	LEE	PA Public Safety 4940-4990 MHz Band	15
	LEON	PA Public Safety 4940-4990 MHz Band	2
	MANATEE	PA Public Safety 4940-4990 MHz Band	4

	MARION	PA Public Safety 4940-4990 MHz Band	2
	MARTIN	PA Public Safety 4940-4990 MHz Band	2
	MIAMI-DADE	PA Public Safety 4940-4990 MHz Band	4
	ORANGE	PA Public Safety 4940-4990 MHz Band	14
	OSCEOLA	PA Public Safety 4940-4990 MHz Band	2
	PALM BEACH	PA Public Safety 4940-4990 MHz Band	7
	PASCO	PA Public Safety 4940-4990 MHz Band	2
	PINELLAS	PA Public Safety 4940-4990 MHz Band	22
	POLK	PA Public Safety 4940-4990 MHz Band	7
	SARASOTA	PA Public Safety 4940-4990 MHz Band	2
	SEMINOLE	PA Public Safety 4940-4990 MHz Band	2
	ST. LUCIE	PA Public Safety 4940-4990 MHz Band	4
	SUMTER	PA Public Safety 4940-4990 MHz Band	2
	VOLUSIA	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	3
FL Total			157
GA	BARTOW	PA Public Safety 4940-4990 MHz Band	2
	BIBB	PA Public Safety 4940-4990 MHz Band	1
	CAMDEN	PA Public Safety 4940-4990 MHz Band	2
	CATOOSA	PA Public Safety 4940-4990 MHz Band	2
	CHATHAM	PA Public Safety 4940-4990 MHz Band	4
	CHEROKEE	PA Public Safety 4940-4990 MHz Band	4
	CLAYTON	PA Public Safety 4940-4990 MHz Band	4
	COBB	PA Public Safety 4940-4990 MHz Band	4
	COLQUITT	PA Public Safety 4940-4990 MHz Band	2
	COLUMBIA	PA Public Safety 4940-4990 MHz Band	2
	COWETA	PA Public Safety 4940-4990 MHz Band	2
	DADE	PA Public Safety 4940-4990 MHz Band	2
	DEKALB	PA Public Safety 4940-4990 MHz Band	4
	FAYETTE	PA Public Safety 4940-4990 MHz Band	6
	FORSYTH	PA Public Safety 4940-4990 MHz Band	2
	FULTON	PA Public Safety 4940-4990 MHz Band	12
	GLYNN	PA Public Safety 4940-4990 MHz Band	2
	GORDON	PA Public Safety 4940-4990 MHz Band	2
	GWINNETT	PA Public Safety 4940-4990 MHz Band	2
	HALL	PA Public Safety 4940-4990 MHz Band	2
	HENRY	PA Public Safety 4940-4990 MHz Band	2
	HOUSTON	PA Public Safety 4940-4990 MHz Band	2
	LOWNDES	PA Public Safety 4940-4990 MHz Band	2
	MCDUFFIE	PA Public Safety 4940-4990 MHz Band	2
	NEWTON	PA Public Safety 4940-4990 MHz Band	2
	ROCKDALE	PA Public Safety 4940-4990 MHz Band	4
	TATTNALL	PA Public Safety 4940-4990 MHz Band	6
	WALKER	PA Public Safety 4940-4990 MHz Band	2
GA Total			85
GU	(blank)	PA Public Safety 4940-4990 MHz Band	2
GU Total			2
HI	HAWAII	PA Public Safety 4940-4990 MHz Band	2
	HONOLULU	PA Public Safety 4940-4990 MHz Band	2

	(blank)	PA Public Safety 4940-4990 MHz Band	2
HI Total			6
IA	APPANOOSE	PA Public Safety 4940-4990 MHz Band	2
	BLACK HAWK	PA Public Safety 4940-4990 MHz Band	4
	BREMER	PA Public Safety 4940-4990 MHz Band	2
	CERRO GORDO	PA Public Safety 4940-4990 MHz Band	2
	DALLAS	PA Public Safety 4940-4990 MHz Band	7
	DAVIS	PA Public Safety 4940-4990 MHz Band	2
	DELAWARE	PA Public Safety 4940-4990 MHz Band	2
	DES MOINES	PA Public Safety 4940-4990 MHz Band	4
	DUBUQUE	PA Public Safety 4940-4990 MHz Band	2
	FLOYD	PA Public Safety 4940-4990 MHz Band	2
	HARDIN	PA Public Safety 4940-4990 MHz Band	2
	HENRY	PA Public Safety 4940-4990 MHz Band	2
	HOWARD	PA Public Safety 4940-4990 MHz Band	2
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	2
	JOHNSON	PA Public Safety 4940-4990 MHz Band	4
	KEOKUK	PA Public Safety 4940-4990 MHz Band	2
	LEE	PA Public Safety 4940-4990 MHz Band	2
	LINN	PA Public Safety 4940-4990 MHz Band	4
	LOUISA	PA Public Safety 4940-4990 MHz Band	2
	LUCAS	PA Public Safety 4940-4990 MHz Band	2
	MAHASKA	PA Public Safety 4940-4990 MHz Band	2
	MARION	PA Public Safety 4940-4990 MHz Band	2
	MARSHALL	PA Public Safety 4940-4990 MHz Band	2
	MONROE	PA Public Safety 4940-4990 MHz Band	2
	MUSCATINE	PA Public Safety 4940-4990 MHz Band	2
	PLYMOUTH	PA Public Safety 4940-4990 MHz Band	2
	POCAHONTAS	PA Public Safety 4940-4990 MHz Band	2
	POLK	PA Public Safety 4940-4990 MHz Band	3
	POWESHIEK	PA Public Safety 4940-4990 MHz Band	3
	SCOTT	PA Public Safety 4940-4990 MHz Band	8
	TAMA	PA Public Safety 4940-4990 MHz Band	2
	VAN BUREN	PA Public Safety 4940-4990 MHz Band	2
	WAPELLO	PA Public Safety 4940-4990 MHz Band	2
	WARREN	PA Public Safety 4940-4990 MHz Band	3
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	WAYNE	PA Public Safety 4940-4990 MHz Band	2
	WOODBURY	PA Public Safety 4940-4990 MHz Band	16
IA Total			110
ID	ADA	PA Public Safety 4940-4990 MHz Band	6
	ADAMS	PA Public Safety 4940-4990 MHz Band	8
	BANNOCK	PA Public Safety 4940-4990 MHz Band	4
	BEAR LAKE	PA Public Safety 4940-4990 MHz Band	5
	BENEWAH	PA Public Safety 4940-4990 MHz Band	4
	BINGHAM	PA Public Safety 4940-4990 MHz Band	8
	BLAINE	PA Public Safety 4940-4990 MHz Band	7
	BOISE	PA Public Safety 4940-4990 MHz Band	1
	BONNER	PA Public Safety 4940-4990 MHz Band	6

	CAMAS	PA Public Safety 4940-4990 MHz Band	2
	CANYON	PA Public Safety 4940-4990 MHz Band	9
	CARIBOU	PA Public Safety 4940-4990 MHz Band	4
	CASSIA	PA Public Safety 4940-4990 MHz Band	10
	CLARK	PA Public Safety 4940-4990 MHz Band	3
	CUSTER	PA Public Safety 4940-4990 MHz Band	5
	ELMORE	PA Public Safety 4940-4990 MHz Band	12
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	3
	FREMONT	PA Public Safety 4940-4990 MHz Band	4
	GEM	PA Public Safety 4940-4990 MHz Band	5
	GOODING	PA Public Safety 4940-4990 MHz Band	3
	IDAHO	PA Public Safety 4940-4990 MHz Band	8
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	7
	JEROME	PA Public Safety 4940-4990 MHz Band	6
	KOOTENAI	PA Public Safety 4940-4990 MHz Band	7
	LEMHI	PA Public Safety 4940-4990 MHz Band	5
	LEWIS	PA Public Safety 4940-4990 MHz Band	2
	LINCOLN	PA Public Safety 4940-4990 MHz Band	11
	MADISON	PA Public Safety 4940-4990 MHz Band	5
	MINIDOKA	PA Public Safety 4940-4990 MHz Band	5
	NEZ PERCE	PA Public Safety 4940-4990 MHz Band	2
	ONEIDA	PA Public Safety 4940-4990 MHz Band	5
	OWYHEE	PA Public Safety 4940-4990 MHz Band	3
	PAYETTE	PA Public Safety 4940-4990 MHz Band	7
	POWER	PA Public Safety 4940-4990 MHz Band	6
	TETON	PA Public Safety 4940-4990 MHz Band	6
	TWIN FALLS	PA Public Safety 4940-4990 MHz Band	3
	VALLEY	PA Public Safety 4940-4990 MHz Band	8
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	4
ID Total			213
IL	BOONE	PA Public Safety 4940-4990 MHz Band	2
	BROWN	PA Public Safety 4940-4990 MHz Band	2
	CHAMPAIGN	PA Public Safety 4940-4990 MHz Band	4
	CLARK	PA Public Safety 4940-4990 MHz Band	2
	COOK	PA Public Safety 4940-4990 MHz Band	65
	DEKALB	PA Public Safety 4940-4990 MHz Band	2
	DUPAGE	PA Public Safety 4940-4990 MHz Band	11
	EFFINGHAM	PA Public Safety 4940-4990 MHz Band	2
	FULTON	PA Public Safety 4940-4990 MHz Band	2
	GRUNDY	PA Public Safety 4940-4990 MHz Band	5
	KANE	PA Public Safety 4940-4990 MHz Band	12
	KANKAKEE	PA Public Safety 4940-4990 MHz Band	2
	KENDALL	PA Public Safety 4940-4990 MHz Band	8
	KNOX	PA Public Safety 4940-4990 MHz Band	3
	LAKE	PA Public Safety 4940-4990 MHz Band	13
	LAWRENCE	PA Public Safety 4940-4990 MHz Band	2
	LOGAN	PA Public Safety 4940-4990 MHz Band	2
	MCDONOUGH	PA Public Safety 4940-4990 MHz Band	2

	OGLE	PA Public Safety 4940-4990 MHz Band	2
	PEORIA	PA Public Safety 4940-4990 MHz Band	2
	ROCK ISLAND	PA Public Safety 4940-4990 MHz Band	4
	SANGAMON	PA Public Safety 4940-4990 MHz Band	2
	ST. CLAIR	PA Public Safety 4940-4990 MHz Band	7
	TAZEWELL	PA Public Safety 4940-4990 MHz Band	2
	WILL	PA Public Safety 4940-4990 MHz Band	23
	WINNEBAGO	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	6
IL Total			193
IN	ADAMS	PA Public Safety 4940-4990 MHz Band	2
	ALLEN	PA Public Safety 4940-4990 MHz Band	4
	BARTHOLOMEW	PA Public Safety 4940-4990 MHz Band	2
	CASS	PA Public Safety 4940-4990 MHz Band	2
	DE KALB	PA Public Safety 4940-4990 MHz Band	1
	DELAWARE	PA Public Safety 4940-4990 MHz Band	2
	FLOYD	PA Public Safety 4940-4990 MHz Band	2
	GRANT	PA Public Safety 4940-4990 MHz Band	2
	HAMILTON	PA Public Safety 4940-4990 MHz Band	2
	HARRISON	PA Public Safety 4940-4990 MHz Band	2
	HENDRICKS	PA Public Safety 4940-4990 MHz Band	4
	HUNTINGTON	PA Public Safety 4940-4990 MHz Band	3
	JASPER	PA Public Safety 4940-4990 MHz Band	
	KOSCIUSKO	PA Public Safety 4940-4990 MHz Band	2
	LA PORTE	PA Public Safety 4940-4990 MHz Band	2
	MARION	PA Public Safety 4940-4990 MHz Band	2
	MIAMI	PA Public Safety 4940-4990 MHz Band	2
	ST. JOSEPH	PA Public Safety 4940-4990 MHz Band	2
	STEUBEN	PA Public Safety 4940-4990 MHz Band	9
	TIPPECANOE	PA Public Safety 4940-4990 MHz Band	2
	TIPTON	PA Public Safety 4940-4990 MHz Band	2
	VANDERBURG	PA Public Safety 4940-4990 MHz Band	2
	VIGO	PA Public Safety 4940-4990 MHz Band	2
	WELLS	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	3
IN Total			60
KS	COFFEY	PA Public Safety 4940-4990 MHz Band	2
	ELLIS	PA Public Safety 4940-4990 MHz Band	2
	JOHNSON	PA Public Safety 4940-4990 MHz Band	4
	MIAMI	PA Public Safety 4940-4990 MHz Band	2
	POTTAWATOMI	PA Public Safety 4940-4990 MHz Band	2
	RILEY	PA Public Safety 4940-4990 MHz Band	4
	SEDGWICK	PA Public Safety 4940-4990 MHz Band	5
	SHAWNEE	PA Public Safety 4940-4990 MHz Band	1
	WYANDOTTE	PA Public Safety 4940-4990 MHz Band	6
	(blank)	PA Public Safety 4940-4990 MHz Band	2
KS Total			30
KY	BARREN	PA Public Safety 4940-4990 MHz Band	8
	BOYLE	PA Public Safety 4940-4990 MHz Band	2

	BULLITT	PA Public Safety 4940-4990 MHz Band	2
	CLARK	PA Public Safety 4940-4990 MHz Band	4
	DAVIESS	PA Public Safety 4940-4990 MHz Band	2
	FAYETTE	PA Public Safety 4940-4990 MHz Band	2
	GREEN	PA Public Safety 4940-4990 MHz Band	4
	GREENUP	PA Public Safety 4940-4990 MHz Band	1
	HARDIN	PA Public Safety 4940-4990 MHz Band	2
	HARLAN	PA Public Safety 4940-4990 MHz Band	11
	LAUREL	PA Public Safety 4940-4990 MHz Band	2
	MADISON	PA Public Safety 4940-4990 MHz Band	2
	MCCRACKEN	PA Public Safety 4940-4990 MHz Band	2
	METCALFE	PA Public Safety 4940-4990 MHz Band	4
	SCOTT	PA Public Safety 4940-4990 MHz Band	2
	SHELBY	PA Public Safety 4940-4990 MHz Band	2
	SPENCER	PA Public Safety 4940-4990 MHz Band	6
	TAYLOR	PA Public Safety 4940-4990 MHz Band	2
	WOODFORD	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	2
KY Total			64
LA	ASCENSION	PA Public Safety 4940-4990 MHz Band	2
	BOSSIER	PA Public Safety 4940-4990 MHz Band	22
	CADDO	PA Public Safety 4940-4990 MHz Band	2
	CALCASIEU	PA Public Safety 4940-4990 MHz Band	2
	DE SOTO	PA Public Safety 4940-4990 MHz Band	2
	EAST BATON R	PA Public Safety 4940-4990 MHz Band	3
	IBERIA	PA Public Safety 4940-4990 MHz Band	2
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	4
	LAFAYETTE	PA Public Safety 4940-4990 MHz Band	4
	LAFOURCHE	PA Public Safety 4940-4990 MHz Band	2
	ORLEANS	PA Public Safety 4940-4990 MHz Band	2
	PLAQUEMINES	PA Public Safety 4940-4990 MHz Band	2
	ST. BERNARD	PA Public Safety 4940-4990 MHz Band	4
	ST. CHARLES	PA Public Safety 4940-4990 MHz Band	6
	ST. JOHN THE	PA Public Safety 4940-4990 MHz Band	2
	ST. TAMMANY	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	4
LA Total			67
MA	BARNSTABLE	PA Public Safety 4940-4990 MHz Band	3
	ESSEX	PA Public Safety 4940-4990 MHz Band	24
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	4
	HAMPDEN	PA Public Safety 4940-4990 MHz Band	28
	HAMPSHIRE	PA Public Safety 4940-4990 MHz Band	1
	MIDDLESEX	PA Public Safety 4940-4990 MHz Band	27
	NANTUCKET	PA Public Safety 4940-4990 MHz Band	5
	NORFOLK	PA Public Safety 4940-4990 MHz Band	16
	PLYMOUTH	PA Public Safety 4940-4990 MHz Band	4
	SUFFOLK	PA Public Safety 4940-4990 MHz Band	10
	WORCESTER	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	27

MA Total			151
MD	ALLEGANY	PA Public Safety 4940-4990 MHz Band	2
	ANNE ARUNDE	PA Public Safety 4940-4990 MHz Band	4
	BALTIMORE	PA Public Safety 4940-4990 MHz Band	2
	BALTIMORE CI	PA Public Safety 4940-4990 MHz Band	4
	CAROLINE	PA Public Safety 4940-4990 MHz Band	2
	CARROLL	PA Public Safety 4940-4990 MHz Band	4
	DORCHESTER	PA Public Safety 4940-4990 MHz Band	2
	HARFORD	PA Public Safety 4940-4990 MHz Band	2
	HOWARD	PA Public Safety 4940-4990 MHz Band	4
	KENT	PA Public Safety 4940-4990 MHz Band	2
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	PRINCE GEOR	PA Public Safety 4940-4990 MHz Band	14
	QUEEN ANNE'S	PA Public Safety 4940-4990 MHz Band	2
	ST. MARY'S	PA Public Safety 4940-4990 MHz Band	2
	TALBOT	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	WICOMICO	PA Public Safety 4940-4990 MHz Band	4
	WORCESTER	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	10
MD Total			68
ME	AROOSTOOK	PA Public Safety 4940-4990 MHz Band	1
	CUMBERLAND	PA Public Safety 4940-4990 MHz Band	14
	HANCOCK	PA Public Safety 4940-4990 MHz Band	2
	LINCOLN	PA Public Safety 4940-4990 MHz Band	10
	SAGADAHOC	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	11
	(blank)	PA Public Safety 4940-4990 MHz Band	2
ME Total			42
MI	BERRIEN	PA Public Safety 4940-4990 MHz Band	2
	BRANCH	PA Public Safety 4940-4990 MHz Band	5
	CALHOUN	PA Public Safety 4940-4990 MHz Band	6
	CHARLEVOIX	PA Public Safety 4940-4990 MHz Band	2
	CHEBOYGAN	PA Public Safety 4940-4990 MHz Band	2
	CHIPPEWA	PA Public Safety 4940-4990 MHz Band	2
	CLINTON	PA Public Safety 4940-4990 MHz Band	4
	EATON	PA Public Safety 4940-4990 MHz Band	10
	EMMET	PA Public Safety 4940-4990 MHz Band	2
	GENESEE	PA Public Safety 4940-4990 MHz Band	13
	HILLSDALE	PA Public Safety 4940-4990 MHz Band	2
	HOUGHTON	PA Public Safety 4940-4990 MHz Band	2
	INGHAM	PA Public Safety 4940-4990 MHz Band	9
	IONIA	PA Public Safety 4940-4990 MHz Band	4
	ISABELLA	PA Public Safety 4940-4990 MHz Band	2
	JACKSON	PA Public Safety 4940-4990 MHz Band	8
	KALKASKA	PA Public Safety 4940-4990 MHz Band	2
	KENT	PA Public Safety 4940-4990 MHz Band	8
	LEELANAU	PA Public Safety 4940-4990 MHz Band	4
	LENAWEE	PA Public Safety 4940-4990 MHz Band	8

	MACKINAC	PA Public Safety 4940-4990 MHz Band	4
	MACOMB	PA Public Safety 4940-4990 MHz Band	2
	OAKLAND	PA Public Safety 4940-4990 MHz Band	2
	OCEANA	PA Public Safety 4940-4990 MHz Band	4
	OTTAWA	PA Public Safety 4940-4990 MHz Band	5
	WASHTENAW	PA Public Safety 4940-4990 MHz Band	2
	WAYNE	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	2
MI Total			122
MN	BELTRAMI	PA Public Safety 4940-4990 MHz Band	2
	BENTON	PA Public Safety 4940-4990 MHz Band	2
	BLUE EARTH	PA Public Safety 4940-4990 MHz Band	2
	DAKOTA	PA Public Safety 4940-4990 MHz Band	2
	GRANT	PA Public Safety 4940-4990 MHz Band	4
	HENNEPIN	PA Public Safety 4940-4990 MHz Band	6
	KANABEC	PA Public Safety 4940-4990 MHz Band	2
	MILLE LACS	PA Public Safety 4940-4990 MHz Band	2
	MORRISON	PA Public Safety 4940-4990 MHz Band	2
	PINE	PA Public Safety 4940-4990 MHz Band	4
	POLK	PA Public Safety 4940-4990 MHz Band	2
	RAMSEY	PA Public Safety 4940-4990 MHz Band	2
	SHERBURNE	PA Public Safety 4940-4990 MHz Band	2
	ST. LOUIS	PA Public Safety 4940-4990 MHz Band	4
	STEARNS	PA Public Safety 4940-4990 MHz Band	2
	WRIGHT	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	2
MN Total			44
MO	AUDRAIN	PA Public Safety 4940-4990 MHz Band	2
	BUTLER	PA Public Safety 4940-4990 MHz Band	1
	CAMDEN	PA Public Safety 4940-4990 MHz Band	6
	CARROLL	PA Public Safety 4940-4990 MHz Band	4
	CRAWFORD	PA Public Safety 4940-4990 MHz Band	8
	GASCONADE	PA Public Safety 4940-4990 MHz Band	2
	HOWELL	PA Public Safety 4940-4990 MHz Band	2
	JACKSON	PA Public Safety 4940-4990 MHz Band	4
	JASPER	PA Public Safety 4940-4990 MHz Band	2
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	28
	MARION	PA Public Safety 4940-4990 MHz Band	4
	SALINE	PA Public Safety 4940-4990 MHz Band	2
	ST. CHARLES	PA Public Safety 4940-4990 MHz Band	29
	ST. LOUIS	PA Public Safety 4940-4990 MHz Band	32
	STODDARD	PA Public Safety 4940-4990 MHz Band	1
	VERNON	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	12
MO Total			141
MP	(blank)	PA Public Safety 4940-4990 MHz Band	2
MP Total			2
MS	HARRISON	PA Public Safety 4940-4990 MHz Band	15
	JACKSON	PA Public Safety 4940-4990 MHz Band	2

	JONES	PA Public Safety 4940-4990 MHz Band	2
	MARSHALL	PA Public Safety 4940-4990 MHz Band	3
	WARREN	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	2
MS Total			28
MT	GALLATIN	PA Public Safety 4940-4990 MHz Band	2
	HILL	PA Public Safety 4940-4990 MHz Band	2
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	2
	LEWIS AND CL	PA Public Safety 4940-4990 MHz Band	23
	MADISON	PA Public Safety 4940-4990 MHz Band	2
	MISSOULA	PA Public Safety 4940-4990 MHz Band	2
	RAVALLI	PA Public Safety 4940-4990 MHz Band	2
MT Total			35
NC	ALAMANCE	PA Public Safety 4940-4990 MHz Band	4
	ALEXANDER	PA Public Safety 4940-4990 MHz Band	2
	ASHE	PA Public Safety 4940-4990 MHz Band	2
	BLADEN	PA Public Safety 4940-4990 MHz Band	2
	BUNCOMBE	PA Public Safety 4940-4990 MHz Band	3
	CABARRUS	PA Public Safety 4940-4990 MHz Band	4
	CALDWELL	PA Public Safety 4940-4990 MHz Band	4
	CAMDEN	PA Public Safety 4940-4990 MHz Band	1
	CATAWBA	PA Public Safety 4940-4990 MHz Band	4
	CUMBERLAND	PA Public Safety 4940-4990 MHz Band	4
	CURRITUCK	PA Public Safety 4940-4990 MHz Band	4
	DARE	PA Public Safety 4940-4990 MHz Band	2
	DUPLIN	PA Public Safety 4940-4990 MHz Band	2
	DURHAM	PA Public Safety 4940-4990 MHz Band	2
	FORSYTH	PA Public Safety 4940-4990 MHz Band	4
	GASTON	PA Public Safety 4940-4990 MHz Band	6
	GUILFORD	PA Public Safety 4940-4990 MHz Band	6
	HENDERSON	PA Public Safety 4940-4990 MHz Band	2
	JOHNSTON	PA Public Safety 4940-4990 MHz Band	2
	JONES	PA Public Safety 4940-4990 MHz Band	2
	LEE	PA Public Safety 4940-4990 MHz Band	2
	LENOIR	PA Public Safety 4940-4990 MHz Band	2
	MECKLENBURG	PA Public Safety 4940-4990 MHz Band	2
	MOORE	PA Public Safety 4940-4990 MHz Band	2
	NASH	PA Public Safety 4940-4990 MHz Band	2
	ONSLOW	PA Public Safety 4940-4990 MHz Band	2
	PASQUOTANK	PA Public Safety 4940-4990 MHz Band	4
	PENDER	PA Public Safety 4940-4990 MHz Band	2
	ROBESON	PA Public Safety 4940-4990 MHz Band	2
	ROCKINGHAM	PA Public Safety 4940-4990 MHz Band	2
	RUTHERFORD	PA Public Safety 4940-4990 MHz Band	2
	SAMPSON	PA Public Safety 4940-4990 MHz Band	2
	WAKE	PA Public Safety 4940-4990 MHz Band	10
	WILKES	PA Public Safety 4940-4990 MHz Band	2
	WILSON	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	7

NC Total			109
ND	BURLEIGH	PA Public Safety 4940-4990 MHz Band	2
	CASS	PA Public Safety 4940-4990 MHz Band	6
	GRAND FORKS	PA Public Safety 4940-4990 MHz Band	22
	(blank)	PA Public Safety 4940-4990 MHz Band	2
ND Total			32
NE	BUFFALO	PA Public Safety 4940-4990 MHz Band	2
	CUSTER	PA Public Safety 4940-4990 MHz Band	2
	DAKOTA	PA Public Safety 4940-4990 MHz Band	4
	DAWSON	PA Public Safety 4940-4990 MHz Band	2
	DODGE	PA Public Safety 4940-4990 MHz Band	4
	DOUGLAS	PA Public Safety 4940-4990 MHz Band	2
	GAGE	PA Public Safety 4940-4990 MHz Band	3
	HALL	PA Public Safety 4940-4990 MHz Band	2
	LANCASTER	PA Public Safety 4940-4990 MHz Band	2
	LOUP	PA Public Safety 4940-4990 MHz Band	2
	SARPY	PA Public Safety 4940-4990 MHz Band	4
	SCOTTS BLUFF	PA Public Safety 4940-4990 MHz Band	2
	VALLEY	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	6
NE Total			39
NH	HILLSBOROUGH	PA Public Safety 4940-4990 MHz Band	7
	(blank)	PA Public Safety 4940-4990 MHz Band	8
NH Total			15
NJ	ATLANTIC	PA Public Safety 4940-4990 MHz Band	4
	BERGEN	PA Public Safety 4940-4990 MHz Band	15
	BURLINGTON	PA Public Safety 4940-4990 MHz Band	8
	CAMDEN	PA Public Safety 4940-4990 MHz Band	2
	CAPE MAY	PA Public Safety 4940-4990 MHz Band	2
	ESSEX	PA Public Safety 4940-4990 MHz Band	18
	GLOUCESTER	PA Public Safety 4940-4990 MHz Band	4
	HUDSON	PA Public Safety 4940-4990 MHz Band	7
	HUNTERDON	PA Public Safety 4940-4990 MHz Band	2
	MERCER	PA Public Safety 4940-4990 MHz Band	7
	MIDDLESEX	PA Public Safety 4940-4990 MHz Band	10
	MONMOUTH	PA Public Safety 4940-4990 MHz Band	8
	MORRIS	PA Public Safety 4940-4990 MHz Band	7
	OCEAN	PA Public Safety 4940-4990 MHz Band	10
	PASSAIC	PA Public Safety 4940-4990 MHz Band	5
	SALEM	PA Public Safety 4940-4990 MHz Band	1
	SOMERSET	PA Public Safety 4940-4990 MHz Band	2
	SUSSEX	PA Public Safety 4940-4990 MHz Band	2
	UNION	PA Public Safety 4940-4990 MHz Band	12
	WARREN	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	7
NJ Total			135
NM	BERNALILLO	PA Public Safety 4940-4990 MHz Band	2
	DONA ANA	PA Public Safety 4940-4990 MHz Band	4
	EDDY	PA Public Safety 4940-4990 MHz Band	10

	HIDALGO	PA Public Safety 4940-4990 MHz Band	2
	LOS ALAMOS	PA Public Safety 4940-4990 MHz Band	2
	MCKINLEY	PA Public Safety 4940-4990 MHz Band	3
	OTERO	PA Public Safety 4940-4990 MHz Band	2
	SAN JUAN	PA Public Safety 4940-4990 MHz Band	13
	SANDOVAL	PA Public Safety 4940-4990 MHz Band	2
	SANTA FE	PA Public Safety 4940-4990 MHz Band	2
	SIERRA	PA Public Safety 4940-4990 MHz Band	1
	VALENCIA	PA Public Safety 4940-4990 MHz Band	3
	(blank)	PA Public Safety 4940-4990 MHz Band	4
NM Total			50
NV	CARSON CITY	PA Public Safety 4940-4990 MHz Band	4
	CLARK	PA Public Safety 4940-4990 MHz Band	32
	DOUGLAS	PA Public Safety 4940-4990 MHz Band	6
	ELKO	PA Public Safety 4940-4990 MHz Band	2
	HUMBOLDT	PA Public Safety 4940-4990 MHz Band	2
	LANDER	PA Public Safety 4940-4990 MHz Band	2
	LYON	PA Public Safety 4940-4990 MHz Band	2
	WASHOE	PA Public Safety 4940-4990 MHz Band	6
	(blank)	PA Public Safety 4940-4990 MHz Band	21
NV Total			77
NY	ALBANY	PA Public Safety 4940-4990 MHz Band	4
	ALLEGANY	PA Public Safety 4940-4990 MHz Band	9
	BRONX	PA Public Safety 4940-4990 MHz Band	18
	BROOME	PA Public Safety 4940-4990 MHz Band	4
	CATTARAUGUS	PA Public Safety 4940-4990 MHz Band	2
	CHAUTAUQUA	PA Public Safety 4940-4990 MHz Band	2
	CHENANGO	PA Public Safety 4940-4990 MHz Band	2
	CORTLAND	PA Public Safety 4940-4990 MHz Band	2
	DELAWARE	PA Public Safety 4940-4990 MHz Band	2
	ERIE	PA Public Safety 4940-4990 MHz Band	26
	ESSEX	PA Public Safety 4940-4990 MHz Band	4
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	2
	GENESEE	PA Public Safety 4940-4990 MHz Band	2
	HERKIMER	PA Public Safety 4940-4990 MHz Band	4
	KINGS	PA Public Safety 4940-4990 MHz Band	40
	LEWIS	PA Public Safety 4940-4990 MHz Band	2
	LIVINGSTON	PA Public Safety 4940-4990 MHz Band	4
	MONROE	PA Public Safety 4940-4990 MHz Band	2
	NASSAU	PA Public Safety 4940-4990 MHz Band	16
	NEW YORK	PA Public Safety 4940-4990 MHz Band	74
	NIAGARA	PA Public Safety 4940-4990 MHz Band	6
	ONEIDA	PA Public Safety 4940-4990 MHz Band	4
	ONONDAGA	PA Public Safety 4940-4990 MHz Band	4
	ORLEANS	PA Public Safety 4940-4990 MHz Band	2
	OTSEGO	PA Public Safety 4940-4990 MHz Band	2
	QUEENS	PA Public Safety 4940-4990 MHz Band	55
	RENSSELAER	PA Public Safety 4940-4990 MHz Band	5
	RICHMOND	PA Public Safety 4940-4990 MHz Band	5

	ROCKLAND	PA Public Safety 4940-4990 MHz Band	4
	SARATOGA	PA Public Safety 4940-4990 MHz Band	2
	SCHENECTADY	PA Public Safety 4940-4990 MHz Band	6
	STEUBEN	PA Public Safety 4940-4990 MHz Band	2
	SUFFOLK	PA Public Safety 4940-4990 MHz Band	12
	TOMPKINS	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	WAYNE	PA Public Safety 4940-4990 MHz Band	2
	WESTCHESTER	PA Public Safety 4940-4990 MHz Band	9
	WYOMING	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	11
NY Total			358
OH	ALLEN	PA Public Safety 4940-4990 MHz Band	2
	ASHLAND	PA Public Safety 4940-4990 MHz Band	2
	ATHENS	PA Public Safety 4940-4990 MHz Band	3
	BUTLER	PA Public Safety 4940-4990 MHz Band	2
	CLERMONT	PA Public Safety 4940-4990 MHz Band	2
	CRAWFORD	PA Public Safety 4940-4990 MHz Band	2
	CUYAHOGA	PA Public Safety 4940-4990 MHz Band	5
	DELAWARE	PA Public Safety 4940-4990 MHz Band	4
	FAYETTE	PA Public Safety 4940-4990 MHz Band	
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	4
	FULTON	PA Public Safety 4940-4990 MHz Band	4
	GEAUGA	PA Public Safety 4940-4990 MHz Band	4
	GREENE	PA Public Safety 4940-4990 MHz Band	2
	HAMILTON	PA Public Safety 4940-4990 MHz Band	4
	HANCOCK	PA Public Safety 4940-4990 MHz Band	2
	HENRY	PA Public Safety 4940-4990 MHz Band	2
	HOLMES	PA Public Safety 4940-4990 MHz Band	2
	JEFFERSON	PA Public Safety 4940-4990 MHz Band	3
	LAKE	PA Public Safety 4940-4990 MHz Band	2
	LAWRENCE	PA Public Safety 4940-4990 MHz Band	2
	LICKING	PA Public Safety 4940-4990 MHz Band	2
	LOGAN	PA Public Safety 4940-4990 MHz Band	6
	LORAIN	PA Public Safety 4940-4990 MHz Band	2
	LUCAS	PA Public Safety 4940-4990 MHz Band	4
	MERCER	PA Public Safety 4940-4990 MHz Band	2
	MONROE	PA Public Safety 4940-4990 MHz Band	1
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	OTTAWA	PA Public Safety 4940-4990 MHz Band	2
	PAULDING	PA Public Safety 4940-4990 MHz Band	2
	PICKAWAY	PA Public Safety 4940-4990 MHz Band	2
	PORTAGE	PA Public Safety 4940-4990 MHz Band	2
	PUTNAM	PA Public Safety 4940-4990 MHz Band	2
	RICHLAND	PA Public Safety 4940-4990 MHz Band	4
	STARK	PA Public Safety 4940-4990 MHz Band	2
	SUMMIT	PA Public Safety 4940-4990 MHz Band	2
	TUSCARAWAS	PA Public Safety 4940-4990 MHz Band	2
	VAN WERT	PA Public Safety 4940-4990 MHz Band	2

	WARREN	PA Public Safety 4940-4990 MHz Band	2
	WILLIAMS	PA Public Safety 4940-4990 MHz Band	6
	WOOD	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	6
OH Total			110
OK	BECKHAM	PA Public Safety 4940-4990 MHz Band	18
	CLEVELAND	PA Public Safety 4940-4990 MHz Band	6
	GARFIELD	PA Public Safety 4940-4990 MHz Band	9
	GRADY	PA Public Safety 4940-4990 MHz Band	2
	LOGAN	PA Public Safety 4940-4990 MHz Band	2
	MAJOR	PA Public Safety 4940-4990 MHz Band	3
	OKLAHOMA	PA Public Safety 4940-4990 MHz Band	30
	OSAGE	PA Public Safety 4940-4990 MHz Band	1
	PAYNE	PA Public Safety 4940-4990 MHz Band	4
	STEPHENS	PA Public Safety 4940-4990 MHz Band	5
	TULSA	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	4
OK Total			88
OR	BENTON	PA Public Safety 4940-4990 MHz Band	2
	CLACKAMAS	PA Public Safety 4940-4990 MHz Band	2
	CLATSOP	PA Public Safety 4940-4990 MHz Band	1
	COLUMBIA	PA Public Safety 4940-4990 MHz Band	3
	COOS	PA Public Safety 4940-4990 MHz Band	
	CURRY	PA Public Safety 4940-4990 MHz Band	4
	DESCHUTES	PA Public Safety 4940-4990 MHz Band	2
	DOUGLAS	PA Public Safety 4940-4990 MHz Band	10
	HOOD RIVER	PA Public Safety 4940-4990 MHz Band	1
	JACKSON	PA Public Safety 4940-4990 MHz Band	9
	KLAMATH	PA Public Safety 4940-4990 MHz Band	4
	LINCOLN	PA Public Safety 4940-4990 MHz Band	6
	LINN	PA Public Safety 4940-4990 MHz Band	4
	MALHEUR	PA Public Safety 4940-4990 MHz Band	2
	MARION	PA Public Safety 4940-4990 MHz Band	7
	MULTNOMAH	PA Public Safety 4940-4990 MHz Band	2
	POLK	PA Public Safety 4940-4990 MHz Band	11
	TILLAMOOK	PA Public Safety 4940-4990 MHz Band	2
	UMATILLA	PA Public Safety 4940-4990 MHz Band	7
	UNION	PA Public Safety 4940-4990 MHz Band	4
	WASCO	PA Public Safety 4940-4990 MHz Band	4
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	12
OR Total			101
PA	ALLEGHENY	PA Public Safety 4940-4990 MHz Band	6
	BEAVER	PA Public Safety 4940-4990 MHz Band	5
	BEDFORD	PA Public Safety 4940-4990 MHz Band	12
	BERKS	PA Public Safety 4940-4990 MHz Band	2
	BLAIR	PA Public Safety 4940-4990 MHz Band	10
	BRADFORD	PA Public Safety 4940-4990 MHz Band	2
	BUCKS	PA Public Safety 4940-4990 MHz Band	5

	CARBON	PA Public Safety 4940-4990 MHz Band	2
	CHESTER	PA Public Safety 4940-4990 MHz Band	2
	CLINTON	PA Public Safety 4940-4990 MHz Band	2
	CUMBERLAND	PA Public Safety 4940-4990 MHz Band	20
	DAUPHIN	PA Public Safety 4940-4990 MHz Band	2
	DELAWARE	PA Public Safety 4940-4990 MHz Band	2
	ERIE	PA Public Safety 4940-4990 MHz Band	2
	HUNTINGDON	PA Public Safety 4940-4990 MHz Band	2
	LACKAWANNA	PA Public Safety 4940-4990 MHz Band	2
	LANCASTER	PA Public Safety 4940-4990 MHz Band	2
	LEHIGH	PA Public Safety 4940-4990 MHz Band	6
	LUZERNE	PA Public Safety 4940-4990 MHz Band	2
	MONROE	PA Public Safety 4940-4990 MHz Band	2
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	NORTHAMPTO	PA Public Safety 4940-4990 MHz Band	4
	PERRY	PA Public Safety 4940-4990 MHz Band	1
	PHILADELPHIA	PA Public Safety 4940-4990 MHz Band	6
	POTTER	PA Public Safety 4940-4990 MHz Band	2
	VENANGO	PA Public Safety 4940-4990 MHz Band	4
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	4
	YORK	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	9
PA Total			124
PR	AGUADILLA	PA Public Safety 4940-4990 MHz Band	9
	AGUAS BUENA	PA Public Safety 4940-4990 MHz Band	4
	CAGUAS	PA Public Safety 4940-4990 MHz Band	5
	FAJARDO	PA Public Safety 4940-4990 MHz Band	2
	GUAYANILLA	PA Public Safety 4940-4990 MHz Band	10
	JAYUYA	PA Public Safety 4940-4990 MHz Band	20
	MOCA	PA Public Safety 4940-4990 MHz Band	8
	PATILLAS	PA Public Safety 4940-4990 MHz Band	19
	SAN SEBASTIA	PA Public Safety 4940-4990 MHz Band	8
	VEGA ALTA	PA Public Safety 4940-4990 MHz Band	9
	VILLALBA	PA Public Safety 4940-4990 MHz Band	19
	(blank)	PA Public Safety 4940-4990 MHz Band	8
PR Total			121
RI	NEWPORT	PA Public Safety 4940-4990 MHz Band	2
	PROVIDENCE	PA Public Safety 4940-4990 MHz Band	8
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	
	(blank)	PA Public Safety 4940-4990 MHz Band	2
RI Total			12
SC	ANDERSON	PA Public Safety 4940-4990 MHz Band	2
	BEAUFORT	PA Public Safety 4940-4990 MHz Band	2
	BERKELEY	PA Public Safety 4940-4990 MHz Band	2
	CHARLESTON	PA Public Safety 4940-4990 MHz Band	2
	HORRY	PA Public Safety 4940-4990 MHz Band	2
	JASPER	PA Public Safety 4940-4990 MHz Band	2
	LAURENS	PA Public Safety 4940-4990 MHz Band	4
	NEWBERRY	PA Public Safety 4940-4990 MHz Band	2

	PICKENS	PA Public Safety 4940-4990 MHz Band	4
	RICHLAND	PA Public Safety 4940-4990 MHz Band	2
	SPARTANBURG	PA Public Safety 4940-4990 MHz Band	2
	YORK	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	2
SC Total			30
SD	BEADLE	PA Public Safety 4940-4990 MHz Band	2
	CODINGTON	PA Public Safety 4940-4990 MHz Band	4
	MINNEHAHA	PA Public Safety 4940-4990 MHz Band	2
	PENNINGTON	PA Public Safety 4940-4990 MHz Band	2
SD Total			10
TN	CHEATHAM	PA Public Safety 4940-4990 MHz Band	2
	COCKE	PA Public Safety 4940-4990 MHz Band	2
	CUMBERLAND	PA Public Safety 4940-4990 MHz Band	5
	DAVIDSON	PA Public Safety 4940-4990 MHz Band	2
	DICKSON	PA Public Safety 4940-4990 MHz Band	2
	GREENE	PA Public Safety 4940-4990 MHz Band	6
	HAMILTON	PA Public Safety 4940-4990 MHz Band	7
	HOUSTON	PA Public Safety 4940-4990 MHz Band	2
	HUMPHREYS	PA Public Safety 4940-4990 MHz Band	2
	KNOX	PA Public Safety 4940-4990 MHz Band	2
	LAWRENCE	PA Public Safety 4940-4990 MHz Band	2
	MADISON	PA Public Safety 4940-4990 MHz Band	2
	MAURY	PA Public Safety 4940-4990 MHz Band	2
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	ROBERTSON	PA Public Safety 4940-4990 MHz Band	2
	SEVIER	PA Public Safety 4940-4990 MHz Band	2
	SHELBY	PA Public Safety 4940-4990 MHz Band	10
	STEWART	PA Public Safety 4940-4990 MHz Band	4
	SUMNER	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	WILLIAMSON	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	4
TN Total			68
TX	ANDERSON	PA Public Safety 4940-4990 MHz Band	2
	ANGELINA	PA Public Safety 4940-4990 MHz Band	5
	BAILEY	PA Public Safety 4940-4990 MHz Band	1
	BEXAR	PA Public Safety 4940-4990 MHz Band	10
	BRAZOS	PA Public Safety 4940-4990 MHz Band	4
	BURLESON	PA Public Safety 4940-4990 MHz Band	1
	BURNET	PA Public Safety 4940-4990 MHz Band	2
	CALHOUN	PA Public Safety 4940-4990 MHz Band	2
	CAMERON	PA Public Safety 4940-4990 MHz Band	2
	COLLIN	PA Public Safety 4940-4990 MHz Band	19
	DALLAS	PA Public Safety 4940-4990 MHz Band	9
	DENTON	PA Public Safety 4940-4990 MHz Band	4
	EASTLAND	PA Public Safety 4940-4990 MHz Band	8
	ECTOR	PA Public Safety 4940-4990 MHz Band	4
	EL PASO	PA Public Safety 4940-4990 MHz Band	2

	ELLIS	PA Public Safety 4940-4990 MHz Band	8
	ERATH	PA Public Safety 4940-4990 MHz Band	2
	FANNIN	PA Public Safety 4940-4990 MHz Band	2
	FORT BEND	PA Public Safety 4940-4990 MHz Band	8
	GALVESTON	PA Public Safety 4940-4990 MHz Band	14
	GONZALES	PA Public Safety 4940-4990 MHz Band	1
	GRAYSON	PA Public Safety 4940-4990 MHz Band	4
	GREGG	PA Public Safety 4940-4990 MHz Band	2
	GUADALUPE	PA Public Safety 4940-4990 MHz Band	5
	HALE	PA Public Safety 4940-4990 MHz Band	2
	HARRIS	PA Public Safety 4940-4990 MHz Band	27
	HARRISON	PA Public Safety 4940-4990 MHz Band	2
	HUNT	PA Public Safety 4940-4990 MHz Band	2
	HUTCHINSON	PA Public Safety 4940-4990 MHz Band	2
	KAUFMAN	PA Public Safety 4940-4990 MHz Band	3
	KERR	PA Public Safety 4940-4990 MHz Band	6
	KLEBERG	PA Public Safety 4940-4990 MHz Band	2
	LAMAR	PA Public Safety 4940-4990 MHz Band	6
	LAMB	PA Public Safety 4940-4990 MHz Band	2
	LIMESTONE	PA Public Safety 4940-4990 MHz Band	2
	LLANO	PA Public Safety 4940-4990 MHz Band	2
	LUBBOCK	PA Public Safety 4940-4990 MHz Band	24
	MATAGORDA	PA Public Safety 4940-4990 MHz Band	2
	MCLENNAN	PA Public Safety 4940-4990 MHz Band	4
	MEDINA	PA Public Safety 4940-4990 MHz Band	2
	MIDLAND	PA Public Safety 4940-4990 MHz Band	4
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	NUECES	PA Public Safety 4940-4990 MHz Band	2
	PARKER	PA Public Safety 4940-4990 MHz Band	2
	POLK	PA Public Safety 4940-4990 MHz Band	2
	POTTER	PA Public Safety 4940-4990 MHz Band	3
	RANDALL	PA Public Safety 4940-4990 MHz Band	2
	ROBERTSON	PA Public Safety 4940-4990 MHz Band	4
	ROCKWALL	PA Public Safety 4940-4990 MHz Band	2
	RUSK	PA Public Safety 4940-4990 MHz Band	4
	TARRANT	PA Public Safety 4940-4990 MHz Band	14
	TAYLOR	PA Public Safety 4940-4990 MHz Band	2
	TOM GREEN	PA Public Safety 4940-4990 MHz Band	2
	TRAVIS	PA Public Safety 4940-4990 MHz Band	6
	TYLER	PA Public Safety 4940-4990 MHz Band	2
	VICTORIA	PA Public Safety 4940-4990 MHz Band	4
	WHARTON	PA Public Safety 4940-4990 MHz Band	2
	WICHITA	PA Public Safety 4940-4990 MHz Band	2
	WILLIAMSON	PA Public Safety 4940-4990 MHz Band	6
	WILSON	PA Public Safety 4940-4990 MHz Band	1
	WOOD	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	14
TX Total			295
UT	BOX ELDER	PA Public Safety 4940-4990 MHz Band	2

	CACHE	PA Public Safety 4940-4990 MHz Band	2
	DAVIS	PA Public Safety 4940-4990 MHz Band	2
	KANE	PA Public Safety 4940-4990 MHz Band	2
	SALT LAKE	PA Public Safety 4940-4990 MHz Band	12
	TOOELE	PA Public Safety 4940-4990 MHz Band	2
	UTAH	PA Public Safety 4940-4990 MHz Band	4
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	4
	WEBER	PA Public Safety 4940-4990 MHz Band	6
	(blank)	PA Public Safety 4940-4990 MHz Band	4
UT Total			40
VA	ALBEMARLE	PA Public Safety 4940-4990 MHz Band	1
	ARLINGTON	PA Public Safety 4940-4990 MHz Band	2
	BOTETOURT	PA Public Safety 4940-4990 MHz Band	1
	CHESTERFIEL	PA Public Safety 4940-4990 MHz Band	2
	DICKENSON	PA Public Safety 4940-4990 MHz Band	
	FAIRFAX	PA Public Safety 4940-4990 MHz Band	6
	FAUQUIER	PA Public Safety 4940-4990 MHz Band	2
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	6
	FREDERICK	PA Public Safety 4940-4990 MHz Band	2
	GLOUCESTER	PA Public Safety 4940-4990 MHz Band	2
	GOOCHLAND	PA Public Safety 4940-4990 MHz Band	1
	HAMPTON CIT	PA Public Safety 4940-4990 MHz Band	2
	HANOVER	PA Public Safety 4940-4990 MHz Band	2
	HENRICO	PA Public Safety 4940-4990 MHz Band	2
	HENRY	PA Public Safety 4940-4990 MHz Band	2
	ISLE OF WIGH	PA Public Safety 4940-4990 MHz Band	2
	JAMES CITY	PA Public Safety 4940-4990 MHz Band	2
	LOUDOUN	PA Public Safety 4940-4990 MHz Band	9
	MONTGOMERY	PA Public Safety 4940-4990 MHz Band	2
	NEW KENT	PA Public Safety 4940-4990 MHz Band	2
	NEWPORT NEV	PA Public Safety 4940-4990 MHz Band	2
	NOTTOWAY	PA Public Safety 4940-4990 MHz Band	2
	RICHMOND	PA Public Safety 4940-4990 MHz Band	6
	RICHMOND CI	PA Public Safety 4940-4990 MHz Band	2
	ROANOKE	PA Public Safety 4940-4990 MHz Band	10
	ROCKBRIDGE	PA Public Safety 4940-4990 MHz Band	4
	ROCKINGHAM	PA Public Safety 4940-4990 MHz Band	2
	SCOTT	PA Public Safety 4940-4990 MHz Band	2
	SMYTH	PA Public Safety 4940-4990 MHz Band	2
	SOUTHAMPTO	PA Public Safety 4940-4990 MHz Band	4
	SPOTSYLVANI	PA Public Safety 4940-4990 MHz Band	2
	VIRGINIA BEA	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	2
	WINCHESTER	PA Public Safety 4940-4990 MHz Band	1
	WISE	PA Public Safety 4940-4990 MHz Band	
	YORK	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	7
VA Total			102
VT	ADDISON	PA Public Safety 4940-4990 MHz Band	2

	CHITTENDEN	PA Public Safety 4940-4990 MHz Band	4
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	2
	LAMOILLE	PA Public Safety 4940-4990 MHz Band	4
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	5
	(blank)	PA Public Safety 4940-4990 MHz Band	4
VT Total			21
WA	BENTON	PA Public Safety 4940-4990 MHz Band	24
	CHELAN	PA Public Safety 4940-4990 MHz Band	14
	CLARK	PA Public Safety 4940-4990 MHz Band	12
	COLUMBIA	PA Public Safety 4940-4990 MHz Band	7
	COWLITZ	PA Public Safety 4940-4990 MHz Band	5
	DOUGLAS	PA Public Safety 4940-4990 MHz Band	2
	FERRY	PA Public Safety 4940-4990 MHz Band	2
	FRANKLIN	PA Public Safety 4940-4990 MHz Band	14
	GRANT	PA Public Safety 4940-4990 MHz Band	2
	GRAYS HARBO	PA Public Safety 4940-4990 MHz Band	2
	KING	PA Public Safety 4940-4990 MHz Band	16
	KITTITAS	PA Public Safety 4940-4990 MHz Band	10
	KLICKITAT	PA Public Safety 4940-4990 MHz Band	1
	LEWIS	PA Public Safety 4940-4990 MHz Band	2
	MASON	PA Public Safety 4940-4990 MHz Band	
	OKANOGAN	PA Public Safety 4940-4990 MHz Band	6
	PIERCE	PA Public Safety 4940-4990 MHz Band	7
	SKAGIT	PA Public Safety 4940-4990 MHz Band	2
	SKAMANIA	PA Public Safety 4940-4990 MHz Band	1
	SNOHOMISH	PA Public Safety 4940-4990 MHz Band	21
	SPOKANE	PA Public Safety 4940-4990 MHz Band	10
	THURSTON	PA Public Safety 4940-4990 MHz Band	11
	WALLA WALLA	PA Public Safety 4940-4990 MHz Band	4
	WHATCOM	PA Public Safety 4940-4990 MHz Band	5
	YAKIMA	PA Public Safety 4940-4990 MHz Band	19
	(blank)	PA Public Safety 4940-4990 MHz Band	6
WA Total			205
WI	BARRON	PA Public Safety 4940-4990 MHz Band	
	BROWN	PA Public Safety 4940-4990 MHz Band	2
	CALUMET	PA Public Safety 4940-4990 MHz Band	2
	DANE	PA Public Safety 4940-4990 MHz Band	2
	DOOR	PA Public Safety 4940-4990 MHz Band	4
	DOUGLAS	PA Public Safety 4940-4990 MHz Band	6
	EAU CLAIRE	PA Public Safety 4940-4990 MHz Band	16
	GRANT	PA Public Safety 4940-4990 MHz Band	4
	KENOSHA	PA Public Safety 4940-4990 MHz Band	5
	LA CROSSE	PA Public Safety 4940-4990 MHz Band	4
	LANGLADE	PA Public Safety 4940-4990 MHz Band	3
	MARATHON	PA Public Safety 4940-4990 MHz Band	6
	MENOMINEE	PA Public Safety 4940-4990 MHz Band	2
	MILWAUKEE	PA Public Safety 4940-4990 MHz Band	2
	OCONTO	PA Public Safety 4940-4990 MHz Band	2
	OUTAGAMIE	PA Public Safety 4940-4990 MHz Band	3

	OZAUKEE	PA Public Safety 4940-4990 MHz Band	3
	POLK	PA Public Safety 4940-4990 MHz Band	
	RACINE	PA Public Safety 4940-4990 MHz Band	6
	ROCK	PA Public Safety 4940-4990 MHz Band	2
	SAUK	PA Public Safety 4940-4990 MHz Band	2
	SHEBOYGAN	PA Public Safety 4940-4990 MHz Band	6
	WASHBURN	PA Public Safety 4940-4990 MHz Band	2
	WASHINGTON	PA Public Safety 4940-4990 MHz Band	12
	WAUKESHA	PA Public Safety 4940-4990 MHz Band	7
	WINNEBAGO	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	2
WI Total			107
WV	BARBOUR	PA Public Safety 4940-4990 MHz Band	2
	CABELL	PA Public Safety 4940-4990 MHz Band	5
	HAMPSHIRE	PA Public Safety 4940-4990 MHz Band	4
	HANCOCK	PA Public Safety 4940-4990 MHz Band	1
	HARRISON	PA Public Safety 4940-4990 MHz Band	2
	MARION	PA Public Safety 4940-4990 MHz Band	2
	MONONGALIA	PA Public Safety 4940-4990 MHz Band	2
	PRESTON	PA Public Safety 4940-4990 MHz Band	2
	RANDOLPH	PA Public Safety 4940-4990 MHz Band	2
	WETZEL	PA Public Safety 4940-4990 MHz Band	2
	(blank)	PA Public Safety 4940-4990 MHz Band	2
WV Total			26
WY	ALBANY	PA Public Safety 4940-4990 MHz Band	2
	CAMPBELL	PA Public Safety 4940-4990 MHz Band	3
	CONVERSE	PA Public Safety 4940-4990 MHz Band	2
	CROOK	PA Public Safety 4940-4990 MHz Band	2
	LARAMIE	PA Public Safety 4940-4990 MHz Band	2
	NATRONA	PA Public Safety 4940-4990 MHz Band	2
	SHERIDAN	PA Public Safety 4940-4990 MHz Band	4
	SUBLETTE	PA Public Safety 4940-4990 MHz Band	2
	TETON	PA Public Safety 4940-4990 MHz Band	2
	UINTA	PA Public Safety 4940-4990 MHz Band	4
	(blank)	PA Public Safety 4940-4990 MHz Band	10
WY Total			35
(blank)	(blank)	PA Public Safety 4940-4990 MHz Band	686
(blank) Total			686
Grand Total			5308

Appendix D – FCC Filings

Who Controls the Network?

The reallocation of the D Block to Public Safety involves many issues including funding the network, how much capacity is needed by Public Safety on a daily basis, and how the network can be used to provide broadband services for non-Public Safety use.

It is clear to me that at the core of this debate is the issue of who will actually control the D Block and manage how it is allocated when there is available capacity. The FCC's position is that the D Block should be owned, operated, and managed by commercial network operators that will work in conjunction with Public Safety on an as-needed basis. Access to the commercial network will be on a priority basis for Public Safety, and the FCC seems to believe priority access is sufficient.

The Public Safety side of the debate is that Public Safety should own, operate, and manage the network and where there is capacity; others should be able to use the network with Public Safety being able to take full control of all of the spectrum on an as-needed basis. Those that would be using the D Block and perhaps some of the Public Safety spectrum as well in rural areas would enter into agreements that would predefine their rights of access. They would become customers of Public Safety with a full understanding that Public Safety has complete and pre-emptive rights to all 20 MHz of the spectrum when needed.

Public Safety has said repeatedly that it is more than willing to work with others and enter into public-private partnerships but that it needs full control over the network's daily operations. Rightfully, Public Safety questions the viability of a commercial network operator deciding where and when to grant priority access to Public Safety. This is a valid concern and neither the FCC nor the commercial operators have addressed it to the satisfaction of the Public Safety community, though Public Safety has been outspoken about how its solution would work.

The amount of available spectrum will change based on geographic area, population density, time of day, and the type and scale of incidents in which the Public Safety community is involved. Meanwhile, commercial operators continue to face increased demand for voice, text, data, and video services from their customers and it is well known that during times of major Public Safety activity, e.g., for a bank robbery or a multi-car collision that can occur any time of day, the demand for broadband and voice services spike for both commercial networks and Public Safety. Expecting a commercial operator to deny service to its regular customer base to satisfy Public Safety's needs will be almost impossible to mandate. Even if mandated by the FCC, the commercial network operator will have to decide whether it agrees with a request for priority access on its network on an incident-by-incident basis.

Commercial networks are run by large companies with multiple layers of management and they have operations centers that may be hundreds or thousands of miles from the incident in question. Public Safety's need for bandwidth is immediate and cannot be pre-planned. Having to request priority access and have it granted on an incident-by-incident basis is not a practical solution. Delays in providing the bandwidth could hamper personnel at the incident. On the other hand, I don't believe commercial network operators would agree to Public Safety being able to grant itself priority access without regard to how congested the commercial network traffic may be. The units in the field that request priority service would be competing with commercial customer requests for service, so it does not appear that there would ever be true “right now” Public Safety priority access to commercial networks. The FCC’s other answer is to pre-stage additional cell capacity mounted on vehicles that can be deployed to an incident when needed. This, too, is unrealistic except for long-term incidents of major proportion such as hurricanes, floods, fires, and the like.

Therefore, the Public Safety community has presented its own idea for priority network management, which is to reverse the process of who has control. Instead of having to contact the commercial network operator or work with it on gaining priority access at some future point in time (time is critical, especially in the early stages of an incident), control over the network would be given to the Public Safety network operator and would be managed in real time. This would provide Public Safety with the assurances that it would have full, pre-emptive priority over all of the spectrum on an as-needed basis.

I believe that commercial users, knowing the circumstances of their network usage ahead of time, would sign up for service and work with Public Safety. I also believe that Public Safety will be cognizant of commercial users’ needs and would take only what additional spectrum is needed for an incident, perhaps bumping the commercial customer down to a lower data rate. If the incident grew and new bandwidth was needed, the commercial customer would be bumped down again and not have any access until such time as Public Safety’s demand for broadband services was reduced.

This method will work, and it is especially viable if you consider that Public Safety will not have to work with individual commercial customers and compete with commercial network operators. Rather, it will work with other city, county, and state agencies, rural power companies, perhaps some rural cellular companies, and organizations that want to use the network to provide broadband to commercial customers in rural America for education, medical, and other uses. These types of partnerships can provide access to both the Public Safety community and these other tenants, and reduce Public Safety’s cost of building out the network and day-to-day operations.

The business model for developing this type of network is readily apparent, as is the fact that as the networks are built out, they will provide broadband services to rural customers years ahead of anything under consideration today. A few examples of the types of partners Public Safety could work with are:

- Rural power companies
    - What they want
        - Smart grid access
        - Broadband access
        - Would like to resell broadband to their rural customers
    - What they have to offer
        - High-tension towers for site location
        - Right-of-ways for backhaul systems

        - Trucks in the field that can be used to equip their rural customers for broadband
        - A desire to partner with Public Safety on this network

- Educational institutions
    - What they want
        - To partner for broadband connections to schools and the student community
    - What they have to offer
        - Access to schools and other properties for cell sites
        - Lease agreements

- Other government agencies
    - Need broadband access
        - City power and water companies
        - Other city agencies
        - Suburban county governments
        - Rural county governments
        - State agencies
    - What they have to offer
        - Lease agreements (funding)
        - Additional sites on government-owned properties

- Tribal lands
    - Need broadband access
        - For Tribal Public Safety
        - For Tribal broadband services
    - What they have to offer
        - Lease agreements
        - Tower sites

- Rural medical services
    - What they need
        - Connections to medical facilities
        - Connections to doctors' offices
        - Connections for visiting nurses
    - What they have to offer
        - Lease agreements
        - Access to medical buildings for cell sites

There are many more types of organizations that could be potential partners, but the above list includes enough organizations to make a solid business case for building out the network as envisioned by the FCC: 44,000 cell sites covering 95% of the population.

In most major metro areas, Public Safety will be using all of the spectrum most of the time. In smaller metro areas, suburbs, and rural areas, there should be enough bandwidth available for these other services, again with the caveat that Public Safety will have full control over the network and be able to allocate resources on an ongoing basis. One example might be in a rural area where a power company is using part of the bandwidth for meter reading at 2:00am and there is a major fire. First responders would use more bandwidth during the incident, including some or all of the spectrum normally available for meter reading, until the incident commander can release some bandwidth, at which time it would be reallocated back to the power company.

The results would be almost the same as what is envisioned by the FCC

- Funding to help with the construction and operation of the network
- Sharing of bandwidth when available
- Public/private partnerships

The ONLY difference here is that the Public Safety community would manage the broadband network. The network would be more tightly integrated for Public Safety devices and applications, and during times of need, Public Safety would not have to contact a commercial network operator to request priority access. All of the other aspects of the FCC National Broadband Plan would remain in place, including Public Safety roaming over commercial networks when there are major incidents, but this type of roaming would not be needed on a daily basis and it would fall under the FCC's plan.

I don't believe commercial network operators want to be in a position of having to make their networks available on a priority basis every day in major metro areas, nor do I believe the type of priority access available in the LTE specifications meets the needs of the Public Safety community. There is no guarantee of full pre-emptive priority, nor are there any mechanisms to ensure that during times of elevated demand on both commercial and Public Safety networks, Public Safety will truly have the level of priority it needs to protect and save.

Further, while LTE is a standard, there are several Public Safety application requirements that are different from those of most commercial customers. Commercial and Public Safety networks operate differently and roaming on commercial networks could result in confusion in the field at times when there is enough confusion in trying to handle the incident. Indeed, LTE is the smartest of all broadband technologies to date and there are many different ways to set allowable data rates, handle capacity, and handle traffic overflows. Most commercial network operators configure their networks to serve the greatest number of commercial customers by managing available bandwidth. Even with priority, there is a serious risk that the most important Public Safety users will be shut out of the network. This is simply not acceptable for mission-critical Public Safety communications.

Reallocating the D Block to Public Safety does not impede private/public partnerships nor does it change the fact that commercial customers can be accommodated over the network, but it does mean that Public Safety will be able to earn revenue from such usage. In fact, it does not diminish any aspect of the FCC's vision for Public Safety, it simply changes who has control of the network so Public Safety is guaranteed full access when needed.

This seems like a reasonable modification to the FCC's recommendations though it does prevent the government from collecting auction funds for the D Block. But in the overall scheme of things, even if the funds amount to $3 billion, that is less than one day's growth of our national debt. Reallocating the D Block to Public Safety is the best approach for all of the stakeholders, including the FCC.

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Comments on:

FCC White Paper

The Public Safety Nationwide Interoperable Broadband Network: A New Model for Capacity, Performance and Cost

Published June 2010

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Executive Summary

In June 2010, the FCC published its second white paper supporting its recommendations in the National Broadband Plan (NBP) submitted to Congress in March of this year. The first white paper detailed the FCC's ideas related to the cost of building and operating a nationwide public safety Broadband network. I reviewed that document and prepared my own white paper challenging many of the FCC's assumptions and questioning its findings.

This second white paper details the FCC's analysis of the capacity of the 10 MHz of spectrum already assigned to the public safety community and claim that 10 MHz of broadband spectrum (5 MHz by 5 MHz) will be sufficient for most public safety broadband requirements well into the future. The following is my response to the FCC's second report.

In the introduction to the Capacity Paper, one of the authors recaps points made in more detail in the body of the paper:

> *"The Federal Communications Commission ("FCC") has performed a technical analysis of the capacity and performance of the public safety broadband network assuming that the National Broadband Plan recommendations concerning this network are implemented. This analysis includes examining different emergency situations based on actual experiences and as submitted in the record of the National Broadband Plan. This analysis shows:*
>
> 1. *The 10 megahertz of dedicated spectrum allocated to public safety in the 700 MHz band for broadband communications provides more than the required capacity for day-to-day communications and for each of the serious emergency scenarios set forth below.*
> 2. *For the worst emergencies for which public safety must prepare, even access to another 10 megahertz of spectrum would be insufficient. Accordingly, priority access and roaming on the 700 MHz commercial networks is critical to providing adequate capacity in these extreme situations. Moreover, priority roaming is a cost-effective way to improve the resilience of public safety communications, along with its capacity, in a way that a single network cannot provide.*
> 3. *The capacity and efficiency of a public safety broadband network will far exceed the expectations of someone who has only experienced narrowband land mobile radio (LMR). This is because of the system architecture, density of cell sites, density of cell sectors per site, network and spectrum management, and the use of new and emerging technologies.*
> 4. *Public safety can make more capacity available when and where it is needed by using all of its spectrum resources appropriately and effectively, no matter how much spectrum is available (e.g., use the 700 MHz band for mobile devices and other frequency bands for fixed devices)."*

In reviewing the assumptions the FCC used in reaching these conclusions, I take issue with the following:

1. The FCC is trying to equate voice with data traffic information. Voice communications requires far less spectrum per conversation than broadband data services require. Further, the types of data have a huge impact on the amount of bandwidth available and the capacity of the network within a given cell sector.

2. The FCC claims that video data rates of 256 Kbps will provide sufficient video resolution for most public safety video applications. I and many others disagree with this assumption for many of the video feeds that will be employed by public safety.
3. The FCC claims that land mobile radio systems (LMR) are underutilized most of the time. This is not a correct assumption. LMR systems, as used by public safety, do have periods of light usage, but there are many times every week when these systems are supporting voice traffic that is beyond the capacity of both the existing LMR systems and the capabilities of the dispatch centers to keep up with the demand.
4. The FCC believes that roaming onto commercial networks will occur on a sporadic basis. My research shows that having only 10 MHz of spectrum available will result in having to roam on commercial networks in at least the top 100 metropolitan areas on a daily basis, and for long periods of time for each occurrence.
5. The FCC assumes that the public safety community will have access to 60 MHz of broadband spectrum (its own and that operated by commercial networks). This assumption is not based on any current rules that mandate commercial priority roaming or type of priority roaming and assumes that the winner of the D Block at auction will make its spectrum available for use by the public safety entities, yet its current recommended rules for the D Block auction do not require such cooperation between the public and private sector.
6. The FCC based its usage models only on major scenarios spread out over large geographic areas of a city or jurisdiction. There are no assumptions that look at capacity requirements for smaller incidents that occur on a daily basis and are fairly local in nature and, therefore, will have broadband coverage from only one or perhaps two cell sectors.
7. The FCC believes that local ordinances need to be changed to require the installation of inbuilding network cells (femto, pico, or distributed antenna systems). Yet the FCC has no authority to require that local communities actually do update their existing ordinances, nor does it take into account the cost of providing this inbuilding coverage, nor how it is to be integrated into the network.
8. The FCC's discussion of how much spectrum is already available to the public safety community is flawed in a number of ways. It counts the broadband spectrum at 4.9 GHz that provides only local-area coverage and does not penetrate buildings, it includes the 220 MHz band that is presently used in only one area of the United States because of a conflict on the Canadian border, and it does not take into account that existing channelized spectrum cannot be aggregated into spectrum that could be used for broadband because the channels already allocated to public safety are interleaved with channels assigned for other land mobile radio services.
9. The FCC claims that the public safety community's only rationale for requesting that the D Block be reallocated to public safety is so it can build fewer cell sites and therefore a less expensive network. This assumption is wrong, since public safety is planning to make use of the same number of cell sites recommended by the FCC (44,000 nationwide). The additional spectrum being requested is to provide additional capacity for the network.
10. The FCC used the New York City report on bandwidth requirements to support its own position. However, instead of using all of the assumptions provided in that report, it chose to discount the requirements listed for video services and use its own assumptions as to the number of video feeds that would be required and the bandwidth consumption of each connection.
11. The FCC assumes for the purpose of this paper and in its general findings, that a guard band is not needed between the D Block and the public safety spectrum. However, on May 18, 2010, the FCC requested comments from interested parties to provide input on whether or not a

guard band will be needed, even though the assumptions in its white paper are based on a guard band NOT being necessary.

12. The 700 MHz commercial spectrum that was already auctioned and on which networks are in the process of being built did not carry any requirements for priority access for the public safety community. It is unclear to me whether the FCC has the authority to now require these network operators to provide some type of priority roaming with the public safety community.

It is clear that those involved in preparing the FCC white paper on capacity tried to make the results fit the recommendations they already included in their National Broadband Report to Congress. In reality, this capacity study should have been prepared and released prior to their recommendations to Congress. The FCC focused only on major events or incidents and did not run scenarios based on day-to-day operational requirements. These daily incidents will occur in small geographic areas, sometimes within only a one or two block area of a city or within one-quarter or one-half mile of a jurisdiction. In many cases, these areas will only have broadband coverage from one or two cell sectors. Since this is the norm for public safety responses, this should have been the criterion for evaluation of the amount of spectrum required.

The FCC statement that capacity is based on a number of cell sectors per site, times the amount of spectrum available within each sector, divided by the frequency reuse factor, is true and correct. However, its assumption that public safety would build out fewer sites if it had more spectrum available is not correct. In the case of public safety and its planned network, doubling the amount of spectrum it has available will double or more the amount of bandwidth available within each cell sector. Therefore, the assumption that total capacity is based on other factors as well is not correct. The proper calculations should look at a single cell sector, map the bandwidth available within that cell sector, and then calculate the amount of data traffic (data and video) that will be required both inbound and outbound for typical incidents including a building fire, bank robbery, hostage situation, gang fight, and other incidents that occur on a daily basis but in random locations within jurisdictions.

Further, their discussion of cell sectors and capacity assumes that incidents will occur in areas already heavily covered by commercial network operators. This too is a flawed assumption. If we look at New York City as an example, the commercial operators have learned from experience that in the Theatre District, when the shows let out, the demand for voice and data services will peak. The network operators design and build their systems based on this type of demand, primarily in identifiable locations. The reality of the situation is that criminal events, fires, and other emergencies are not predictable by location, and in many instances the demand for public safety services will occur in areas of the jurisdiction that are lightly served by commercial operators, but bandwidth must be available for public safety.

It is my opinion that the authors of the paper were charged with reinforcing the position previously taken by the FCC that the D Block should be auctioned to a commercial operator. Instead, they should have been charged with taking an uncommitted view of the needs of the public safety community and developing a paper based on an understanding of the differences between commercial and public safety networks and requirements. It appears that this FCC white paper was developed for the purpose of further justifying a position it already recommended to Congress in the National Broadband Report. There are many discrepancies in the FCC white paper and a number of assumptions that, while they may be valid for commercial networks, are not valid for a mission-critical public safety broadband network.

The bottom line for me is that the FCC delivered a report that attempts to once again justify its position that 10 MHz of spectrum is sufficient for use by public safety on a daily basis and that during the occasional times when this is not enough, public safety will be able to make use of commercial network operators' spectrum on some as yet undefined type of priority access. Further, the studies referenced in this report look at broadband capacity from a macro level rather than from a cell sector level. The result is a paper that does not address the real-world broadband requirements of the public safety community on a daily basis, though it does meet the FCC's goal of justifying its recommendations already presented to Congress.

Andrew M. Seybold
Note: My full response to the FCC's capacity white paper is below in PDF format.

Comments on the FCC White Paper on Capacity

Section I: Introduction

In this section of the paper, the FCC reiterates its belief that "*creation of incentive-based partnerships with commercial entities*" will provide many advantages for the public safety community. However, the National Broadband Report does not include any information concerning this type of sharing nor does it require the winners of the D Block auction to work with the public safety community. The FCC seems to believe that the winners of the D Block will be willing to work with the public safety community on a joint build-out. If, as the FCC is presently proposing, the D Block is auctioned in 10 licenses, and the licenses are won by various commercial operators or green field operators, the burden placed on the public safety community to obtain agreements with the D Block winners could materially delay the construction of the public safety side of the network.

Further, as detailed below, 10 MHz (5 MHz X 5 MHz) of spectrum does not provide sufficient capacity for daily public safety needs, let alone enough capacity for commercial operators (the D Block). Thus it is unlikely that the winners of the D Block spectrum will be willing to voluntarily encumber a portion of their commercial spectrum. It is our belief that if public safety is restricted to its own 10 MHz of spectrum, it will have to roam onto the D Block or other commercial spectrum on a daily basis in many of the top 100 metro areas (see below). The FCC is basing some of its recommendations on the fact that the LTE technology supports priority access and roaming. However, the method of priority access (next in line for service or ruthless pre-emption) has not been discussed nor has the number of priority access levels been clarified. The FCC appears to be conducting research and reaching its own conclusions AFTER its broadband report was forwarded to Congress. Many of these issues should have been investigated prior to submission of the report. Now each of the FCC white papers, the previous one on network costs and this one on capacity, are viewed by many as reports designed to reinforce the FCC's recommendations after the fact. It is easy to deliver white papers that "prove" a specific, predetermined view.

It is also unclear to this author whether the FCC will be able to convince the existing 700 MHz spectrum winners that even though they won the spectrum at auction, they must now agree to priority roaming for public safety services. If this roaming will occur on a daily basis, as we believe it will, the value of their spectrum will be impacted as will the level of service they will be able to provide to their customers. If, in a given city, one network operator decides to cooperate with public safety while another operator decides not to, the operator that will not have to share its network with public safety will have a marketing advantage. It will be able to use 100% of its spectrum all of the time while the cooperating network operator will not be able to guarantee full access to all of its spectrum during emergency incidents, when, it has been proven time and again, the demand for both public safety and consumer and business usage in a given area all peak to load requirements that cannot be handled by any network operator. If network operators have to share some of their spectrum during these events, both the public safety community and the network operators' customers will suffer loss of service. And if public safety does not have ruthless pre-emption, it will end up, even with priority, competing with the networks' customers for service.

Another of the FCC's assumptions in this paper has to do with its vision "*that coverage and capacity of the public safety broadband network will be supplemented through in-building systems and through provision of deployable cell sites and vehicular relays.*" It does not say where and how many of these deployable cell sites (cells on wheels or COWs) will be stationed, who will own them, who will pay for them, and how they will be deployed. If they are staged in only a few areas of the nation, the transport time to an emergency scene could be hours if not days and they would not be available at the start of the incident when capacity will be critical. During a major storm or disaster, these COWs will be a welcome addition to capacity for long-term operations, but many incidents are kept from becoming major incidents by decisive action on the part of first responders in the first few minutes or hours. This is the critical period of time when those in charge of the incident need all of the information about the incident available to them, and when they need to disseminate video and other data to those who are in the field as well as back to the dispatch or command center.

The use of vehicular relays or vehicular repeaters has become standard practice within the first responder community for voice services. It is not clear from the LTE specifications if and when this type of device will be supported. However, the 3GPP standards body has addressed the issue of vehicular relays. Unless there is a demand for these devices, the cost of their deployment will be high, and it is not clear exactly how an LTE broadband network will be able to integrate these types of devices. Unlike traditional voice systems employed by the first responders today, LTE networks control the power levels of the devices in the field, decreasing the transmit power if a device is close to the cell center, and increasing it if the device is out toward the edge of the cell. This method of power control is vital to minimizing interference to and from the various sites as well as to and from field devices. Adding vehicular relays that would be capable of higher power or that will use external antennas could easily unbalance the power management important to the LTE network. Further, it remains unclear whether the devices carried by those in the field will have to include additional radios in order to use these relays. In short, the vehicular relay method of supplementing the coverage and capacity of the public safety systems is proven, but there are a large number of logistical problems associated with this approach on LTE networks.

Section II: Why the Plan Meets Public Safety Capacity Requirements: Baseline Capacity

This portion of the paper starts out with the contention that the public safety community already has 60 MHz of spectrum available for broadband use, and that overall, the allocation of spectrum per user for public safety is now 25 times that of commercial providers. There are a number of statements here to which we take exception. The first concerns the 50 MHz of broadband spectrum at 4.9 GHz that the FCC includes in its figure of 60 MHz available for broadband. While licensed for public safety use, this spectrum is adjacent to the 5.8 GHz Wi-Fi unlicensed band and the characteristics of this band make it unsuitable for any type of wide-area broadband coverage. This is a band that can be used for local-area but NOT wide-area communications, therefore it should not be included in the FCC's broadband-available number. This takes the FCC's 60 MHz available for broadband down to 10 MHz of spectrum presently licensed to public safety in the 700 MHz band.

If we deduct this 50 MHz of local-area spectrum, we end up with public safety allocations of 47.1 MHz including the 24 MHz at 700 MHz. Prior to the release of the 700 MHz spectrum, public safety had operated its systems in a total of 23.1 MHz of spectrum in the 30, 150, 450, and 800 MHz bands, with some use of 470 MHz shared with TV stations in major metropolitan areas, and a small slice of 220 MHz spectrum authorized for use in upstate New York because there is a conflict with Canadian spectrum usage on some of the public safety bands. Of the 23.1 MHz of spectrum that has been allocated to public safety over the last 60 years, all of it is channelized AND the channels are intermingled with other land mobile radio systems. Even if there was enough spectrum in any one of the bands, it could not be aggregated for broadband usage.

That this spectrum has been allocated over a 60-year period, that none of it is contiguous, and that it is spread over six to eight different portions of the spectrum is what led to the lack of interoperability for public safety in the first place. Elsewhere in its paper, the FCC contends that this 23 MHz of spectrum is lightly used most of the time. What it doesn't point out is that many times during every week of the year, there is substantial demand for this spectrum, which results in delayed dispatches and response times. States that have been aggressive in building statewide, interoperable voice networks on the spectrum available to them have found that they do not have the capacity to handle the demand for voice radio traffic. For example, Indiana's statewide wireless public safety communications network is now facing overcrowding issues due to a lack of spectrum,[1] and this is for a statewide system that supports 52,000 registered users.

We also find fault with the number of first responders the FCC claims would need access to the network. Its number cited in a footnote on page 4 of its report states in part, "*public safety: According to the Bureau of Labor Statistics, U.S. Department of Labor, there are 1.1 million police, fire and EMS professionals. This number excludes some first responders, such as volunteer firefighters. For this analysis, we assume 2 million public safety users.*" It does not include volunteer firefighters nor does it count other organizations that will need access to this interoperable spectrum such as federal agencies, and agencies and organizations that take on the status of "first responder" during some types of incidents. For example, an automobile that has hit a telephone pole and has a high-power electric line on top of it requires first responder response from the electric company to disable the power line prior to any rescue attempt by fire and EMS personnel. We believe that the true number of users should be in the 4 to 5 million range.

But even using the FCC's number, what it fails to take into account is that most incidents are local in nature and that there will be a concentration of vehicles and personnel in small geographic areas for long periods of time, all needing access to video and data services. As more units and personnel respond to an incident, there will be an increased need to receive information regarding the incident and their assignments. Today, this information is disseminated primarily using the voice channels assigned to a jurisdiction. However, when the broadband network is in place, much of this information will be shared in a digital format including video transmitted from units already on the scene. This concentration of personnel will also lead to the arrival of the press and a number of citizens who are curious about the incident or whose home or business is part of or adjacent to the incident. This, in turn, will lead to increased network usage both for the public safety network and the commercial networks. If, as we believe, public safety will have more demand for digital services than it has spectrum (based on the 10 MHz currently allocated), there will be a need for public safety to roam onto these already congested commercial networks and, even with priority access, there will be delays and loss of information that could end up causing the additional loss of life and/or property.

We believe that the FCC should not have looked at the network capacity issues from a nationwide or major incident basis where there is access to the network through many different cells sites and cell sectors, but rather within the confines of typical daily incidents that take place in much smaller areas of several city blocks or within one-quarter or one-half a mile in which the number of vehicles and personnel will be concentrated and where broadband coverage will be limited to one or possibly two cell sectors. The FCC's report tries to equate voice and data traffic, and the total number of users for a given incident. However, in practice, much of the voice traffic during these typical incidents is taken off the network voice systems and moved onto channels where units can talk to each other without having

[1] Crisis-comm network nearing capacity http://tribstar.com/local/x1703931790/Crisis-comm-network-nearing-capacity

to use the main network. The incident commander will stay in contact on the main network channel, but teams in the field will be assigned simplex or tactical channels.[2] Therefore, the voice traffic will be spread over many different channels enabling teams to communicate among themselves without interfering with other teams at the same incident. The team commanders will be in direct contact with both their own team and the incident commander.

In the case of the public safety broadband network, all of these teams will have to rely on the total bandwidth provided within a single cell sector or two. According to the FCC's own calculations, the total available bandwidth for a cell sector using 10 MHz of spectrum will be 7.5 Mbps down to devices and 3.25 Mbps for the uplink (from the device to the network).[3] However, this bandwidth is not available in the entire cell sector; the amount of bandwidth will diminish toward the cell edges. The FCC's report states that cell edge data capacity will be an acceptable 256 Kbps and points to the National Public Safety Telecommunications Council (NPTSC) report which states "that a system that supports 256 kb/s per video device throughout the coverage area, including edge of cell, is sufficient for public safety in urban areas (and lower data rates are acceptable in suburban and rural areas)" in support of its position. This report was generated in 2007 and was based on technology that was then available in the market. Since this report was published, there have been many studies that conclude that video data rates of 256 Kbps do not provide the level of resolution that will be needed for various kinds of incidents.

For example, in the case of a hostage situation where a sniper is in place and watching the hostage taker and hostages inside a building through a window, video at 256 Kbps will not provide the level of detail needed by the swat team commander and the incident commander, and several other video feeds will probably be needed simultaneously. A number of commercial companies have demonstrated video over LTE at various levels of resolution and have found that 1.2 Mbps video is required in many cases for both the type of resolution and depth of field necessary to be able to properly assess an incident. Even deferring to the Department of Homeland Security's SAFECOM program, we find that 512 Kbps video may be needed. If we run the FCC's own calculations against the benchmark of 512 Kbps video, we come up short on a cell sector basis. However, using the same numbers but with 20 MHz of spectrum, we can achieve the required 512 Kbps of video service availability for a given cell sector.

Also in this section, the FCC tries to make a case concerning the cost of mobile devices if the D Block is not auctioned to a commercial network operator or green field company. Its contention is that the device costs will be higher because there will not be enough demand to reach quantities necessary to provide devices at reasonable pricing levels. On the surface this may appear to be true, but the fact is that many public safety devices will necessarily differ from commercial devices in a variety of ways. They must be hardened products with bright screens that can be viewed in bright sunlight, they must have greater battery capacity, and they must be built for single-handed use (public safety personnel cannot be required to make use of devices that require the use of both of their hands while involved in an incident). By their very nature, they will cost more to build than typical commercial devices. Enabling these devices to work on the lower portion of the 700 MHz band (on AT&T and Verizon's spectrum) will

[2] Channelized Communications http://andrewseybold.com/1456-channellized-communications

[3] Appendix of FCC white paper on Capacity: "In this Appendix, we analyze public safety use of broadband wireless communications employing a network built in accordance with the FCC Cost Model in 10 megahertz of spectrum in four scenarios depicting various types of emergencies. For each scenario, we calculate the expected value of utilization[3] of the network.[3] We assume for purposes of this analysis an LTE network whose capacity averaged over each sector[3] is 7.5 Mb/s (downlink) and 3.25 Mb/s (uplink). These figures represent average throughput and are in-line with current industry benchmarks"

drive the costs even higher. The D Block devices will cost more, but they will cost more than commercial LTE devices as well.

One thing the FCC did not consider in its argument for cost savings is that if the D Block is auctioned and all of the commercial devices built for the D Block licensee are capable of operating on the public safety spectrum, the odds of hackers making their way onto the public safety spectrum and disrupting mission-critical communications are increased dramatically. However, if the devices are built to support the lower bands on the commercial networks and a combined D Block and public safety band for public safety, the commercial devices deployed on the upper and lower 700 MHz commercial spectrum will not be capable of operating in the public safety spectrum, thus reducing the chance of intentional hacking by those interested in proving they are smart enough, or the criminal element who want to disrupt public safety's ability to communicate during an incident or a terror attack.

In Section II, A. Network Capacity Drivers, the FCC attempts to explain that merely increasing the amount of spectrum available does not necessarily mean an increase in capacity. However, here, as elsewhere in its white paper, the FCC seems to be saying that it does not believe public safety will build out its broadband networks to commercial standards and that public safety is only asking for more spectrum in order to be able to construct networks that have fewer cell sites. Therefore, the additional spectrum is needed for added capacity.

This is the formula used by the FCC:

$$\text{Total capacity} = \frac{(\text{\# of sites}) * (\text{\# of sectors per site}) * (\text{Capacity/MHz}) * (\text{\# of MHz of spectrum})}{\text{Frequency Reuse Factor}}$$

The problem with this formula is that it is based on the total number of sites in a system. As discussed above, we need to be looking at the total amount of available bandwidth on a sector-by-sector basis and not based on a total number of cell sites. If we change the formula to reflect the capacity of a single cell sector, we are left with only two numbers:

1) A cell sector with 10 MHz of spectrum available (5 X 5 MHz) has an average throughput capacity of 7.5 Mbps
2) A cell sector with 20 MHz of spectrum available (10 X 10 MHz) has an average throughput capacity of 15+ Mbps

When planning a public safety broadband system, or for that matter a commercial LTE network, these are the only numbers that have any relevance on a day-to-day basis. During a major disaster that covers a large geographic area, there will be more total system capacity. However, toward the epicenter of the incident, we are back to having to contend with the amount of bandwidth available in each cell sector.

According to the FCC, commercial networks are built out using a high density of cell sites, and this is a true statement. However, the FCC does not mention that when commercial operators calculate cell sector capacity, they build in "headroom," or more precisely, they do not plan on a cell sector being full during normal operation. This type of design allows other customers to come into a cell and not be denied service. Thus in reality, the total bandwidth available for load planning purposes is less than the maximum available bandwidth in each cell sector. The calculations are made by determining projected cell sector loading during times known as "busy hours," or the times when demand for service is highest.

Unlike voice networks where there are specific demand peaks before and after work hours, for example, peak data demand occurs more often during each day.

We do not yet know what the design criteria will be for LTE, but we can look at a DSL build-out to understand the relationships of the numbers. With DSL, the network is designed with a standard ratio of 20:1, which means 3 Mbps of data access is available for twenty subscribers. But for the twenty customers, the network is built for an average of 1 Mbps, which assumes that not all 20 subscribers will be using the network at once. This ratio is different for wireless and may in fact be based on 30, 40 or even 50:1. This is important to know because an incident within a given cell sector will break that model due to the high number of users requesting service at one time. If we use these figures and revisit the numbers the FCC provides in the white paper appendix, we find that the system capacity is vastly different from the capacity numbers shown by the FCC. If we push the capacity per cell sector up to 75% utilization, we end up with a total sector capacity of 5.63 Mbps for a 10 MHz system and 11.25 Mbps for a 20 MHz system. These numbers could be lower and have a huge impact on the total bandwidth available during an incident. Adding another 10 MHz of spectrum will provide public safety with more capacity on a sector-by-sector basis. Again, running the calculations in the FCC's white paper appendix using these numbers produces a very different view of the available cell sector capacity.

Typical commercial networks are built out over time and more cell sites continue to be added where there is increased demand for service for a number of years after the initial construction. Demand for commercial capacity can also be planned for. For example, all of the network operators in New York City have more cell sites located near Times Square than in a comparable area in other parts of the city. This is because of the high volume of customers around Times Square and because they know that before and after Broadway shows or other events, network capacity must be increased in these areas to handle the potential demand for services. Even with all of this planning, it is possible to run out of available spectrum. Recently, AT&T announced it would be deploying Wi-Fi access in the Times Square area to help off-load some of the demand for broadband data services over its network.[4]

When designing a public safety broadband network, it is possible to review crime patterns and plan for areas where more capacity will probably be needed, but you cannot plan for incidents that may occur in areas that are not normally affected by high crime rates. For example, in October of 2006, a private plane crashed into a 50-story apartment building on the Upper East Side of Manhattan[5] where crime rates are not normally high, and in 2009 a US Airways plane landed in the Hudson River[6] where one would not normally think a lot of capacity would be needed.

In both of these incidents, all of the commercial networks were quickly jammed beyond capacity as on-lookers, survivors, and the media descended on the areas. The public safety voice channels were also overloaded, and in both instances there needed to be coordination between multiple agencies including several federal agencies. While airplane crashes are, thankfully, few and far between, these are only two examples of incidents that can and do take place in portions of metro areas where you would not build out as many cell sites as you would in Times Square. In both of these cases, public safety would have eaten through its bandwidth capabilities quickly, but having the additional 10 MHz of spectrum from the D Block would have made a huge difference in the total on-scene capabilities of the various agencies that responded.

[4] http://www.computerworld.com/s/article/9177327/AT_T_adds_Wi_Fi_hot_zone_to_relieve_Times_Square_congestion_
[5] http://www.independent.co.uk/news/world/americas/plane-crashes-into-new-york-apartment-block-419676.html
[6] http://www.cnn.com/2009/US/01/15/new.york.plane.crash/

Designing and building broadband networks is not something where a network is built once and never expanded. However, commercial network operators have a distinct advantage because they pre-plan their network architecture to concentrate more capacity in known areas of congestion. If there is a pre-planned event such as a World Series, Super Bowl, or some other large event, cells on wheels can be pre-installed. In the case of public safety systems, the incident types and locations are not as predictable, so it is imperative that each cell sector be deployed with the maximum possible capacity.

Further on in this section of the white paper, the FCC states:

"Another way to increase capacity is to provide supplemental infrastructure to expand available capacity. There are unique strategies for increasing capacity within buildings, where a substantial amount of cellular network traffic originates. Additional infrastructure, such as distributed antenna systems (DAS) and pico cells, can be installed inside buildings to improve coverage and offload traffic from external cell towers. These approaches decrease strains on the available cell site infrastructure. The NBP recommends that building codes be changed or enacted to enable greater use of these technologies and that FCC rules be developed that enable and facilitate their use. Further, additional outreach by the federal, state and local governments to building and facility owners can assist in ensuring that this technology is widely pervasive as 4G networks are deployed.

Capacity can be further expanded by utilizing deployable communications systems, such as next generation cell sites on wheels (a.k.a. "COWs" or "COLTs"[7]*) and vehicular relays, as is frequently done with today's wireless technologies during disasters and major incidents or events. The NBP recommends deployment of these technologies for public safety broadband use, through a program that would help fund caches of equipment throughout the country that can be rapidly deployed to the site of any major disaster."*

I do not believe that the FCC or the federal government has the authority to require changes to local ordinances that would require homeowners, apartment building owners, and office building owners to install distributed antenna systems and picocells (or femtocells). Further, there is a problem with the FCC's logic in this recommendation. Picocells or femtocells would, in fact, increase the broadband capacity inside a given building, but the data would have to be carried over the building's Internet connection back to the main public safety network center where it would have to be integrated with the main broadband network. If the building picocell or femtocell is using DSL or cable bandwidth (or even a T1 line) for backhaul, the effective capacity increase is limited to the capacity of the backhaul. For example, Starbucks offers free Wi-Fi services that it advertises as 802.11G or up to 56 Mbps. However, since it uses a T1 line for backhaul, the maximum bandwidth available within any Starbucks is the capacity of the T1 line (1.54 Mbps). Moreover, the Internet is NOT a mission-critical network.

The public safety community has been hampered by a lack of inbuilding coverage on its land mobile radio channel systems and for years has been struggling with the issue of inbuilding systems. The public safety community has no authority to require inbuilding coverage and building owners strongly lobby against these costly requirements. The FCC believes that these devices will contribute to the overall capacity of the networks, but did not calculate the cost of their deployment or the ongoing costs of the backhaul required to add them to the network. Therefore it is unrealistic on the part of the FCC to include these devices in its calculations of capacity availability for public safety broadband.

[7] "COW" and "COLT" are common industry terms for Cell On Wheels and Cell On Light Truck.

The most glaring of issues here is that distributed antenna systems (DAS) do not increase capacity, they merely make it available inside buildings that are not covered by external cell sites. The reason distributed antenna systems do not increase capacity is that they require a donor cell. They communicate with an external cell sector, making use of that cell sector's capacity and amplifying the signals inside a building. The use of distributed antenna systems will increase data coverage but will do nothing to increase the amount of data capacity available at an incident.

The idea of using deployable communications systems was discussed earlier in this paper, and their applicability would depend on where they are stored, who maintains them, and how long it takes to transport them to an incident. Further, these deployables will require backhaul to the main network, and with LTE networks, they must be interfaced with the network so they can become part of the system. All of this is time consuming and assumes that backhaul data transport is available for this purpose at every scene where deployables might be important in helping with capacity constraints.

Next up is the FCC's recommendation that the public safety community should rely on other transmission technologies such as wireline and fixed wireless technologies for video, which will "*enable public safety to preserve its 700 MHz capacity for mobile broadband communications.*" This recommendation is based on a belief that all video needed at an incident can be delivered by using fixed cameras that are already in place, and that public safety has access to these video feeds. They may have access in some cases, but it is not only the dispatcher who needs to view the camera feed in question, the field incident commander and others at the incident need to view the video as well. The feed from the wired camera will need to be sent over the 700 MHz broadband network if it is to be of value to those at the scene. We also know that many of the video cameras will need to be deployed by personnel at the incident. The only way to transmit this data to others in the field plus the command center will be via the 700 MHz broadband network.

Some of these video feeds will require higher resolution than others. In the case of the sniper on the roof watching a hostage situation unfold through a window, a higher resolution color video stream will be needed. When monitoring congestion on a freeway, a black and white camera with less resolution will suffice. The only way public safety can make use of aerial cameras today is by working with the news media when available. If this video is available, it is high resolution and would need to be rebroadcast over the broadband network to deliver it to those at the incident. It should be noted that the use of cameras in helicopters and airplanes is prohibited by the FCC in both the 700 MHz band and the local-area 4.9 GHz band presently assigned to public safety.

Today's broadband network helicopters transmit video that is of the quality needed by fire and other personnel during these times but 256 Mbps data is not adequate to handle these requirements. Public safety realizes that it will need to manage its bandwidth, but this type of bandwidth management will be much easier on its own network with its own controls. Using a combination of dedicated and commercial shared spectrum at an incident will require expertise and will be a time-consuming process. It would be far better if public safety had to share spectrum only in rare instances rather than on a daily basis, which will be the case with an allocation of only 10 MHz of bandwidth.

Last in this section is the FCC's discussion about how much bandwidth is enough bandwidth. Once again, it missed the point. In the FCC's estimation, there will be times when 10, 20, or even 30 MHz of spectrum will not be enough to meet the demand of the public safety community. This is a true and correct statement. In cases where it does not have sufficient bandwidth available, public safety will be forced to roam onto commercial networks. The question here is if this will occur daily, monthly, or occasionally. The FCC maintains that this need for roaming onto commercial networks will be on an occasional basis, but that assessment is based on bandwidth utilization that considers the total amount of bandwidth available within a system. In fact, the need for more spectrum will arise much more often than our analysis of cell sector capacity shows (see above). The FCC also states that "*Guaranteeing access to these networks will enable the public safety community to have access to substantially more capacity than a dedicated network can provide without vastly more dedicated spectrum than is under consideration. Roaming with priority access will also provide increased reliability and resiliency, especially if any roaming partner utilizes different cell tower sites for all or some of its network."* Yet neither the priority rules nor the type of pre-emption have been discussed with the commercial network operators. The FCC seems comfortable that priority access as defined in the LTE specification will be sufficient. However, this view is based on systems that have not yet been implemented, and using pre-emption that could force public safety to wait in line for access to the bandwidth in a given cell sector, pushing commercial customers to lower speeds but not kicking them off of the network in real time. This means that only a portion of the commercial network operators' spectrum will be available (to be determined by the network operator). Commercial operators will not want to have to explain to their higher paying customers why they could not access their broadband services.

The greatest point of disagreement between the FCC's report and our findings is that the FCC is considering total system bandwidth and we are more concerned about sector bandwidth. At my recent meeting with the FCC's Public Safety and Homeland Security Bureau's technology experts, there were two statements that really brought home to me their lack of understanding when it comes to the needs of the public safety community. The first FCC assumption was that the public safety community wants to model its broadband network after its existing voice networks with fewer high sites and therefore needs the additional spectrum. The other was that during an incident, if a command vehicle was not ideally located it might have to be relocated so it would be covered by a different cell sector with more capacity available. I can just imagine the instructions to the incident commander: "Move the command vehicle one-half mile further from the incident so we can get our video feed." Somehow I don't think this is going to happen. It is the same thing as telling a police officer involved in a shoot-out that he will have to move 20 feet to be able to call for help—and 20 feet from his position behind his car would put him directly in the line of fire. Good luck!

The FCC's final point in this section really tells the whole story about its white paper on capacity. It states, "*As long as sound network management is adhered to, including the provision of adequate funding to construct sufficient cell sites in the network area, the deployment of cutting-edge technology in each cell site, and the use of supplemental tools to increase capacity, network capacity for public safety communications will be significant in 10 megahertz of dedicated capacity."* Any time a statement starts out with "as long as" and then adds conditions on top of conditions, you can be assured that it won't end up being reality. And please note that the FCC used the word *significant* and not "sufficient" in this statement. Not only is the FCC hedging its bets and providing a report after the National Broadband Report was issued, it is carefully making sure that the wording is such that when it is proven wrong, it will be able to hide behind statements such as this one. But by then the damage will have been done.

Section II: B. Public Safety Communications Today

This section starts off with the following statement:

"Unless we are able to get past the mindset that network capacity is synonymous with spectrum, it would be natural to expect that the capacity from this 10 megahertz Block at 700 MHz will be comparable to what public safety has experienced in the past. This is not the case. The public safety LMR networks in use today consume a large amount of spectrum per user. This occurs in part because of legacy network design and technical considerations: public safety networks utilize radio systems with a relatively small number of high site towers and very sensitive radios. This technology and design greatly increases the amount of spectrum needed per user when compared to cellular architectures, which are used for today's commercial communications networks. Further, unlike cellular commercial systems, public safety communications have generally been locally operated, which necessarily results in spectrally inefficient overlapping, independent networks. The NBP recommends that the public safety broadband network utilize a cellular architecture with LTE technology and be deployed in a coherent manner throughout larger non-overlapping geographies. This should result in dramatic increases in spectrum and cost efficiencies, while handling heavier traffic demands than currently exist."

This entire statement, once again, shows the lack of understanding of the real world of public safety communications. Even the proposed public safety broadband network will be comprised of a number of local, metro, regional, and statewide systems. The FCC founded ERIC to assist in making sure that all of these networks are built to the same standards and will interface with each other. It is difficult to understand why the FCC believes that communications networks for public safety, which serve local jurisdictions first, and then coordinate with adjacent jurisdictions, regions, states, and then on a national level, should not be locally operated. There is a significant difference between the types of jurisdictional controls that are needed by local law enforcement, fire, and EMS and the construction of a network or combination of networks.

It is important to decouple the concept of a nationwide broadband interoperable network with the daily needs of local communities. The concept to which the FCC appears to be subscribing seems to suggest that there should be a single 911 answering point located in DC and that all dispatches be made from that center to the entire nation on an area-by-area basis. This, of course, is not a practical solution. What is really needed is to provide for local management of the communications resources of the broadband network with the ability to expand that interface of the local network to regional, state, and even nationwide interoperability on a when-needed basis. Local jurisdictions know more about their own requirements than someone sitting 200 or 2,000 miles away from the agency.

It is also clear from the following statement in this section that the FCC considers broadband systems fully capable of meeting all of the public safety community's voice requirements:

"For example, a recent study of public safety communications in the greater Los Angeles area showed that a shift from today's LMR technology to even a pre-LTE cellular technology could increase capacity per megahertz by a factor of 16. In other words, the study demonstrated that 10 megahertz of capacity on a cellular network would be the equivalent of 160 megahertz on an LMR-type network."

It is interesting that this cited example just happens to come from a paper written by one of the authors of the FCC white paper on capacity.[8] Further, it really underscores the fact that those within the Public Safety Bureau of the FCC, and the commissioners, do not understand the different types of voice

[8] J.M. Peha, "How America's Fragmented Approach to Public Safety Wastes Money and Spectrum," *Telecommunications Policy,* Vol. 31, No. 10-11, 2007, p. 605-618.

communications that are a requirement of the public safety community and not simply a "nice to have" set of capabilities.[9]

There is no doubt that for data services, broadband is more spectrally efficient than channelized communications. However, the FCC failed to point out that many broadband systems do NOT offer voice services. In the CDMA world, Verizon and Sprint, among others, have dedicated data channels for broadband and voice is still run on their 2G networks. Further, in the GSM world, most of the voice traffic is still run over 2G networks and not over the 3G networks, which are primarily reserved for data services. VoIP is, today, less spectrally efficient than 2G commercial voice services or channelized land mobile radio systems.

A blanket statement that more voice calls can fit into less spectrum over broadband is not correct today and will not be correct for the foreseeable future. Further, in order to reach the data speeds required for broadband services, you need far more spectrum than for voice calls. Add to this the fact that today's broadband services and those being planned for tomorrow cannot provide communications when the devices are not within cell coverage, whereas land mobile radio systems do have that capability, and it very quickly becomes clear that the issues indentified in the paper and cited in the FCC report are mixing apples and oranges in order to prove a point that is not based on the realities faced by either the public safety or the commercial wireless community.

The statement by the FCC in this document that says, *"It would be a mistake to design a network based upon the public safety's past experience in using spectrum. Public safety agencies do not have significant incentives to use spectrum efficiently, because, unlike commercial entities, public safety agencies in America do not pay for spectrum"*[10] is confusing at best since the public safety community has already accepted the FCC's recommendation that the entire nationwide system should include 44,000 cell sites. It has never been contemplated by any public safety organization that public safety follow the land mobile radio model. It should be pointed out, once again, that the issue of capacity and capabilities should not be based on the number of cell sites across the nation, but needs to be calculated on a cell sector basis. None of the public safety entities that have been granted waivers by the FCC are planning to skimp on construction of their networks. A review of these proposed networks will show that they are being designed in accordance with standard commercial practices, and take into account the cellular nature of systems used for wireless broadband services. The assumption that the public safety community is attempting to build systems with fewer sites and therefore needs the additional 10 MHz of spectrum is a faulty assumption on the FCC's part.

The issue of how much spectrum is currently available to public safety is overstated by the FCC in some places in this report and stated correctly in others. In one part of the report, the FCC contends that public safety has access to 60 MHz of broadband-capable spectrum at present, but it is counting the 50 MHz of licensed spectrum in the 4.9 GHz range that is totally unsuited for wide-area data services. In yet another part of the report, it states that the public safety community currently has access to only 23 MHz of spectrum for all of its voice services. Not included is the additional information that this spectrum has been assigned over a 60-year period of time, and in many different frequency bands, which is the root cause of the interoperability issue public safety is facing today. Nor does the FCC acknowledge that this 23 MHz of spectrum is not contiguous, which means that today public safety's voice channels are intermingled with those of other land mobile radio users. It also means that even if

[9] http://andrewseybold.com/1456-channellized-communications
[10] Page 8 of the FCC white paper

the spectrum was contiguous, there is not enough of it available in any one band for it to be converted to broadband usage.

It appears that this FCC is determined to repeat the past by providing too little spectrum in one band while stating its willingness to "find" additional spectrum in a different frequency band if needed in the future. Our contention is that public safety has proven, with hard data, that 10 MHz of broadband spectrum (5 X 5) is not sufficient today and it certainly won't meet the needs of the public safety community in the future. If the D Block is not reallocated to public safety, more spectrum will be needed very soon. If that spectrum is located in another band, the public safety community will have to spend even more money adding that spectrum to its broadband network. There will be yet another round of new equipment and new cell site costs, and mobile and handheld devices used on the public safety broadband network will have to be discarded and replaced with new equipment at even higher costs. It makes little sense to build a network and then have to build an additional network that will only perpetuate the FCC administration's earlier mistakes.

Today there is an opportunity to provide additional bandwidth for public safety that is adjacent to its existing 10 MHz of broadband spectrum, the deployment of which would add little to the network and device costs. The D Block, which the FCC has recommended be auctioned to one or more commercial broadband operator, is adjacent to the existing public safety broadband spectrum and this spectrum is needed in order to ensure that public safety, for the first time, has sufficient contiguous spectrum to build a common, nationwide, interoperable broadband network.

Section III: How the Plan Meets Public Safety Capability Needs; Capability Back-Stop

In this section, the FCC continues to try to prove that there is enough capacity within the 10 MHz of previously allocated public safety broadband spectrum. Early in the section, it states that commercial providers will serve 2.7 times the number of users per megahertz than public safety. Here again, the FCC appears to be using numbers for public safety personnel that are too low. It does not acknowledge that during a major incident there are times when off-duty personnel are called back for the incident, nor does it discuss the fact that public safety incidents are usually within confined areas where the number of cell sectors available could be limited to one or two. It does not address the issue of blocked calls or lower data rates that are the result of overloading on the commercial networks that cannot be tolerated in the public safety environment. It should be noted that most of the commercial operators have discontinued their all-you-can-eat data plans in order to help manage their networks more efficiently because, especially in major metropolitan areas, they are experiencing cell sector capacity limitations.

In a footnote to this white paper,[11] the FCC describes how public safety networks are designed for worst-case usage and most of the time they are underutilized. We disagree with this assessment. In

11 For example, as was observed based on usage data from Denver's public safety communications systems, "[m]odern public safety wireless communications systems are generally designed for the worst-case scenario: a large-scale event which requires communication between large numbers of first responders, potentially from diverse agencies. . . . Most of the time, these systems operate at the low end of their designed-for capacity." Joshua Marsh, "Secondary Markets in Non-Federal Public Safety Spectrum," Telecommunications Policy Research Conference (2004). In addition, at its peak, the Minneapolis system handled over two times the number of calls during the I-35W bridge collapse that it would typically expect. During the busy-hour of September 17, 2008, the Harris County Regional Radio System handled almost twice as many PTTs than it would handle on a typical day. See Federal Communications Commission, Emergency Communications during the Minneapolis Bridge Disaster: A Technical Case Study of the Federal Communications Commission's Public Safety and Homeland Security Bureau's Communications Systems Analysis Division at 16-17 (2008) (Minneapolis Bridge Case Study), available at http://www.fcc.gov/pshs/docs/clearinghouse/references/minneapolis-bridge-report.pdf; see also Federal Communications

times of major incidents, the existing voice networks are called upon to operate beyond the capacity they were designed to handle and on Friday and Saturday nights as well as holidays, these networks are already overloaded and dispatch and response delays occur on a regular basis. Long ago, the FCC established guidelines for voice traffic loading on public safety networks.[12] In order to qualify for additional voice spectrum, if any is available, the criteria established by the FCC says that on a single conventional voice channel, the proper public safety loading should be 70 units, and when using trunked radio systems, that loading can be increased to 90 units. Most dispatch systems in the United States have exceeded these loading numbers because voice spectrum is in such short supply. Having broadband capabilities in addition to existing voice networks will reduce some of the overcrowding being experienced on the voice channels, but if there is not enough bandwidth available for day-to-day operations, public safety will experience the same type of overcrowding on its broadband network as it does on its voice networks.

It should be noted that the federal government agencies that are considered to be part of the public safety community include the Secret Service, FBI, and others, and that all of these have networks that are designed along the lines of today's public safety networks. It also should be pointed out that much of this spectrum is lightly used during normal operations but must be available at a moment's notice when needed. When looking at broadband services for all public safety agencies, especially a new broadband network that is intended to serve both day-to-day operations and interoperability requirements, the FCC does not take into account that many types of new applications and services will be developed to take advantage of this network. One example, which will keep police officers on the streets for more hours per shift, will be the ability to complete reports and file them from the field as opposed to the officer making notes with a pen and paper and then having to return to the office to transfer this information into a computer system. It is our contention that just as the iPhone and other smartphones have driven wireless broadband usage up by 5000% over the last two years,[13] the amount of data over public safety networks will also grow substantially as new applications are introduced and as broadband devices are extended from within the vehicles, as they are today, to being worn on the person.

Section III: B. Possible Future Capacity Expansions

The next section of the FCC white paper concerns LTE support of priority access and priority access on different levels. It also states "*Such prioritization schemes have been used successfully in military systems.*" What the FCC fails to disclose in this statement is that many of the military systems use pre-emptive priority—a system where those with high priority can have access to the network immediately and not have to wait for existing users to complete their traffic or to join a network and be assigned only a portion of the bandwidth. Until there are LTE services in commercial operation and agreements with commercial operators are in place, there is no guarantee that the type of priority access envisioned by the FCC will, in fact, be available. Further, as stated before, the FCC is of the belief that the need to employ commercial networks' spectrum on a priority basis will arise only "occasionally" while our findings show that based on cell sector capacity studies, the need to use commercial network spectrum will arise on a daily basis in most metropolitan areas. No matter how many cell sites are developed for

Commission, Emergency Communications During Hurricane Ike: Harris County Regional Radio System: A Technical Case Study by the Federal Communications Commission's Public Safety and Homeland Security Bureau's Communications Systems Analysis Division at 12-13 (2009) (Hurricane Ike Case Study), available at http://www.fcc.gov/pshs/docs/clearinghouse/case-studies/Hurricane-Ike-Harris%20County-120109.pdf.

12 FCC Rules Part 90.269

13 http://blogs.broughturner.com/2010/02/overestimating-mobile-data-growth.html

the public safety system, or the overall capacity of a metro-wide network, the capacity per cell sector is the most important criteria for determining the amount of spectrum required.

The FCC's final point in this section is that "*LTE is in the early stage of technology deployment, and it will continue to progress,"* which is a true statement that should have been qualified with, "However, it will progress based on the stated needs of the commercial network operators that are concerned about issues that affect their own network performance." The FCC also states "*Commercial operators are constantly upgrading their network capabilities to take advantage of greater spectrum and operational efficiencies*." Yet in my discussions with the technologists within the Public Safety and Homeland Security Bureau, these people appear to believe that the public safety network will be built once and not enhanced, and that the number of cell sites will not be increased over time and as demand dictates. This is not a safe assumption, and since the FCC seems to believe that going forward, commercial broadband networks are the model for the public safety broadband network, then the same criteria should apply.

Section III: C. Efficient Use of Public Safety Spectrum

In this section of the white paper, the FCC focuses on the importance of spectrum management and contends that ERIC (the Emergency Response Interoperability Center) will be in a position to help public safety prioritize applications over this network. Again, it includes the roaming portion of its plan to demonstrate the role ERIC can play. However, public safety normally operates on a local basis and each community's needs, and their choice of applications and devices, will be different. The use of this network will be primarily on a local level, thus macro-management from ERIC will not be possible. ERIC's job, as I understand it, is much more confined to the task of making sure that all local, regional, and state networks can interconnect with each other and that devices used in one jurisdiction will work across the entire network when needed. Once again, the FCC seems to believe that federal oversight is all that will be needed to ensure sound network management.

Section III: D. The Role of Video and Future Bandwidth Intensive Applications

I have commented in depth on the differences between what the FCC believes is adequate for video data rates and what will be needed in the real world. Here again, the FCC's attitude is that no matter how much spectrum is available, it will never be enough for all of the video being contemplated for use by public safety. This is an accurate statement, but it does not address the issue of how much video can be employed using 10 MHz of spectrum in a given cell sector versus how much can be employed in the same size cell sector using 20 MHz of spectrum. The answer is more than double. And data rates will be higher in more portions of the cell sector with twice the amount of spectrum.

Public safety today operates in a mode where visual representation of an incident is provided by those on the scene through the use of voice communications. It is envisioned that this will change dramatically when broadband technologies become available. The use of video will add an entirely new dimension to public safety's ability to respond to incidents and to contain incidents that could escalate quickly. Yes, video will have to be managed, and the FCC believes that much of the video should be apart from the wireless broadband network, using wireline and other forms of transporting the video from a camera back to the dispatch center. But delivering video to the dispatch center is only half of the requirement. Once it is received at dispatch, it becomes much more valuable if it is transmitted to those in the field. Likewise, setting up cameras at an incident will provide all who are involved in the incident with the ability to see as well as hear what is happening. Both the dispatch center and incident command personnel will be able to make better, faster decisions about the best course of action. Giving public safety new tools to work with is important, but giving them new tools without the spectrum to use them is not an acceptable solution.

The FCC continues by saying that video resolutions that require 1.2 Mbps are not realistic and therefore should not be used, citing the cost of the network as a basis for this argument and pointing out that in order to support video of this resolution or higher, 2.85 times the number of cell sites would be needed. This statement does not include any data points and is simply presented as a statement of fact. The new FCC management has stressed from the first day of its term that the FCC would be a data driven organization, but in this part of the white paper as well as many others, statements are presented with no supporting data provided.

In reality, high-resolution video will sometimes be required. In the example used previously where a SWAT team sniper is on a rooftop watching a hostage situation unfold through a window, he has a high-resolution scope mounted on his rifle. If the sniper had a camera with high-resolution, it could provide a valuable video feed to the incident commander and others at the scene, and they could better plan their approach to the incident and perhaps save lives in the process. Video bandwidth has been and will continue to be an issue when it comes to how much is needed. However, there will be times when video will be required and if the incident commander deems it necessary for a specific incident, the capacity to provide it must be available.

Section 3: E. The Effect of Interference

This section deals with the issues of adjacent cell interference. The FCC claims that LTE will be more immune from adjacent cell interference than existing LMR systems, and that LTE can be better managed to mitigate next-cell interference issues. This is partially true. LTE handles adjacent cell frequency reuse in a number of ways. However, in a 10 MHz system, each cell will use exactly the same frequency, so minimizing interference through frequency reuse above 1-1 is not possible. This leaves LTE's inherent ability to provide soft frequency reuse. With this method of reuse, the system adjusts the power allocated to certain cell sectors to mitigate intra-cell interference. This is an efficient method of managing cell-to-cell interference, but it means that when there is interference, the amount of power (capacity) at the cell edge is diminished.[14]

During the discussion of the D Block and the public safety spectrum (which are adjacent), the FCC white paper, once again, contradicts itself. On the one hand, the paper claims that no guard band will be needed between the D Block and the public safety spectrum, while in another portion of the paper the FCC states that this is true as long at the two systems do not share the same tower sites.

As mentioned previously, in one of the footnotes to this section, the FCC compares and contrasts interference between LMR radio systems and LTE cell site systems. Since public safety is not planning to build its LTE network based on LMR standards, but rather on the cell standards that are being used in the commercial network world, this comparison is meaningless.[15] The FCC has built much if its case on

[14] http://www.mpirical.com/lms/file.php/1/LTE-Planning-Principles-Part-II.pdf

[15] One important reason that adjacent channel interference can more easily become harmful to LMR systems is that LMR systems are noise limited, meaning that radios must operate well even when they receive very weak signal levels. In contrast to LMR networks, commercial cellular networks are designed to operate despite significant interference. Accordingly, LMR-based networks are inherently more vulnerable to interference, including adjacent-channel interference, than commercial networks. The problem is compounded by differences in the number of cell sites deployed in a given region. The site density of commercial wireless networks is typically much higher than that of public safety LMR networks, as discussed infra. Thus, it is

its belief that the public safety community plans to force fit LTE broadband systems into its existing land mobile radio system designs even though the public safety community has continued to agree with the FCC that the entire system should be comprised of 44,000 cell sites. The FCC has been informed many times that this not correct, yet it continues to include this assumption in its documents to prop up its recommendations to Congress. Once again it must be made clear to the FCC that there is not and never has been such a plan.

Section III: Cost as a Driver for Network Capability
[Editor's Note: This section carries the same number as the previous section]

The main thrust of this section is explained in the first paragraph of the FCC white paper that states in part, "*If public safety uses commercial-scale components in its devices, they will benefit from commercial economies of scale. This is achieved in part by requiring the D Block licensee, and perhaps other 700 MHz licensees, to offer some devices that are also capable of operating in the public safety band. However, if there is no D Block commercial operator, then there will be no ecosystem of D Block commercial devices*." This statement indicates that the FCC does not believe vendors will step up to building chips and infrastructure for the public safety spectrum unless the D Block is auctioned to a commercial network operator, and that if the D Block is allocated to public safety, as it should be, then all of the devices will cost more and there will be little or no incentive for vendors to build these devices.

I have spent a lot of time over the past year addressing this issue, as have others. As of today, there are several chip-level vendors that have already undertaken the task of building chipsets for both the D Block and the public safety broadband network, and others are interested. The device may, in fact, be somewhat more expensive than commercial devices, but as I have stated elsewhere in this report, devices required for many within the public safety community will cost more due to their inherent design requirements: They must be resistant to water and shock, and ruggedized to withstand other typical usage conditions. My conversations with the chip-level vendors indicate that these devices can become available in a number of ways. First, several vendors have said they will build the chipsets and sell them at near commercial pricing if they receive non-recurring engineering funds in the $3-8 million range. This is a onetime expense that can be funded by monies set aside by Congress for these systems, if such funding is forthcoming.

Second, the chip vendors will build chips for this combination of bands and sell them to device vendors at a premium of between $10 and $20 each over commercial chip pricing. In the overall scheme of things, it is far better to have to pay a little extra for these devices than it would be to have to build a second generation of devices with broadband capabilities on multiple bands (the FCC has said if more spectrum is required it will "find it" in another portion of the spectrum). The public safety community does not accept that its special-purpose devices will be made available at the same prices that are paid for smartphones on commercial networks, especially smartphones that are subsidized by multi-year

common for an LMR public safety radio to be far from an LMR cell site, receiving a weak signal that is close to the noise floor and close to a commercial cell site that is transmitting in adjacent spectrum. In this case, interference in the public safety spectrum allocation may be raised in the area directly around the commercial cell site, due to a) the presence of high levels of radiated power in out-of-band emissions; and/or b) intermodulation products that fall within the public safety channel; and/or c) in-band emissions that are too strong to be adequately filtered out by the public safety receiver. Thus, a commercial site using adjacent spectrum can create a coverage hole for LMR radios. This is called a "near-far" interference scenario. The larger the difference in site density between the commercial network and the adjacent public safety network, the greater the probability that this form of harmful interference will occur.

contracts. Our research shows that a wide variety of devices can and will be made available to the public safety sector for pricing in the $500 to $600 range.

The FCC states in this white paper that "*Although not required, NBP deployment costs were calculated using this approach, and the savings were considerable when compared to a stand-alone network dedicated to public safety and does not leverage commercial infrastructure,*" and in the paragraph above this is another statement "*If public safety uses commercial-scale components in its devices, they will benefit from commercial economies of scale. This is achieved in part by requiring the D Block licensee, and perhaps other 700 MHz licensees, to offer some devices that are also capable of operating in the public safety band.*" So on one hand, the FCC white paper is based on device and network pricing that coincides with that of a commercial operator on the D Block. On the other hand, it admits that currently there are no such requirements in the National Broadband Report. Within the same section, the FCC appears to be saying that it will require this type of device cost sharing even by network operators that have already paid for their spectrum and on a different portion of the 700 MHz spectrum.

This raises the issue of the cost differential between a commercial D Block operator and operators that have spectrum in the lower portion of the band. The cost of building a device that provides for operation in the A, B, and/or C Blocks as well as the public safety band will be lower (because of volume) than a device built for use in only the D Block and public safety band. It is hard to imagine that the FCC could mandate what would amount to a price advantage for one network operator over others competing for the same business.

This FCC white paper makes many references to incentive-based partnerships and the cost savings they will offer. However, nowhere in the National Broadband Plan nor this white paper does the FCC say it will require these partnerships, or what type of incentives would be included. The FCC has little if any incentives it can offer commercial network operators without the concurrence of or at the direction of Congress. As far as I am aware, the FCC has not had meetings with commercial network operators to discuss these incentive programs. If and when it does, the results will be very different if the public safety community will be roaming on the commercial networks on a daily basis as opposed to an "occasional" basis as the FCC contends will be the case. Once again, if you review the capacity capabilities of 10 MHz versus 20 MHz of spectrum given the same number of sites, and your calculations are based on cell sector capacity instead of systemwide capacity, the answer to this question will be very different.

Section IV: Conclusion

The Conclusion section of the white paper starts out with this paragraph: *"The NBP's recommendations for the deployment of a nationwide interoperable public safety broadband wireless network were developed over the course of almost a year of intense study, inquiry, analysis and meetings with and input from public safety leaders, communications engineers and industry experts. The result is a plan that will provide public safety with a nationwide, interoperable network that has the capacity for all day-to-day operations and with the innovation of public safety roaming and priority access across the 700 MHz cellular spectrum, surge capacity for emergencies, and even extraordinary contingencies."* And while I am sure this is true, I don't believe the FCC asked either the right questions or asked questions in such a way as to illicit answers that differed from its preconceived notions of what its recommendations should be. I find it difficult to understand how a bureau charged with overseeing Public Safety and Homeland Security communications has put itself at odds with the public safety community from the onset of this important project that should have been approached with a clean slate and open minds.

The FCC has placed too much faith in its own calculations of network capacity and has failed to review demand in terms of cell sector capacity, preferring instead to treat capacity as a networkwide issue. It is also relying on priority access and roaming over commercial networks when priority roaming over LTE is still only a part of the specification and has not been proven to work in the real world. The FCC's white paper is slanted toward its goal of protecting its recommendations to Congress in the National Broadband Report and misses the mark as a fair and complete assessment of the needs of the public safety community.

As stated, it is obvious to me that this white paper was written with the single goal of trying to shore up the FCC's position that the public safety community should be short-changed once again when it comes to the amount of spectrum it needs. In the appendix of this white paper, the FCC cites various large-scale emergency scenarios including one provided in the New York City White Paper on Capacity Usage. Interestingly enough, when discussing this scenario, the FCC discounts the resources those on the front line of these types of incidents call for in favor of its own interpretation of what will be needed. It also ignores the fact that building cell sites that are hardened and include back-up batteries and generators is a problem in a city where most of the cell sites in use are located on building rooftops where fire codes do not permit generators. Building a hardened network in major metro areas will require trade-offs in the number of cells that can be deployed and how many of these can be truly hardened and include back-up power and backhaul redundancy.

Finally, all of the FCC's calculators are based on multiple cell sectors covering a given area. This is not consistent with even the most robust of the existing commercial networks, thus the findings in the FCC white paper are suspect. For more than 60 years, the public safety community has been short-changed when it comes to spectrum allocations. Historically, the FCC has chosen not to commit the amount of spectrum needed by public safety. Now is the first opportunity for this wrong to be righted.

The FCC continues to equate the public safety land mobile radio systems to the new broadband system, but there are many differences between the two. First, over time, the land mobile radio spectrum that was added enabled the public safety community to separate its voice channels onto different parts of the spectrum. By doing so, it gave up the ability to interoperate but was able to use what meager spectrum resources it had been allocated for maximum benefit. For example, in the city and county in which I live, the fire departments for all of the cities and the county make use of the 150 MHz band, using radios capable of all of the channels in use throughout the county as well as channels that are used by Cal Fire and the Forestry Service. This provides a level of interoperability while accommodating as much voice capacity as possible. Meanwhile, the police and sheriff departments use channels in the 450 MHz band. They too have interoperability between the agencies, but in the event of a major incident, the fire and law enforcement agencies cannot effectively communicate with each other.

When implementing a common portion of the spectrum for broadband services, all of these agencies will be sharing the same spectrum and it will not be possible to isolate one from another. Network demand for broadband services will escalate and the result could be network blocking and dropped "calls," which simply cannot be tolerated during even daily incidents. It is imperative that this new network be designed and implemented so there is enough spectrum available for use during multiple daily incidents, and that this bandwidth be sufficient on a sector basis, not on an overall system basis.

The FCC white paper discussion about capacity is based on a view that public safety wants to build fewer cell sites, which is not a correct assumption since public safety has concurred with the FCC recommendation of 44,000 cell sites. It is also based on priority roaming on commercial networks that will only happen on an occasional basis and not on a daily basis as we believe. Then there is the premise that inbuilding network expansion will provide more capacity, which is not true when distributed antenna systems are used, and it is not within the purview of the FCC to mandate such expansion. Further, the cost of deployment was not included in the FCC's white paper on network costs. Finally, the FCC continues to believe that priority roaming over commercial networks will perform as advertised and will provide quick and easy access to commercial network spectrum—even though it has been proven that in times of emergency the demand loads on both the public safety and the commercial networks increase dramatically.

Our Recommendation

It is time for the FCC to revisit its recommendations for the allocation of the D Block that it presented to Congress. If the D Block is auctioned and the public safety community is short-changed once again, it will only be a few years before it will have to return to the FCC and Congress begging for additional spectrum. After more years of delay, perhaps the next FCC will find more spectrum for public safety, but it will be on yet another portion of the spectrum and cause needless increases in both network and device costs. The D Block is ideally suited to being combined with the public safety spectrum and the costs associated with building out 20 MHz of spectrum will be much less than building out two 10 MHz bands located in different portions of the spectrum.

Respectfully submitted,

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Comments on the FCC White Paper:

Federal Communications Commission
Omnibus Broadband Initiative

A Broadband Network Cost Model:
A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America's First Responders

Published by the Federal Communications Commission April 2010

Andrew M. Seybold
Andrew Seybold, Inc.
April 26, 2010

Executive Summary

The March 2010 FCC National Broadband Plan (NBP) was completed and presented to Congress. A portion of this plan (Chapter 16) was devoted to broadband for the public safety community (Public Safety Broadband Network) for first responders and other public safety personnel. The FCC's recommendations included:

1) *"Creating an administrative system that ensures access to sufficient capacity on a day-to-day and emergency basis;*
2) *Ensuring there is a mechanism in place to promote interoperability and operability of the network; and*
3) *Establishing a funding mechanism to ensure the network is deployed throughout the United States and has necessary coverage, resiliency and redundancy."*

Prior to and after the NBP being presented to Congress, the public safety community as a whole expressed many reservations with this plan. These reservations included concerns about the amount of spectrum that was allocated solely for public safety broadband use based on the FCC's findings that public safety does not need more spectrum for day-to-day operations, the assertion that under this plan, the public safety community would have priority access to all of the spectrum licensed and operated by the 700-MHz commercial operators, and the FCC's projected funding requirements.

In subsequent speeches and presentations,[1] the FCC Chairman and staffers embarked on a campaign to 1) garner support from the public safety community, and 2) defend the recommendations made in the plan. The public safety community was and remains adamant that the NBP as presented does not address the needs of the public safety community for an interoperable nationwide broadband network.[2] It has requested that changes be made to the report and that the members of Congress introduce legislation to correct these deficiencies. Congress has responded with the introduction of H.R.5081[3] on April 20, 2010, and has sent this bill to committee for action.

The FCC's tenor when discussing the NBP report with the public safety community[4] appears to be that if the public safety community wants FCC support for funding the network build-out, it needs to accept the rest of the FCC's recommendations in the NBP report.

The public safety community has responded that the funding is immaterial without enough broadband spectrum to build out the network and has concentrated on pointing out the need for additional spectrum, the willingness of commercial operators to work with public safety, and the fact that even the funding model used by the FCC is flawed.

[1] http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296504A1.pdf
http://www.fcc.gov/pshs/docs/speeches/Jamie-Barnett-Comm-Sector-Remarks-04072010.pdf
[2] http://www.npstc.org/documents/PERF-SubjectToDebate.pdf
[3] http://www.opencongress.org/bill/111-h5081/show
[4] http://andrewseybold.com/1518-fcc-a-political-organization

In its latest effort to convince others that its vision for a nationwide public safety broadband network is correct, the FCC has published a white paper[5] that recaps and further explains its rationale for its funding estimates.

Our response takes issue with many of the FCC's assumptions, calculations, and recommendations. For clarity, we have chosen to model this rebuttal on the white paper that was released by the FCC on April 23, 2010, and to discuss these points so they may be easily compared to statements included in the FCC document.

In addition to the issue of funding for construction and maintenance of a nationwide broadband network for the public safety community, there remain a number of other issues including, but not limited to, the amount of bandwidth the FCC believes should be allocated to a standalone public safety network and its assumption that the public safety community will have total, complete priority access to all of the commercial spectrum within the 700-MHz band as it is deployed by the license holders. These issues have been addressed in other articles[6] and publications but have not had as much of an impact on the overall FCC plan as the funding model.

We believe that the FCC white paper is based on flawed network assumptions and design and, therefore, the financial calculations are also flawed. In the body of this paper, we will prove that the entire FCC white paper is based on faulty and unsupported logic.

[5] http://download.broadband.gov/plan/fcc-omnibus-broadband-initiative-(obi)-technical-paper-broadband-network-cost-model-basis-for-public-funding-essential-to-bringing-nationwide-interoperable-communications-to-americas-first-responders.pdf

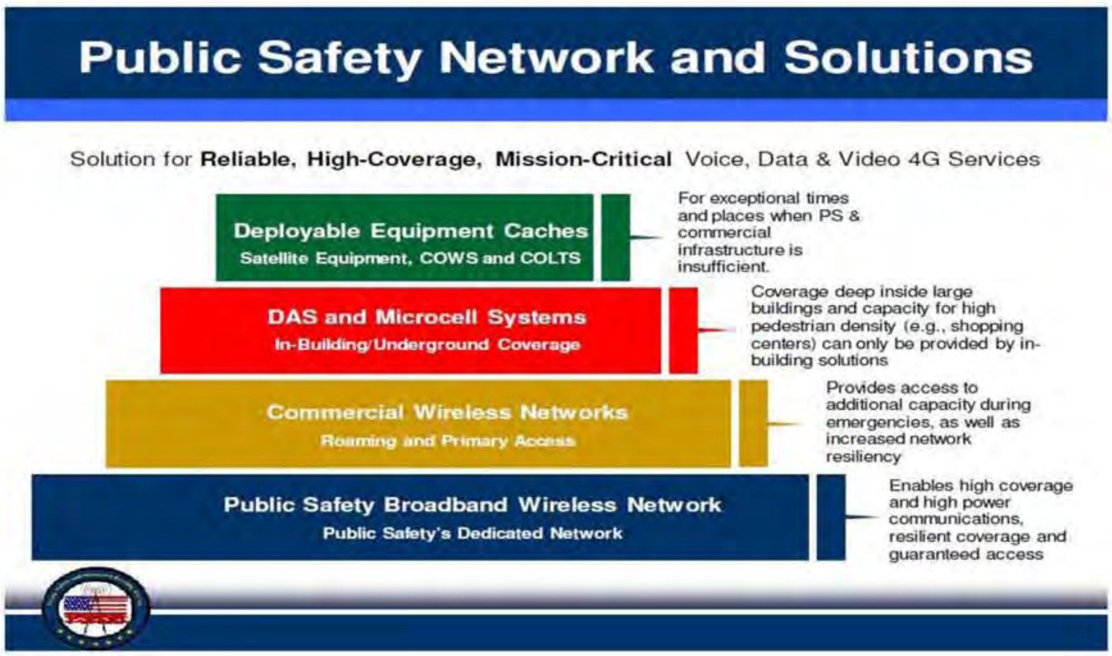
[6] http://andrewseybold.com/1548-fcc-spectrum-plan-based-on-faulty-logic

A. Introduction

The Introduction section of the FCC white paper discusses the vision of the NBP to provide "*cutting-edge*" broadband technologies and access to commercial technologies, but at much lower costs. The public safety community specifically, and the wireless community as a whole, have shared this vision for many years. However, if this goal is to become a reality, it will need to be funded appropriately, and will need ongoing support for network operation.

To illustrate this objective, the FCC has included the following diagram and explanation of its multi-pronged approach to solve public safety's communications issues:

Exhibit 2: The Future of Public Safety Broadband Communications



We believe that some false assumptions were made in the crafting of this diagram. First, it appears that the FCC intends for the public safety broadband network to be capable of higher power and to be designed differently from commercial networks within the 700-MHz band. This does not accomplish the stated goal of making use of off-the-shelf commercial technologies, nor does it address the issue of potential interference between public safety and commercial networks. Is the FCC suggesting that the public safety broadband network be another one-off network and not conform to industry standards for broadband networks within the 700-MHz band? If this is really the intent of the FCC, then its assumptions regarding deployment costs are based on this premise and not on providing network architecture in keeping with today's commercial networks or published standards for the technology.

Having a public safety network that runs more power than adjacent commercial systems, with its design based on higher power for both cell sites and devices, has far reaching implications. First is the issue of roaming onto commercial networks with devices that are capable of running higher power than typical commercial devices. Fourth-generation networks control the power output of the mobile device by measuring the signal strength from and to the device and sending signals to the device to adjust the power. If public safety is to make use of higher-power devices, the ability to share common network services with commercial network operators will be compromised, and/or it will mean that each network (public safety and commercial) will need different levels of power management built into them.

Further, if the FCC's intent is to provide higher-power cell sites and devices so fewer cell sites will need to be constructed for the public safety portion of the network, this will also have an adverse effect on the capacity of each cell site, as well as the broadband speeds of these cells, especially at the cell edges. The public safety community has already proven to the FCC that 10 MHz of spectrum will not be sufficient[7] for normal, day-to-day operations, and if the number of cell sites is reduced because higher power is permitted for these sites, the capacity of the overall network will suffer even further. The sensible approach is to design the public safety network in accordance with commercial industry standards for cell density and location. Since it appears as though the FCC financial model was based, in part, on this design criteria, the entire financial model is suspect.

The FCC's diagram shows that public safety will have roaming and primary access on commercial networks that will *"provide additional capacity during emergencies as well as increased network resiliency."* This too is based on faulty assumptions since our calculations[8] and those of others[9] indicate that given the lack of spectrum presently assigned full time to the public safety community, its need to roam onto commercial networks will occur multiple times per day, at least in the top 100 markets. We believe this could easily strain the existing relationship between the public safety community and the commercial license holders. Making sure that public safety roams onto the commercial networks on an *"emergency basis"*-only will require many more cell sites for the public safety network and more broadband spectrum.

During emergencies, commercial networks are typically saturated, which is why public safety needs its own network or, at minimum, a shared network with sufficient spectrum exclusively for public safety. During local emergencies, customers on the commercial networks saturate the network by picking up their cell phones and calling their friends and family members to see if they are safe and to share information and experiences, and every local emergency results in a media response, further saturating the network. Commercial networks fail sooner than public safety networks, so how can commercial networks back up public safety networks?

[7] http://andrewseybold.com/1338-public-safety-broadband
[8] http://andrewseybold.com/1548-fcc-spectrum-plan-based-on-faulty-logic
[9] http://urgentcomm.com/policy_and_law/commentary/fcc-makes-it-worse-20100423/index.html

Next on the chart is the box depicting DAS (Distributed Antenna Systems) and microcell systems for *"in-building and underground coverage."* We agree that this type of equipment will be needed for both public safety and commercial networks. However, we do not see the cost of this equipment included in the FCC's white paper presentation. In metropolitan areas, this type of network deployment can add substantially to overall network deployment costs.

Further, commercial operators that will be deploying small cells, known as femtocells, will require customers to provide their own connection back to the network. At present, this connection can be over DSL or cable modem, and then over the Internet. Therefore, femtocells cannot be considered as mission-critical devices, and their data capacity will be limited by the capacity of the DSL or cable line used to transport the signals back to the network.

The last part of the diagram shows what is called *"deployable"* equipment that is cached at specific locations and deployed on an as-needed basis. This technique has been used by the fire service for years,[10] and has proven effective. However, we believe costs for this equipment are grossly understated and we can find no indication of the inclusion of costs for storage, routine maintenance, or deployment of these caches of equipment.

This one diagram casts doubts on the entire report. A number of the assumptions are not based on real-world understanding or expertise and these assumptions impact all of the budgetary numbers that follow.

The next section of the white paper discusses the costs the FCC believes will be incurred in building and operating the network. It states that costs over the next 10 years will be in the $12-$16 billion range and with state and local governments taking part in some of the funding, the federal government's contribution should only be $6.5 billion for CapEx, which it goes on to justify in the balance of the paper. It further discusses the formation of ERIC, the Emergency Response Interoperability Center that will *"set common standards and practices for the nationwide network."* However, there do not appear to be any costs associated with this government organization to operate ERIC, and we question whether this is even within the purview of the FCC since the Public Safety Spectrum Trust (PSST) is the license holder of the spectrum. According to the FCC's website, the ERIC mission is as follows:

"The mission of the Emergency Response Interoperability Center is to establish a technical and operational framework that will ensure nationwide operability and interoperability in deployment and operation of the 700 MHz public safety broadband wireless network.

ERIC will adopt, implement, and coordinate interoperability regulations, license requirements, grant conditions and technical standards. The Department of Homeland Security and the National Institute of Standards and Technology will contribute to ERIC's functions."

[10] http://www.nifc.gov/communications_radios.htm

While it is not the purpose of this document to discuss the pros and cons of having a federally operated interoperability center, it should be noted here that the public safety community has already developed a set of working criteria for networks[11] that will join in the creation of a nationwide public safety broadband network. It appears from the FCC white paper that one of the primary purposes of ERIC will be to ensure that any public funding will go to organizations and agencies that comply with ERIC requirements.

The final paragraph of the introduction states that:

"The cost model the NBP used to calculate capital expenses and ongoing costs for the network and to inform its recommendation for the public funding program was validated through multiple approaches. First, a detailed radio frequency (RF) model was constructed, and its RF assumptions were validated through a technical analysis that used data acquired from several major commercial service providers, their competitors, and vendors. Costs were based on appropriate comparables, including tariff rates, actual proposals from service providers for similar network builds and operations, and information obtained directly from service providers, equipment vendors, and integrators. Detailed cost scenarios were also developed—and compared with cost scenarios provided by service providers and equipment vendors—to further validate costs."

This set the stage for what those who contributed to the FCC white paper perceive as undisputable facts regarding cost models. However, since the entire network design proposed by the FCC in this paper and in other documents is not based on real-world scenarios, and include the issues we have identified above as well as others, the entire pricing model is suspect. It appears from reading the pages of the paper and discussing them with at least one of the authors, that the cost questions were asked about a design that was already conceived by the FCC. Further, the only information sought from these companies and organizations were answers to specific funding questions rather than a discussion of the fundamental network design and concept.

We believe that if the Commission had asked each of the equipment vendors and integrators it asked about this network, as conceived by the FCC, was practical and whether it would truly meet the needs of the first responder community, the answers and cost estimates would have been very different. The FCC started from a point of believing that 10 MHz of dedicated spectrum will be enough for public safety for the foreseeable future and that most of the networks that will be built will make use of existing commercial cell sites in conjunction with existing public safety sites. The proven reality of the situation is that as envisioned by the FCC, the public safety community will have to make use of commercial spectrum on a daily basis, and this will put a strain on the commercial operators as well as the public safety system.

[11] http://www.npstc.org/documents/700_MHz_BBTF_Final_Report_0090904_v1_1.pdf

In its white paper, the FCC envisions this 10 MHz of spectrum being used not only to carry data and video broadband services but, over time, mission-critical voice and other services. This will compound the issue of not having enough bandwidth on a daily basis, especially in major urban areas. The public safety community, commercial network operators, and equipment vendors (the same ones the FCC relied on for its pricing models below) have already provided the FCC with quantitative data that disputes the FCC's assumptions that 10 MHz of broadband spectrum will be sufficient for the public safety community.[12]

In response to this additional data, the FCC has stated that *IF* it is wrong and more spectrum is needed, it will *"find"* additional frequencies in another portion of the spectrum, which means the FCC will only be compounding the problem of interoperability, network and device complexity, and costs. For decades, past Commissions' failure to allocate sufficient spectrum for public safety communications has resulted in public safety having spectrum resources spread out over many different portions of the spectrum, making interoperability both difficult and expensive to achieve.

B. Assumptions

In the first part of the Assumptions section of its white paper, the Commission outlines what it believes will be a move by public safety to make use of the broadband network for voice, including mission-critical voice services. The evolution as described in the paper is for data and video services first, followed by interoperable mission-critical voice. The report does not make any distinction between the two types of voice services required by the first responder community, neither of which is supported by commercial networks today, and one that is not even on the roadmap for fourth-generation wireless broadband technology. The first type of voice service is one-to-many voice communications, which is a vital element of public safety communications. The second type is the ability for public safety organizations to communicate by voice when they are out of range of a cell site or on an incident that requires one-to-many direct communications.

Because the one-to-many direct communications voice requirement is specific to public safety, and is a core differentiator between commercial wireless voice services and public safety voice services, there is no interest within the commercial wireless community to provide this functionality. Further, the chances of the public safety community having these requirements included in future releases of fourth-generation technology are slim to none. There are a number of technological challenges here and commercial network operators are not interested in providing off-network peer-to-peer or one-to-many voice communications services[13] since they could negatively impact their revenue. Add to this the fact that the command-and-control

[12] http://andrewseybold.com/1548-fcc-spectrum-plan-based-on-faulty-logic
[13] An email to FCC Commissioner McDowell: http://andrewseybold.com/1456-channellized-communications

functions of commercial devices are controlled within the network and not on the device, and it becomes obvious that to include this type of communications capabilities to support 3-4 million customers out of a total customer base of more than 285 million would not make financial sense and will not be included in new versions of the LTE standard developed by the 3GPP.[14]

The next paragraph in this section is also telling since both Verizon and AT&T are already well underway with their 700-MHz construction programs. In fact, Verizon is far ahead in the construction of its network and expects to launch LTE broadband services in the top 30 markets in 2010, covering 100 million POPs and heading for full nationwide roll-out by 2013.[15] Meanwhile, the FCC has failed to act on any of the waivers that have been submitted requesting permission to start building out on the PSST's already licensed spectrum. The FCC's white paper assumes that public safety and commercial networks will be built out together, which is clearly not possible since Verizon is already well on its way toward a nationwide build-out, AT&T is a year behind at most, and the issues with public safety relating to the amount of spectrum and funding have yet to be resolved.

Had these waiver requests been granted in a timely fashion, some of these systems would already be underway in conjunction with commercial operators and we would be within a few months of proving conclusively in actual network operations that the 10 MHz of spectrum allocated to first responders is not sufficient to meet their broadband data demands, and certainly not enough to support data, video, and mission-critical voice services.

This means that savings that might have been possible with a simultaneous build-out of both systems will not happen, at least in the top 100 markets, and this will result in increased costs for the public safety build-out going forward. Even if Congress and the FCC act swiftly with spectrum allocations, new priority access rulemaking, and funding, the window for dual, simultaneous build-outs will have passed.

Commercial operators have no incentive today to design their sites for co-location of public safety systems, or to harden their sites in anticipation that public safety will receive both the approval and the funding to move ahead on a regional basis. There are a number of public safety systems that are in the planning stages but, like their commercial counterparts, they cannot develop network designs that include co-location on sites, and they cannot plan on cost savings from sharing back-end infrastructure and facilities. Thus these systems are being designed to be standalone systems that will meet the stringent requirements for first responder reliability and could be connected to commercial systems in the future.

[14] http://www.3gpp.org/LTE
[15] http://news.vzw.com/news/2010/03/pr2010-03-22c.html

The third paragraph of this section discussed not only the projected coverage of 700-MHz commercial networks, but also the power levels required for the devices to be able to work within these networks. It goes on to state that public safety will be *"able to achieve better coverage and performance than commercial systems by using higher-gain (more powerful) devices with specialized antennas."* This statement, once again, is based on the assumption that commercial and public safety networks will be designed differently and that the public safety network cell sites and devices will be able to run more power to compensate for fewer cell sites. This premise is based on neither sound engineering nor economic criteria.

The FCC appears to assume that the majority of public safety broadband usage will be from within a vehicle where power for devices is not an issue. The reality of the situation is that the public safety community, like the business and consumer communities before them, will require devices that are carried on the person and, therefore, will be limited in power output, antenna design, and battery life. Increasing the power of these devices will greatly reduce their battery life, and could easily cause interference to commercial network cell sites within proximity of the public safety devices.

One of the most troubling of all paragraphs in this section reads:

"Ongoing costs were also calculated on the basis of an incentive-based partnership model. This model assumes that backhaul, core network, managed IP services and ancillary services will be paid through an operating expense charged through a managed service fee. This managed service fee is based on the existing air card managed service fee structure—with the radio access network (RAN) share of the service eliminated, since public safety partners will be using their own spectrum for their primary service."

The commercial wireless community has already drastically changed its business models for broadband pricing. Gone are the days of unlimited broadband services for a fixed monthly fee. This has been replaced with tiered pricing for 50 MB or 5 GB of service per month for laptop systems, and network operators are currently reviewing their options for smartphone broadband usage. Once fourth-generation systems are in place and available to customers, there will be further changes in customer pricing as ways to better manage data usage become necessary. AT&T [16] has reported that only 3% of its iPhone customer's account for more than 40% of its iPhone data traffic on the network, and other operators are finding that they need additional ways in which to manage and control wireless broadband usage. These new pricing discussions have been reported in the press for the past year, yet the FCC seems to be basing its cost estimates for the public safety community on pricing models that were abandoned several years ago.

[16] http://online.wsj.com/article/SB10001424052748704240504574586160553502526.html

Next, the FCC has not factored in the cost of a commercial operator having to split its back-end network to provide for increased security and services for the first responder community, nor has it taken into account the additional hard costs for splitting the back-end services into commercial and mission-critical segments. The commercial operators have expressed a willingness to work closely with the first responder community, but they are not prepared to lose revenue or take a chance on losing commercial customers to provide secure and mission-critical services for public safety.

Commercial operators are in business to make a return on their investment, and they must answer to their stockholders. It was recently reported by Verizon Wireless[17] that its revenue from data services has reached 30% of its total quarterly revenue; the balance was from wireless voice services. As demand for broadband data grows, so too, will the income. However, the FCC certainly cannot expect companies such as Verizon or AT&T to reduce their ability to service their commercial customers and provide them with the best possible broadband experience in order to provide additional capacity that will be needed on a daily basis by the public safety community if its spectrum holdings are limited to 10 MHz of broadband spectrum.

The final paragraph in this section deals with the FCC's determination that the public safety community can make do with 10 MHz of spectrum. One of the reasons provided by the FCC is that there will be roaming on commercial wireless networks. It appears as though the FCC has interpreted the data provided to it in such a way as to believe that this need for use of commercial spectrum will be on an occasional and infrequent basis. The data we have reviewed[18] indicates that if the public safety community must operate within the confines of the 10 MHz presently assigned to it, its encroachment into the public spectrum, on a priority basis, will occur multiple times a day in major metropolitan areas.

The FCC seems to believe that transportable infrastructure will be available to add capacity when there is an incident that requires more bandwidth. It is also relying on in-building supplemental systems to provide resiliency for capacity surges, increased coverage, and increased redundancy. What it is missing is that public safety must respond within minutes and has literally minutes in which to contain a situation that could easily become a major incident. If the communications resources are not available at the start of the incident and first responders have to wait until they can be trucked in, the value of those communications resources is greatly diminished for many incidents.

There appears to be a lack of understanding within the FCC as to how important the first 10, 15, or 20 minutes of an incident are, or how the odds of catching perpetrators or saving buildings decrease only a few hours into the incident. It is obvious to us that the FCC is equating public safety requirements only to events that stretch over multiple days or weeks such at hurricanes or other disasters. Most of the incidents that will require full broadband capacity will require

[17] http://news.vzw.com/investor/20100422.pdf
[18] http://andrewseybold.com/1548-fcc-spectrum-plan-based-on-faulty-logic

that capacity within the first few minutes or hours. Beyond that, for the majority of incidents, there will be fewer requirements, and there will not be the same concentration of first responders on and around the scene.

C. Capital Expenses (CapEx)

This section of the Commission's white paper outlines the total funds it believes are needed for Capital Expenses over a 10-year period. The bottom-line number is $6.5 billion, and in the paper it claims that that figure will provide public safety broadband services for 99% of all Americans. These expenditures are further broken down into $4.0 billion for equipment for commercial towers, $1.5 billion to harden commercial towers, $0.8 billion to equip 3,200 rural towers with public safety broadband spectrum radios, and $0.2 billion for public safety deployable network sites.

Item	Cost	Notes
41,600 Commercially Deployed Non-rural Sites	$4.0 B	Excludes hardening costs. Ethernet over fiber backhaul connectivity to commercial carrier's backhaul Assumes PS RAN (lit) added to 100% of sites (conservative)
Hardening of Existing Commercial Sites	$1.5 B	Assumes 100% of sites need hardening (conservative)
3,200 Rural Sites (includes hardening)	$0.8 B	Assumes EMA, Blend of 25% new and 75% upgraded sites
Deployable Equipment and Development	$0.2 B	
TOTAL CAPEX	**$6.5 B**	

Based on this model, a reasonable year-by-year projection capital expenses is as depicted in Exhibit 4:[11]

There are a number of other charts and graphs in this section that break out in more detail how and when these funds will be needed and in what year of the 10-year project. This budget does not include any costs that might be incurred for roaming by the public safety operator on a commercial network. The use of the word MIGHT in this omission of costs again demonstrates that the Commission believes that 10 MHz of public safety spectrum will be sufficient for its use with only the occasional requirement to roam onto commercial networks. As we have stated, this is one of the items in this report, and in the National Broadband Plan, to which we take exception.

We will comment on the Commission's budgetary Capital Expense figures below, especially when examining the more detailed expenditures outlined in Appendixes B and C, but once again, we believe that none of the assumptions on which this capital expenditure budget result in real-world estimates, nor do they take into account planning and engineering costs, increased site rental fees due to additional antennas required on the cell sites, or any contingency funding. Sound business practice would see an inclusion of contingency funds of between 10% and 20% of the total project, which, in itself, would raise the Commission's budget to between $7.15 and $7.8 billion.

D. Ongoing Costs

In this section of the paper, the Commission discusses its assumptions and the amount of projected ongoing costs. It indicates that by year 10 of the project, the ongoing costs will be $1.3 billion per year broken out as shown in the following chart:

Exhibit 5: Ongoing Network Costs Chart

Item	Cost	Notes
Annual OA&M Including Transport Managed Services Fee	$0.9 B	For 3 M Public Safety Subscribers at $25 per month
Annual RAN Managed Services Fee	$0.2 B	44,800 Sites at $1500 per year for site equipment, OA&M, and $2400 for additional lease cost (this achieves a 99% population coverage)
Additional costs in rural areas (microwave backhaul, additional site lease costs, deployable OpEx)	$0.2 B	Microwave antenna, power and maintenance lease; miscellaneous ongoing costs
TOTAL ONGOING COSTS	**$1.3 B**	

There is a caveat indicated as footnote 12, which states:

"The proposed funding covers network operations. The funding is not intended to cover the operations of the services and applications running on top of that network nor various administrative functions associated with public safety network operations that agencies may incur. These costs which are part of day-to-day operations today which we have assumed will continue to be borne by the local agencies."

Again, since our basic premise is that we do not believe that the underlying assumptions on which this white paper are based are correct, we do not believe the numbers cited are representative of the true ongoing costs of the network, and we will address our concerns later in this document.

E. Cost of Separate Public Safety Network

In this part of the paper, the Commission continues to try to make its case that the cost of its "incentive based" network design described in section B of the paper is $6.3 B but that the cost of an entirely separate network would be $15.7 B. However, it states that "*the cost of the Stand-Alone network described here are less detailed, in part because of the potential range of ongoing costs.*"

The Commission seems to believe that there are only two choices for building out the public safety broadband network. The first choice is its option to essentially combine it with the commercial networks except for some of the radio equipment. The second is to provide a totally separate and standalone network. The FCC does not take into account that between these two extremes are a number of options that can and should be explored. In some parts of the country, the Commission's vision might, in fact, be the best one, in some areas the public safety community will need complete standalone systems, and in other places there could be a combination of the two options offered. For example, it would not be out of the realm of possibility for a core public safety network to be built in a high-use urban area that is not augmented by additional shared sites provided in conjunction with commercial operators. Nor should the possibility of sharing back-end and IP services with commercial operators while maintaining both commercial combined sites and existing public safety sites be ignored.

The Commission is only looking at the two extremes in this paper. It still believes that a total of 44,800 sites will be needed by the public safety community, but states that in its incentive-based partnership it considers the *"marginal cost"* of adding a new radio access network (RAN) for public safety to an existing tower site. Later in this paper, it presents the costs of providing this separate RAN using a common, across-the-board number per site. Reality is quite different.

As commercial network operators build out their own LTE or fourth-generation networks, they will be upgrading their sites in a number of ways, depending on what equipment is already in place, how old the equipment is, and other factors. In some cases, these upgrades will require all new equipment with fiber or microwave backhaul. In others, they will be able to add LTE capabilities to their existing RAN along with new antennas and filtering, and in some cases they will have to find new sites because the sites they presently occupy are saturated and unusable for additional RAN and antennas. Another point that has not been considered in the FCC's white paper is that sites are not always owned by the commercial network operator and can be owned by a third party who rents space to the network operators.

The paper states that *"the differences emerge in the cost per cell site: both CapEx; and OpEx; the costs in zoning and site acquisition, because of many more new cell sites beyond the base required for public safety LMR (Land Mobile Radio) networks; the costs of backhaul from the cell sites; and the costs for the core network."* The Commission has apparently, once again, not considered any options between the two extremes, including sharing backhaul and IP back-end resources with the commercial network operators, acquiring access to sites already developed but owned and managed by third-party tower owners, and other combination solutions. Therefore, we disagree that there is the large cost differentiation detailed in the paper and believe that the real CapEx number lies somewhere between the two extremes.

Exhibit 7: Incentive-Based Partnership vs. Stand-alone Public Safety Network Capital Expenses

Comparison Cost of 44,800 Sites		
	Incentive-Based Partnership	**Stand-Alone Public Safety Network**
Urban Upgraded Site	$95,000	$163,752
Urban New Site	N/A	$223,752
SubUrban Upgraded Site	$95,000	$213,752
SubUrban New Site	N/A	$288,752
Rural Upgraded Site	$216,000	$247,232
SubUrban New Site	$363,000	$394,632
Total CapEx for Sites including Hardening	$6.3 B	$12.6 B
Backhaul - Installation to Core Fiber Ring, Non-Rural Sites	$0	$2.1 B
IP Core Equipment, Network Operations Centers	$0	$1 B
TOTAL CAPEX	**$6.3 B**	**$15.7 B**

The paper continues that in the analysis, *"we considered the complexity and scope of constructing a nationwide public safety network, in which 80% of the 44,800 sites would be new builds."* We disagree with this assumption as well. There are a number of ways to provide access to existing sites for the public safety community, including requirements that any new commercial site constructed be made available, reduced time for permitting if public safety is included in the construction, and other incentives for tower and land owners. Comparing the two extremes in costs in order to justify the Commission's recommendations does not give fair consideration the other available options.

The Commission also neglected to look at the costs to increase the public safety spectrum from 10 to 20 MHz as has been requested and introduced as a pending bill (H.R.5081). The actual costs associated with the addition of 10 MHz of spectrum (the D Block) are minor when compared with the future costs of having to allocate additional broadband spectrum for public safety in yet another portion of the spectrum. The costs for a new spectrum allocation could easily drive the cost of the overall network up by 50% to 75%. The addition of the 10 MHz of adjacent spectrum would only increase the total network costs by 15%-25%.

The Commission's final cost figure for a complete, standalone network including both CapEx and OpEx is $34.4 billion over a 10-year period. Once again, we dispute this number, which the Commission claims is based on documents referenced in the footnotes of the report. Again, the Commission's position is that there are only two options for building and maintaining the public safety broadband network: Its incentive-based network plan or a complete nationwide standalone network owned and operated strictly by the public safety community.

While the public safety community wants and needs its own standalone network that is hardened and secure, there will be trade-offs in different areas of the nation. The series of networks that will eventually be constructed will be made up of a combination of standalone, partially shared, and perhaps even fully shared systems. The Commission's assumption that these networks will be all of one type or another is not correct. Another point worth making is that on the federal government side of law enforcement, there are a number of nationwide, standalone networks that are not shared and are considered to be required because of the needs of the agencies. These networks include the FBI, DEA, Secret Service, and others. Yet the Commission seems to be saying that the state and local public safety community does not have the same needs as these federal agencies. Therefore, public safety should make do with a shared network and less broadband spectrum than it has proven it needs.

In the same section of the paper, the Commission states, "*This lack of scope is compounded if the public safety entity is operating on an LTE network that utilizes spectrum in a band class assigned exclusively for the public safety community. This would be the case if the D block was reallocated to public safety. In that situation, there would be no commercial service provider in LTE Band Class 14 in the 700 MHz band. While technically such a system could be deployed and supported, the costs of the network equipment, most notably the devices, would increase substantially. Without the ability to leverage the economies of scale of a commercial deployment in a band class, there is significantly less market incentive to develop network equipment and devices capable of operating in that band. Therefore, public safety would have to pay significant premiums for equipment and devices under such a scenario."*

This would be a valid point if public safety LTE devices will be built for Band Class 14 only. However, in our conversations with the microchip suppliers, we have determined that all of the basic chips support Class 14, and that while there will need to be changes made to the software masks, some filters, and other components, most of the devices that will be used will be capable of providing service across both the public safety and commercial networks. It is also true that the public safety community is not expecting to be able to purchase broadband devices in their local communications stores. Because of the unique needs of the public safety community, many of the devices will be built specifically to meet public safety's requirements and will, therefore, be priced higher than a $200 smartphone for commercial use. However, the overall cost savings will be substantial and we believe that the industry is willing to work with the public safety community to provide the types of devices it requires at reasonable costs.

Appendix A: Deployable Equipment

This Appendix discusses the inclusion of the deployable caches of equipment that are included in the public funding proposal, which should continue to be a requirement for the overall public safety broadband network. However, it also includes funding for Non-Recurring Engineering (NRE) costs to ensure that specialized chipsets and software will be developed to meet the

needs of the first responder community. This contradicts the statement in Section E above, which states: "*This lack of scope is compounded if the public safety entity is operating on an LTE network that utilizes spectrum in a band class assigned exclusively for the public safety community.*
This would be the case if the D block was reallocated to public safety. In that situation, there would be no commercial service provider in LTE Band Class 14 in the 700 MHz band. While technically such a system could be deployed and supported, the costs of the network equipment, most notably the devices, would increase substantially. Without the ability to leverage the economies of scale of a commercial deployment in a band class, there is significantly less market incentive to develop network equipment and devices capable of operating in that band. Therefore, public safety would have to pay significant premiums for equipment and devices under such a scenario."

The Commission has recognized the need to incent chipset vendors and others to build chipsets and other components capable of providing devices for use in the public safety spectrum, and our discussions with these vendors over the past year indicate that the NRE involved would be the same for developing products only for the 10 MHz of public safety spectrum or for the combination of the D Block and the public safety spectrum. Further, in the overall system costs, these NRE fees will amount to single-digit $millions, and will not have a material impact on the overall cost of the system.

Appendix B: Network Cost Model Assumptions

In this Appendix, the Commission lays out its assumptions that were used to support its costing models and to support its recommendations that the D Block be auctioned in order to provide a commercial network operator that *will "simultaneously build out the LTE Band 14 profile that includes both the D block and public safety spectrum."* However, the proposed D Block spectrum auction rules have been stripped of any requirements for the auction winner to work with the public safety community except to provide priority access.

It is possible, and perhaps likely, that the winner of the D Block auction will decide it can build its own system out quicker and with less expense than by sharing the costs and having to include the hardening required for many of its sites, even if the costs were included in the funding for the public safety network. Any new operator that won the D Block auction would already be several years behind the existing 700-MHz commercial license holders and would, therefore, be incented to move ahead rapidly on its own.

One of the network operators that has expressed interest in bidding on the D Block indicated to us that 10 MHz of spectrum is not enough 700-MHz spectrum for it to be able to compete with the existing license holders, and that if the D Block and public safety systems are built out as separate systems, some spectrum will need to be left fallow between the two systems to prevent interference. This will reduce not only the amount of spectrum available for the D Block winner, it will also reduce the amount of spectrum available for public safety. This, in turn, will have a negative impact for both operators and will reduce both their capacity and their data rates.

The Commission seems to believe that adding another commercial network operator to the mix of existing license holders will put additional pressure on broadband pricing, and that having only two network operators in the band will not provide the same level of competition. This is based on the fact that the two largest network operators have licenses on a nationwide basis. It does not take into account that on a region-by-region or city-by-city basis, there will be three or more broadband providers in the 700-MHz band.

The next point has to do with the subscriber device model and the Commission's assumption that public safety personnel will be able to use larger devices with external antennas and larger batteries, gaining a power advantage over commercial devices. Again, this does not take into account that these devices will also have to be capable of operating on the commercial networks, which are not being designed to accommodate these increased power levels, and some adjustments will have to be made to provide the necessary safeguards if higher-power devices are employed.

Most of the other assumptions in this Appendix have been discussed in detail in other portions of this paper. However, it is worth repeating that the entire Commission plan for the public safety broadband network is based on this statement:

"Priority wireless service on commercial networks, deployables and in-building Supplementation provides for capacity surges, more extensive coverage, and more resiliency thus lowering site requirements on core network."

If required, as we believe they will be on a daily basis in major metro areas, priority wireless services on commercial networks will create both short and long-term issues for both the public safety community and the commercial operators that are trying to keep their commercial customers happy while at the same time accommodating the public safety community. The best way to ensure that public safety's roaming requirements are minimized during normal types of emergency calls is to provide the additional 10 MHz of spectrum known as the D Block.

Again, it should be recognized by the Commission that between the two network extremes discussed in its paper, there are many viable options for public safety and commercial operators working together. If public safety has the spectrum it needs (20 MHz), the level of cooperation will be better on both sides and we believe that more areas of this country will be willing to embrace different types of partnering arrangements when they know they have full and complete access to the bandwidth they need on a daily basis.

At the end of this Appendix is a final statement: *"The model will be refined based on real-life experience in future public funding years."* This means that if the above assumptions are wrong, as we believe they are, then the pricing models are also wrong, and the public safety community could not only be left without enough spectrum for its needs, but with half-completed networks across the United States as well. We have to wonder whether the Commission and Congress are willing to take these risks.

Appendix C: Underlying Equipment and Cost for Capital Expense Assumptions

Here again, a number of the issues we have discussed above are applicable to this Appendix as well. However, we do have some additional observations:

1) Diagrams A and B for Non-Rural site configurations contain detailed lists of equipment and funds for engineering and installation. We find it interesting that these diagrams and their associated pricing are so complete and include equipment down to the most basic levels. It appears as though the authors of this paper were trying to convey a sense of thoroughness in their pricing assumptions. However, their pricing assumptions are based on a flawed system design level as discussed above, and they did not include any contingency funding on a per-site basis. Their assumption appears to be that these numbers would average out across the country. It is not productive in this paper to compare and contrast every item listed in the bills of materials in these diagrams, but we do believe that these estimates are low and that the actual costs will be considerably higher, especially in areas where commercial operators have already built out their networks.
2) Hardening: The assumptions are listed on page 23 of the paper and include generators and associated equipment. However, they do not take into account the fact that many urban cell sites are located on the tops of buildings and it is not possible to add generators due to the weight of the equipment, the storage of flammable liquids, and local ordinances. These sites will have to be hardened in different ways with a different set of cost parameters. Again, we question the costs presented in this section.
3) Microwave System: These prices, while documented, are on a site basis and appear to provide a single path back to either another site or a hub. At the very least, the network hardening should include dual-diversity antennas, and for major sites, a second path to a different entry point within the network.
4) Fiber: There are no cost assumptions listed for fiber, which is also being used for backhaul at many sites, especially within urban areas where microwave (which requires line-of-sight) cannot be deployed. If the assumption is that the public safety system will make use of existing fiber and not need additional fiber connections, we find this to be shortsighted.

Since we believe that the system design and amount of available public safety-only spectrum are based on faulty assumptions, we also believe that all of these cost estimates should be increased to reflect real-world system design criteria.

Appendix D: Capex for Public Safety 700 MHz Builds-Stand-Alone

This section also assumes that each and every network that is to be integrated into the public safety nationwide system will require 100% standalone towers, equipment, backhaul, and back-end services. This would represent the ideal world for public safety—one common network for public safety on a nationwide basis with no equipment or commercial sharing—and it is what the public safety community needs and deserves. However, there is a reality here that there must be compromise if the network is to be underway in a timely and more cost-effective manner.

Conclusions

The Federal Communications Commission seems to be perplexed that the public safety community did not simply endorse the recommendations contained in the National Broadband Plan in Chapter 16. It attempts to make the case that public safety does not need more than 10 MHz of spectrum even though the data provided shows otherwise. It seems to believe that what is best for the nation is to ensure that a third commercial network provider be empowered with its own 10 MHz of spectrum and it has rationalized that public safety can make do with its own 10 MHz of spectrum and sharing, on a priority basis, with all of the commercial operators.

Historically, public safety on a federal, state, and local level has not had to compete with consumers for use of spectrum and has had what little spectrum it controls available to it on a 24 by 7 basis. But now the Commission believes it will not impact public safety communications to have to share spectrum and contend for bandwidth with those who may be viewing streaming video, surfing the web, or playing multiplayer games across the network.

The Commission appears to be baffled that public safety wants 20 MHz of contiguous spectrum and won't settle for a promise that if it needs more than 10 MHz of spectrum it will be supplied at a later date, in yet another portion of the spectrum. It does not seem to comprehend that the reason the public safety community has an interoperability problem in the first place is that over many decades, previous Commissions have allocated small slices of spectrum to public safety and never enough contiguous spectrum to be able to develop and implement interoperability for its voice services.

Now this Commission is about to make the same mistake when it comes to broadband spectrum allocations and leave it to a future Commission to, once again, dole out another sliver of spectrum in yet another portion of the spectrum. At the same time, it is telling the commercial operators that it will find them up to 500 MHz of additional spectrum over the next 10 years and that 300 MHz of this spectrum will be allocated within the next 5 years!

The white paper released on April 23, which is the subject of this paper, is one more way in which the FCC is trying to justify its position and once again short-change the public safety community. It is disappointing that the FCC feels it needs to prove that its plan is the only plan that will work, and by issuing veiled threats, make it clear to the public safety community that if it wants the support of the FCC when it comes to federal funding requests, it needs to endorse the NBP as it has been written.

The white paper does not accomplish its goal. Instead, it makes it clear that the FCC's plan for public safety was, from the start, based on flawed logic and data points that were molded to suit the Commission's beliefs. It was not based on fact, and largely ignored the input provided by the public safety community, commercial network operators, and equipment vendors, all of whom have the experience and knowledge to understand the issues and to prove that 10 MHz of spectrum is not enough for public safety even at the outset, nor is it possible for public safety to share bandwidth with business and consumer customers whose broadband usage peaks at the same time there is maximum demand for bandwidth from the public safety community.

It is even more difficult to understand why, given the opportunity to rectify errors made by previous Commissions at little additional cost to taxpayers, the Commission did not, from the outset, simply propose as part of the National Broadband Report that public safety needed the full 20 MHz of spectrum, and that this would not preclude the public safety community, as well as the commercial community from working together to build a world-class public safety network that would provide, most of the time, the bandwidth they need on a daily basis.

Several times over the last few months, the FCC has indicated that there was no support for the public safety position as advocated by all of the major national public safety organizations and endorsed by major network operators and vendors. Now that there is movement within Congress to address this issue, those within the FCC feel they have to justify their position rather than agree to take a new look at the issues and modify their plan.

Those reading the FCC's white paper who does not understand all of the issues will probably be convinced by all of the charts and graphs that the FCC plan is well thought out and well crafted. They won't understand that the underlying motive is to be able to auction the D Block to enhance competition within the ranks of the commercial network operators. To accomplish that, they will have to short-change the public safety community once again.

Andrew M. Seybold

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Interoperability	)	**PS Docket No. 06-229**
and Equipment Certification for 700 MHz	)	**DA 10-884**
Public Safety Broadband Networks	)	

COMMENTS OF NATIONAL BOMB SQUAD COMMANDERS ADVISORY BOARD ON INTEROPERABILITY AND EQUIPMENT CERTIFICATION FOR HAZARDOUS DUTY ROBOTICS SYSTEMS

The National Bomb Squad Commanders Advisory Board ("NBSCAB") hereby submits the following comments in response to the Commission's *Public Notice,* DA 10-884 (May 18, 2009), in the above captioned proceeding, wherein the Commission seeks comment on interoperability and equipment certification for broadband public safety networks. NBSCAB respectfully seeks the Commission consider hazardous duty robotics application in their pending rules making process for the 700 MHz broadband public safety spectrum.

I. INTRODUCTION

NBSCAB, an organization of elected public safety bomb squad commanders representing the bomb squad profession, has the mission to act in a leadership role for the bomb squad community, providing guidance and advice on important issues. The Board promotes initiatives to improve bomb squad tactics, techniques, procedures, training and equipment. The Board provides input and direction toward research and development programs affecting the bomb technician profession. The Board acts as the liaison to the many federal agencies who are involved in issues related to state and local bomb squads. The Board is charged with the responsibility to set guidelines and standards for the bomb squad community through its role as the elected representatives for state and local bomb squads.

II. HAZARDOUS DUTY ROBOTICS IN PUBLIC SAFETY

First responders across the nation face hazardous conditions in the form Improvised Explosive Devices ("IED"), Chemical, Biological, Radiological & Nuclear ("CBRN"), explosive atmospheres, natural disasters, industrial accidents, terrorists, and other hostile criminals. In order to meet each of these types of threats with maximum efficiency and safety, First Responders are increasingly utilizing wireless robotics systems to penetrate hostile environments without exposing personnel to extreme personal risk of physical harm, or death. Robots are utilized for the purposes of visual surveillance, scene assessment, contaminant & volatile atmosphere detection, IED suppression, hostage negotiation, and many other tasks which would have otherwise placed a First Responder at extreme risk.

Robotics control systems, which form an essential point-to-point wireless communications network, are a key aspect of these critical tools, allowing First Responders to maneuver unmanned ground vehicles ("UGV") into hazardous locations from a safe distance away from the threat. These wireless systems are called upon to provide robust connections for the purposes of streaming near-real time video, audio, and telecommand control information, forming a UGV control-loop, with the human operator closing the loop. As threats may occur in any type of terrain, or structure, a

UGV control system must also be robust enough to cope with considerable power losses associated with building penetration and other non-line of sight operating conditions.

III. TECHNICAL REQUIREMENTS

In non-line of sight conditions, an Operator Control Unit ("OCU") video display monitor functions in the same manner as the view through an automobile windshield. The control panel is likewise analogous to the steering wheel and throttle/brake pedals in an automobile. The video signal and the control signals in this type of semi-closed loop control system require RADIO FREQUENCY channel bandwidths 1.25 MHz, up to 6 MHz, depending upon what type of video signal is transported over the air, and what type of RADIO FREQUENCY modulation scheme is utilized. As digital technology continues to mature, these channel bandwidth requirements will continue to decrease. However, today's current state of art video compression and radio frequency equipment continue to demand channel bandwidths in the ranges mentioned above.

The non-line of sight nature of the First Responder threat in which a UGV is typically deployed also demands significant radio frequency channel power to overcome losses created by natural and structural barriers between the mobile UGV and the operator. Stand-off ranges great enough to ensure operator safety contribute to additional propagation losses. Radio frequency channel power loss considerations have traditionally limited industry to utilize channel carrier frequencies under 2.5 GHz, as frequencies above this range incur intolerable losses during normal UGV operations which would include deep penetration into industrial complexes, high-rise buildings, sports arenas, railway tunnels, and other man-made structures.

IV. AUTHORIZATION AND CHANNEL COORDINATION DIFFICULTIES

NBSCAB has identified a nation-wide problem associated with radio frequency station licensing associated with First Responder UGV control equipment. State and local agencies attempting to obtain the required authorizations to operate mobile robotics radio frequency control equipment, pursuant to compliance with *Part 90 Rules,* encounter difficulties associated with channel availability and the unusual nature of the station class. These difficulties regularly result in delays in obtaining operator licensing averaging four to six months, and occasionally up to two years, depending upon the geographical location of the area of operation being requested. These delays, in the opinion of NBSCAB, result in an increased risk to national security, as critical equipment, necessary to defeat threats which include vehicle born IED threats, is unable to be deployed without violating the Commission's Rules. Part of the issue has been determined to be the lack of a regulatory definition, reference of a robotics control station class in the Commission's Rules regulating Public Safety radio frequency stations. Regional and local coordinators have expressed confusion as to what type of equipment is being operated, how it is employed, and why it might require a channel authorization at all, leading to delayed licensing. Additionally, the lack of an official designation for this type of radio frequency station creates channel coordination difficulties during emergencies, particularly wherein multiple agencies may respond to an incident with multiple UGVs. It has been determined that coordination of UGV radio control equipment which is co-located with other First Responder radio frequency equipment, and other UGVs in particular, is essentially non-existent in many locations, creating an additional gap in First Responder safety.

V. INTEROPERABILITY

While NBSCAB recognizes the Commission's commendable and important primary purpose expressed in the *Public Notice* seeking comments on 700 MHz broadband*,* we would respectfully ask the Commission to consider allowing First Responder hazardous duty robotics equipment a presence in the 700 MHz Public Safety spectrum. The channel bandwidth requirements illustrated above indicate a similarity to broadband emissions and this type of equipment may not be authorized for use in much of the spectrum allocated for Public Safety applications. These channel bandwidths greatly exceed those of narrow-band channels dedicated to voice and low-speed data and may not function within the channelization schemes in much of the Public Safety spectrum. Further, Public Safety spectrum which is currently available under *Parts 15* and *90* of the *Rules* for UGV operations either restrict channel power levels to unreliable levels, force UGV operations into shared, uncoordinated bands, or provide carrier frequencies which are susceptible to unsatisfactory propagation characteristics.

The 700 MHz Public Safety spectrum provides an opportunity to populate UGV equipment with wide channels, significant power, up to 5 Watts ERP, effective coordination, and a means to provide a regulatory definition for UGV stations, addressing the difficulties encountered in obtaining channel authorizations. 700 MHz provides superior propagation characteristics, increasing the effectiveness of UGV equipment in hazardous, non-line of sight conditions to any other band of spectrum set-aside for wide-band Public Safety applications. The itinerant nature of UGV emissions, the operational reality that these emissions are limited in geographical area when present due to antenna positioning of between three and fifteen feet above ground level, and the relatively low power of these emissions, 5 Watt maximum, have provided little risk in causing harmful interference to existing broadband networks today. As the equipment is operated directly at an incident scene, with the control unit positioned as forward as possible, while still providing the operator with a safe stand-off range, all civilians are typically evacuated from those hazardous locations and other radio frequency devices are typically limited to tactical communications equipment, the risk of harmful interference from UGV equipment which certified pursuant to the Commission's *Rules* and provided with coordination visibility is limited.

CONCLUSION

Therefore, the Commission should consider the addition of a regulatory definition of UGV equipment to the *Rules* and authorization of UGV stations in the 700 MHz Public Safety Broadband spectrum.

Respectfully submitted,

Jim Hansen

Chairman, NBSCAB

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Mark S. Adams
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March 11, 2010

Via Electronic Submission

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Notice of Oral *Ex Parte* Communication
GN Docket Nos. 09-47, 09-51 and 09-137
WT Docket No. 06-150
PS Docket No. 06-229

Dear Ms. Dortch:

This letter is to notify you that on March 9, 2010, Northrop Grumman Information Systems ("Northrop Grumman") representatives Edward J. Dempsey, Manager, Wireless and Public Safety Solutions, Ajay Gupta, Engineer, Communications Systems, Thomas S. Afferton, Director of Strategy and Technology, Commercial State and Local Programs, and I, along with William J. Andrle, Jr., Telecom and Spectrum Strategy Vice President of TASC, Inc., participated in a telephone conference with representatives of the Commission's National Broadband Plan, Office of Engineering and Technology, and Public Safety and Homeland Security Bureau being copied on this letter as shown below.

This discussion was at the request of the Commission's staff, to answer their questions regarding the New York City Wireless Network (NYCWiN) citywide mission-critical broadband mobile wireless system for public safety, which was designed and built by Northrop Grumman. The conversation covered the following points:

- Operational details and performance parameters of the NYCWiN system derived from actual public safety operations, and future usage and network loading projections based on these actual results and trends in usage.
- The application of this data to public safety requirements and spectrum needs, now and in the future, for the operation of such a network in the 700 MHz band.

- Based on this actual data and derived analyses, the potential or likelihood that any foreseeable regime of public safety "roaming and priority access" on commercial 700 MHz networks, as suggested by the Commission in recent statements,[1] would not be an adequate substitute for direct public safety access to 20 MHz of spectrum (as proposed by the public safety community in seeking the 700 MHz D Block spectrum) to meet public safety needs for mission-critical grade mobile broadband wireless service.

All of the NYCWiN system data and projections discussed by Northrop Grumman are on record with the Commission in a filing by the City of New York in WT Docket No. 06-150 and PS Docket No. 06-229.[2]

Although this conversation was within the Sunshine Agenda period prior to a scheduled Commission meeting involving some of the subject matter, the Commission has waived the Sunshine prohibition on *ex parte* communication under the Commission's Rules.[3]

If you have any questions regarding this notice, please do not hesitate to contact me.

Sincerely,

cc:
Stagg Newman, Chief Technologist, National Broadband Plan
Thomas Peha, FCC Chief Technologist
Walter Johnston, Chief, Electromagnetic Compatibility Division, Office of Engineering and Technology
Pat Amodio, Public Safety and Homeland Security Bureau

[1] *Prepared Remarks, Chairman Julius Genachowski, Federal Communications Commission, Public Safety Briefing*, released February 25, 2010, at 3. *See also* Statement of James Arden Barnett, Jr., Chief, Public Safety and Homeland Security Bureau, released February 25, 2010, at 7-8.
[2] *See 700 MHz Broadband Public Safety Applications And Spectrum Requirements* filed by the City of New York in WT Docket No. 06-150 and PS Docket No. 06-229 on February 23, 2010.
[3] 47 C.F.R. §§ 1.1200(a), 1.1203; *Public Notice, FCC to Hold Open Commission Meeting Tuesday, March 16, 2010*, released March 9, 2010.

Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, DC 20554

In the Matter of	)	
	)	
Public Safety And Homeland Security	)	
Bureau Seeks Comment On	)	PS Docket No. 06-229
Interoperability, Out Of Band Emissions,	)	
And Equipment Certification For 700 MHz	)	
Public Safety Broadband Networks	)	

COMMENTS OF MOTOROLA, INC.

Robert D. Kubik, Ph.D.
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July 19, 2010

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Summary

Creating a nationwide interoperable public safety broadband network is rightfully a key priority of the Commission. The Commission's May 12, 2010, Order granting waivers to twenty one public safety entities to allow for early deployment of statewide or local public safety broadband networks in the 700 MHz public safety broadband spectrum was an important step towards realizing this goal. In these comments, Motorola offers guidance on how the Commission can best nurture these and other pioneering networks through a light-touch regulatory approach based on setting the key requirements for interoperability, encouraging the use of standards-based solutions wherever possible, and otherwise allowing public safety waiver recipients to develop the best networks for public safety's particular needs.

Ensuring interoperability among the many regional networks is essential to the success of providing nationwide public safety broadband services. While providing service to roaming public safety responders is key for all networks, each local and regional public safety broadband network will have different challenges and requirements that will demand at least some level of customization. This flexibility and creativity should not be suppressed with onerous regulations. Motorola recommends that the Commission set only the minimum requirements necessary to ensure interoperability among the public safety broadband networks and otherwise refrain from prescriptive regulatory mandates. This approach will allow public safety networks to develop according to the needs of their users, while also providing an interoperable foundation upon which the nationwide interoperable public safety network can be built.

In these comments, Motorola identifies specific areas and parameters where standards should be established for public safety broadband networks. These standards need not be codified into the rules – Motorola expects that public safety users, vendors and 700 MHz commercial service providers will find the appropriate vehicle to effectuate these types of recommendations without regulation. The Commission's Emergency Response Interoperability Center should monitor and facilitate such efforts as needed.

To provide the best route for an advanced, interoperable, nationwide wireless broadband network that will serve public safety needs in times when emergency communications are needed most, the Commission should support efforts to obtain a reallocation of the D block directly to the public safety community. Without the D block spectrum, public safety users will have insufficient resources to accomplish their missions during times of emergency and may even be prevented from taking advantage of the full benefits of wireless broadband technologies and applications during their day to day use. This will require greater reliance on commercial networks, even for day to day activities, which will increase operational costs for local governments. Moreover, reallocation of the D block would help resolve some of the outstanding technical and operational issues identified by the Commission in the Public Notice, such as those related to roaming, network performance and interference protection.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Public Safety And Homeland Security	)	
Bureau Seeks Comment On	)	PS Docket No. 06-229
Interoperability, Out Of Band Emissions,	)	
And Equipment Certification For 700 MHz	)	
Public Safety Broadband Networks	)	

COMMENTS OF MOTOROLA, INC.

Motorola, Inc. ("Motorola") hereby responds to the request for comments on the necessary technical requirements for public safety broadband networks operating in the 700 MHz band.[1] Motorola strongly supports the efforts of the Federal Communications Commission ("Commission") and its Public Safety and Homeland Security Bureau ("Bureau") to promote the development and construction of interoperable regional public safety broadband networks that collectively contribute toward the goal of a nationwide public safety broadband network.

I. Introduction and Summary.

Creating a nationwide interoperable public safety broadband network is rightfully a key priority of the Commission. As the Commission explained in the National Broadband Plan, "the country has long recognized the potential for broadband technologies to revolutionize emergency response wireless mobile communications. This

[1] Public Safety And Homeland Security Bureau Seeks Comment On Interoperability, Out Of Band Emissions, And Equipment Certification For 700 MHz Public Safety Broadband Networks, PS Docket No. 06-229, *Public Notice*, 25 FCC Rcd 5486 (2010) ("*Interoperability Public Notice*").

technology will give first responders new tools to save American lives."[2] The Commission's May 12, 2010, Order[3] granting waivers to twenty one public safety entities to allow for early deployment of statewide or local public safety broadband networks in the 700 MHz public safety broadband spectrum was an important step towards realizing this potential. In these comments, Motorola offers guidance on how the Commission can best nurture these pioneering networks through a light-touch regulatory approach based on setting the key requirements for interoperability, encouraging the use of standards-based solutions wherever possible, and otherwise allowing public safety waiver recipients to develop the best networks for public safety's particular needs.

Although the vision of a nationwide interoperable public safety communications network goes back much farther, the current proceeding can trace its immediate roots to the 2008 700 MHz auction ("Auction 73"), in which the Commission set forth a 700 MHz band plan that included one 10 MHz paired (5 + 5 MHz) block of public safety broadband spectrum (763-768/793-798 MHz) and one 10 MHz paired (5 + 5 MHz) block of commercial spectrum at the Upper 700 MHz D block (758-763/788-793 MHz) that were to be used together to provide spectrum for public safety broadband services through the creation of a public-private partnership.[4] Under the 700 MHz service rules in place at the time of Auction 73, the D block licensee would be responsible for helping to

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[2] Federal Communications Commission, *Connecting America: The National Broadband Plan*, Recommendation 16.1, at 314 (2010) ("*NBP*").

[3] *See* Requests for Waiver of Various Petitioners to Allow the Establishment of 700 MHz Interoperable Public Safety Wireless Broadband Networks, PS Docket 06-229, Order, 25 FCC Rcd 5145 (2010) ("*Waiver Order*").

[4] *See* Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, *Second Report and Order*, 22 FCC Rcd 15289 (2007).

fund and develop the nationwide public safety broadband network and would provide to public safety users preemptive and priority access to the D block commercial broadband spectrum during times of emergency. In exchange, the commercial D block licensee and its commercial customers would have access to the public safety broadband spectrum on a secondary basis.

The D block license did not attract a bid above the Commission's reserve price at auction. As Motorola has explained previously, the D block auction failed because commercial entities could not absorb the additional costs of building a commercial system designed to public safety specifications and still be able to charge commercially competitive rates.[5] The costs of meeting the heightened coverage and reliability requirements demanded of a nationwide public safety wireless broadband network for the relatively small number of first responders across the nation made it difficult, if not impossible, to comprehend building a network that was viable based on market competitive service rates.[6]

In the wake of Auction 73 the Commission initiated proceedings to determine how best to move forward with promoting the development of a nationwide public safety wireless broadband network and how the Upper 700 MHz D block spectrum can best facilitate this goal.[7] These issues have yet to be resolved. In the meantime, however, at

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5 *See* Comments of Motorola, Inc., PS Docket No. 06-229 at 4 (filed June 20, 2008).

6 *Id.* at 5.

7 *See* Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, WT Docket No. 06-150, PS Docket No. 06-229, *Second Further Notice of Proposed Rulemaking*, 22 FCC Rcd 8047 (2008); Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety

least twenty one jurisdictions have indicated that they are ready to begin development of public safety broadband networks now, in advance of final rules for the 700 MHz Public Safety Broadband spectrum and the Upper 700 MHz D block.[8]

The initial requests for waiver were publicly supported by the Public Safety Broadband Licensee ("PSBL") the Public Safety Spectrum Trust ("PSST"),[9] the National Public Safety Telecommunications Council ("NPSTC"),[10] Motorola,[11] and numerous other parties. The PSST also submitted, in an ex parte filing, a report completed by the NPSTC Broadband Task Force ("BBTF"), which addressed recommended conditions for the waiver petitions and proposed other operational and governance structures to help ensure such deployments are interoperable.[12] Most commenters generally supported the recommendations of the NPSTC BBTF Report, including the use of the 3GPP Release 8 ("LTE") protocol as a standard air interface for all public safety wireless broadband networks. On May 12, 2010, the Commission granted the waivers, conditioning its grant on adherence to a limited set of operational and technical requirements meant to ensure

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Network in the 700 MHz Band, WT Docket No. 06-150, PS Docket No. 06-229, *Third Further Notice of Proposed Rulemaking*, 23 FCC Rcd 14301 (2008).

8 In addition to the twenty-one waivers that the Commission has conditionally granted, as of July 19, 2010, there are twelve additional waiver requests pending that further underscore public safety's interest in moving forward with broadband deployment.

9 *See* Public Safety Spectrum Trust Ex Parte Filing, PS Docket No. 06-229 (Dec. 15, 2009) (entering into the docket National Public Safety Telecommunications Council, 700 MHz Public Safety Broadband Task Force Report and Recommendations (2009) ("*NPSTC BBTF Report*")).

10 *See id.*, *see also* Comments of National Public Safety Telecommunications Council, PS Docket No. 06-229 (filed Oct. 16, 2009).

11 *See* Comments of Motorola, Inc., PS Docket No. 06-229 (filed Oct. 16, 2009).

12 *See NPSTC BBTF Report*.

that the public safety wireless broadband networks that develop are sufficiently robust, well-funded and interoperable, and that they are constructed within a reasonably quick time frame.[13] The present *Interoperability Public Notice* was issued to assist the Commission in gathering data and facts that would help guide the development of additional rules and policies that would be applicable to subsequent public safety regional broadband networks.

As the Commission is well aware, ensuring interoperability among the many regional networks is essential to the success of providing nationwide public safety broadband services. While providing service to roaming public safety responders is key for all networks, each local and regional public safety broadband network will have different challenges and requirements that will demand at least some level of customization. This flexibility and creativity should not be suppressed with onerous top-down regulations. Thus, Motorola recommends that the Commission set only the minimum requirements necessary to ensure interoperability among the public safety broadband networks and otherwise refrain from prescriptive regulatory mandates. This approach will allow public safety networks to develop according to the needs of their users, while also providing an interoperable foundation upon which the nationwide interoperable public safety network can be built.

Finally, to provide the best route for an advanced, interoperable, nationwide wireless broadband network that will serve public safety needs in times when emergency communications are needed most, the Commission should support efforts to obtain a reallocation of the D block directly to the public safety community. As Motorola

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13 *See Waiver Order*.

explained in its recent analysis on the issue,[14] without the D block spectrum, public safety users will have insufficient resources to accomplish their missions during times of emergency and may even be prevented from taking advantage of the full benefits of wireless broadband technologies and applications during their day to day use. This will require greater reliance on commercial networks, even for day to day activities, which will increase operational costs for local governments.[15] Moreover, reallocation of the D block would help resolve some of the outstanding technical and operational issues identified by the Commission in the Public Notice, such as those related to roaming, network performance and interference protection.

II. Interoperability.

While granting local jurisdictions waivers to build public safety broadband networks on a regional basis, the Commission made clear that one of its fundamental goals remains the development of a nationwide interoperable broadband network for public safety services. To that end, the Commission conditioned the waiver grants on the use of the 3GPP Release 8 ("LTE") protocol air interface and additional baseline interoperability criteria.[16] The *Interoperability Public Notice* seeks comment on whether additional interoperability requirements should be imposed and implemented in its rules

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14 *See* Letter from Robert D. Kubik, Director, Telecom Relations Global, Motorola, to Marlene H. Dortch, Secretary, Federal Communications Commission, PS Docket No. 06-229, WT Docket No. 06-150 (filed July 2, 2010).

15 Public safety access to commercial systems will not be free of charge but instead "[c]ommercial operators should receive reasonable compensation for public safety priority access and roaming capabilities on their networks." *NBP* Recommendation 16.1, at 316.

16 *Waiver Order*, 25 FCC Rcd at 5157, ¶ 38.

for the public safety broadband networks.[17] The public notice introduced a number of areas associated with public safety broadband interoperability, each of which are discussed below.

1. *Applications*.

Consistent with the recommendations of the NPSTC BBTF Report, the *Waiver Order* required the waiver recipients to initially support the following applications: (1) Internet access; (2) VPN access to any authorized site and to home networks; (3) a status or information "homepage;" (4) access to responders under the Incident Command System; (5) and field-based server applications.[18] The *Interoperability Public Notice* seeks comments on whether specifying these applications is sufficient for the purpose of promoting nationwide interoperability and, if so, should the requirements be codified in the rules and applicable for all future licensees.[19] The Bureau also asks whether additional applications should be required.

Motorola believes that the Commission conditioned the waiver grants appropriately through the minimum application requirements for initial deployments detailed in the *Waiver Order*. The identified applications are sufficient to support the foundational public safety usage scenarios. Motorola notes, however, that there remain many options for the design and use of these and other applications that might greatly facilitate long term interoperability. Additional decisions will be required, however, before final application determinations can made for all regions. The Emergency

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[17] *Interoperability Public Notice*, 25 FCC Rcd at 5486.

[18] *Waiver Order* at 25 FCC Rcd at 5160, ¶ 46.

[19] *Interoperability Public Notice*, 25 FCC Rcd at 5487.

Response Interoperability Center ("ERIC"), working in consultation with its Technical Advisory Committee and the PSST, could provide a forum for these discussions and help to expedite these decisions.

Migration to standard, regional applications is envisioned to be a long-term process that must have appropriate funding, planning, and consensus within the public safety community. Motorola therefore believes that the Commission should refrain from specifying additional applications that would be available on all public safety broadband networks and, in the near term, focus instead on the underlying LTE network level interoperability that will provide the foundation for all future, broader interoperability objectives. LTE network level interoperability ensures that a public safety user device can attach, authenticate, and be provided bearer services as it roams over other regional public safety LTE deployments and participating commercial LTE networks, regardless of what application is intended to be used. Moreover, it is vitally important that public safety have continued access to the broad range of applications and services in place today that support the unique use cases of local agencies (*e.g*. Computer Aided Dispatch ("CAD"), Mobile VPN, etc.). These applications represent large investments by the agencies over several years, and their use will be essential to the effective performance of public safety's mission as agencies and users transition to next generation networks and services.

In the long term, an application interoperability strategy should be implemented to complement LTE's network level interoperability. Options for application level interoperability include: standardized User Equipment-to-Network Interface ("UNI") specifications, standardized Network-to-Network Interface ("NNI") specifications, downloadable application clients when in visited networks, or nationally hosted interoperability applications. Motorola recommends the standardized NNI approach as it accommodates the existing local and regional diversity in existing application deployments, and autonomy in future application selection, while still ensuring that public safety users can achieve the desired application interoperability.

For example, public safety CAD applications used today support Simple Mail Transfer Protocol ("SMTP") interfaces, essentially making this common format for email exchanges a method to transfer information to a CAD server for dispatch messaging to first responders. At the same time, nearly all application servers implementing Short Messaging Service (SMS) for cellular text messaging also support SMTP interfaces. So in this example SMTP could easily serve as the NNI for messaging interoperability between regions that choose to use either CAD or SMS, or both, for their local or regional messaging needs. NNI techniques are commonly used between cellular service providers to provide interoperability between their independently hosted services and can be exploited similarly for these public safety networks. Again, the ERIC, working in consultation with its Technical Advisory Committee and the PSST, would be the logical organization to oversee and expedite the development of these standards.

Recognizing that public safety devices can fall into unauthorized possession, the physical device level authentication afforded by LTE standards should be augmented with true user authentication that validates the user behind the device. For example, a means to support federated identity management when roaming must be implemented. One such option would be Security Assertion Markup Language ("SAML"), which is used widely by both enterprises and federal government agencies and can work well in conjunction with the framework that is being proposed for network level interoperability and the mandatory status/information home page application required by the Waiver Order.[20]

Imposing application performance requirements may delay deployment, thereby negatively impacting the effective use of public safety networks—especially if funding is not provided to support assured levels of performance. Operability should not be sacrificed in the name of interoperability. Motorola urges the Commission to refrain from adopting minimum application performance specifications until the approaches for roaming and application interoperability have been selected and public safety agencies have a chance to weigh in on the required application performance characteristics. The Commission should also recognize that the cost and complexity for achieving compliance with any performance specifications for application will vary greatly across different coverage areas.

2. *Roaming*.

The *Waiver Order* requires each waiver recipient's system to be capable of supporting roaming by users from all other systems authorized by waiver and from all future regional, state, Tribal and local public safety broadband systems.[21] Relying on the NPSTC's BBTF Report, the *Waiver Order* required that two categories of roaming must be supported: (1) home-routed traffic, such that a "visiting" user's traffic is routed back to the home network to enable the use of home resources, and (2) local breakout traffic,

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20 *Waiver Order* at 25 FCC Rcd at 5160, ¶ 46.

21 *Id.* at ¶ 45.

such that a visiting user can utilize the resources of the host network.[22] The *Interoperability Public Notice* seeks comment on whether any additional roaming requirements should be added to the rules, such as handoff between public safety networks especially in case of regional emergencies.[23] The Bureau also seeks comment on the technical ramifications on public safety networks if it should adopt rules requiring or allowing roaming to and from commercial networks.[24]

Motorola supports the *Waiver Order's* requirements that the initially deployed networks support roaming through home-routed traffic and local breakout traffic. For future systems, Motorola believes that the Commission should limit the requirement for supporting roaming to home-routed traffic due to its advantages in the area of security and home-based policy control. Additional roaming requirements for future systems are not recommended.

Governance and technical parameter definitions are needed to facilitate roaming within the nationwide public safety broadband network, as well as to facilitate roaming with commercial carriers. However, a nationwide roaming clearinghouse does not need to be established initially, as this would introduce unnecessary cost and complexity for roaming scenarios that are unlikely to occur between these waiver system users and their geographically dispersed deployments. Given that the broadband network is a complex undertaking, and that LTE is a nascent technology, waiver recipients require flexibility to work out roaming arrangements and models that meet their operational needs and the

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22 *Id.*

23 *Interoperability Public Notice*, 25 FCC Rcd at 5487.

24 *Id.*

business needs of commercial carriers. Thus, the Commission should establish only the minimum rules necessary to achieve roaming, while allowing for organic technological evolution. For example, a key roaming issue is the handling of mutual aid scenarios. Varying degrees of service levels and priorities may be desired in mutual aid scenarios, but practical limitations of technological and operational capabilities will guide the development of realistic mutual aid policies.

Waiver recipients must be allowed to develop and implement policies that provide essential capabilities within their operational and technological constraints. Evolution and refinement are inevitable as these policies get implemented and exercised, and this process should be encouraged. In this regard, Motorola endorses the recommendation of the NPSTC BBTF Report and the PSST that an advisory group made up of waiver recipients work with the PSST in establishing roaming policies and associated technical parameters.[25] This advisory group would also be responsible for recommending the long-term establishment of a nationwide roaming clearinghouse when considerations of operational and technological readiness make it appropriate.[26]

Bilateral roaming agreements between regions will be necessary and should be constructed under a common framework set by the ERIC and the PSST. However, terms and conditions of the individual agreements must be established on a regional basis, with consideration of agency-level needs and dependencies, without a federal mandate. A similar approach should be adopted as regional entities establish terms and conditions for roaming agreements with Commercial Carriers.

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25 *See NPSTC BBTF Report* at 6.1.1.

26 *See id.* at 6.1.4.

3. *Priority Access.*

The *Interoperability Public Notice* seeks comment on the requirements for priority access on public safety broadband networks – an issue not addressed in the *Waiver Order*.[27] The Bureau states that it envisions that priority access, as a technical matter, will be commonly standardized, supported and required among public safety networks and will include, as a minimum, both the access to the common air interface and prioritization of traffic.[28] The Bureau asks whether any other elements should be included in the definition of priority access and, in general, how the capability should be implemented in public safety networks.[29]

Public safety broadband networks will need to establish priority access for both home users and public safety roamers from other regions. LTE offers the most advanced Quality of Service ("QoS") capabilities of any commercial cellular technology; however the technology must be properly configured for optimal public safety implementation and to support roaming. Motorola believes that appropriate LTE configurations should be standardized across all public safety regional systems in order to facilitate nationwide interoperability and roaming access. The appropriate national framework must contain sufficient flexibility so that each public safety region can choose a prioritization model that best suits its needs while allowing roamers to maintain consistent QoS.

When a responder roams from one regional system to another regional system (or to a commercial carrier's network), certain parameters should be standardized so that

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27 *Interoperability Public Notice* 25 FCC Rcd at 5487.

28 *Id.*

29 *Id.*

roaming QoS can be more easily facilitated. Standardized QoS parameters are especially needed for LTE "home routed traffic" through the S8 roaming interface that the Commission has required all waiver recipients to support in the *Waiver Order*.[30] Motorola believes that the following items should be standardized on public safety broadband networks:

- ***Policy and Charging Rules Function ("PCRF").*** An optional function of the LTE architecture, the PCRF would provide QoS policy for responder devices whether at home or while roaming. Because of public safety's desire to support session-oriented, QoS-enabled traffic, home routed traffic, and roaming to both public safety and commercial carrier networks, the PCRF is essential.

- ***Access Class Barring.*** LTE includes "Access Class Barring", a method to prevent congestion of the control channel at busy Evolved Node Bs ("eNBs"). The highest class—access class 14—should be reserved for public safety first responders. This is not expected to offer significant differentiation for public safety users roaming to other public safety networks as most devices will be the same access class. However, it can provide significant benefit if and when public safety LTE devices roam onto commercial carrier networks. For this to be effective, access class 14 should be reserved for public safety usage on both commercial and public safety networks.

- ***Quality of Service Class Identifier ("QCI").*** The QCI is a scalar parameter that maps to QoS scheduling characteristics at the eNB (such as scheduling priority, packet delay budget, packet error loss rate, *etc*.). Technical standards map standard QCI values to QoS attributes.[31] When a User Equipment ("UE") roams, the QCI scalar is passed from the home to visited system. If the QoS attributes that map to the QCI scalar are different than the home system, this could result in poor (or no) application performance. It is key to require 3GPP standardized QCI scalars (and the QoS characteristics they map to) for public safety and participating commercial LTE systems.

- ***Allocation and Retention Priority ("ARP").*** LTE's ARP includes 3 attributes: 1) the priority a bearer will have for admission control at the eNB, 2) whether or not the bearer can be preempted, and 3) whether the eNB should attempt to preempt other bearers to make room for the new bearer. Motorola

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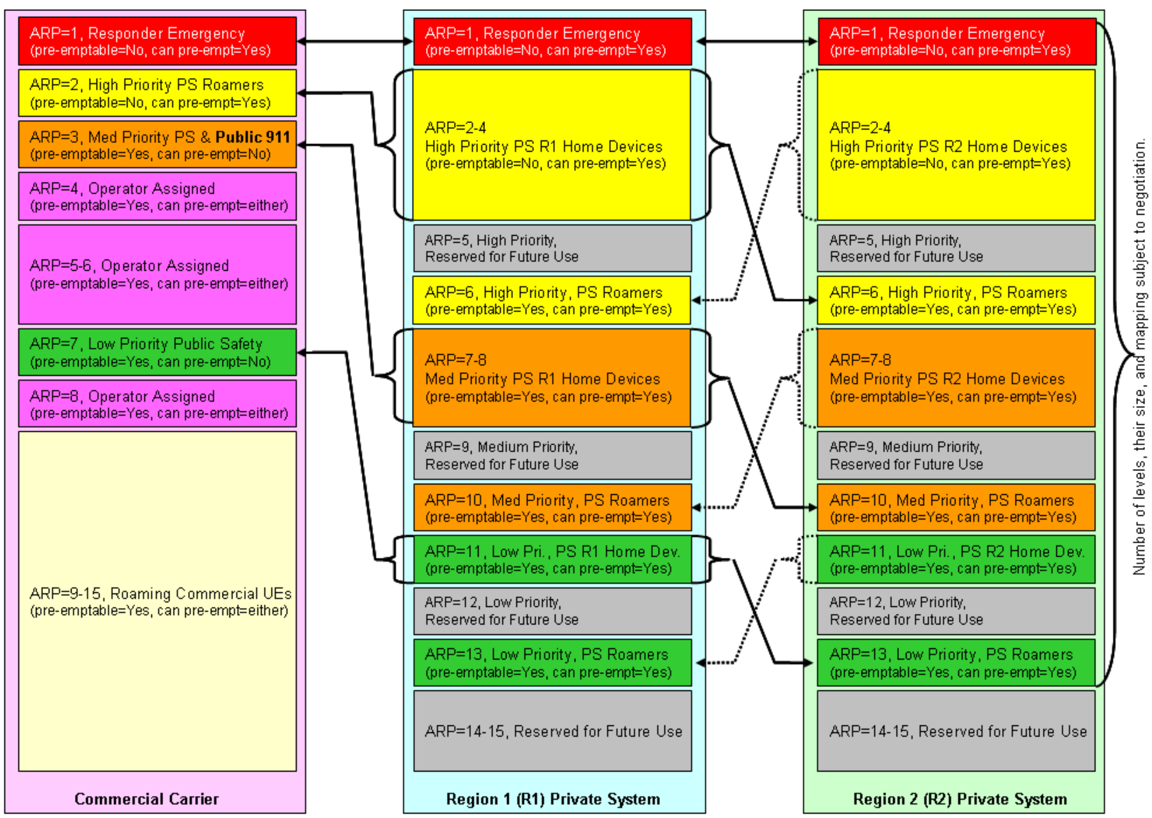
[30] *See Waiver Order*, 25 FCC Rcd at 5160, ¶ 47.

[31] 3GPP, "Policy and Charging Control Architecture" 3GPP TS 23.203 *available at* http://www.3gpp.org/ftp/Specs/html-info/23203.htm.

recommends that the Highest ARP priority be reserved for Responder Emergency, which denotes that public safety responders are in life threatening situations. Motorola also recommends that the number of ARP priority "buckets" or levels should be standardized.

The following figure provides an example of the issue of ARP and the importance of establishing a standardized number of priority levels. The example shows four priority levels (Responder Emergency, High, Medium, Low) but the actual number of levels is not critical. Once the number of levels is standardized, they must be consistently made available on both participating commercial and regional public safety systems to facilitate inter-system QoS, which is essential to a consistent roaming experience.

ARP Mapping Between Public Safety and Commercial Carrier Networks
Example for Illustrative Purposes



Within the above framework, certain standards and policies should be adopted by public safety networks to accommodate public safety roamers from other regions. During roaming scenarios, prioritization policy should be implemented such that when a public safety user roams to a visited system, the priority for that user is consistent with the visited system's prioritization policy. To accomplish that goal, Motorola recommends that the following policies should apply to the case when a public safety device (homed to a specific regional system) attempts to roam to an Evolved Packet Core ("EPC") serving another public safety region:

- ***Allow Each Region to Use the ARP Priority Levels to Fit Their Needs***. Within the confines of each priority level in the public safety regional network, public safety should be free to assign what UEs, applications, etc. map to each priority level. Today, some public safety systems prioritize based on application, and others based on responder role. Many agencies have expressed a desire for incident-based priority. This recommendation gives public safety an excellent balance between regional flexibility (whether for incident, application, device, or other priority scheme) and inter-system roaming compatibility.

- ***Public Safety Roamers Can Be Assigned to Each Priority Level.*** In order to facilitate relatively consistent prioritization between public safety regions, it is expected that roamers between regional public safety systems be allowed to utilize each of the ARP levels. For LTE home routed traffic, the home PCRF assigns the ARP priority of the bearer established in the visited system's eNB. For this reason, a consistent treatment of roamers is essential in the prioritization hierarchy.

- ***A Roaming UE's Bearers May be Preempted***. When a public safety UE roams to another public safety LTE system, the visited system should have ultimate control over its resources. For this reason, all bearers for roamers (other than the Responder Emergency level) should be susceptible to preemption.

- ***Public Safety Bearers Associated with the Responder Emergency and High Priority ARP Values Should Be Able to Preempt Other Lower Priority Bearers***. Bearers with higher priority ARP ranges must be allowed to instantly obtain resources as needed from lower priority public safety bearers.

The above standards and policies to enable priority access should not be codified in the Commission's rules. Motorola expects that public safety users, vendors and 700 MHz commercial service providers, with the encouragement and oversight of the ERIC and PSST, will find the appropriate vehicles to effectuate these types of recommendations without regulation. Even when such discussions are completed, codification of the final agreements should be eschewed in order to avoid restricting progress and innovation.

Consistent with the questions raised in the *Interoperability Public Notice*, these comments focus on priority access capabilities for public safety users on public safety broadband networks. However, if public safety is to use commercial broadband networks for public safety applications, these capabilities must also be incorporated and consistently applied to participating 700 MHz commercial LTE systems. Participating commercial operators will need to explicitly provide priority for public safety users through the use of standards based mechanisms (*i.e*. QCI, ARP). Participating commercial operators will need to implement a specific Access Class Barring policy for public safety that is timely and consistent with public safety needs. And, most importantly, public safety will require instantaneous preemptive access to commercial networks during periods of emergency. Unless these features are available to public safety users, commercial networks will not be relied upon to meet mission critical needs for first responders.

4. *System Characteristics, Interfaces and Testing*.

The *Waiver Order* imposed a number of technical specifications on the waiver recipients related to system characteristics, interfaces and testing as recommended by the

NPSTC BBTF Report.[32] The *Interoperability Public Notice* seeks comment on whether these specifications should be codified in the rules.[33] The public notice further asks if self-certification is sufficient to satisfy the need for interoperability testing on a long-term basis.[34]

In the long term, Motorola recommends the use of a self-certification relying on test suites developed specifically for public safety use of Band Class 14. These tests should be patterned after, and similar to, the tests that are applicable to other 700 MHz commercial bands and should be defined through the collaborative work of NIST, public safety representatives and the vendor community. Until a standard profile for the public safety band is established, a set of specific tests agreeable to public safety operators to enable initial deployments is recommended.

The *Waiver Order* indicated that the ERIC would consider the networks' Public Land Mobile Network ("PLMN") ID strategy.[35] Motorola urges the Commission and the ERIC to pursue this immediately in coordination with the PSST. The PLMN ID strategy will impact the number and scope of roaming instances within the nationwide broadband network; Evolved Packet Core ("EPC") equipment scaling requirements; and the statistical occurrences of application exposure to roaming transitions. The PLMN ID assignment scheme is a key element in network planning and optimization, and may be costly to modify post-deployment. Differing assumptions regarding the PLMN ID

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32 *See Waiver Order*, 25 FCC Rcd 5160-61, ¶¶ 47-48.

33 *See Interoperability Public Notice*, 25 FCC Rcd 5487-88.

34 *Id.* at 5487.

35 *Waiver Order*, 25 FCC Rcd at 5161, ¶ 48.

scheme may lead to future interoperability delays and challenges. Therefore, a uniform approach should be adopted as soon as possible.

Motorola recommends adopting a two-pronged PLMN ID scheme whereby one unique PLMN ID is allocated for each regional entity, and one common PLMN ID is allocated for the nationwide public safety network. The unique PLMN ID per region would be used as a typical PLMN ID delineation of network administrative domains. The nationwide public safety PLMN ID may be used as a pseudonym, representing a virtual network, similar to mobile virtual network operator ("MVNO") PLMN ID's used in commercial carrier networks. The Nationwide public safety PLMN ID can also be used by entities not otherwise affiliated with regional entities, such as federal agencies. Lastly, the Nationwide PLMN ID can also be used by the public safety roaming clearinghouse for aggregating the identity of public safety entities for inter-operations with commercial carriers.

5. *Security.*

The *Interoperability Public Notice* notes that the *Waiver Order* requires that public safety equipment and devices offer technical support for all the optional LTE security features, but that the selection of the security features used will be specified by the ERIC.[36] The Bureau therefore asks what features for Key Management, Encryption, Authentication, Authorization, and Identification need to be selected in order to optimize network security.[37]

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36 *Interoperability Public Notice*, 25 FCC Rcd at 5488.

37 *Id.*

***Application and Services Security*:**

Motorola recommends that public safety agencies continue to maintain agency-level control over key management functions, identity management functions, and authentication/authorization functions. Agencies should be able to locally manage the digital identities and credentials of their first responders. To promote interoperability between public safety agencies, Motorola recommends that agencies federate their identity, such that a responder from one agency can use their agency-provisioned identity and credentials to obtain access to other agencies services, such as the status/information homepage. The technology to enable identity federation is both mature and widely deployed across a horizontal slice of industry, including federal law enforcement, healthcare, and finance.

Technology to enable federated identity management—such as SAML—is needed for additional security.[38] SAML-based technologies bring a plethora of benefits, including enabling a single sign-on (authenticate once, authorize to many services), support for personalization (user attributes, roles), and policy control (authentication and authorization are decoupled). And, because SAML is widely used by other industries and user groups, adoption of SAML will facilitate interoperability among public safety agencies, as well as between public safety and federal law enforcement, and public safety and healthcare.

Another powerful feature of SAML is the means by which it separates authentication from authorization. SAML alone does not provide authentication; rather it asserts to a service provider that the user has been authenticated, and defines their roles and attributes. This allows authentication of the user to occur closest to the source, using already deployed agency authentication mechanisms such as Kerberos[39] or multi-factor authentication such as Smart Cards.

With respect to authentication, it is critical that not only the responder's device be authenticated, but that the user behind the device is authenticated as well. Many existing public safety applications such as CAD and voice over IP ("VoIP") telephony solutions depend upon identifying the responder in possession of the device. This is especially important in scenarios where multiple first responders will log onto an agency application through the same device, such as in the case of a fire truck with a shared Mobile Data Terminal (MDT). In such instances, simply authenticating the device is not sufficient. Motorola recommends that for public safety applications both the device and user be authenticated.

In addition to agency-controlled identity management, authentication and authorization, agencies should also maintain control over key management for their applications. Cryptographic keys managed by the network provider have a well-suited place providing defense in depth, but the ability for an agency to manage its own keys and provide end-to-end encryption of their communications must be supported by the access network. As such, encryption at either the VPN layer or application layer must not prohibit communications between the responder and their home agency applications while roaming. Motorola recommends that public safety agencies continue to maintain control over application level cryptographic keys.

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38 *See* Section II.1, *supra* pp. 9-10.

***Network Domain Security*:**

Motorola recommends that public safety broadband networks support both the mandatory aspects of the 3GPP SAE security architecture specification as well as certain optional aspects.[40] More specifically, Motorola recommends that the following optional aspects of the security specification be applied to all public safety networks:

- Both control plane and bearer plane traffic should be encrypted over-the-air. This includes Radio Resource Control (RRC) signaling, Non-Access Stratum (NAS) signaling, and user plane traffic.

- The 3GPP security specification requires the support of both the SNOW 3G and AES encryption algorithms. AES should be the preferred choice, as it is a NIST/FIPS recommended algorithm for securing public safety communications.

Motorola further recommends adoption of the 3GPP defined mechanisms for Network Domain Security.[41] According to the standard, the interfaces between the network entities in the network are to be secured using Internet Protocol Security (IPsec) associations. The security associations will be established and maintained as stated in the standard, specifically:

- Network Domain Security / Internet Protocol (NDS/IP) inter-domain interface (Za) cryptographic protection via Security Gateways (SEGs) will be provided and is used to interface between two security domains. The Za interface security associations will be established using IKEv1 or IKEv2. X.509 digital certificate based authentication will be utilized between SEGs in different security domains.

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[39] *See, e.g.* Kerberos: The Network Authentication Protocol, *available at* http://web.mit.edu/kerberos/.

[40] 3GPP, "3GPP System Architecture Evolution (SAE); Security Architecture" 3GPP TS 33.401 *available at* http://www.3gpp.org/ftp/Specs/html-info/33401.htm.

[41] *See* 3GPP, "3G security: Network Domain Security(NDS), IP Network Layer Security" 3GPP TS 33.210 *available at* http://www.3gpp.org/ftp/Specs/html-info/33210.htm.

- NDS/IP intra-domain interfaces (Zb) will be cryptographically protected unless within physically secure and/or fully trusted environments is used to interface between the various network entities within a single security domain.

Moreover, Motorola believes that the need for secure key storage in the UEs and all network entities. The level of security needed would be dictated by the security assurance required by the regional public safety network operator.

***<u>VPN Access to Home</u>*:**

Motorola recommends VPN/MVPN access to the home network for public safety users. Criminal Justice Information System ("CJIS") requirements mandate the use of FIPS 140-2 validated encryption. Therefore, Motorola recommends the use of FIPS 140 validated VPN/MVPN solutions to maintain compliance with the CJIS security policy and to access CJIS related services.

6. *Performance, Reliability, Capacity and Coverage.*

The *Waiver Order* did not address the performance, reliability, capacity or coverage of public safety wireless broadband networks and thus, the *Interoperability Public Notice* asks the general question of whether these parameters affect interoperability and what requirements for performance, reliability, capacity and coverage, if any, should the Commission adopt for the public safety broadband network and devices utilized on the network.[42] The *Interoperability Public Notice* asks whether a "network of networks" with different operational characteristics at various points hinders nationwide interoperability.[43]

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42 *See Interoperability Public Notice* 25 FCC Rcd at 5488.

43 *Id.*

In short, the answer is no. Nationwide interoperability will be achieved by the selection of standard interoperability interfaces—most notably the LTE air interface and EPC roaming interfaces specified in the standard—with the addition of a basic set of applications for interoperability that should be defined by the PSST in coordination with the waiver recipients and the ERIC rather than included as a mandate in the rules. Performance, reliability, capacity, and coverage are all operational parameters that public safety has experience in specifying when designing and procuring systems. Interoperability does not require regulatory mandates in these areas. In fact, because the environmental and operational challenges, and thus the corresponding performance requirements, will vary substantially among regional public safety networks, any federal mandate is likely to be a poor fit to some situations and cost-prohibitive to implement for others. Motorola recommends that the Commission set only the minimum requirements necessary to ensure interoperability among the public safety broadband networks and otherwise refrain from prescriptive regulatory mandates. This approach will allow public safety networks to develop according to the needs of their users, while also providing an interoperable foundation upon which the nationwide interoperable public safety network can be built.

The *Interoperability Public Notice* further asks if the benefit of local control over these matters outweighs the benefit of service ubiquity and transparency across networks.[44] Local control of network performance definitely outweighs any perceived benefits of national service ubiquity. Regulation should not prevent local agencies from making dynamic policy decisions to enhance the priority and the performance of their

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[44] *Id.*

users and roamers. Most appropriately, these determinations will be made under the cooperative control of the local multiagency network managers or emergency incident commander(s) who will have the authority and experience to most efficiency control the local emergency incident scene communications effectiveness. Public safety requires continued control over its broadband networks to ensure that communications can be authorized appropriately and dynamically as an incident demands.

7. *Nationwide Core.*

The *Interoperability Public Notice* notes that the *Waiver Order* requires the use of LTE and an associated Evolved Packet Core ("EPC") for each public safety regional network but does not address whether there should be a nationwide core to which all the individual networks would be connected.[45] Thus, the Bureau seeks comment on whether there should be a nationwide core created for the purpose of achieving a nationwide interoperable broadband network for public safety and, if so, how it should be operated and maintained.[46]

Motorola does not believe that a national core would be particularly useful for enhancing interoperability and may have drawbacks such as decreased nationwide reliability. LTE Standard interfaces provide both roaming and interoperability requirements without a centralized core. Further, maintaining separate public safety EPCs will allow public safety regions to independently negotiate favorable policies with different carrier networks. In short, a common EPC core provides little additional benefit

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45 *Id.*

46 *Id.*

and limits important public safety operational requirements that can be better maintained at the local level.

8. *Network Operations, Administration and Maintenance (OA&M).*

The *Interoperability Public Notice* notes that the *Waiver Order* did not address the technological and operational features of network operations and management, administration/provisioning, and maintenance and seeks comment on what operational capability, if any, should be required in order to maintain and enhance interoperability.[47]

Public safety network deployments are expected to occur first within statewide, regional, or metropolitan areas, and to later tie-in to a nationwide level. These deployments will eventually support multiple independent jurisdictions within the overall network operational area. Each region is likely to differ in terms of needs and resources in ways that will rationally affect its decisions with respect to network operations, administration and maintenance. Standardization of network management beyond what is already afforded by common industry standards and conventions is not necessary to achieve interoperability. If a nationwide framework is initiated and if northbound interface (NBI) data from the various regional networks to the nationwide operations center is required, the minimum requirements for such an interface can be addressed by public safety and the ERIC at that time.

In addition to basic network management, additional OA&M functions can be defined to support interoperability. In the area of device management, for example, a standard protocol such as OMA-DM (Open Mobile Alliance – Device Management) should be implemented to facilitate different vendor devices being managed by the same regional network operations center. The OTA (Over the Air Activation) device management (DM) solution employed to manage the broadband networks should, at a minimum, support an OMA-DM based standardized device management interface. A vendor may still continue to support a vendor device manager and a vendor client on a handset employing proprietary technology as long as such technology supports OTA OMA-DM based management, as a baseline support.

9. *Governance.*

The *Interoperability Public Notice* seeks comment on an approach for governance of the nationwide public safety broadband network that promotes interoperability.[48] The public notice asks if the Commission should require the waiver jurisdictions to submit reports that detail the steps they are taking to align their investments to governance standards relating to interoperable emergency communications, including alignment of investments to relevant Statewide Communications Interoperability Plans (SCIP), coordination of expenditures with the grantees' Statewide Interoperability Coordinators (SWIC), and any review required by the relevant Statewide Interoperability Governing Bodies (SIGB) and network.

In supporting the initial requests for waiver submitted by the various local and state jurisdictions, Motorola urged the Commission to require the waiver recipients to obtain the approval of the PSST to deploy the regional network through a sub-license or lease agreement with the PSST.[49] Motorola stated that authorizing regional public safety

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47 *Id.*

48 *Id.* at 5489.

49 Comments of Motorola, WT Docket No. 06-229, October 16, 2009, at 10.

broadband networks should flow directly from the nationwide license issued to the PSST as this would preserve the opportunity for ultimately achieving a nationwide network of networks to provide near ubiquitous public safety broadband access.[50] Motorola further supported one of the key recommendations of NPSTC's BBTF Report that an Advisory Group made up of representatives of the regional system operators and the PSBL be established to continue follow-on work and to provide advice to the PSST and help ensure that future network development will benefit from the best practices learned by the early adopters.[51]

Motorola believes that these basic requirements provide the best governance framework for the public safety broadband spectrum. Under the oversight of the ERIC, regional public safety operators should be encouraged to share information and best practices with the PSST to assist with the development of future networks. Additional reporting requirements beyond those implemented by the *Waiver Order,* should not be imposed but the ability of the ERIC and the PSST to solicit information from regional operators should be clarified.

III. Out-of-Band Emissions.

The *Waiver Order* imposed out-of-band emissions ("OOBE") requirements on public safety broadband base stations and user equipment of 43+10log(P) outside of the licensed frequency block.[52] The *Interoperability Public Notice* seeks comment on the sufficiency of this requirement and further asks what steps can be taken to make the

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[50] *Id.* at 7.

[51] *Id.* at 6.

[52] *Waiver Order*, 25 FCC Rcd at 5159, ¶ 44.

equipment deployed via waiver comply with more stringent standards that may be adopted in the future.[53]

Motorola recommends that base stations be required to meet the current provisions of Section 90.543(e) that specify an OOBE attenuation requirement of 76+10log(P) per 6.25 kHz in order to minimize interference to public safety narrowband operations in the 769 – 775 MHz and 799 – 805 MHz bands. The 3GPP TS 36.104 standard has incorporated these public safety protection requirements as regional options[54] and 700 MHz base stations that are compliant with this requirement have received FCC equipment certification. For base station OOBE that fall into commercial portions of the 700 MHz band, the 43 + 10log(P) specification is appropriate.

With regard to UE, Section 90.543(e) requires OOBE emissions in the public safety narrowband blocks to be attenuated in accordance with the specification 65 + 10 log(P). Compliance with this requirement is an issue in the short term. A preliminary analysis of Band Class 14 with some of the performance specifications added to 3GPP TS 36.101[55] had been performed in 3GPP RAN4, but without the final D block rules, the work was not completed. Recently, 3GPP RAN4 has begun work on Band Class 14 devices with respect to meeting the requirements of Section 90.543(e), Section 27.53(c)

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53 *Interoperability Public Notice*, 25 FCC Rcd at 5489.

54 3GPP, "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception" 3GPP TS 36.104 *available at* http://www.3gpp.org/ftp/Specs/html-info/36104.htm.

55 3GPP, "Evolved Universal Terrestrial Radio Access (E-UTRA); Mobile Station (MS) radio transmission and reception" 3GPP TS 36.101 *available at* http://www.3gpp.org/ftp/Specs/html-info/36101.htm.

and Section 27.53(d) of the Commission's Rules. Motorola is supporting this work[56] and expects that 3GPP will soon address these Band Class 14 specifications. Until then, Motorola concurs with the Commission that waiver recipients be allowed to operate UE devices that meet 43 + 10log(P) into the public safety narrowband 700 MHz allocation. Because this offers less protection that the Commission's rules, waiver customers should coordinate their LTE deployments with any 700 MHz narrowband operations in order to minimize the potential for interference as specified in the Commission waiver grant. The existing provisions of Section 90.543(e) should be maintained in order to provide necessary protection for critical public safety systems. Since this rule has long been published and applied to the existing 700 MHz band deployments, vendors should be well versed in the requirement and in existing 3GPP maximum power reduction techniques that may be added for Band Class 14 operations.

The *Interoperability Public Notice* asks whether it would be possible to further attenuate signals outside the public safety band without a guard band between D block and the Public Safety Broadband ("PSBB") block if more stringent OOBE limits are applied to the PSBB spectrum than those applied in the *Waiver Order*.[57] Motorola believes that this is not a feasible solution to the spectrum coexistence problem that will exist between independent D block and PSBB networks operating on adjacent frequencies. A guard band between these two blocks will be necessary to account for the different network topology used by public safety (*i.e.*, relatively high tower and larger cell sites) as compared to D block commercial broadband (high to medium tower and

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[56] *See* Motorola, R4-102686, 3GPP TSG-RAN4 Ad Hoc #2010-03,"*FCC emission requirements for B13 and B14*", Bratislava, Slovakia, June 2010

[57] *Interoperability Public Notice*, 25 FCC Rcd at 5489.

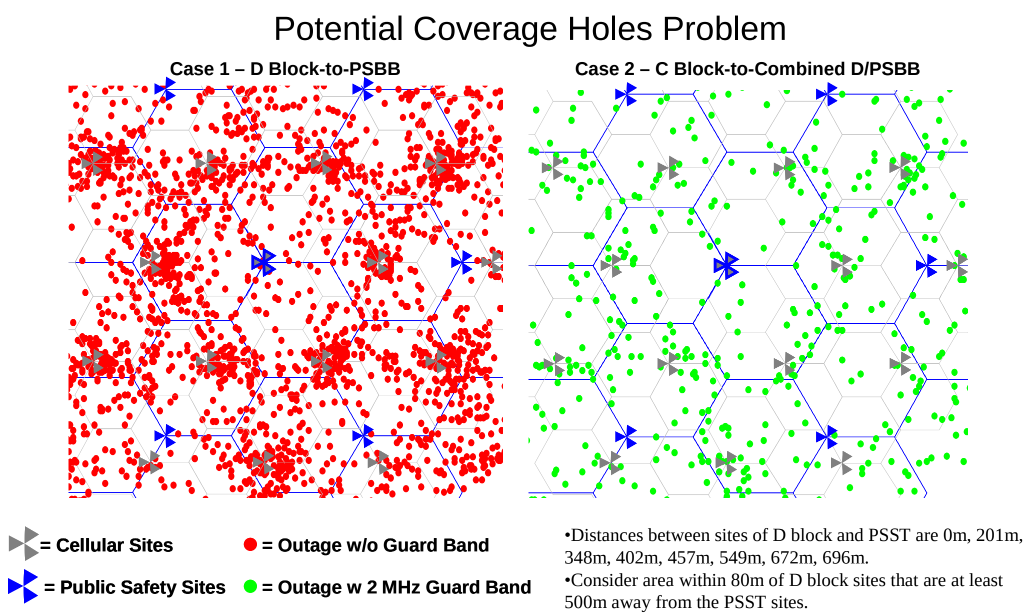
high density cell sites). Additional filtering in most cases would be ineffective and/or infeasible for adjacent 5 MHz LTE channels. In particular, further reduction of the base station OOBE will not be effective because the downlink interference path (*i.e.*, interference from base stations to adjacent channel LTE user equipment) is dominated by the UE Adjacent Channel Selectivity (ACS) specification of 33 dB (3GPP TS 36.101) and not the LTE base station Adjacent Channel Leakage Ratio (ACLR) of 45 dB (3GPP TS 36.104). Changing the LTE user equipment ACS specification is not practical because it would force fundamental changes to the chip set and the UE receiver design.

Conversely, interference in the uplink path (*i.e.*, interference from user equipment to adjacent channel LTE base stations) is dominated by UE OOBE rather than base station ACS and there is little that can be done about it other than restricting UE transmitter power and transmission bandwidth. This solution comes at the expense of uplink coverage and capacity. However, the uplink path is believed to be less problematic from an interference standpoint than the down link due to the much lower power of the UE compared to the base station. In short, the need for a guard band between independent 5 MHz LTE networks operating on the D block and the PSBB is predicated primarily on the interference in the downlink path from relatively high powered base stations interfering with nearby UE and this interference is largely unaffected by further reduction in base station OOBE.

Interference to public safety UE on the downlink is a serious concern because it leads to coverage holes around the D block's base sites. Fundamentally, there are three approaches to minimize this interference problem to PSBB UE: 1) reduce the bandwidth of emissions in the D block and/or PSBB to 3 MHz to create a guard band, 2) deploy similar network topologies in both D block and PSBB spectrum (which may or may not co-locate D block and public safety base sites) and 3) combine the D block and PSBB spectrum into a single 10+10 MHz block for public safety utilization. Reducing bandwidth to create a guard band is inefficient and, in the case of public safety spectrum, totally unacceptable given their already inadequate allocations. The deployment alternative requires that a PSBB site reside at every D block site (and vice versa) or at similar site spacing forcing public safety operators to build capacity equal to the commercial operator even if it is not necessary or economically viable. Even if the funding were available, the logistics of keeping commercial D block operators and public safety site development in lock-step are not workable as commercial carriers are constantly optimizing their network for their performance tuning driven by economic business models. There is also the scenario where the D block carrier deploys temporary site(s) for special events. Such sites will be an interference source to public safety users located at the same event as the public safety users will likely be located further away from the public safety base site.

One advantage of combining the D block and PSBB block can be seen in the following scenario. If the blocks remain independent, a C block commercial operator deploying equipment compliant to 3GPP band class 13 would utilize 746-756 MHz band, the D block commercial operator would utilize 758-763 MHz, and the public safety network would utilize 763-768 MHz. A combined D block/PSBB block would allow a public safety system to utilize 758-768 MHz. The public safety system would then have a 2 MHz guard band between it and the 3GPP band class 13, which would result in improved receiver selectivity between the public safety system and the adjacent commercial system, the impact of which can be evaluated using coverage modeling.

The following picture uses coverage modeling to show the impact of a non-collocated D Dlock network on PSBB coverage (case 1).[58] This is contrasted against the impact that a non-collocated network operating in the Upper 700 MHz C block would have on a public safety network from combining the D block and PSBB block (case 2). The difference between the two cases is that there is no guard band in case 1 and there is 2 MHz of guard band in case 2.



	D-Block 5MHz BTS to PSST 5MHz UE (0 MHz Guard Band)	C-Block 10MHz BTS to (D + PSST) 10MHz UE (2 MHz Guard Band)
Throughput Loss	Average: 7.9% Near Site: 55%	Average: 3.1% Near Site: 28%
Outage Increase	Average: 2.4% Near Site: 22%	Average: 0.8% Near Site: 8%

58 This scenario was based the 3GPP TR 36.942 parameters of 20W base station power and base to UE antenna minimum coupling loss (MCL) of 70 dB. Many LTE base stations will have more power and will be have lower antenna heights thus reducing the MCL below 70 dB that we used. These are typical parameters and the interference can be better or worse based on actual deployments.

Coverage outage in the public safety block due to the D block sites for case 1, or the C block sites in case 2, is caused by the signal strength of the cellular base station signal exceeding the signal strength of the desired public safety base station signal by 43 dB.[59] This is attributed to differences in public safety and commercial broadband network deployment topology. The red dots in the picture show outage in the PSBB block due to interference from the D block and the green dots show outage in the combined D/PSBB block due to the C block.

Public safety is more concerned about small coverage holes than typical commercial operations, which balance other factors in their deployments. The analysis shows the public safety system's average outage can be reduced from 2.4% to 0.8% when combining D block and the PSBB block. For locations nearest the D block transmitter sites, the effect of joining the D block and the PSBB block together reduces the outage area from 22% to 8%.[60] Reduction of throughput due to adjacent channel interference is also shown in the table in the figure. The table shows that average throughput is not significantly affected by adjacent channel interference. The impact of low ACS to average throughput is less of a concern to commercial operators than the resulting coverage holes are to public safety operations.

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59 This was calculated as 33 dB for ACS and -10 dB SINR for the interference criterion. This is the most optimistic approach as LTE operation at -10 dB SINR produces the lowest usable data rates of approximately 0.06 bits/Hz (or only 10 kb/s per 180 kHz LTE subchannel). Increasing this threshold SINR to provide better performance levels for Public Safety will force even more coverage holes around C block or D block sites.

60 The 22% outage is calculated over the area within 80 meters of D block sites that are at least 500 meters away from the PSBB sites. The holes in coverage can be seen by

IV. Equipment Certification.

In the Waiver Order, the Commission waived the equipment certification requirements of Section 90.203 of its rules and instead required manufacturers to comply with the various technical requirements of 3GPP Release 8 LTE specifications pending finalization of the rules.[61] The *Interoperability Public Notice* seeks comment on the impact of any future rules adopted by the Commission on equipment deployed prior to the adoption of final rules.[62] The Bureau further asks how the continuing evolution of the 3GPP standard from Release 8 LTE to future 3GPP releases should be handled such that there is minimal impact on deployed equipment while continuing to provide necessary functionality.[63]

The Commission must be careful to avoid paralyzing the development of new technologies by over-reliance on the regulatory process to establish rules and standards. While technical standards ensure interoperability and provide manufacturing economies of scale that help drive down the cost of devices, codification of these standards into the Commission's rules will potentially subject advancements and enhancements to lengthy rule making processes before being approved. If public safety operators are to benefit from technology platforms that are shared with commercial networks, they should have similar opportunities to deploy next generation advancements without lengthy Commission approval. Motorola urges the Commission to consider how the ERIC can be

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the grouping of the red dots near the D block sites. The green dots show some amount of grouping, too, but to a much less degree.

61 *Waiver Order*, 25 FCC Rcd at 5157 n.88.

62 *Interoperability Public Notice*, 25 FCC Rcd at 5489.

63 *Id.* at 5490.

utilized to review new technologies and issue technology recommendations outside of the rulemaking process to guide public safety purchase decisions. Future designs of LTE will almost certainly retain backward compatibility with all of the baseline interoperability requirements.

Motorola believes that to promote the deployment of public safety broadband networks, it is essential that it define only those standards necessary to ensure roaming and interoperability. The Commission should attempt to minimize the impact of any future rules on the waiver recipients and other early adopter and avoid regulations that require replacement of initial products and designs.

V. Conclusion.

The development of public safety broadband networks is an ambitious task that surpasses all previous efforts to enhance the communications capabilities of America's first responders. The Commission, vendors and users will all benefit greatly from the experiences of the waiver recipients as they deploy the first public safety grade wireless broadband networks. While the Commission, through the ERIC, should keenly monitor the deployment of these networks to ensure that interoperability is preserved, it should refrain from establishing requirements for applications or performance standards, especially at this early stage of development.

Respectfully submitted,

/S/ Robert D. Kubik
Robert D. Kubik, Ph.D.
Director, Telecom Relations Global
Global Government Affairs

Motorola, Inc.
1455 Pennsylvania Avenue, NW
Washington, DC 20004
TEL: 202.371.6900

July 19, 2010

Marlene H. Dortch, Secretary July 2, 2010
Federal Communications Commission
Office of the Secretary
445 12th Street, SW
Washington, DC 20554

Re: PS Docket 06-229
WT Docket 06-150

Dear Ms. Dortch:

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, Motorola submits this written ex parte filing in the above captioned proceeding.

On June 15, the Commission released a staff white paper titled *The Public Safety Nationwide Interoperable Broadband Network: A New Model for Capacity, Performance and Cost* ("staff white paper"). The staff white paper purports to show that:

1) The 10 MHz of dedicated broadband spectrum allocated to Public Safety in the 700 MHz band for broadband communications provides more than the required capacity for day to day communications and scenarios the staff selected to analyze; and

2) For the worst emergencies even access to another 10 MHz of spectrum would be insufficient.

The staff white paper then concludes that in these situations, priority access and roaming on the 700 MHz commercial networks is the solution.

Motorola respectfully disagrees with the staff's analysis and conclusions in this white paper. As addressed in the attachment, many of the assumptions used in this paper apply to commercial systems and consumer requirements but are inapplicable to Public Safety broadband operational requirements. In addition to covering issues specifically pertinent to the staff white paper, additional implications for Public Safety of the staff's recommended plan are addressed herein.

Pursuant to the Commission's Rules, one copy of this notice is being filed electronically with the Commission. If you require any additional information please contact the undersigned at (202) 371-6900.

Respectfully submitted,

/s/ *Rob Kubik*
Robert D. Kubik, Ph.D.
Director, Telecom Relations Global

MOTOROLA

The staff's capacity analysis suggests that 10 MHz (5+5 MHz) of dedicated spectrum provides the required capacity and the required performance for serious emergency scenarios. Is this analysis correct?

No. Public Safety agencies do not get to predict or choose where an incident will occur. They must respond wherever the need occurs within their jurisdiction. Therefore, as Public Safety systems deploy new broadband technology, the systems must be designed to meet anticipated requirements throughout the jurisdiction or region for which the system is designed, whether the incident occurs at the center of a cell or on the cell edge. The staff's analysis is based on average sector capacity which may be applicable to consumer based deployments, but does not accurately model the network performance required for mission critical broadband Public Safety operations. These Public Safety broadband operations must be highly reliable and available even on the cell edge, to the extent possible. The cell edge capacity of any technology, especially single frequency reuse, self-interference based technologies, exhibits much less user and sector capacity on the edge of a cell. For example, based on 3GPP requirements, the average per user throughput in a sector is approximately 3 times that of the edge throughput per user.

Performance based on 3GPP TR 36.913 V9.0.0 (EUTRA Advanced Requirements)						
Communications Direction	**Antenna Config. (TxR)**	**Average Spectrum Efficiency (Sector bits/Hz.)**	**Cell Edge Throughput (per UE bits/Hz.)**	**Average to Edge Ratio (per UE)**	**5+5 MHz Average Sector Throughput (kb/s)**	**5+5 MHz Cell Edge UE Throughput (kb/s)**
Uplink	1x2	1.2	0.04	3.0	6000	200
Uplink	2x4	2.0	0.07	2.9	10000	350
Downlink	2x2	2.4	0.07	3.4	12000	350
Downlink	4x2	2.6	0.09	2.9	13000	450
Downlink	4x4	3.7	0.12	3.1	18500	600

Therefore, the staff white paper overstates the capacity that would be available to agencies when an incident occurs at a cell edge. The capacity available at the point of an incident is what is relevant, not the average capacity throughout a cell. The staff white paper also seems to believe that any capacity problem can be solved just by adding more cell sites. This appears to ignore the many practical tradeoffs of adding cell sites such as increased need for backhaul links and spectrum, zoning, and cost, especially for Public Safety grade facilities.

Additionally, the staff's analysis does not accurately reflect the capacity demand. A successful solution must fully comprehend and address the needs of the Public Safety community as defined by that community. Motorola's customer research indicates the Public Safety community will require 400-1200 kb/s for tactical decision making. We have used state of the art video codec's to ensure efficient operation and have done trade-off analyses with customers who project that they will need these higher rates and the resulting higher quality video to allow for tactical operations. For example, the video could need to show whether a suspect is holding a bomb…or a baby.

The staff's white paper significantly reduces the anticipated required video data rate down to 256 - 512 kb/s while relying on the Project Safecom document.[1] While the report suggest that 256 – 512 kb/s may be sufficient for the video system under certain prescribed constraints, the report has most all items as either "Under Study" or "Not Specified" for the video acquisition and video display systems. One should not draw a formal conclusion from this previous unfinished work. We suggest that the Project SAFECOM video performance subject be revisited and evaluated by the Public Safety community and industry before any hard conclusions can come to consensus.

The staff use of average sector capacity, coupled with low-rate, low quality video, skews the analysis. Assumptions more applicable to Public Safety operational requirements should be used when predicting capacity and spectrum requirements for a mission critical broadband environment.

Why does Public Safety need the D block spectrum?

It is contradictory to predict that Public Safety will be limited in its broadband requirements while at the same time accepting that consumer requirements for broadband will soar. To the contrary, Public Safety has identified a host of applications for broadband. Public Safety agencies will be able to utilize the data applications in place today with faster, more responsive performance, increasing their utility and benefit. Also, sufficient broadband capacity can offer access to a whole array of advanced, multimedia applications that take advantage of key enablers including:

- Bi-directional, vehicular and portable video
- Location aware real-time services
- Mobile office, in-field productivity
- Multimedia command & control
- Dynamic mapping, weather & traffic flows
- Content-rich lookups to complex databases
- Biometric data

The Public Safety broadband network can provide greater efficiencies in day-to-day Public Safety operations, management of emergency incidents and major events, as well as providing the critical support needed for catastrophic incidents. Failure to reallocate the D block to Public Safety will limit its ability to get the full use of these applications.

Given the likely increased Public Safety data consumption, Public Safety agencies that are constrained on their own network will face increasing data roaming costs to support capacity requirements on a commercial network. We note that one major carrier recently adjusted its rate plan to effectively eliminate its unlimited tier in an effort to moderate demand from users with greater airtime requirements.

[1] Public Safety Statement of Requirements for Communications and Interoperability, (Project Safecom Document) Volume II Version 1.2 2008.

MOTOROLA

How will the staff's plan impact multi-agency interoperability?

Broadband has been promoted as a solution for Public Safety interoperability by Congress, the Commission, the Public Safety community and industry. Public Safety operations require multi-agency coordination. Even a fairly routine incident may call in over 100 responders and over 50 vehicles – all requiring coordinated, interoperable communications. More expansive incidents like the 2007 Minneapolis I-35 bridge collapse had over 128 agencies and over 1200 first responders involved in the rescue operations.[2]

Public Safety communications capacity requirements have exceeded every spectrum allocation made throughout the years. Even with improvements in technology and efficiency and sharing of systems among multiple jurisdictions, growing requirements have exceeded the spectrum capacity available. Unfortunately, continuing the same history by providing Public Safety the minimum allocation possible at the outset of broadband deployment negatively impacts the ability to ensure effective interoperability across all levels of government. Refusing to reallocate the D block to Public Safety will result in the need for future Public Safety broadband allocations that ultimately have to be sourced from another spectrum band, further hampering interoperability and significantly increasing the cost for deployment, as well as ongoing operations and maintenance.

Will reallocating the D block to Public Safety increase the cost of the network and associated devices and evaporate the benefits of aligning to the broader commercial LTE market?

No. Public Safety will benefit from a healthy, commercial market-driven ecosystem at 700 MHz. Verizon Wireless, AT&T and other carriers have committed to using LTE for their 700 MHz deployments.[3] In fact, LTE will be the dominant commercial platform across the overwhelming majority of the commercial 700 MHz allocation. Critical mass has been achieved and the commercial eco-system at 700 MHz will not be affected by a decision to reallocate the D block. From a base transceiver (eNodeB) standpoint, we already see vendors in the process of offering Band Class 14 equipment to the Public Safety Communications Research test bed, so those investments have already been made. Also, regardless of whether the D block is reallocated, roaming across other 700 MHz commercial systems as the Commission's National Broadband Plan recommends would require devices to cover one or more commercial 700 MHz LTE band classes.

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[2] Statement of Minneapolis Deputy Police Chief Rob Allen, *Subject to Debate- A Newsletter of the Police Executive Research Forum*, Vol 24, No.3, March 2010 at page 3.

[3] "Analyst Angle: A market perspective on LTE's rollout", *RCR Wireless News*, June 30, 2010 (http://www.rcrwireless.com/apps/pbcs.dll/article?AID=/20100630/OPINION/100639995/-1, visited June 30, 2010)

Can roaming onto carrier networks eliminate the need to dedicate the D block to Public Safety?

No. The staff's white paper positions priority access and roaming onto commercial networks as the solution, in lieu of providing Public Safety sufficient dedicated spectrum. However, large scale incidents requiring Public Safety to utilize commercial spectrum under the staff's plan, are the very same times that such incidents dramatically increase commercial networks demand and make them congested and least available to other users.

Public Safety has first hand knowledge of the need to control its communications networks. Many disaster situations have shown that commercial systems get clogged with drastic increase in demand, just as Public Safety systems do. Even priority access (without pre-emption) on a clogged commercial system does not guarantee Public Safety access to the capacity it will need.[4]

Furthermore, commercial systems are necessarily built to meet the needs of consumers, not the higher levels of reliability, availability, in-building coverage, and user feature flexibility inherent in dedicated Public Safety networks. For the worst emergencies, most commercial networks will not be available since their hardening and reliability is often less than that of the typical dedicated Public Safety system. Even the staff's previous proposals that envisioned additional hardening for commercial networks did not apply to all commercial systems. Therefore, depending on where the emergency occurs, Public Safety may or may not have service from roaming.

A Public Safety responder handing over to the commercial network looking for capacity may discover that the sites are down or overloaded and experience dropped service connections. There is no device visibility to the status of other networks and no guarantee that capacity will be available when switching between networks.[5]

In times when commercial networks are available, roaming onto a commercial carrier with priority access will offer a significant back-up capability. However, the costs of roaming, priority access, and data usage have not been factored into the staff's cost model. With overly-limited Public Safety spectrum, these costs will be considerable in daily emergency situations as well as major incidents.

Additionally, commercial LTE prioritization policy as defined in the 3GPP standard cannot distinguish between Public Safety incidents.[6] There is no ability to distinguish between a firefighter responding to a cat in a tree one day or a 4 alarm fire the next day.

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4 For examples, see "700 MHz Broadband Public Safety Applications And Spectrum Requirements", submitted February 23, 2010 by the City of New York, and the Police Executive Research Forum paper, "Subject to Debate", March 2010.

5 3GPP TS 23.401 General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (Release 9) V9.5.0.

6 3GPP TS 23.203 Policy and Charging Control Architecture (Release 9) V9.5.0

MOTOROLA

What is “pre-emption” and why is this important to Public Safety?

“Pre-emption” is the ability to immediately drop active communications of low priority users off of the network during emergency incidents to direct necessary capacity to critical public safety user communications. This is an important feature that is built into the foundation of Public Safety mission critical voice communication systems.

Priority access alone without pre-emption, as the FCC staff has suggested, would not guarantee immediate access to public safety users. It only puts that a public safety user’s request at the head of the queue waiting for available bandwidth to free up. The higher priority public safety user would not be allocated bandwidth if the non-priority users were active in guaranteed bit rate sessions, as are used for real-time video and voice communications. For example, citizens at the scene of an emergency who are streaming video from their smartphones to their friends, or in phone calls with their friends, could tie up the commercial bandwidth and prevent public safety access until a citizen ended his/her session and made the bandwidth available. Priority access alone is therefore unacceptable for time sensitive public safety communications, and pre-emptive access would be required.

Can Public Safety rely on commercial carriers to provide pre-emption capabilities during critical incidents?

While providing pre-emption on a commercial network would be necessary for Public Safety operations, doing so would not be viewed as a positive experience by consumers booted off the network during an emergency. Also, requiring pre-emption on all commercial networks would essentially change the terms of operation under which operators have acquired spectrum in the previous 700 MHz band auction. A further policy challenge is deciding the priority level of next generation 911 calls by citizens with respect to the priority of communications from Public Safety users. Next generation 911 calls may involve high bandwidth video sessions.

What is the impact to the public of removing the D block from the auction?

First, dedicating spectrum to further empower Public Safety with broadband tools benefits the entire public community being served by police officers, firefighters and emergency medical personnel. Without adequate safety and homeland security, the entire U.S. economy and way of life suffers. Second, removing the 10 MHz of the D block from the auction would be only a 2% impact on the 500 MHz the Commission has targeted for overall commercial broadband operations.

In contrast reallocating the D block to Public Safety can effectively double the capacity guaranteed to be available to protect public life and property and help ensure homeland security by reducing Public Safety’s reliance on commercial networks that are often inadequately designed to meet Public Safety’s operational needs.

Furthermore, removing the D block from auction does not prevent Congress from appropriating funding for Public Safety broadband deployment. The Administration and the Commission are promoting making 500 MHz of spectrum available for commercial broadband. Should Congress choose to support Public Safety through auction revenues, doing so should be accomplishable even if the D block is reallocated and not auctioned. In unveiling the Administration's proposal, Larry Summers, Director of the National Economic Council advised that Public Safety would have first claim to revenue generated by the spectrum auctions.[7]

How do we know what quality of video is really required for Public Safety operations?

The Department of Homeland Security has established the working group Video Quality in Public Safety (VQiPS) to determine standards around video presentation in various Public Safety use cases.[8] While the industry awaits the analysis and outcomes from the working group, Public Safety agencies along with leading technology vendors have identified requirements for higher video quality and data rates. For example, New York's DoITT (Department of Information Technology and Telecommunications) has specified requirements for 1-2 Mbps cameras supporting mobile operations:

> The system shall be able to support full motion video (30 frames per second) or data transmission speeds in excess of 2 Mbps at anytime to any one user regardless of any other network activity.[9]

Will increasing advancements in video technology allow us to transmit higher quality video using less spectrum in the near future?

On the one hand, video encoding and compression advancements anticipated in the next decade will shrink the transmit size of a given video stream by increasing the optimization of rate control, motion estimation, and adaptive noise reductions. There will also be some improvements in the LTE technology over time. However, at the same time, the number of users and traffic on both the Public Safety and the commercial networks will continue to grow. In addition, as history on both Public Safety and commercial networks has shown, valuable new applications will come to market that need more and more bandwidth to serve each user. Public Safety and the Commission all anticipate that Public Safety will need more bandwidth to accommodate this trend. This analysis is wholly consistent with the Commission's and the administration's desire to find an additional 500 MHz for commercial broadband networks.

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[7] See "White House Backs Spectrum Reallocation, Voluntary Actions" Communications Daily, June 29, 2010 at page 2.

[8] See http://www.safecomprogram.gov/SAFECOM/currentprojects/videoquality/, visited July 1, 2010.

[9] City of New York, Department of Information Technology and Telecommunication, Request for Proposal, Citywide Mobile Wireless Network, March 24, 2004.

Commercial demand for more spectrum is being driven by the amount of bandwidth required for each user, an increasing number of broadband users and a broader set of users, including machine to machine, at the same time efficiencies in bandwidth delivery improve. The same is true for Public Safety services.

Today, Motorola's analysis shows that 10 MHz alone will not support expected Public Safety video applications for real-time incident scene decision-making.[10] Thorough analysis and modeling by Public Safety agencies and leading vendors have considered the state-of-the-art, best-in-class techniques for video encoding and compression to determine the baseline capacity needs from the broadband network. Public Safety's bandwidth constraints will only worsen over time.

Can Public Safety use delayed video or image grabs to alleviate the capacity concerns?

Delayed video is video that is transmitted at a lower rate (bits per second) than the rate at which it was captured (seemingly because of a limitation in the network's transmission capacity or in an attempt to take advantage of non-real-time compression techniques). Transmitting video in this way causes two problems. First, the video seen on the receiving end will not be real-time, so Public Safety decision making suffers.

Second, since the outgoing bits move more slowly than the incoming bits, the camera's buffer will fill and it will have to stop recording until it catches up. Video transmission that is not real-time and has large holes endangers the response by influencing decisions based on misinformation regarding the current state of the situation. Image grabs (i.e. transmitted pictures) present the same problem, but are even more limiting. For example, assessing whether an incident is escalating (decision: send more resources) or calming down (decision: do not send any more resources or switch to clean-up resources) would be severely impaired. Decisions made and actions taken can determine the extent of lost lives and damage. The most effective Public Safety response will require real-time, situational awareness of the incident as it unfolds.

Will auctioning the D block to a commercial operator result in interference and coverage holes for Public Safety?

Yes. Interference based coverage holes will result in unexpected and unpredictable dropped calls for emergency responders.

- Coverage holes appear due to adjacent channel interference between D block Base Sites and Public Safety Base Sites.

[10] Motorola Ex Parte presentation, WT Docket 06-150 and PS Docket 06-229, April 12, 2010.

- The coverage holes may appear anywhere across the broadband coverage area as RF shadowing and multipath phenomenon create unpredictable coverage gaps where a user connection would become suddenly terminated.
- The probability of a coverage hole appearing increases when the Public Safety user travels toward the coverage edge of a Public Safety Base Site and arrives in proximity to a D block site.
- As the D block commercial operator builds out their network to increase coverage in "hot spots" or indoor locations using microcells or picocells; the probability of a coverage gap will increase.
- Coexistence analysis methods used for purposes of commercial carrier spectrum allocations, and which the staff has relied upon, are focused on overall sector throughput reduction measurements and not on specific areas of coverage outage and capacity degradations, which is necessary for determining the impact to mission critical public safety communications. [11]
- Users traveling within 80 meters of a D block site increase their probability of a sudden communications outage by over 20% and a capacity degradation of over 50%.[12]

Public Safety cannot predict or plan where an incident will occur. If an incident occurs at the location of a coverage hole, the impact is significant, even though the "average" impact throughout a cell or sector may be viewed as low.

In short, disassociating the D block from the Public Safety broadband spectrum will result in interference scenarios similar to those experienced by Public Safety in the 800 MHz band. The plan to resolve the 800 MHz interference is currently in its 6th year with no end in sight and is likely to cost the industry more than $4 billion to complete.

The only practical solutions to mitigating this potential interference are spectrum guard bands or co-located base stations facilities between Public Safety and the D block networks. Assuming the guard bands would come from the commercial spectrum allocations, this would disadvantage D block licensees from a competitive business perspective. Any required co-location of commercial and Public Safety base sites effectively prohibits public safety from competitive partnerships with other 700 MHz carriers, and introduces substantial issues with coordinating the timing of deployments between public safety needs in a given region and the commercial D block operator's budgets and operating plans.

Can filters be used to suppress the interference between the D block and the Public Safety PSST spectrum?

No. The major interference scenario is D block base site transmitter power coming into public safety handsets in their adjacent spectrum. Practical duplexer filters that can fit into a handset form factor are not narrow enough to significantly attenuate the adjacent D block signal. A

[11] Motorola Ex Parte presentation, WT Docket 06-150 and PS Docket 06-229, April 12, 2010.

[12] Motorola Ex Parte presentation, WT Docket 06-150 and PS Docket 06-229, April 12, 2010.

forced guard band and/or reduced power allowance on the D block may help reduce the extent of this interference. Further, any guard band between the D block and Public Safety would essentially reduce the D block to only 3+3 MHz of spectrum if compliance with the LTE standard is maintained because the next channel size below a 5+5 MHz channel in the standard is 3+3 MHz .[13]

How does the staff's plan impact competition and fair play among commercial carriers?

The staff's plan eliminates competition and hampers fair play, to the disadvantage of both Public Safety and commercial carriers. There are only two foreseeable options (as challenged as they are in other ways) to manage the interference between the Public Safety block and the D block. In a any given area, 1) the D block winner implements a guard band and is reduced to a 3 MHz channel, i.e., the next size down from 5 MHz in the LTE standard; or 2) the Public Safety and D block site deployments must be collocated and coordinated such that Public Safety will have no option but to work exclusively with the D block winner in that area.

Under option 1, the D block winner is obviously disadvantaged from a business perspective. In option 2, Public Safety agencies will be disadvantaged because their freedom of choice is removed and the D block winner becomes a sole-source partner for life. Public Safety will be forced to the terms and conditions of an adjacent neighbor motivated by consumer services. Maintenance and service upgrades of shared equipment will be dictated by the priorities of the D block winner, a profit-motivated consumer-focused business that knows it has a captive audience.

Further, the commercial auction regions chosen by the Commission may not align with practical regional areas for Public Safety broadband systems, requiring Public Safety to coordinate with multiple D block winners.

Commercial carriers outside the D block are disadvantaged by being kept from effectively competing on a level playing field to win new Public Safety LTE business. Additionally, all existing Public Safety subscriptions are likely to churn to the D block winner.

How do differences in LTE systems and Public Safety voice systems impact the need for spectrum?

The staff has made a point in its white paper to note that broadband systems differ from current land mobile radio (LMR) technology. LTE broadband systems will greatly improve data communications for Public Safety by offering data rates unattainable on current public safety voice networks. In addition, as noted above, the choice of LTE for broadband public safety

[13] TS 36.101 V9.4.0 E-UTRA Users Equipment (UE) radio transmission and reception (Release 9)

systems can help leverage equipment economies of scale as two major commercial operators have already chosen to deploy LTE in their 700 MHz band segments.

However, the real issue at hand is not the differences in current LMR voice system and LTE systems, but the fact that Public Safety's broadband capacity needs will expand similar to those already accepted by the Commission for commercial networks and general consumers. Whether commercial operators/consumers or Public Safety agencies, systems must be designed to meet a combination of needs, not just capacity. Therefore, the spectrum available is the key parameter that affects the capacity available, as the Commission staff has readily accepted for commercial/consumer requirements but seems to reject for Public Safety.

The staff white paper claims that Public Safety already has per-user spectrum allocations that are 25 times that of a commercial provider. Is this correct?

The staff states that in a comparison of users per MHz of spectrum that the ratio of commercial users per MHz is 25 times that of Public Safety users per MHz. Unfortunately, the staff uses an "apples-to-oranges" comparison that is irrelevant at best. The real issue is not just the number of users, but also the amount of usage and type of usage compared to operational requirements.

Even if one assumes the comparison were relevant, the ratio is only about one tenth of that the staff claims.[14] Out of the 97 MHz of Public Safety spectrum the staff considered in its calculation, 50 MHz comes from the 4.9 GHz band which the white paper clearly recognizes is well-suited only for "fixed" deployments. For mobile broadband capability, Public Safety today only has the 10 MHz allocation at 700 MHz. If one takes out the 50 MHz of spectrum the staff states is better for fixed deployments and adds in the 500 MHz of additional spectrum the staff will allocate for commercial use, the number is closer to 2.7 times.[15] Again, even this number is irrelevant. With the growth in broadband applications, it is not unreasonable to believe that a Public Safety user's capacity demand at an emergency will be greater than that of the average consumer user.

The staff has suggested that it will give Public Safety additional spectrum sometime later, why isn't that good enough?

The fact that the D block is directly adjacent to the Public Safety band allows Public Safety to build one network, double its capacity, solve the interference issue, eliminate dropped calls and allow Public Safety to keep up with advancing requirements. Having the two bands combined to serve one network significantly reduces the cost and complexity of the network equipment and devices compared to having the spectrum split across two non-adjacent bands. Additionally, by combining the two bands, Public Safety could utilize the entire 10 MHz where having the D

[14] Staff white paper, page 3.

[15] Staff white paper, page 10.

block separated will necessitate wasting spectrum to carve out a guard band between D block and Public Safety.

This approach repeats the history of providing Public Safety with additional spectrum allocations in differing bands that are not easy to integrate and thus frustrate Public Safety interoperability. This is precisely what the 700 MHz allocations were intended to address.

Appendix E – Bill Language

II

Calendar No. _____

112TH CONGRESS
1ST SESSION

S. 911

[Report No. 112–_____]

To establish the sense of Congress that Congress should enact, and the President should sign, bipartisan legislation to strengthen public safety and to enhance wireless communications.

IN THE SENATE OF THE UNITED STATES

MAY 9, 2011

Mr. ROCKEFELLER (for himself and Mrs. HUTCHISON) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

_____________ (legislative day, _____________), _____

Reported by Mr. ROCKEFELLER, with an amendment

[Strike out all after the enacting clause and insert the part printed in italic]

A BILL

To establish the sense of Congress that Congress should enact, and the President should sign, bipartisan legislation to strengthen public safety and to enhance wireless communications.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

~~**SECTION 1. SHORT TITLE.**~~

~~This Act may be cited as the "Strengthening Public-safety and Enhancing Communications Through Reform, Utilization, and Modernization Act" or the "SPECTRUM Act".~~

~~**SEC. 2. SENSE OF CONGRESS.**~~

~~It is the sense of Congress that Congress should enact, and the President should sign, bipartisan legislation to strengthen public safety and to enhance wireless communications by—~~

~~(1) providing sufficient wireless spectrum and other resources to build a nationwide interoperable wireless public safety broadband network;~~

~~(2) encouraging more efficient, flexible, and effective use of spectrum, a valuable and finite public resource;~~

~~(3) promoting voluntary market mechanisms to ensure the optimal allocation of spectrum;~~

~~(4) reforming the Federal Government's spectrum management practices; and~~

~~(5) engaging in advanced research and development into emerging wireless technologies.~~

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Public Safety Spectrum and Wireless Innovation Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act, the following definitions shall apply:

(1) 700 MHZ BAND.—The term "700 MHz band" means the portion of the electromagnetic spectrum between the frequencies from 698 megahertz to 806 megahertz.

(2) 700 MHZ D BLOCK SPECTRUM.—The term "700 MHz D block spectrum" means the portion of

the electromagnetic spectrum between the frequencies from 758 megahertz to 763 megahertz and between the frequencies from 788 megahertz to 793 megahertz.

(3) APPROPRIATE COMMITTEES OF CONGRESS.—Except as otherwise specifically provided, the term "appropriate committees of Congress" means—

(A) the Committee on Commerce, Science, and Transportation of the Senate; and

(B) the Committee on Energy and Commerce of the House of Representatives.

(4) ASSISTANT SECRETARY.—The term "Assistant Secretary" means the Assistant Secretary of Commerce for Communications and Information.

(5) COMMISSION.—The term "Commission" means the Federal Communications Commission.

(6) CORPORATION.—The term "Corporation" means the Public Safety Broadband Corporation established under subtitle A of title II.

(7) EXISTING PUBLIC SAFETY BROADBAND SPECTRUM.—The term "existing public safety broadband spectrum" means the portion of the electromagnetic spectrum between the frequencies—

(A) from 763 megahertz to 768 megahertz;

(B) from 793 megahertz to 798 megahertz;

(C) from 768 megahertz to 769 megahertz; and

(D) from 798 megahertz to 799 megahertz.

(8) FEDERAL ENTITY.—The term "Federal entity" has the same meaning as in section 113(i) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(i)).

(9) NARROWBAND SPECTRUM.—The term "narrowband spectrum" means the portion of the electromagnetic spectrum between the frequencies from 769 megahertz to 775 megahertz and between the frequencies from 799 megahertz to 805 megahertz.

(10) NIST.—The term "NIST" means the National Institute of Standards and Technology.

(11) NTIA.—The term "NTIA" means the National Telecommunications and Information Administration.

(12) PUBLIC SAFETY ENTITY.—The term "public safety entity" means an entity that provides public safety services.

(13) PUBLIC SAFETY SERVICES.—The term "public safety services"—

(A) has the meaning given the term in section 337(f) of the Communications Act of 1934 (47 U.S.C. 337(f)); and

(B) includes services provided by emergency response providers, as that term is defined in section 2 of the Homeland Security Act of 2002 (6 U.S.C. 101).

TITLE I—REALLOCATION OF PUBLIC SAFETY SPECTRUM

SEC. 101. REALLOCATION OF D BLOCK TO PUBLIC SAFETY.

(a) IN GENERAL.—The Commission shall reallocate the 700 MHz D block spectrum for use by public safety entities in accordance with the provisions of this Act.

(b) SPECTRUM ALLOCATION.—Section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)) is amended—

(1) by striking "24" in paragraph (1) and inserting "34"; and

(2) by striking "36" in paragraph (2) and inserting "26".

SEC. 102. FLEXIBLE USE OF NARROWBAND SPECTRUM.

The Commission may allow the narrowband spectrum to be used in a flexible manner, including usage for public safety broadband communications, subject to such technical and interference protection measures as the Commission may require.

TITLE II—GOVERNANCE OF PUBLIC SAFETY SPECTRUM

Subtitle A—Public Safety Broadband Corporation

SEC. 201. SINGLE PUBLIC SAFETY WIRELESS NETWORK LICENSEE.

(a) REALLOCATION AND GRANT OF LICENSE.—Notwithstanding any other provision of law, and subject to the provisions of this Act, the Commission shall reallocate and grant a license to the Public Safety Broadband Corporation established under section 202 for the use of the 700 MHz D block spectrum and existing public safety broadband spectrum.

(b) TERM OF LICENSE.—

(1) INITIAL LICENSE.—The license granted under subsection (a) shall be for an initial term of 10 years from the date of the initial issuance of the license.

(2) RENEWAL OF LICENSE.—Prior to expiration of the term of the initial license granted under subsection (a) or the expiration of any subsequent renewal of such license, the Corporation shall submit to the Commission an application for the renewal of such license. Such renewal application shall demonstrate that, during the preceding license term, the Corporation has met the duties and obligations set

forth under this Act. A renewal license granted under this paragraph shall be for a term of not to exceed 10 years.

(c) FACILITATION OF TRANSITION.—The Commission shall take all actions necessary to facilitate the transition of the existing public safety broadband spectrum to the Public Safety Broadband Corporation established under section 202.

SEC. 202. ESTABLISHMENT OF PUBLIC SAFETY BROADBAND CORPORATION.

(a) ESTABLISHMENT.—There is authorized to be established a private, nonprofit corporation, to be known as the "Public Safety Broadband Corporation", which is neither an agency nor establishment of the United States Government or the District of Columbia Government.

(b) APPLICATION OF PROVISIONS.—The Corporation shall be subject to the provisions of this Act, and, to the extent consistent with this Act, to the District of Columbia Nonprofit Corporation Act (sec. 29–301.01 et seq., D.C. Official Code).

(c) RESIDENCE.—The Corporation shall have its place of business in the District of Columbia and shall be considered, for purposes of venue in civil actions, to be a resident of the District of Columbia.

(d) POWERS UNDER DC ACT.—In order to carry out the duties and activities of the Corporation, the Corporation shall have the usual powers conferred upon a nonprofit corporation by the District of Columbia Nonprofit Corporation Act.

(e) INCORPORATION.—The members of the initial Board of Directors of the Corporation shall serve as incorporators and shall take whatever steps that are necessary to establish the Corporation under the District of Columbia Nonprofit Corporation Act.

SEC. 203. BOARD OF DIRECTORS OF THE CORPORATION.

(a) MEMBERSHIP.—The management of the Corporation shall be vested in a Board of Directors (referred to in this subtitle as the "Board"), which shall consist of the following members:

(1) FEDERAL MEMBERS.—The following individuals, or their respective designees, shall serve as Federal members:

(A) The Secretary of Commerce.

(B) The Secretary of Homeland Security.

(C) The Attorney General of the United States.

(D) The Director of the Office of Management and Budget.

(2) NON-FEDERAL MEMBERS.—

(A) IN GENERAL.—The Secretary of Commerce shall appoint 11 individuals to serve as non-Federal members of the Board.

(B) STATE AND LOCAL INTERESTS TO BE REPRESENTED.—In making appointments under subparagraph (A), the Secretary of Commerce, in consultation with the Secretary of Homeland Security and the Attorney General of the United States, should—

(i) appoint at least 3 individuals to represent the collective interests of the States, localities, tribes, and territories;

(ii) seek to ensure geographic and regional representation of the United States in such appointments; and

(iii) seek to ensure rural and urban representation in such appointments.

(C) PUBLIC SAFETY INTERESTS TO BE REPRESENTED.—In making appointments under subparagraph (A), the Secretary of Commerce should appoint at least 3 individuals who have served or are currently serving as public safety professionals.

(D) REQUIRED QUALIFICATIONS.—

(i) IN GENERAL.—Each non-Federal member appointed under subparagraph (A) should meet at least 1 of the following criteria:

(I) PUBLIC SAFETY EXPERIENCE.—Knowledge and experience in the use of Federal, State, local, or tribal public safety or emergency response.

(II) TECHNICAL EXPERTISE.—Technical expertise and fluency regarding broadband communications, including public safety communications.

(III) NETWORK EXPERTISE.—Expertise in building, deploying, and operating commercial telecommunications networks.

(IV) FINANCIAL EXPERTISE.—Expertise in financing and funding telecommunications networks.

(ii) EXPERTISE TO BE REPRESENTED.—In making appointments under subparagraph (A), the Secretary of Commerce shall appoint—

(I) at least one individual who satisfies the requirement under subclause (II) of clause (i);

(II) at least one individual who satisfies the requirement under subclause (III) of clause (i); and

(III) at least one individual who satisfies the requirement under subclause (IV) of clause (i).

(E) INDEPENDENCE.—

(i) IN GENERAL.—Each non-Federal member of the Board shall be independent and neutral.

(ii) INDEPENDENCE DETERMINATION.—In order to be considered independent for purposes of this subparagraph, a member of the Board—

(I) may not, other than in his or her capacity as a member of the Board or any committee thereof—

(aa) accept any consulting, advisory, or other compensatory fee from the Corporation; or

(bb) be a person associated with the Corporation or with any affiliated company thereof; and

(II) shall be disqualified from any deliberation involving any transaction of the Corporation in which the Board member has a financial interest in the outcome of the transaction.

(F) NOT OFFICERS OR EMPLOYEES.—The non-Federal members of the Board shall not, by reason of such membership, be considered to be officers or employees of the United States Government or of the District of Columbia Government.

(G) CITIZENSHIP.—No individual other than a citizen of the United States may serve as a non-Federal member of the Board.

(b) TERMS OF APPOINTMENT.—

(1) INITIAL APPOINTMENT DEADLINE.—Members of the Board shall be appointed not later than 180 days after the date of the enactment of this Act.

(2) TERMS.—

(A) LENGTH.—

(i) FEDERAL MEMBERS.—Each Federal member of the Board shall serve as a

member of the Board for the life of the Corporation.

(ii) NON-FEDERAL MEMBERS.—The term of office of each non-Federal member of the Board shall be 3 years. No non-Federal member of the Board may serve more than 2 consecutive full 3-year terms.

(B) EXPIRATION OF TERM.—Any member whose term has expired may serve until such member's successor has taken office, or until the end of the calendar year in which such member's term has expired, whichever is earlier.

(C) APPOINTMENT TO FILL VACANCY.—Any non-Federal member appointed to fill a vacancy occurring prior to the expiration of the term for which that member's predecessor was appointed shall be appointed for the remainder of the predecessor's term.

(D) STAGGERED TERMS.—With respect to the initial non-Federal members of the Board—

(i) 4 members shall serve for a term of 3 years;

(ii) 4 members shall serve for a term of 2 years; and

(iii) 3 members shall serve for a term of 1 year.

(3) VACANCIES.—A vacancy in the membership of the Board shall not affect the Board's powers, and shall be filled in the same manner as the original member was appointed.

(c) CHAIR.—

(1) SELECTION.—The Secretary of Commerce shall select, from among the non-Federal members of the Board, an individual to serve for a 2-year term as Chair of the Board.

(2) CONSECUTIVE TERMS.—An individual may not serve for more than 2 consecutive terms as Chair of the Board.

(3) REMOVAL FOR CAUSE.—The Secretary of Commerce may remove the Chair of the Board and any non-Federal member for good cause.

(d) REMOVAL.—All members of the Board may by majority vote—

(1) remove any non-Federal member of the Board from office for conduct determined by the Board to be detrimental to the Board or Corporation; and

(2) request that the Secretary of Commerce exercise his or her authority to remove the Chair of the

Board for conduct determined by the Board to be detrimental to the Board or Corporation.

(e) MEETINGS.—

(1) FREQUENCY.—The Board shall meet in accordance with the bylaws of the Corporation—

(A) at the call of the Chairperson; and

(B) not less frequently than once each quarter.

(2) TRANSPARENCY.—Meetings of the Board, including any committee of the Board, shall be open to the public. The Board may, by majority vote, close any such meeting only for the time necessary to preserve the confidentiality of commercial or financial information that is privileged or confidential, to discuss personnel matters, or to discuss legal matters affecting the Corporation, including pending or potential litigation.

(f) QUORUM.—Eight members of the Board shall constitute a quorum, including at least 6 non-Federal members of the Board.

(g) BYLAWS.—A majority of the members of the Board of Directors may amend the bylaws of the Corporation.

(h) ATTENDANCE.—Members of the Board of Directors may attend meetings of the Corporation and vote in person, via telephone conference, or via video conference.

(i) PROHIBITION ON COMPENSATION.—A member of the Board of the Corporation shall serve without pay, and shall not otherwise benefit, directly or indirectly, as a result of their service to the Corporation, but shall be allowed a per diem allowance for travel expenses, at rates authorized for an employee of an agency under subchapter I of chapter 57 of title 5, United States Code, while away from the home or regular place of business of the member in the performance of the duties of the Corporation.

SEC. 204. OFFICERS, EMPLOYEES, AND COMMITTEES OF THE CORPORATION.

(a) OFFICERS AND EMPLOYEES.—

(1) IN GENERAL.—The Corporation shall have a Chief Executive Officer, and such other officers and employees as may be named and appointed by the Board for terms and at rates of compensation fixed by the Board pursuant to this subsection. The Chief Executive Officer may name and appoint such employees as are necessary. All officers and employees shall serve at the pleasure of the Board.

(2) LIMITATION.—No individual other than a citizen of the United States may be an officer of the Corporation.

(3) NONPOLITICAL NATURE OF APPOINTMENT.—No political test or qualification shall be used in se-

lecting, appointing, promoting, or taking other personnel actions with respect to officers, agents, or employees of the Corporation.

(4) COMPENSATION.—

(A) IN GENERAL.—The Board may hire and fix the compensation of employees hired under this subsection as may be necessary to carry out the purposes of the Corporation.

(B) APPROVAL OF COMPENSATION BY FEDERAL MEMBERS.—Notwithstanding any other provision of law, or any bylaw adopted by the Corporation, all rates of compensation, including benefit plans and salary ranges, for officers and employees of the Board, shall be jointly approved by the Federal members of the Board.

(C) LIMITATION ON OTHER COMPENSATION.—No officer or employee of the Corporation may receive any salary or other compensation (except for compensation for services on boards of directors of other organizations that do not receive funds from the Corporation, on committees of such boards, and in similar activities for such organizations) from any sources other than the Corporation for services rendered during the pe-

riod of the employment of the officer or employee by the Corporation.

(5) SERVICE ON OTHER BOARDS.—Service by any officer on boards of directors of other organizations, on committees of such boards, and in similar activities for such organizations shall be subject to annual advance approval by the Board and subject to the provisions of the Corporation's Statement of Ethical Conduct.

(6) RULE OF CONSTRUCTION.—No officer or employee of the Board or of the Corporation shall be considered to be an officer or employee of the United States Government or of the government of the District of Columbia.

(b) ADVISORY COMMITTEES.—The Board—

(1) shall establish a standing public safety advisory committee to assist the Board in carrying out its duties and responsibilities under this subtitle; and

(2) may establish additional standing or ad hoc committees, panels, or councils as the Board determines are necessary.

(c) SELECTION OF AGENTS, CONSULTANTS, AND EXPERTS.—

(1) IN GENERAL.—The Board shall select parties to serve as its agents, consultants, or experts in a fair, transparent, and objective manner.

(2) BINDING AND FINAL.—If the selection of an agent, consultant, or expert satisfies the requirements under paragraph (1), the selection of that agent, consultant, or expert shall be final and binding.

SEC. 205. NONPROFIT AND NONPOLITICAL NATURE OF THE CORPORATION.

(a) STOCK.—The Corporation shall have no power to issue any shares of stock, or to declare or pay any dividends.

(b) PROFIT.—No part of the income or assets of the Corporation shall inure to the benefit of any director, officer, employee, or any other individual associated with the Corporation, except as salary or reasonable compensation for services.

(c) POLITICS.—The Corporation may not contribute to or otherwise support any political party or candidate for elective public office.

(d) PROHIBITION ON LOBBYING ACTIVITIES.—The Corporation shall not engage in lobbying activities (as defined in section 3(7) of the Lobbying Disclosure Act of 1995 (5 U.S.C. 1602(7))).

SEC. 206. POWERS, DUTIES, AND RESPONSIBILITIES OF THE CORPORATION.

(a) GENERAL POWERS.—The Corporation shall have the authority to do the following:

(1) To adopt and use a corporate seal.

(2) To have succession until dissolved by an Act of Congress.

(3) To prescribe, through the actions of its Board, bylaws not inconsistent with Federal law and the laws of the District of Columbia, regulating the manner in which the Corporation's general business may be conducted and the manner in which the privileges granted to the Corporation by law may be exercised.

(4) To exercise, through the actions of its Board, all powers specifically granted by the provisions of this subtitle, and such incidental powers as shall be necessary.

(5) To hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as the Corporation considers necessary to carry out its responsibilities and duties.

(6) To obtain grants and funds from and make contracts with individuals, private companies, organizations, institutions, and Federal, State, regional, and local agencies.

(7) To accept, hold, administer, and utilize gifts, donations, and bequests of property, both real and personal, for the purposes of aiding or facilitating the work of the Corporation.

(8) To issue notes or bonds to purchasers of such instruments in the private capital markets.

(9) To incur indebtedness to carry out the purposes of this subtitle.

(10) To spend funds under paragraph (6) in a manner authorized by the Board, but only for purposes that will advance or enhance public safety communications consistent with this Act.

(11) To establish reserve accounts with funds that the Corporation may receive from time to time that exceed the amounts required by the Corporation to timely pay its debt service and other obligations.

(12) To expend the funds placed in any reserve accounts established under paragraph (11) (including interest earned on any such amounts) in a manner authorized by the Board, but only for purposes that—

(A) will advance or enhance public safety communications consistent with this Act; or

(B) are otherwise approved by an Act of Congress.

(13) To take such other actions as the Corporation (through its Board) may from time to time determine necessary, appropriate, or advisable to accomplish the purposes of this subtitle.

(b) Duty and Responsibility to Deploy and Operate a Nationwide Public Safety Interoperable Broadband Network.—

(1) In general.—The Corporation shall hold the single public safety wireless license granted under section 201 and take all actions necessary to ensure the building, deployment, and operation of a nationwide public safety interoperable broadband network in consultation with Federal, State, tribal, and local public safety entities, the Director of NIST, the Commission, and the public safety advisory committee established in section 204(b)(1), including by, at a minimum—

(A) ensuring nationwide standards for use and access of the network;

(B) issuing open, transparent, and competitive requests for proposals to private sector entities for the purposes of building, operating, and maintaining the network;

(C) encouraging that such requests leverage, to the maximum extent economically desirable,

existing commercial wireless infrastructure to speed deployment of the network; and

(D) managing and overseeing the implementation and execution of contracts or agreements with non-Federal entities to build, operate, and maintain the network.

(2) INTEROPERABILITY.—In carrying out the duties and responsibilities of this subsection, including issuing requests for proposals, the Corporation shall—

(A) ensure the safety, security, and resiliency of the network, including requirements for protecting and monitoring the network to protect against cyberattack;

(B) promote competition in the equipment market, including devices for public safety communications, by requiring that equipment for use on the network be—

(i) built to open, non-proprietary, commercially available standards;

(ii) capable of being used by any public safety entity and by multiple vendors across all public safety broadband networks operating in the 700 MHz band; and

(iii) backward-compatible with existing second and third generation commercial

networks to the extent that such capabilities are necessary and technically and economically reasonable; and

(C) promote integration of the network with public safety answering points or their equivalent.

(3) RURAL COVERAGE.—In carrying out the duties and responsibilities of this subsection, including issuing requests for proposals, the Corporation, consistent with the license granted under section 201, shall require deployment phases with substantial rural coverage milestones as part of each phase of the construction and deployment of the network. To the maximum extent economically desirable, such proposals shall include partnerships with existing commercial mobile providers to utilize cost-effective opportunities to speed deployment in rural areas.

(4) EXECUTION OF AUTHORITY.—In carrying out the duties and responsibilities of this subsection, the Corporation may—

(A) obtain grants from and make contracts with individuals, private companies, and Federal, State, regional, and local agencies;

(B) hire or accept voluntary services of consultants, experts, advisory boards, and panels to

aid the Corporation in carrying out such duties and responsibilities;

(C) receive payment for use of—

(i) network capacity licensed to the Corporation; and

(ii) network infrastructure constructed, owned, or operated by the Corporation; and

(D) take such other actions as may be necessary to accomplish the purposes set forth in this subsection.

(c) OTHER SPECIFIC DUTIES AND RESPONSIBILITIES.—

(1) ESTABLISHMENT OF NETWORK POLICIES.—In carrying out the requirements under subsection (b), the Corporation shall develop—

(A) requests for proposals with appropriate—

(i) timetables for construction, including by taking into consideration the time needed to build out to rural areas and the advantages offered through partnerships with existing commercial providers under paragraph (3);

(ii) coverage areas, including coverage in rural and nonurban areas;

(iii) service levels;

(iv) performance criteria; and

(v) other similar matters for the construction and deployment of such network;

(B) the technical and operational requirements of the network;

(C) practices, procedures, and standards for the management and operation of such network;

(D) terms of service for the use of such network, including billing practices; and

(E) ongoing compliance review and monitoring of the—

(i) management and operation of such network;

(ii) practices and procedures of the entities operating on and the personnel using such network; and

(iii) necessary training needs of network operators and users.

(2) STATE AND LOCAL PLANNING.—

(A) REQUIRED CONSULTATION.—In developing requests for proposals and otherwise carrying out its responsibilities under this Act, the Corporation shall consult with regional, State, tribal, and local jurisdictions regarding the dis-

tribution and expenditure of any amounts required to carry out the policies established under paragraph (1), including with regard to the—

(i) construction of an Evolved Packet Core and any Radio Access Network build out;

(ii) placement of towers;

(iii) coverage areas of the network, whether at the regional, State, tribal, or local level;

(iv) adequacy of hardening, security, reliability, and resiliency requirements;

(v) assignment of priority to local users;

(vi) assignment of priority and selection of entities seeking access to or use of the nationwide public safety interoperable broadband network established under subsection (b); and

(vii) training needs of local users.

(B) METHOD OF CONSULTATION.—The consultation required under subparagraph (A) shall occur between the Corporation and the single officer or governmental body designated under section 222(d).

(3) LEVERAGING EXISTING INFRASTRUCTURE.—In carrying out the requirement under subsection (b), the Corporation shall enter into agreements to utilize, to the maximum extent economically desirable, existing—

(A) commercial or other communications infrastructure; and

(B) Federal, State, tribal, or local infrastructure.

(4) MAINTENANCE AND UPGRADES.—The Corporation shall ensure the maintenance, operation, and improvement of the nationwide public safety interoperable broadband network established under subsection (b), including by ensuring that the Corporation updates and revises any policies established under paragraph (1) to take into account new and evolving technologies.

(5) ROAMING AGREEMENTS.—The Corporation shall negotiate and enter into, as it determines appropriate, roaming agreements with commercial network providers to allow the nationwide public safety interoperable broadband network to roam onto commercial networks and gain prioritization of public safety communications over such networks in times of an emergency.

(6) NETWORK INFRASTRUCTURE AND DEVICE CRITERIA.—The Director of NIST, in consultation with the Corporation and the Commission, shall ensure the development of a list of certified devices and components meeting appropriate protocols and standards for public safety entities and commercial vendors to adhere to, if such entities or vendors seek to have access to, use of, or compatibility with the nationwide public safety interoperable broadband network established under subsection (b).

(7) REPRESENTATION BEFORE STANDARD SETTING ENTITIES.—The Director of NIST, in consultation with the Corporation, the Commission, and the public safety advisory committee established under section 204(b)(1), shall represent the interests of public safety users of the nationwide public safety interoperable broadband network established under subsection (b) before any proceeding, negotiation, or other matter in which a standards organization, standards body, standards development organization, or any other recognized standards-setting entity regarding the development of standards relating to interoperability.

(8) PROHIBITION ON NEGOTIATION WITH FOREIGN GOVERNMENTS.—The Corporation shall not have

the authority to negotiate or enter into any agreements with a foreign government on behalf of the United States.

(d) USE OF MAILS.—The Corporation may use the United States mails in the same manner and under the same conditions as the departments and agencies of the United States.

SEC. 207. INITIAL FUNDING FOR THE CORPORATION.

(a) NTIA LOANS TO THE CORPORATION.—

(1) IN GENERAL.—Prior to the commencement of incentive auctions to be carried out under section 309(j)(8)(F) of the Communications Act of 1934 or the auction of spectrum pursuant to section 302, the NTIA is authorized to make loans to the Corporation.

(2) CONDITION OF LOANS.—At the time of application for, and as a condition to, any such loan, the Corporation shall file with the NTIA a statement with respect to the anticipated use of the proceeds of the loan.

(3) NTIA APPROVAL.—If the NTIA determines that such loan is necessary for the Corporation to carry out its duties and responsibilities under this subtitle and that the Corporation has submitted a plan which provides as reasonable an assurance of prompt repayment as may be feasible under the cir-

cumstances, then the NTIA shall so certify to the Secretary of the Treasury, and issue notes or other obligations to the Secretary of the Treasury pursuant to subsection (b).

(b) NTIA NOTES ISSUED TO TREASURY.—

(1) IN GENERAL.—To enable the NTIA to make loans under subsection (a), the NTIA is authorized to issue to the Secretary of the Treasury notes or other obligations, in such forms and denominations, bearing such maturities, and subject to such terms and conditions, as may be prescribed by the Secretary of the Treasury.

(2) INTEREST ON NOTES.—

(A) ESTABLISHMENT.—Any notes or other obligations issued pursuant to paragraph (1) shall bear interest at a rate determined by the Secretary of the Treasury, taking into consideration the current average market yield on outstanding marketable obligations of the United States of comparable maturities during the month preceding the issuance of the notes or other obligations.

(B) REDUCTION.—The Secretary of the Treasury may reduce the interest rate set forth

under subparagraph (A) if he determines such reduction to be in the national interest.

(3) AUTHORITY OF THE TREASURY TO SELL NOTES.—The Secretary of the Treasury may at any time sell any of the notes or other obligations acquired by him under this subsection. All redemptions, purchases, and sales by the Secretary of the Treasury of such notes or other obligations shall be treated as public debt transactions of the United States.

SEC. 208. PERMANENT SELF-FUNDING; DUTY TO ASSESS AND COLLECT FEES FOR NETWORK USE.

(a) IN GENERAL.—The Corporation is authorized to assess and collect the following fees:

(1) NETWORK USER FEE.—A user or subscription fee from each entity, including any public safety entity or secondary user, that seeks access to or use of the nationwide public safety interoperable broadband network established under this subtitle.

(2) LEASE FEES RELATED TO NETWORK CAPACITY.—

(A) IN GENERAL.—A fee from any entity that seeks to enter into a covered leasing agreement.

(B) COVERED LEASING AGREEMENT.—For purposes of subparagraph (A), a "covered leasing

agreement" means a written agreement between the Corporation and secondary user to permit—

(i) access to network capacity on a secondary basis for non-public safety services; and

(ii) the spectrum allocated to such entity to be used for commercial transmissions along the dark fiber of the long-haul network of such entity.

(3) LEASE FEES RELATED TO NETWORK EQUIPMENT AND INFRASTRUCTURE.—A fee from any entity that seeks access to or use of any equipment or infrastructure, including antennas or towers, constructed or otherwise owned by the Corporation.

(b) ESTABLISHMENT OF FEE AMOUNTS; PERMANENT SELF-FUNDING.—The total amount of the fees assessed for each fiscal year pursuant to this section shall be sufficient, and shall not exceed the amount necessary, to recoup the total expenses of the Corporation in carrying out its duties and responsibilities described under this subtitle for the fiscal year involved.

(c) REQUIRED REINVESTMENT OF FUNDS.—The Corporation shall reinvest amounts received from the assessment of fees under this section in the nationwide public safety interoperable broadband network by using such funds

only for constructing, maintaining, or improving the network.

SEC. 209. AUDIT AND REPORT.

(a) AUDIT.—

(1) IN GENERAL.—The financial transactions of the Corporation for any fiscal year during which Federal funds are available to finance any portion of its operations shall be audited by the Comptroller General of the United States annually in accordance with the principles and procedures applicable to commercial corporate transactions and under such rules and regulations as may be prescribed by the Comptroller General. Each audit conducted by the Comptroller General under this paragraph shall be made available to Congress.

(2) LOCATION.—Any audit conducted under paragraph (1) shall be conducted at the place or places where accounts of the Corporation are normally kept.

(3) ACCESS TO CORPORATION BOOKS AND DOCUMENTS.—

(A) IN GENERAL.—For purposes of an audit conducted under paragraph (1), the representatives of the Comptroller General shall—

(i) have access to all books, accounts, records, reports, files, and all other papers, things, or property belonging to or in use by the Corporation that pertain to the financial transactions of the Corporation and are necessary to facilitate the audit; and

(ii) be afforded full facilities for verifying transactions with the balances or securities held by depositories, fiscal agents, and custodians.

(B) REQUIREMENT.—All books, accounts, records, reports, files, papers, and property of the Corporation shall remain in the possession and custody of the Corporation.

(b) REPORT.—

(1) IN GENERAL.—The Comptroller General of the United States shall submit a report of each audit conducted under subsection (a) to—

(A) the appropriate committees of Congress;

(B) the President; aud

(C) the Corporation.

(2) CONTENTS.—Each report submitted under paragraph (1) shall contain—

(A) such comments and information as the Comptroller General determines necessary to in-

form Congress of the financial operations and condition of the Corporation;

(B) any recommendations of the Comptroller General relating to the financial operations and condition of the Corporation; and

(C) a description of any program, expenditure, or other financial transaction or undertaking of the Corporation that was observed during the course of the audit, which, in the opinion of the Comptroller General, has been carried on or made without the authority of law.

SEC. 210. ANNUAL REPORT TO CONGRESS.

(a) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, and each year thereafter, the Corporation shall submit an annual report covering the preceding fiscal year to the appropriate committees of Congress.

(b) REQUIRED CONTENT.—The report required under subsection (a) shall include—

(1) a comprehensive and detailed report of the operations, activities, financial condition, and accomplishments of the Corporation under this section; and

(2) such recommendations or proposals for legislative or administrative action as the Corporation deems appropriate.

(c) AVAILABILITY TO TESTIFY.—The directors, officers, employees, and agents of the Corporation shall be available to testify before the appropriate committees of the Congress with respect to—

(1) the report required under subsection (a);

(2) the report of any audit made by the Comptroller General under section 209; or

(3) any other matter which such committees may determine appropriate.

SEC. 211. PUBLIC SAFETY ROAMING AND PRIORITY ACCESS.

The Commission may adopt rules, if necessary in the public interest, to improve the ability of public safety networks to roam onto commercial networks and to gain priority access to commercial networks in an emergency if—

(1) the public safety entity equipment is technically compatible with the commercial network;

(2) the commercial network is reasonably compensated; and

(3) such access does not preempt or otherwise terminate or degrade all existing voice conversations or data sessions.

SEC. 212. TRANSITIONAL ANALYSIS OF PUBLIC SAFETY NETWORK ATTRIBUTES.

(a) ESTABLISHMENT OF EVALUATION FRAMEWORK.—Not later than 180 days after the date of enactment of this

Act, the Director of NIST, in consultation with the Secretary of Homeland Security, the Attorney General, and the Director of the Office of Management and Budget, shall develop an evaluation framework. The development of such an evaluation framework shall be informed by a study commissioned by the Director of NIST and completed by an independent and neutral agent, consultant, or expert, who has—

(1) at least 5 years of technical and economic experience in analyzing the costs and effectiveness of communications networks; and

(2) agreed not to contract or subcontract with the Corporation for at least 3 years from the date such study is completed other than for follow-on and related studies.

(b) CONSIDERATIONS.—The evaluation framework required to be developed under subsection (a) shall take into consideration the public safety network attributes identified in a report completed by the Visiting Committee on Advanced Technology of NIST. The report required under this subsection shall identify the desired attributes of the nationwide public safety interoperable broadband network to be established under this title, as well as any other attributes the Secretary of Commerce may request.

(c) REQUIRED EVALUATIONS.—The evaluation framework required to be developed under subsection (a) shall evaluate—

(1) the marginal cost of each public safety network attribute in developing, deploying, and operating the nationwide public safety interoperable broadband network to be established under this title;

(2) the benefit of each public safety network attribute to the nationwide public safety interoperable broadband network;

(3) the economic feasibility of requiring that each public safety attribute be required as part of the nationwide public safety interoperable broadband network;

(4) the resulting competitive vendor supply ecosystem created by each public safety attribute that is a part of the nationwide public safety interoperable broadband network; and

(5) the level of variability in regional requirements for each public safety attribute that is a part of the nationwide public safety interoperable broadband network.

(d) PROVISION OF FRAMEWORK TO THE CORPORATION.—The evaluation framework required to be developed under subsection (a) shall be provided to the Board of Direc-

tors of the Corporation, and the Corporation shall utilize the findings of such framework to develop a cost-benefit analysis to inform the building, deployment, and operation of the nationwide public safety interoperable broadband network to be established under this title.

(e) OMB RESPONSIBILITY.—The Director of the Office of Management and Budget, or his designee, as a member of the Board of Directors of the Corporation, shall have the responsibility to ensure that evaluation framework required to be developed under subsection (a) is appropriately utilized by the Corporation.

SEC. 213. PROHIBITION ON DIRECT OFFERING OF COMMERCIAL TELECOMMUNICATIONS SERVICE DIRECTLY TO CONSUMERS.

(a) IN GENERAL.—The Corporation shall not offer, provide, or market commercial telecommunications or information services directly to consumers.

(b) RULE OF CONSTRUCTION.—Nothing in this section shall be construed to prohibit the Corporation and a secondary user from entering into a covered leasing agreement pursuant to section 208(a)(2)(B). Nothing in this section shall be construed to limit the Corporation from collecting lease fees related to network equipment and infrastructure pursuant to section 208(a)(3).

SEC. 214. PROVISION OF TECHNICAL ASSISTANCE.

The Commission may provide technical assistance to the Corporation and may take any action necessary to assist the Corporation in effectuating its duties and responsibilities under this subtitle.

Subtitle B—Public Safety Commitments

SEC. 221. STATE AND LOCAL IMPLEMENTATION FUND.

(a) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the "State and Local Implementation Fund".

(b) PURPOSE.—The Assistant Secretary shall establish and administer the grant program under section 222 using the funds deposited in the State and Local Implementation Fund.

(c) CREDITING OF RECEIPTS.—There shall be deposited into or credited to the State and Local Implementation Fund—

(1) any amounts specified in section 401; and

(2) any amounts borrowed by the Assistant Secretary under subsection (d).

(d) BORROWING AUTHORITY.—

(1) IN GENERAL.—The Assistant Secretary may borrow from the general fund of the Treasury beginning on October 1, 2011, such sums as may be nec-

essary, but not to exceed $250,000,000, to implement section 222.

(2) REIMBURSEMENT.—The Assistant Secretary shall reimburse the general fund of the Treasury, without interest, for any amounts borrowed under subparagraph (A) as funds are deposited into the State and Local Implementation Fund.

SEC. 222. STATE AND LOCAL IMPLEMENTATION.

(a) ESTABLISHMENT OF STATE AND LOCAL IMPLEMENTATION GRANT PROGRAM.—The Assistant Secretary, in consultation with the Corporation, shall take such action as is necessary to establish a grant program to make grants to States to assist State, regional, tribal, and local jurisdictions to identify, plan, and implement the most efficient and effective way for such jurisdictions to utilize and integrate the infrastructure, equipment, and other architecture associated with the nationwide public safety interoperable broadband network established under subtitle A to satisfy the wireless communications and data services needs of that jurisdiction, including with regards to coverage, siting, and other needs.

(b) MATCHING REQUIREMENTS; FEDERAL SHARE.—

(1) IN GENERAL.—The Federal share of the cost of any activity carried out using a grant under this section may not exceed 80 percent of the eligible costs

of carrying out that activity, as determined by the Assistant Secretary, in consultation with the Corporation.

(2) WAIVER.—The Assistant Secretary may waive, in whole or in part, the requirements of paragraph (1) for good cause shown if the Assistant Secretary determines that such a waiver is in the public interest.

(c) PROGRAMMATIC REQUIREMENTS.—Not later than 6 months after the establishment of the bylaws of the Corporation pursuant to section 206, the Assistant Secretary, in consultation with the Corporation, shall establish requirements relating to the grant program to be carried out under this section, including the following:

(1) Defining eligible costs for purposes of subsection (b)(1).

(2) Determining the scope of eligible activities for grant funding under this section.

(3) Prioritizing grants for activities that ensure coverage in rural as well as urban areas.

(d) CERTIFICATION AND DESIGNATION OF OFFICER OR GOVERNMENTAL BODY.—In carrying out the grant program established under this section, the Assistant Secretary shall require each State to certify in its application for grant funds that the State has designated a single officer

or governmental body to serve as the coordinator of implementation of the grant funds.

SEC. 223. PUBLIC SAFETY WIRELESS COMMUNICATIONS RESEARCH AND DEVELOPMENT.

(a) NIST DIRECTED RESEARCH AND DEVELOPMENT PROGRAM.—From amounts made available from the Public Safety Trust Fund established under section 401, the Director of NIST, in consultation with the Commission, the Secretary of Homeland Security, and the National Institute of Justice of the Department of Justice, as appropriate, shall conduct research and assist with the development of standards, technologies, and applications to advance wireless public safety communications.

(b) REQUIRED ACTIVITIES.—In carrying out the requirement under subsection (a), the Director of NIST, in consultation with the Corporation and the public safety advisory committee established under section 204(b)(1), shall—

(1) document public safety wireless communications technical requirements;

(2) accelerate the development of the capability for communications between currently deployed public safety narrowband systems and the nationwide public safety interoperable broadband network to be established under this title;

(3) establish a research plan, and direct research, that addresses the wireless communications needs of public safety entities beyond what can be provided by the current generation of broadband technology;

(4) accelerate the development of mission critical voice, including device-to-device "talkaround" capability over broadband networks, public safety prioritization, authentication capabilities, and standard application programing interfaces for the nationwide public safety interoperable broadband network to be established under this title, if necessary and practical;

(5) accelerate the development of communications technology and equipment that can facilitate the eventual migration of public safety narrowband communications to the nationwide public safety interoperable broadband network to be established under this title; and

(6) convene working groups of relevant government and commercial parties to achieve the requirements in paragraphs (1) through (5).

SEC. 224. ADVANCED INFORMATION AND COMMUNICATIONS TECHNOLOGY RESEARCH.

(a) TELECOMMUNICATIONS INNOVATION ACCELERATION.—

(1) IN GENERAL.—In order to accelerate the pace of innovation with respect to advanced telecommunications capability (as such term is defined in section 706(c)(1) of the Telecommunications Act of 1996 (47 U.S.C. 1302), the Director of NIST and the Director of the National Science Foundation shall expand existing programs to support and promote innovation in the United States through transformative telecommunications research.

(2) COMPETITIONS.—The Director of NIST and the Director of the National Science Foundation shall, on an annual basis, jointly solicit proposals to address areas of national need for transformative telecommunications research, as such areas are identified by each of the Directors.

(3) TRANSFORMATIVE TELECOMMUNICATIONS RESEARCH DEFINED.—In this section, the term "transformative telecommunications research" means basic research with respect to telecommunications, as that term is defined in section 3(43) of the Communications Act of 1934 (47 U.S.C. 153(43)) that involves ideas, discoveries, or tools that —

(A) radically change understanding of an important existing scientific or engineering concept or educational practice; or

(B) leads to the creation of a new paradigm or field of science, engineering, or education related to telecommunications.

(b) ADVANCED COMMUNICATIONS SERVICES FOR ALL AMERICANS.—The Director of NIST shall continue to support research and support standards development in advanced information and communications technologies focused on enhancing or facilitating the availability and affordability of advanced communications services to all Americans, in order to implement the Institute's responsibilities under section 2(c)(12) of the National Institute of Standards and Technology Act (15 U.S.C. 272(c)(12)). The Director of NIST shall support intramural research and cooperative research with institutions of higher education (as defined in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a))) and industry.

(c) EMERGING WIRELESS TECHNOLOGY RESEARCH.—

(1) IN GENERAL.—From amounts made available from the Public Safety Trust Fund established under section 401, the Director of the National Science Foundation shall expand existing grant programs to include transformative telecommunications research relevant to emerging wireless technologies that may enhance advanced communications services or make such services more affordable for consumers.

Areas of research to be supported through these grants may include—

(A) opportunistic spectrum sharing;

(B) wireless cyberphysical systems;

(C) more efficient use of the wireless spectrum;

(D) dynamic spectrum access, including cognitive radio technologies;

(E) interference mitigation;

(F) emerging user interface and sensing technologies;

(G) wireless ad hoc networks;

(H) network resiliency and cybersecurity;

(I) communications interoperability, particularly between heterogeneous network technologies;

(J) pervasive information technology;

(K) nanoelectronics for communications applications;

(L) low-power communications electronics;

(M) networking protocols and architectures; and

(N) such other related areas as the Director finds appropriate.

(2) APPLICATIONS.—The Director of the National Science Foundation shall establish criteria for the award of grants under paragraph (1). Grants awarded under paragraph (1) shall be awarded on a merit-reviewed competitive basis. The Director of the National Science Foundation shall give priority to grants that offer the potential for transformative breakthroughs.

(3) LIMITATION ON USE.—Not more than 5 percent of any amounts made available in a fiscal year from the Public Safety Trust Fund established under section 401 may be used by the Director of the National Science Foundation to cover the administrative expenses incurred in carrying out this subsection.

(d) DARPA RESEARCH.—

(1) IN GENERAL.—From amounts made available from the Public Safety Trust Fund established under section 401, the Defense Advanced Research Projects Agency (referred to in this subsection as "DARPA") shall conduct wireless communications research to develop more secure, reliable, and flexible radio-frequency systems for Federal wireless users. Areas of research to be supported by this subsection include, but are not limited to—

(A) technologies to increase wireless data transmission speeds to enable the next generation of Federal networks;

(B) spectrum sharing and interference mitigation techniques to enable more efficient uses of wireless spectrum;

(C) technologies to allow and foster the reallocation of spectrum, if appropriate, for non-Federal use; and

(D) research that fosters the conversion of the Department of Defense's wireless communications systems, and those of other Federal users, to more advanced or more efficient systems.

(2) COOPERATION.—In carrying out this subsection, DARPA shall collaborate where appropriate with NTIA, NIST, NSF, and other interested Federal agencies.

(3) LIMITATION ON USE.—Not more than 5 percent of any amounts made available in a fiscal year from the Public Safety Trust Fund established under section 401 may be used by DARPA to cover the administrative expenses incurred in carrying out this subsection.

(4) OMB REVIEW.—Amounts appropriated to DARPA under this subsection shall be available upon

approval by the Director of the Office of Management and Budget of an implementation plan that has been developed and submitted to the Director by the head of DARPA.

TITLE III—SPECTRUM AUCTION AUTHORITY

SEC. 301. EXTENSION OF AUCTION AUTHORITY.

Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking "2012" and inserting "2021".

SEC. 302. AUCTION OF SPECTRUM.

(a) IDENTIFICATION OF SPECTRUM.—Not later than 1 year after the date of enactment of this Act, the Assistant Secretary shall identify and make available for immediate reallocation, at a minimum, 15 megahertz of contiguous spectrum at frequencies located between 1675 megahertz and 1710 megahertz, inclusive, minus the geographic exclusion zones, or any amendment thereof, identified in NTIA's October 2010 report entitled "An Assessment of Near-Term Viability of Accommodating Wireless Broadband Systems in 1675–1710 MHz, 1755–1780 MHz, 3500–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands".

(b) AUCTION.—Not later than January 31, 2014, the Commission shall conduct the auctions of the following licenses, by commencing the bidding for:

(1) The spectrum between the frequencies of 1915 megahertz and 1920 megahertz, inclusive.

(2) The spectrum between the frequencies of 1995 megahertz and 2000 megahertz, inclusive.

(3) The spectrum between the frequencies of 2020 megahertz and 2025 megahertz, inclusive.

(4) The spectrum between the frequencies of 2155 megahertz and 2175 megahertz, inclusive.

(5) The spectrum between the frequencies of 2175 megahertz and 2180 megahertz, inclusive.

(6) The spectrum between the frequencies of 1755 megahertz and 1850 megahertz, inclusive.

(7) The spectrum identified pursuant to subsection (a).

(c) AUCTION ORGANIZATION.—The Commission may, if technically feasible and consistent with the public interest, combine the spectrum identified in paragraphs (4), (5), and the portion of paragraph (6) between the frequencies of 1755 megahertz and 1780 megahertz, inclusive, of subsection (b) in an auction of licenses for paired spectrum blocks.

(d) FURTHER REALLOCATION OF CERTAIN OTHER SPECTRUM.—

(1) COVERED SPECTRUM.—For purposes of this subsection, the term "covered spectrum" means the

portion of the electromagnetic spectrum between the frequencies of 3550 to 3650 megahertz, inclusive, minus the geographic exclusion zones, or any amendment thereof, identified in NTIA's October 2010 report entitled "An Assessment of Near-Term Viability of Accommodating Wireless Broadband Systems in 1675–1710 MHz, 1755–1780 MHz, 3550–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands".

(2) IN GENERAL.—Consistent with requirements of section 309(j) of the Communications Act of 1934, the Commission shall reallocate covered spectrum for assignment by competitive bidding unless the President of the United States determines that—

(A) such spectrum cannot be reallocated due to the need to protect incumbent Federal systems from interference; or

(B) allocation of other spectrum—

(i) better serves the public interest, convenience, and necessity; and

(ii) can reasonably be expected to produce receipts comparable to what the covered spectrum might auction for without the geographic exclusion zones.

(3) ACTIONS REQUIRED IF COVERED SPECTRUM CANNOT BE REALLOCATED.—

(A) In general.—If the President makes a determination under paragraph (2) that the covered spectrum cannot be reallocated, then the President shall, within 1 year after the date of such determination—

(i) identify alternative bands of frequencies totaling more than 20 megahertz and no more than 100 megahertz of spectrum used primarily by Federal agencies that satisfy the requirements of clauses (i) and (ii) of paragraph (2)(B);

(ii) report to the appropriate committees of Congress and the Commission an identification of such alternative spectrum for assignment by competitive bidding; and

(iii) make such alternative spectrum for assignment immediately available for reallocation.

(B) Auction.—If the President makes a determination under paragraph (2) that the covered spectrum cannot be reallocated, the Commission shall commence the bidding of the alternative spectrum identified pursuant to subparagraph (A) within 3 years of the date of enactment of this Act.

(4) ACTIONS REQUIRED IF COVERED SPECTRUM CAN BE REALLOCATED.—If the President does not make a determination under paragraph (1) that the covered spectrum cannot be reallocated, the Commission shall commence the competitive bidding for the covered spectrum within 3 years of the date of enactment of this Act.

(e) PROCEEDS.—Notwithstanding section 309(j)(8)(A) of the Communications Act of 1934, and except as provided in subparagraphs (B), (C), and (D) of such section 309(j)(8), all proceeds (including deposits and up front payments from successful bidders) from the auctions to be carried out pursuant to subsections (b) and (d) shall be deposited with the Public Safety Trust Fund established under section 401.

(f) AMENDMENTS TO DESIGN REQUIREMENTS RELATED TO COMPETITIVE BIDDING.—Section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) is amended—

(1) in paragraph (3)—

(A) in subparagraph (E)(ii), by striking "; and" and inserting a semicolon;

(B) in subparagraph (F), by striking the period at the end and inserting a semicolon; and

(C) by adding at the end the following:

"(G) ensuring that there is an adequate opportunity for applicants to obtain licenses covering both large and small geographic areas, as such areas are determined by the Commission."; and

(2) by amending clause (i) of the second sentence of paragraph (8)(C) to read as follows:

"(i) the deposits—

"(I) of successful bidders of any auction conducted pursuant to subparagraph (F) or to section 302 of the Public Safety Spectrum and Wireless Innovation Act shall be paid to the Public Safety Trust Fund established under section 401 of such Act; and

"(II) of successful bidders of any other auction shall be paid to the Treasury;".

SEC. 303. INCENTIVE AUCTION AUTHORITY.

(a) IN GENERAL.—Paragraph (8) of section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) is amended—

(1) in subparagraph (A), by striking "(B), (D), and (E)," and inserting "(B), (D), (E), and (F),"; and

(2) by adding at the end the following:

"(F) INCENTIVE AUCTION AUTHORITY.—

"(i) AUTHORITY.—Notwithstanding any other provision of law, if the Commission determines that it is consistent with the public interest in utilization of the spectrum for a licensee to relinquish voluntarily some or all of its licensed spectrum usage rights in order to permit the assignment of new initial licenses through a competitive bidding process subject to new service rules, or the designation of new spectrum for unlicensed use, the Commission may disburse to that licensee a portion of any auction proceeds that the Commission determines, in its discretion, are attributable to the licensee's relinquished spectrum usage rights, provided that television broadcast stations required to be carried pursuant to sections 338, 614, or 615 that voluntarily elect to share a channel shall retain the rights to carriage set forth in such sections and the rules of the Commission, as such rights apply to such station at its shared location.

"(ii) PROHIBITION.—

"(I) IN GENERAL.—*The Commission may not reclaim spectrum licensed on a primary basis to a television broadcast station, directly or indirectly, on an involuntary basis for purposes of providing spectrum to carry out an incentive auction under this subparagraph.*

"(II) EXCEPTION.—*The Commission may reclaim spectrum licensed to a television broadcast station licensee for the purposes of providing spectrum to carry out an incentive auction under this subparagraph, only if the Commission assigns an identical amount of contiguous spectrum, located between channels 14 and 50, in the same geographic market, if the spectrum was reclaimed from between channels 14 and 51, or located between channels 2 and 13, inclusive, in the same geographic market, to the television broadcast station licensee if the spectrum was reclaimed from between channels 2 and 13, provided that—*

"(aa) the Commission may not involuntarily co-locate multiple television broadcast station licensees on the same channel; and

"(bb) television broadcast stations required to be carried pursuant to sections 338, 614, or 615 that voluntarily elect to share a channel shall retain the rights to carriage set forth in such sections and the rules of the Commission, as such rights apply to such station at its shared location.

"(III) REPACKING.—When assigning spectrum to television broadcast station licensees pursuant to subclause (II), if the Commission determines that it is in the public interest to modify the spectrum usage rights of any incumbent licensee in order to facilitate the assignment of such new initial licenses subject to new service rules, or the designation of spectrum for an unlicensed use, the Commission may disburse to such licensee a portion of the

auction proceeds for the purpose of relocating to any alternative frequency or location that the Commission may designate, and the Commission shall, to the extent technically feasible and in the public interest, make reasonable efforts to—

"(aa) preserve the amount of population covered by a licensee's signal within the licensee's service area;

"(bb) avoid any involuntary increase in interference to the licensee's signal that may otherwise result from new spectrum assignments;

"(cc) allow licensees assigned to broadcast channels 2 through 6 to relocate to channels in the UHF range, if possible and consistent with the goals of the incentive auction, as determined by the Commission; and

"(dd) allow low power television broadcast licensees assigned

to channels in the UHF range that are impacted by relocation of other licensees pursuant to this subclause to relocate to channels in the VHF range.

"(IV) UNLICENSED SPECTRUM.—With respect to frequency bands between 54 and 72 MHz, 76 and 88 MHz, 174 and 216 MHz, 470 and 698 MHz, 84 MHz shall be assigned via a competitive bidding process. A portion of the proceeds from the competitive bidding of the frequency bands identified in the prior sentence may, if consistent with the public interest, be disbursed to other licensees, for the purpose of ensuring that unlicensed spectrum remains available in these frequency bands, nationwide, and in each local market.

"(iii) TREATMENT OF REVENUES.—Notwithstanding subparagraph (A), and except as provided in subparagraphs (B), (C), and (D), all proceeds (including deposits and up front payments from successful bid-

ders) from the auction of spectrum under this subparagraph shall be deposited with the Public Safety Trust Fund established under section 401 of the Public Safety Spectrum and Wireless Innovation Act.

"(G) ESTABLISHMENT OF INCENTIVE AUCTION RELOCATION FUND.—

"(i) IN GENERAL.—There is established in the Treasury of the United States a fund to be known as the 'Incentive Auction Relocation Fund'.

"(ii) ADMINISTRATION.—The Assistant Secretary shall administer the Incentive Auction Relocation Fund using the amounts deposited pursuant to this section.

"(iii) CREDITING OF RECEIPTS.—There shall be deposited into or credited to the Incentive Auction Relocation Fund any amounts specified in section 401 of the Public Safety Spectrum and Wireless Innovation Act.

"(iv) AVAILABILITY.—Amounts in the Incentive Auction Relocation Fund shall be available to the NTIA for use—

"(I) for a period not to exceed 18 months following the later of—

"(aa) the completion of incentive auction from which such amounts were derived; or

"(bb) the date on which the Commission issues all the new channel assignments pursuant to any repacking required under subparagraph (F)(ii); and

"(II) without further appropriation.

"(v) USE OF FUNDS.—Amounts in the Incentive Auction Relocation Fund may only be used by the NTIA, in consultation with the Commission, to cover—

"(I) the reasonable costs of television broadcast stations that are relocated to a different spectrum channel or geographic location following an incentive auction under subparagraph (F), or that are impacted by such relocations, including to cover the cost of new equipment, installation, and construction; and

"(II) the costs incurred by multichannel video programming distributors for new equipment, installation, and construction related to the carriage of such relocated stations or the carriage of stations that voluntarily elect to share a channel, but retain their existing rights to carriage pursuant to sections 338, 614, and 615.".

(b) INCENTIVE AUCTIONS TO REPURPOSE CERTAIN MOBILE SATELLITE SERVICES SPECTRUM FOR TERRESTRIAL BROADBAND USE.—To the extent that the Commission makes available spectrum licenses on some or all of the frequencies between 2000 and 2020 MHz and 2180 and 2200 MHz for terrestrial broadband use, such licenses shall be assigned pursuant to the authority provided in section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)), including, as appropriate, subparagraph (F) of such section.

(c) SENSE OF CONGRESS.—It is the sense of Congress that any spectrum identified for auction under this section should be licensed—

(1) on a flexible use basis to the extent technologically feasible; and

(2) consistent with the public interest, convenience, and necessity.

SEC. 304. EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.

(a) STUDY AND REPORT.—Not later than 180 days after the date of enactment of this Act and not later than every 2 years thereafter, the Commission shall conduct a study and submit a report to the appropriate committees of Congress and to the Corporation on the spectrum used by public safety licensees or for public safety services pursuant to section 337(f) of the Communications Act of 1934 (47 U.S.C. 337).

(b) REQUIREMENTS.—The report required under subsection (a) shall—

(1) inventory the spectrum assigned to public safety use; and

(2) include—

(A) the amount of spectrum allocated to public safety use;

(B) the number of licensees and amount of spectrum assigned to each licensee;

(C) a general description of technologies and systems in each band;

(D) an approximation of network coverage, as appropriate, of major systems (such as an es-

timation of land mobile radio coverage by population) in major metropolitan areas; and

(E) an approximate number of users of major systems, such as the number of first responders using land mobile radio, in major metro areas;

(3) assess if spectrum is adequate to meet the current and future needs for public safety services; and

(4) assess the opportunity for return of any additional spectrum to the Commission for reallocation.

SEC. 305. REPORT ON SATELLITE BROADBAND.

Not later than 2 years after the date of enactment of this Act, the Comptroller General of the United States shall conduct a study and submit to the appropriate committees of Congress a report on the current and future capabilities of fixed and mobile satellite broadband to assist public safety entities during an emergency.

SEC. 306. FEDERAL INFRASTRUCTURE SHARING.

The Administrator of General Services shall establish rules to allow public safety entities licensed or otherwise permitted to use spectrum allocated to the Public Safety Broadband Corporation to have access to those components of Federal infrastructure appropriate for the construction *and maintenance of the nationwide public safety interoperable broadband network to be established under title II.*

SEC. 307. REPORT ON UNLICENSED SPECTRUM.

Not later than 5 years after the date of enactment of this Act, the Commission shall submit to the appropriate committees of Congress a report on—

(1) the status of development of any spectrum designated as unlicensed spectrum by the Commission under this Act; and

(2) the use of any unlicensed spectrum described in paragraph (1).

TITLE IV—PUBLIC SAFETY TRUST FUND

SEC. 401. PUBLIC SAFETY TRUST FUND.

(a) ESTABLISHMENT OF PUBLIC SAFETY TRUST FUND.—

(1) IN GENERAL.—There is established in the Treasury of the United States a trust fund to be known as the "Public Safety Trust Fund".

(2) CREDITING OF RECEIPTS.—

(A) IN GENERAL.—There shall be deposited into or credited to the Public Safety Trust Fund the proceeds from the auction of spectrum carried out pursuant to—

(i) section 302 of this Act; and

(ii) section 309(j)(8)(F) of the Communications Act of 1934, as added by section 303 of this Act.

(B) AVAILABILITY.—Amounts deposited into or credited to the Public Safety Trust Fund in accordance with subparagraph (A) shall remain available until the end of fiscal year 2021. Upon the expiration of the period described in the prior sentence such amounts shall be deposited in the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(b) USE OF FUND.—Amounts deposited in the Public Safety Trust Fund shall be used in the following manner:

(1) PAYMENT OF AUCTION INCENTIVE.—

(A) REQUIRED DISBURSALS.—Amounts in the Public Safety Trust Fund shall be used to make any required disbursal of payments to licensees required pursuant to—

(i) clause (i) and subclause (IV) of clause (ii) of section 309(j)(8)(F) of the Communications Act of 1934; and

(ii) section 303(b) of this Act.

(B) NOTIFICATION TO CONGRESS.—

(i) IN GENERAL.—At least 3 months in advance of any incentive auction conducted pursuant to subparagraph (F) of section 309(j)(8) of the Communications Act of 1934, the Chairman of the Commission, in consultation with the Director of the Office of Management and Budget, shall notify the appropriate committees of Congress—

(I) of the methodology for calculating the disbursal of payments to certain licensees required pursuant to clause (i) and subclauses (III) and (IV) of clause of (ii) of such section; and

(II) thot such methodology considers the value of the spectrum voluntarily relinquished in its current use and the timeliness with which the licensee will clear its use of such spectrum.

(ii) DEFINITION.—In this clause, the term "appropriate committees of Congress" means—

(I) the Committee on Commerce, Science, and Transportation of the Senate;

(II) the Committee on Appropriations of the Senate;

(III) the Committee on Energy and Commerce of the House of Representatives; and

(IV) the Committee on Appropriations of the House of Representatives.

(2) INCENTIVE AUCTION RELOCATION FUND.—Not less than 5 percent of the amounts in the Public Safety Trust Fund but not more than $1,000,000,000 shall be deposited in the Incentive Auction Relocation Fund established under section 309(j)(8)(G) of the Communications Act of 1934.

(3) STATE AND LOCAL IMPLEMENTATION FUND.—$250,000,000 shall be deposited in the State and Local Implementation Fund established under section 221.

(4) PUBLIC SAFETY BROADBAND CORPORATION.—$11,750,000,000 shall deposited with the Public Safety Broadband Corporation established under section 202, of which pursuant to its responsibilities and duties set forth under section 206 to deploy and

operate a nationwide public safety interoperable broadband network—

(A) not less than $10,500,000,000 shall be made available for any Radio Access Network build out; and

(B) not less than $1,250,000,000 shall be made available to develop an Evolved Packet Core.

(5) PUBLIC SAFETY RESEARCH AND DEVELOPMENT.—$100,000,000 per year for each of the fiscal years 2012 through 2016 shall be made available for use by the Director of NIST to carry out the research program established under section 223.

(6) ADVANCED INFORMATION AND TECHNOLOGY RESEARCH.—$200,000,000 per year for each of the fiscal years 2012 through 2016 shall be made available to carry out the programs established under section 224, of which—

(A) $130,000,000 per year shall be made available to the Director of the National Science Foundation to carry out the grant program established under section 224(c); and

(B) $70,000,000 per year shall be made available to DARPA to carry out the research program established under section 224(d).

(7) DEFICIT REDUCTION.—Any amounts remaining after the deduction of the amounts required under paragraphs (1) through (6) shall be deposited in the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(c) INVESTMENT.—Amounts in the Public Safety Trust Fund shall be invested in accordance with section 9702 of title 31, United States Code, and any interest on, and proceeds from, any such investment shall be credited to, and become a part of, the Fund.

TITLE V—SPECTRUM POLICY

Subtitle A—Inventory and Planning

SEC. 501. RADIO SPECTRUM INVENTORY.

(a) SPECTRUM INVENTORY.—Part I of title III of the Communications Act of 1934 (47 U.S.C. 301 et seq.) is amended by adding at the end the following:

"SEC. 342. SPECTRUM INVENTORY.

"(a) RADIO SPECTRUM INVENTORY.—Not later than 180 days after the date of enactment of the Public Safety Spectrum and Wireless Innovation Act, and biennially thereafter, the Commission, in consultation with the NTIA and the Office of Science and Technology Policy, shall carry out the following activities:

"(1) REPORT.—Prepare a report that includes an inventory of each radio spectrum band, from 300 MHz to 3.5 GHz, at a minimum, managed by each such agency. Except as provided in subsection (b), the report shall include—

"(A) the licensee or government user authorized in the band;

"(B) the total spectrum authorized for each licensee or government user (in percentage terms and in sum) in the band;

"(C) the approximate number of transmitters, end-user terminals, or receivers, excluding unintended radiators, that have been deployed or authorized, for each licensee or government user, in the band; and

"(D) if such information is available—

"(i) the type of transmitters, end-user terminals, or receivers, excluding unintended radiators, operating in the band and whether they are space-, air-, or ground-based;

"(ii) the type of transmitters, end-user terminals, or receivers, excluding unintended radiators, authorized to operate in

the band and whether they are space-, air-, or ground-based;

"(iii) contour maps or other information that illustrate the coverage area, receiver performance, and other parameters relevant to an assessment of the availability of spectrum in each band;

"(iv) the approximate geolocation of base stations or fixed transmitters;

"(v) the approximate extent of use, by geography, of each band of frequencies, such as the amount and percentage of time of use, number of end-users, or other measures as appropriate to the particular band;

"(vi) the activities, capabilities, functions, or missions supported by the transmitters, end-user terminals, or receivers; and

"(vii) the types of unlicensed devices authorized to operate in the band.

"(2) PUBLIC ACCESS.—Create a centralized portal or website utilizing data from the Commission and the NTIA to make a centralized inventory of the bands of each agency available to the public via an Internet-accessible website.

"(3) UPDATES.—Make all reasonable efforts to maintain and update the information required under paragraph (2) no less frequently than quarterly to reflect, at a minimum, any transfer or auction of licenses or change in allocation, assignment, or authorization.

"(4) FCC TO BEAR COSTS.—Notwithstanding any other provision of law, all costs incurred by the Commission and the NTIA in establishing and maintaining the centralized inventory and the centralized portal or website shall be borne exclusively by the Commission.

"(5) PAPERWORK REDUCTION ACT EXEMPTION.—Any forms prescribed by the Commission under this section, and any information-gathering activities of the Commission under this section, shall not be subject to the provisions of sections 3507 or 3512 of title 44, United States Code (44 U.S.C. 3507, 3512).

"(b) NATIONAL SECURITY; CLASSIFIED INFORMATION.—

"(1) IN GENERAL.—If the head of a Federal agency determines that disclosure of information required by subsection (a) would be harmful to the national security of the United States, the agency shall—

"(A) notify the NTIA of its determination; and

"(B) provide to the NTIA—

"(i) the other publicly releasable information required by subsection (a);

"(ii) to the maximum extent practicable, a summary description of the information with respect to which the determination was made; and

"(iii) an annex containing the information with respect to which the determination was made.

"(2) CLASSIFIED INFORMATION.—If the head of a Federal agency determines that any information required by subsection (a) is classified in accordance with Executive Order 13526 of December 29, 2009, or any successor Executive Order establishing or modifying the uniform system for classifying, safeguarding, and declassifying national security information, the agency shall—

"(A) notify the NTIA of its determination; and

"(B) provide to the NTIA—

"(i) the information required by subsection (a)(1) that is not classified;

"(ii) to the maximum extent practicable, a summary description of the information that is classified; and

"(iii) an annex containing the information that is classified.

"(3) ANNEX RESTRICTION.—The NTIA shall make an annex described in paragraph (1)(B)(iii) or (2)(B)(iii) available to the Commission. Neither the NTIA nor the Commission may make any such annex available to the public pursuant to subsection (a)(2) or to any unauthorized person through any other means.

"(e) PUBLIC SAFETY NONDISCLOSURE.—

"(1) IN GENERAL.—If a licensee of non-Federal spectrum determines that public disclosure of certain information held by that licensee and required to be included in the report under subsection (a) would reveal information for which public disclosure would be detrimental to public safety, or that the licensee is otherwise prohibited by law from disclosing, the licensee may petition the Commission for a partial or total exemption from inclusion on the centralized portal or website under subsection (a)(2) and in the reports required under subsection (d).

"(2) BURDEN.—A licensee seeking an exemption under this subsection bears the burden of justifying the exemption and shall provide clear and convincing evidence to support the requested exemption.

"(3) INFORMATION REQUIRED.—If the Commission grants an exemption under this subsection, the licensee shall provide to the Commission—

"(A) the publicly releasable information required by subsection (a)(1) for the inventory;

"(B) to the maximum extent practicable, a summary description, suitable for public release, of the information for which public disclosure would be detrimental to public safety or that the licensee is prohibited by law from disclosing; and

"(C) an annex, under appropriate cover, containing the information that the Commission has determined should be withheld from public disclosure.

"(d) INFORMING THE CONGRESS.—

"(1) IN GENERAL.—Except as provided in paragraph (3), the NTIA and the Commission shall submit each report required by subsection (a)(1) to the appropriate committees of Congress.

"(2) NONDISCLOSURE OF ANNEXES.—Each such report shall be submitted in unclassified form, but

may include 1 or more annexes as provided for by subsections (b)(1)(B)(iii), (b)(2)(B)(iii), and (c)(3)(C). No Congressional committee may make any such annex available to the public or to any unauthorized person.

"(3) CLASSIFIED ANNEXES.—If a report includes a classified annex as provided for by subsection (b)(2)(B)(iii), the NTIA and the Commission shall—

"(A) submit the classified annex only to the appropriate committees of Congress with primary oversight jurisdiction for the user agencies or licensees concerned; and

"(B) provide notice of the submission to the other appropriate committees of Congress.

"(e) DEFINITIONS.—In this section:

"(1) APPROPRIATE COMMITTEES OF CONGRESS.—The term 'appropriate committees of Congress' means the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Energy and Commerce of the House of Representatives, and any other congressional committee with primary oversight jurisdiction for the user agencies or licensees concerned.

"(2) NTIA.—The term 'NTIA' means the National Telecommunications and Information Administration.".

(b) PROGRESS REPORT.—Within 180 days after the date of enactment of this title, the Commission and the NTIA shall provide an update as to the status of the inventory and report required by section 342(a) of the Communications Act of 1934, as added by subsection (a), to the appropriate committees of Congress.

SEC. 502. FEDERAL SPECTRUM PLANNING.

(a) REVIEW OF EVALUATION PROCESS.—Not later than 6 months after the date of enactment of this title, the Comptroller General of the United States shall—

(1) conduct a review of the processes that Federal entities utilize to evaluate their spectrum needs and manage their spectrum resources;

(2) make recommendations on how to improve such processes; and

(3) submit a written report to the appropriate committees of Congress on the review, analysis, and recommendations made pursuant to paragraphs (1) and (2).

(b) REVISION OF EVALUATION PROCESS.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this title, each Federal entity

shall establish, update, or revise the process used by such entity to evaluate their proposed spectrum needs, taking into account any applicable recommendations made in the report required under subsection (a).

(2) REQUIRED INCLUSIONS.—

(A) ANALYSIS OF OPTIONS.—Each process described under paragraph (1), whether newly established or otherwise revised, shall include an analysis and assessment of—

(i) the options available to a Federal entity to obtain associated communications services that are the most spectrum-efficient; and

(ii) the effective alternatives available to such entity that will permit the entity to continue to satisfy the mission requirements of the entity.

(B) ANALYSIS SUBMITTED TO NTIA.—The analysis and assessment carried out pursuant to subparagraph (A) shall be submitted by the Federal entity to the NTIA at the same time that the entity seeks certification or recertification, if applicable, of spectrum support from the NTIA pursuant to the requirements of the National Telecommunications and Information Adminis-

tration Organization Act and OMB Circular A–11.

(c) SPECTRUM PLANS OF FEDERAL ENTITIES.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this title, and every 2 years thereafter, each Federal entity shall provide an entity-specific strategic spectrum plan to the Assistant Secretary and the Director of the Office of Management and Budget.

(2) REQUIRED INCLUSIONS.—Each strategic spectrum plan submitted pursuant to paragraph (1) shall include—

(A) the spectrum requirements of the entity;

(B) the planned uses of new technologies or expanded services requiring spectrum over a period of time agreed to by the entity;

(C) suggested spectrum-efficient approaches to meeting the spectrum requirements identified under subparagraph (A); and

(D) progress reports on what the entity is doing to improve its spectrum management.

(d) NATIONAL SECURITY; CLASSIFIED INFORMATION.—

(1) IN GENERAL.—If the head of a Federal entity determines that disclosure of information required by

subsection (c) would be harmful to the national security of the United States, the entity shall—

(A) notify the NTIA of its determination; and

(B) provide to the NTIA—

(i) the other publicly releasable information required by subsection (c);

(ii) to the maximum extent practicable, a summary description of the information with respect to which the determination was made; and

(iii) an annex containing the information with respect to which the determination was made.

(2) CLASSIFIED INFORMATION.—If the head of a Federal entity determines that any information required by subsection (c) is classified in accordance with Executive Order 13526 of December 29, 2009, or any successor Executive Order establishing or modifying the uniform system for classifying, safeguarding, and declassifying national security information, the entity shall—

(A) notify the NTIA of its determination; and

(B) provide to the NTIA—

(i) the information required by subsection (c) that is not classified;

(ii) to the maximum extent practicable, a summary description of the information that is classified; and

(iii) an annex containing the information that is classified.

(3) ANNEX RESTRICTION.—The NTIA shall make an annex described in paragraph (1)(B)(iii) or (2)(B)(iii) available to the Secretary of Commerce and the Director of the Office of Management and Budget. Neither the NTIA, the Secretary of Commerce, nor the Director of the Office of Management and Budget may make any such annex available to the public or to any unauthorized person through any other means.

(e) FEDERAL STRATEGIC SPECTRUM PLAN.—

(1) DEVELOPMENT AND SUBMISSION.—

(A) IN GENERAL.—Not later than 6 months after the receipt of the initial entity-specific strategic spectrum plans required under subsection (c), the Secretary of Commerce shall develop a Federal Strategic Spectrum Plan, in coordination with the Assistant Secretary and the Director of the Office of Management and Budget.

(B) SUBMISSION TO CONGRESS.—Consistent with the requirements set forth in subsection (d)(3), the Secretary of Commerce shall submit the Federal Strategic Spectrum Plan developed under subparagraph (A) to the appropriate committees of Congress.

(C) NONDISCLOSURE OF ANNEXES.—The Federal Strategic Spectrum Plan required to be submitted under subparagraph (B) shall be submitted in unclassified form, but shall include, if appropriate, 1 or more annexes as provided for by subsections (d)(1)(B)(iii) and (d)(2)(B)(iii). No Congressional committee may make any such annex available to the public or to any unauthorized person.

(D) CLASSIFIED ANNEXES.—If the Federal Strategic Spectrum Plan includes a classified annex as provided for by subsection (d)(2)(B)(iii), the Secretary of Commerce shall—

(i) submit the classified annex only to the appropriate committees of Congress with primary oversight jurisdiction for the user entities or licensees concerned; and

(ii) provide notice of the submission to the other appropriate committees of Congress.

(E) DEFINITION.—In this subsection, the term "appropriate committees of Congress" means the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Energy and Commerce of the House of Representatives, and any other congressional committee with primary oversight jurisdiction for the user entity or licensees concerned.

(2) INCORPORATION OF ENTITY PLANS.—The Federal Strategic Spectrum Plan developed under paragraph (1) shall incorporate, consistent with the requirements of subsection (d), the initial entity-specific strategic spectrum plans submitted under subsection (c).

(3) REQUIRED INCLUSIONS.—The Federal Strategic Spectrum Plan developed under paragraph (1) shall include—

(A) information on how spectrum assigned and used by Federal entities is being used;

(B) opportunities to increase efficient use of infrastructure and spectrum assigned and used by Federal entities;

(C) an assessment of the future spectrum needs of the Federal Government; and

(D) plans to incorporate such needs in the NTIA's frequency assignment, equipment certification, and review processes.

(4) UPDATES.—The Secretary of Commerce shall revise and update the Federal Strategic Spectrum Plan developed under paragraph (1) accordingly pursuant to the biennial submission of the entity-specific strategic spectrum plans submitted under subsection (c).

(f) NATIONAL STRATEGIC SPECTRUM PLAN.—

(1) IN GENERAL.—Not later than 2 years after the date of enactment of this title, the NTIA and the Commission, in consultation with other Federal, State, local, and tribal governments and commercial spectrum interests, shall develop a quadrennial National Strategic Spectrum Plan.

(2) REQUIRED INCLUSION.—The National Strategic Spectrum Plan shall include the following:

(A) The Federal Strategic Spectrum Plan developed under subsection (e).

(B) Long-range spectrum planning of both commercial, State and local government, and Federal Government users.

(C) New technologies or expanded services requiring spectrum.

(D) The nature and characteristics of the new radio communication systems required and the nature and characteristics of the spectrum required.

(E) Efficient approaches to meeting the future spectrum requirements of all users, including—

(i) requiring certain standards-based technologies that improve spectrum efficiencies;

(ii) spectrum sharing and reuse opportunities;

(iii) possible reallocation; and

(iv) any other approaches that promote efficient use of spectrum.

(F) An evaluation of current auction processes to determine the effectiveness of such processes in—

(i) promoting competition;

(ii) improving spectrum use efficiency; and

(iii) maximizing the full economic value to customers, industry, and the taxpayer of the spectrum.

Subtitle B—Markets

SEC. 511. PROMOTING SECONDARY SPECTRUM MARKETS.

(a) IN GENERAL.—Not later than 18 months after the date of enactment of this title, the Commission shall conduct a rulemaking proceeding to determine how to further promote a more robust secondary spectrum market.

(b) CONSIDERATION.—In carrying out the rulemaking required under subsection (a), the Commission shall consider the feasability and value of establishing a national database to collect and disseminate information on secondary spectrum market opportunities.

SEC. 512. UNLICENSED USE IN 5 GHZ.

(a) MODIFICATION OF REGULATIONS.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this title, the Commission shall modify part 15 of title 47, Code of Federal Regulations, to allow unlicensed devices intended and marketed for indoor use to operate in the 5350–5470 MHz band.

(2) CONCERNS AND CONSIDERATIONS.—In carrying out the modification requirement set forth under paragraph (1), the Commission shall allow the

unlicensed devices described in paragraph (1) to operate in the 5350–5470 MHz band, on an indoor basis only, if it—

(A) finds that technical solutions will protect licensed users, including use of existing, modified, or new spectrum sharing technologies and solutions, such as dynamic frequency selection; and

(B) determines that the primary mission of Federal spectrum users in the 5350–5470 MHz band will not be compromised by the introduction of unlicensed devices in the 5350–5470 MHz band.

(b) NTIA STUDY.—

(1) IN GENERAL.—Not later than 8 months after the date of enactment of this title, and in consultation with the Commission, the NTIA shall conduct and submit a study as provided in paragraph (2) evaluating known and proposed sharing technologies and the risk to Federal users if unlicensed U–NII devices were allowed to operate indoors in the 5350–5470 MHz band.

(2) SUBMITTING STUDY.—The study required by paragraph (1) shall be submitted to the appropriate committees of Congress and the Commission.

SEC. 513. EXPERIMENTAL LICENSES.

Not later than 9 months after the date of enactment of this title, the Commission shall revise part 5 of chapter I of title 47, Code of Federal Regulations, to—

(1) streamline such regulations to promote greater experimentation;

(2) broaden opportunities for market trials;

(3) promote advancements in health care;

(4) establish innovation zones; and

(5) establish a process by which qualified entities, including colleges, universities, public and private companies, and non-profit research organizations, will be permitted to use a broad range of radio frequencies for research and experimentation on a non-interference basis without having to obtain prior authorization from the Commission for the use of specific frequencies.

SEC. 514. REPURPOSING FEDERAL SPECTRUM FOR COMMERCIAL PURPOSES AND FEDERAL SPECTRUM SHARING.

(a) ELIGIBLE FEDERAL ENTITIES.—Section 113(g)(1) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(1)) is amended to read as follows:

"(1) ELIGIBLE FEDERAL ENTITIES.—Any Federal entity that operates a Federal Government sta-

tion authorized to use a band of frequencies specified in paragraph (2) and that incurs relocation costs because of planning for a potential auction of spectrum frequencies, a planned auction of spectrum frequencies, or the reallocation of spectrum frequencies from Federal use to exclusive non-Federal use, or shared Federal and non-Federal use shall receive payment for such costs from the Spectrum Relocation Fund, in accordance with section 118 of this Act. For purposes of this paragraph, Federal power agencies exempted under subsection (c)(4) that choose to relocate from the frequencies identified for reallocation pursuant to subsection (a), are eligible to receive payment under this paragraph.".

(b) ELIGIBLE FREQUENCIES.—Section 113(g)(2)(B) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(2)(B)) is amended to read as follows:

"(B) any other band of frequencies reallocated from Federal use to non-Federal or shared use, whether for licensed or unlicensed use, after January 1, 2003, that is assigned—

"(i) by competitive bidding pursuant to section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)); or

"(ii) as a result of an Act of Congress or any other administrative or executive direction.".

(c) DEFINITION OF RELOCATION AND SHARING COSTS.—Section 113(g)(3) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(3)) is amended to read as follows:

"(3) DEFINITION OF RELOCATION AND SHARING COSTS.—For purposes of this subsection, the terms 'relocation costs' and 'sharing costs' mean the costs incurred by a Federal entity to plan for a potential or planned auction or sharing of spectrum frequencies to achieve comparable capability of systems, regardless of whether that capability is achieved by relocating to a new frequency assignment, relocating a Federal Government station to a different geographic location, modifying Federal Government equipment to mitigate interference or use less spectrum, in terms of bandwidth, geography, or time, and thereby permitting spectrum sharing (including sharing among relocated Federal entities and incumbents to make spectrum available for non-Federal use) or relocation, or by utilizing an alternative technology. Comparable capability of systems includes the acquisition of state-of-the art replacement systems intended to meet com-

parable operational scope, which may include incidental increases in functionality, including those necessary to achieve security, reliability, and resiliency. Such costs include—

"(A) the costs of any modification or replacement of equipment, spares, associated ancillary equipment, software, facilities, operating manuals, training costs, or regulations that are attributable to relocation or sharing;

"(B) the costs of all engineering, equipment, software, site acquisition, and construction costs, as well as any legitimate and prudent transaction expense, including term-limited Federal civil servant and contractor staff necessary to carry out the relocation activities of an eligible Federal entity, and reasonable additional costs incurred by the Federal entity that are attributable to relocation or sharing, including increased recurring costs associated with the replacement of facilities;

"(C) the costs of research, engineering studies, economic analyses, or other expenses reasonably incurred in connection with—

"(i) calculating the estimated relocation costs that are provided to the Commis-

sion pursuant to paragraph (4) of this subsection, or in calculating the estimated sharing costs;

"(ii) determining the technical or operational feasibility of relocation to 1 or more potential relocation bands; or

"(iii) planning for or managing a relocation or sharing project (including spectrum coordination with auction winners) or potential relocation or sharing project;

"(D) the one-time costs of any modification of equipment reasonably necessary to accommodate commercial use of shared frequencies or, in the case of frequencies reallocated to exclusive commercial use, prior to the termination of the Federal entity's primary allocation or protected status, when the eligible frequencies as defined in paragraph (2) of this subsection are made available for private sector uses by competitive bidding and a Federal entity retains primary allocation or protected status in those frequencies for a period of time after the completion of the competitive bidding process;

"(E) the costs associated with the accelerated replacement of systems and equipment if

such acceleration is necessary to ensure the timely relocation of systems to a new frequency assignment or the timely accommodation of sharing of Federal frequencies; and

"(F) the costs of the use of commercial systems (including systems not utilising spectrum) to replace Federal systems discontinued or relocated pursuant to this Act, including lease (including lease of land), subscription, and equipment costs over an appropriate period, such as the anticipated life of an equivalent Federal system or other period determined by the Director of the Office of Management and Budget.".

(d) SPECTRUM SHARING.—Section 113(g) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)) is amended by adding at the end the following:

"(7) SPECTRUM SHARING.—A Federal entity is permitted to allow access to its frequency assignments by a non-Federal entity upon approval of NTIA, in consultation with the Director of the Office of Management and Budget. Such non-Federal entities shall comply with all applicable rules of the Commission and the NTIA, including any regulations promulgated pursuant to this section. Any remuneration as-

sociated with such access shall be deposited into the Spectrum Relocation Fund established under section 118. A Federal entity that incurs costs as a result of such access is eligible for payment from the Fund for the purposes specified in paragraph (3) of this section. The revenue associated with such access shall be at least 110 percent of the estimated Federal costs.".

(e) SPECTRUM RELOCATION FUND.—Section 118 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 928) is amended—

(1) in subsection (b), by inserting before the period at the end the following: "and any payments made by non-Federal entities for access to Federal spectrum pursuant to section 113(g)(7) (47 U.S.C. 113(g)(7))";

(2) by amending subsection (c) to read as follows:

"(c) USE OF FUNDS.—

"(1) FUNDS FROM AUCTIONS.—The amounts in the Fund from auctions of eligible frequencies are authorized to be used to pay relocation costs, as such costs are defined in section 113(g)(3), of an eligible Federal entity incurring such costs with respect to relocation from any eligible frequency.

"(2) FUNDS FROM PAYMENTS BY NON-FEDERAL ENTITIES.—The amounts in the Fund from payments by non-Federal entities for access to Federal spectrum are authorized to be used to pay the sharing costs, as such costs are defined in section 113(g)(3), of an eligible Federal entity incurring such costs.

"(3) TRANSFER OF FUNDS.—

"(A) IN GENERAL.—Subject to subparagraph (B), the Director of OMB may transfer at any time (including prior to any auction or contemplated auction, or sharing initiative) such sums as may be available in the Fund to an eligible Federal entity to pay eligible relocation or sharing costs related to pre-auction estimates or research, as such costs are described in section 113(g)(3)(C).

"(B) NOTIFICATION.—No funds may be transferred pursuant to subparagraph (A) unless the notification provided under subsection (d)(2)(B) of this section includes a certification from the Director of OMB that—

"(i) funds transferred before an auction will likely allow for a timely relocation, thereby increasing net expected auction proceeds by an amount equal to or

greater than the time value of the amount of funds transferred; and

"(ii) the auction is intended to occur within 5 years of transfer of funds.

"(C) APPLICABILITY.—

"(i) PRIOR COSTS INCURRED.—The Director of OMB may transfer up to $10,000,000 to eligible Federal entities for eligible relocation or sharing costs related to pre-auction estimates or research, as such costs are described in section 113(g)(3)(C), for costs incurred prior to the date of the enactment of the Public Safety Spectrum and Wireless Innovation Act, but after June 28th, 2010.

"(ii) SUPPLEMENT NOT SUPPLANT.—Any amounts transferred by the Director of OMB pursuant to clause (i) shall be in addition to any amounts that the Director of OMB may transfer after the date of the enactment of the Public Safety Spectrum and Wireless Innovation Act.";

(3) in subsection (d)—

(A) in paragraph (1), by inserting "and sharing" before "costs";

(B) in paragraph (2)(B)—

(i) by inserting "and sharing" before "costs"; and

(ii) by inserting "and sharing" before the period at the end; and

(C) by amending paragraph (3) to read as follows:

"(3) REVERSION OF UNUSED FUNDS.—

"(A) IN GENERAL.—Any amounts in the Fund that are remaining after the payment of the relocation and sharing costs that are payable from the Fund shall revert to and be deposited in the General Fund of the Treasury not later than 8 years after the date of the deposit of such proceeds to the Fund, unless within 60 days in advance of the reversion of such funds, the Director of OMB, in consultation with the Assistant Secretary for Communications and Information, notifies the appropriate committees of Congress that such funds are needed to complete or to implement current or future relocations or sharing initiatives.

"(B) DEFINITION.—In this paragraph, the term 'appropriate committees of Congress' means

"(i) the Committee on Appropriations of the Senate;

"(ii) the Committee on Commerce, Science, and Transportation of the Senate;

"(iii) the Committee on Appropriations of the House of Representatives; and

"(iv) the Committee on Energy and Commerce of the House of Representatives.";

(4) in subsection (e)(2)—

(A) by inserting "and sharing" before "costs";

(B) by inserting "or sharing" before "is complete"; and

(C) by inserting "or sharing" before "in accordance"; and

(5) by adding at the end the following:

"(f) ADDITIONAL PAYMENTS FROM THE FUND.—Notwithstanding subsections (c) through (e), after the date of the enactment of the Public Safety Spectrum and Wireless Innovation Act, and following the credit of any amounts specified in subsection (b), there are hereby appropriated from the Fund and available to the Director of the OMB up to 10 percent of the amounts deposited in the Fund from the auction of licenses for frequencies of spectrum vacated by Federal entities, or up to 10 percent of the amounts de-

posited in the Fund by non-Federal entities for sharing of Federal spectrum. The Director of OMB, in consultation with the Assistant Secretary for Communications and Information, may use such amounts to pay eligible Federal entities for the purpose of encouraging timely access to such spectrum, provided that—

"(1) any such payment by the Director of OMB is based on the market value of the spectrum, the timeliness with which the licensee cleared its use of such spectrum, and the need for such spectrum in order for the Federal entity to conduct its essential missions;

"(2) any such payment by the Director of OMB is used to carry out the purposes specified in subparagraphs (A) through (F) of paragraph (3) of subsection 113(g) to achieve enhanced capability for those systems affected by reallocation of Federal spectrum to commercial use, or by sharing of Federal frequencies with non-Federal entities;

"(3) the amount remaining in the Fund after any such payment by the Director is not less than 10 percent of the winning bids in the relevant auction, or is not less than 10 percent of the payments from non-Federal entities in the relevant sharing agreement; and

"(4) any such payment by the Director shall not be made until 30 days after the Director has notified the Committees on Appropriations and Commerce, Science, and Transportation of the Senate, and the Committees on Appropriations and Energy and Commerce of the House of Representatives.".

(f) COMPETITIVE BIDDING; TREATMENT OF REVENUES.—Subparagraph (D) of section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)) is amended by inserting "excluding frequencies identified by the Federal Communications Commission to be auctioned in conjunction with eligible frequencies described in section 113(g)(2)" before "shall be deposited".

(g) PUBLIC DISCLOSURE AND NONDISCLOSURE.—If the head of an executive agency of the Federal Government determines that public disclosure of any information contained in notifications and reports required by sections 113 or 118 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923 and 928) would reveal classified national security information or other information for which there is a legal basis for nondisclosure and such public disclosure would be detrimental to national security, homeland security, public safety, or jeopardize law enforcement investigations, the head of the executive agency shall notify the NTIA of that deter-

mination prior to release of such information. In that event, such classified information shall be included in a separate annex, as needed. These annexes shall be provided to the appropriate subcommittee in accordance with appropriate national security stipulations, but shall not be disclosed to the public or provided to any unauthorized person through any other means.

SEC. 515. REPORT ON SPECTRUM SHARING.

(a) IDENTIFICATION OF SPECTRUM; REPORT TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, the NTIA shall conduct a study and submit a report to the appropriate committees of Congress—

(1) that identifies spectrum between 225 MHz and 3700 MHz operated or licensed by a Federal entity that the NTIA, in consultation with the Commission, determines appropriate for sharing with non-government entities or non-Federal government entities, including, after taking into account any spectrum identified by the NTIA in its October 2010 report entitled "An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz, 4380-4400 MHz Bands", the additional 100 MHz most likely to be appropriate for wireless broadband operations; and

(2) on how Federal entities can utilize dynamic spectrum sharing technologies to allow non-government entities or non-Federal government entities to share underutilized spectrum without interference to the primary usage by the Federal Government of that spectrum, including through use of cognitive radio and sensing technologies and database and geolocation approaches.

(b) CONSIDERATIONS.—In carrying out the study and report required under subsection (a), the NTIA should consider—

(1) radio systems that are utilized in fixed or predictable geographic locations;

(2) radio systems that are only utilized intermittently at fixed or predictable times;

(3) spectrum allocations in which radio systems are currently not deployed; and

(4) spectrum that is harmonized regionally or globally.

(c) PUBLIC CONSULTATION AND RULE CHANGES.—

(1) IN GENERAL.—Not later than 6 months after the report required under subsection (a) is submitted, the NTIA shall conduct a public consultation and, with the Interdepartment Radio Advisory Committee,

develop rules for Federal users to increase spectrum sharing by Federal entities.

(2) CONSIDERATIONS.—In carrying out the rulemaking required under paragraph (1), the NTIA shall consider—

(A) the findings of the report required under subsection (a); and

(B) the recommendations in the Final Report, dated November 8, 2010, issued by the Interference and Dynamic Spectrum Access Subcommittee of the Commerce Spectrum Management Advisory Committee.

Subtitle C—Efficiency and Management

SEC. 521. FUNCTIONAL RESPONSIBILITY OF THE NTIA TO ENSURE EFFICIENT USE OF SPECTRUM.

Section 103(b)(2) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 902(b)(2)) is amended—

(1) by redesignating subparagraphs (B) through (T) as subparagraphs (C) through (U), respectively; and

(2) by inserting after subparagraph (A) the following:

"(B) The responsibility to promote the best possible and most efficient use of electromagnetic spectrum resources across the Federal Government, subject to and consistent with the needs and missions of Federal agencies.".

SEC. 522. SPECTRUM EFFICIENCY ANALYTIC TOOLS.

(a) IN GENERAL.—Not later than 18 months after the date of enactment of this title, the NTIA, in consultation with NIST and the Commission, as appropriate, shall develop analytic tools or metrics for the NTIA and Federal entities to measure the spectrum efficiency of Federal spectrum systems used by such entities.

(b) REQUIRED CONSIDERATION.—In developing the tools or metrics to measure spectrum efficiency pursuant to subsection (a)(1), the NTIA shall consider the conclusions reached in the report entitled "Definitions of Efficiency in Spectrum Use", authored by the Commerce Spectrum Management Advisory Committee and dated October 1, 2008.

SEC. 523. STUDY ON RECEIVER PERFORMANCE AND SPECTRUM EFFICIENCY.

(a) IN GENERAL.—The Comptroller General of the United States shall conduct a study to consider efforts to ensure that each transmission system that employs radio spectrum is designed and operated so that reasonable use

of adjacent spectrum does not excessively impair the functioning of such system.

(b) REQUIRED CONSIDERATIONS.—At a minimum, the study required under subsection (a) shall consider—

(1) the value of—

(A) improving receiver performance as it relates to increasing spectral efficiency;

(B) improving operation of services in adjacent frequencies; and

(C) narrowing the guard bands between adjacent spectrum use.

(2) the role of manufacturers, commercial licensees, and government users with respect to their transmission systems and use of adjacent spectrum described in subsection (a);

(3) the feasibility of industry self-compliance with respect to the design and operational requirements of transmission systems and the reasonable use of adjacent spectrum described in subsection (a); and

(4) the value of Commission and NTIA action to establish, by rule, technical requirements or standards for non-Federal or Federal use, respectively, with respect to the reasonable use of adjacent spectrum described in subsection (a).

(c) DEFINITION.—For purposes of this section, the term "transmission system" means any telecommunications, broadcast, satellite, commercial mobile service, or other communications system that employs radio spectrum.

(d) REPORT.—Not later than 1 year after the date of enactment of this Act, the Comptroller General of the United States shall submit a report to the appropriate committees of Congress on the results of the study required under subsection (a).

SEC. 524. FREQUENCY ASSIGNMENT.

(a) EXAMINATION.—Not later than 6 months after the date of enactment of this title, the NTIA, in consultation with the Interdepartment Radio Advisory Committee, shall—

(1) examine its frequency assignment processes, including the 5-year frequency assignment review program, and

(2) consider best practices to determine if the current approach for collecting and validating data from Federal entities can be streamlined or improved to help ensure that such entities are managing current and future spectrum assignments efficiently.

(b) REQUIRED CONSIDERATIONS.—In carrying out the requirements of subsection (a), the NTIA shall consider—

(1) providing Federal entities with specific guidance or requirements on how to justify to the NTIA that requested spectrum frequency assignments would fulfill an established mission need and that other means of communication are not appropriate or available;

(2) requiring Federal entities to submit documentation, as part of the spectrum frequency assignment process;

(3) verifying that such entity has completed an analysis to support the use and need of the requested assignment; and

(4) requiring managers of spectrum resources at each Federal entity to validate, verify, or attest to the accuracy of spectrum information submitted by their entity to the NTIA.

SEC. 625. SPECTRUM OPPORTUNITY COST TRANSPARENCY.

(a) ANALYSIS OF ECONOMIC OPPORTUNITY COST.—

(1) DEVELOPMENT OF FRAMEWORK.—

(A) IN GENERAL.—Not later than 1 year after the date of enactment of this title, the NTIA, in consultation with the Commission and the Director of the Office of Management and Budget, shall develop a framework for determining the annual economic opportunity cost of

each specific Federal spectrum band assigned or otherwise allocated for use by Federal entities.

(B) CONSIDERATIONS.—In developing the framework required under subparagraph (A), the NTIA shall take into account the spectrum pricing methodologies adopted by other countries which utilize administered incentive pricing of spectrum for government users.

(2) SCOPE.—The framework developed under paragraph (1) shall cover all Federally allocated spectrum bands between 150 MHz and 6000 MHz, inclusive.

(3) GOALS.—The goal of the framework developed under paragraph (1) is—

(A) to provide Federal entities with a sustained long-term signal of spectrum value to inform the spectrum management decisions of such entities; and

(B) to provide the public with increased transparency about how Federal entities use a scare physical resource.

(4) REQUIREMENTS.—The framework developed under paragraph (1) shall—

(A) define the term "opportunity cost" as the value of the spectrum, in dollar terms, as if

such spectrum were to be reallocated to the highest commercial alternative use that currently does not have access to that spectrum;

(B) be updated, on an annual basis, to take into account observed market valuations from spectrum auctions, secondary spectrum trading, and other market indicators of spectrum value;

(C) determine the opportunity costs borne by each Federal entity for each spectrum band that is entirely under the control of a single agency; and

(D) determine the opportunity costs for spectrum assigned or otherwise allocated to Federal entities for both primary use and secondary use.

(b) REPORT ON OPPORTUNITY COSTS.—Each Federal entity that has been assigned or otherwise allocated use of a Federal spectrum band shall report, as an off-budget item, the opportunity cost borne by the entity for each spectrum band the entity uses—

(1) in the budget of the entity to be included in the budget of the United States Government submitted by the President under section 1105 of title 31, United States Code; and

(2) in the annual financial statement of the entity required to be filed under section 3515 of title 31, United States Code.

(c) SPECTRUM VALUE ANALYSIS.—Not later than 5 years after the date of the enactment of this title, and every 5 years thereafter, each Federal entity that has been assigned or otherwise allocated use of a Federal spectrum band, or otherwise utilizes such spectrum, shall engage in an analysis comparing the opportunity cost of that spectrum, as such cost is determined by the framework developed by the NTIA under subsection (a), to the projected costs of the entity relocating to other government spectrum holdings, co-locating with other government agencies, leasing other non-Federal spectrum, or contracting out for its spectrum activities.

(d) SPECTRUM TECHNOLOGY STUDY.—

(1) IN GENERAL.—Not later than 18 months after the date of the enactment of this title, and every 5 years thereafter, the Comptroller General of the United States, in consultation with NTIA, shall examine the technologies and equipment used by Federal entities operating on Federal spectrum allocations and determine if such technologies and equipment are the most spectrum efficient available.

(2) CERTAIN DETERMINATIONS MADE.—If the results of any study required under paragraph (1) determines that the technologies and equipment of Federal entities operating on Federal spectrum allocations are not the most spectrum efficient available, the Comptroller General shall determine—

(A) what the costs would be to upgrade such systems to more up-to-date and readily available systems;

(B) what benefits would be gained from upgrading, particularly any cost savings or increases in spectrum utilization efficiency; and

(C) if there are any possible problems with upgrading to more up-to-date systems.

SEC. 526. SYSTEM CERTIFICATION.

Not later than 6 months after the date of enactment of this title, the Director of the Office of Management and Budget shall update and revise section 33.4 of OMB Circular A–11 to reflect the recommendations regarding such Circular made in the Commerce Spectrum Management Advisory Committee Incentive Subcommittee report, adopted January 11, 2011.

SEC. 527. REPORT TO CONGRESS ON IMPROVING SPECTRUM MANAGEMENT.

Not later than 3 months after the date of enactment of this title, the NTIA shall submit to the appropriate committees of Congress a report on the status of the NTIA's plan to implement the recommendations contained in the "President's Memorandum on Improving Spectrum Management for the 21st Century", 49 Weekly Comp. Pres. Doc. 2875, Nov. 29, 2004.

SEC. 528. WIRELESS FACILITIES DEPLOYMENT.

(a) FACILITY MODIFICATIONS.—

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 or any other provision of law, a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower that does not substantially change the physical dimensions of such tower.

(2) ELIGIBLE FACILITIES REQUEST.—For purposes this subsection, the term "eligible facilities request" means any request for modification of an existing wireless tower that involves—

(A) collocation of new transmission equipment;

(B) removal of transmission equipment; and

(C) replacement of transmission equipment.

(b) FEDERAL EASEMENTS AND RIGHTS-OF-WAY.—

(1) GRANT.—If an executive agency, a State, a political subdivision or agency of a State, or a person, firm, or organization applies for the grant of an easement or rights-of-way to, in, over, or on a building owned by the Federal Government for the right to install, construct, and maintain wireless service antenna structures and equipment, and backhaul transmission, the executive agency having control of the building may grant to the applicant, on behalf of the Federal Government, an easement or rights-of-way to perform such installation, construction, and maintenance.

(2) APPLICATION.—The Administrator of the General Services Administration shall develop a common form for rights-of-way applications required under paragraph (1) for all executive agencies that shall be used by applicants with respect to the buildings or property of each such agency.

(3) FEE.—

(A) IN GENERAL.—Notwithstanding any other provision of law, in making a grant of an easement or rights-of-way pursuant to paragraph (1), the Administrator of the General

Services Administration shall establish a fee for the award of such grant that is based on direct cost recovery.

(B) EXCEPTIONS.—The Administrator of the General Services Administration may establish exceptions to the fee amount required under subparagraph (A)—

(i) in consideration of the public benefit provided by a grant of an easement or rights-of-way; and

(ii) in the interest of expanding wireless and broadband coverage.

(4) USE OF FEES COLLECTED.—Any fee amounts collected by an executive agency pursuant to paragraph (2) shall be made available, without further appropriation, to such agency for purposes of the agency's telecommunications and information technology needs and any excess funds shall then be deposited into the Federal Building Fund.

(c) MASTER CONTRACTS FOR WIRELESS TOWER SITINGS.—

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 or any other provision of law, and not later than 60 days after the

date of enactment of this Act, the Administrator of the General Services Administration shall—

(A) develop 1 or more master contracts that shall govern the placement of wireless service antenna structures on buildings and property owned by the Federal Government; and

(B) in developing the master contract, with respect to the siting of wireless service antenna structures, standardize the treatment of the placement of wireless service antenna structures on rooftop or building facades, the placement of equipment on rooftops or inside buildings, and technology, and any other key issues that the Administrator determines appropriate.

(2) APPLICABILITY.—The master contract developed by the Administrator of the General Services Administration under paragraph (1) shall apply to all publicly accessible property owned by the Federal Government, unless the Administrator decides that issues with respect to the siting of a wireless service antenna structure on a specific building or property warrant nonstandard treatment of a specific property.

(3) APPLICATION.—The Administrator of the General Services Administration shall develop a com-

mon form or set of forms for wireless service antenna structure siting applications required under this section for all executive agencies that shall be used by applicants with respect to the buildings of each such agency.

TITLE VI—STUDIES ON NEXT GENERATION 9-1-1 SERVICES

SEC. 601. DEFINITIONS.

As used in this title, the following definitions shall apply:

(1) 9–1–1 SERVICES.—The term "9–1–1 services" includes both E9–1–1 services and Next Generation 9–1–1 services.

(2) E9–1–1 SERVICES.—The term "E9–1–1 services" means both phase I and phase II enhanced 9–1–1 services, as described in section 20.18 of the Commission's regulations (47 C.F.R. 20.18), as in effect on the date of enactment of this title, or as subsequently revised by the Commission.

(3) NEXT GENERATION 9–1–1 SERVICES.—The term "Next Generation 9–1–1 services" means an IP-based system comprised of hardware, software, data, and operational policies and procedures that—

(A) provides standardized interfaces from emergency call and message services to support emergency communications;

(B) processes all types of emergency calls, including voice, data, and multimedia information;

(C) acquires and integrates additional emergency call data useful to call routing and handling;

(D) delivers the emergency calls, messages, and data to the appropriate public safety answering point and other appropriate emergency entities;

(E) supports data or video communications needs for coordinated incident response and management; or

(F) provides broadband service to public safety answering points or other first responder entities.

(4) PUBLIC SAFETY ANSWERING POINT.—The term "public safety answering point" has the meaning given the term in section 222 of the Communications Act of 1934 (47 U.S.C. 222).

SEC. 602. NHTSA REPORT ON COSTS FOR REQUIREMENTS AND SPECIFICATIONS OF NEXT GENERATION 9–1–1 SERVICES.

(a) IN GENERAL.—Not later than 1 year after the date of enactment of this title, the Administrator of the National Highway Traffic Safety Administration, in consultation with the Commission and the Secretary of Homeland Security, shall prepare and submit a report to Congress that analyzes and determines detailed costs for specific Next Generation 9–1–1 service requirements and specifications.

(b) PURPOSE OF REPORT.—The purpose of the report required under subsection (a) is to serve as a resource for Congress as it considers creating a coordinated, long-term funding mechanism for the deployment and operation, accessibility, application development, equipment procurement, and training of personnel for Next Generation 9–1–1 services.

(c) REQUIRED INCLUSIONS.—The report required under subsection (a) shall include the following:

(1) How costs would be broken out geographically and/or allocated among public safety answering points, broadband service providers, and third-party providers of Next Generation 9-1-1 services.

(2) An assessment of the current state of Next Generation 9–1–1 service readiness among public safety answering points.

(3) How differences in public safety answering points' access to broadband across the country may affect costs.

(4) A technical analysis and cost study of different delivery platforms such as wireline, wireless, and satellite.

(5) An assessment of the architectural characteristics, feasibility, and limitations of Next Generation 9–1–1 service delivery.

(6) An analysis of the needs for Next Generation 9–1–1 service of persons with disabilities.

(7) Standards and protocols for Next Generation 9–1–1 service and for incorporating Voice over Internet Protocol and "Real-Time Text" standards.

SEC. 603. FCC RECOMMENDATIONS FOR LEGAL AND STATUTORY FRAMEWORK FOR NEXT GENERATION 9–1–1 SERVICES.

Not later than 1 year after the date of enactment of this title, the Commission, in coordination with the Secretary of Homeland Security and the Administrator of the National Highway Traffic Safety Administration, shall prepare and submit a report to Congress that contains recommendations for the legal and statutory framework for Next Generation 9–1–1 services, consistent with recommendations in the National Broadband Plan developed *by the Commission pursuant to Public Law 111–5, including the following:*

(1) A legal and regulatory framework for the development of Next Generation 9–1–1 services and the transition from legacy 9–1–1 to Next Generation 9–1–1 networks.

(2) Legal mechanisms to ensure efficient and accurate transmission of 9–1–1 caller information to emergency response agencies.

(3) Recommendations for removing jurisdictional barriers and inconsistent legacy regulations including—

(A) proposals that would require States to remove regulatory roadblocks to Next Generation 9–1–1 services development, while recognizing existing State authority over 9–1–1 services;

(B) eliminating outdated 9–1–1 regulations at the Federal level; and

(C) preempting inconsistent State regulations.

TITLE VII—MISCELLANEOUS

SEC. 701. SEVERABILITY.

If any provision of this Act or an amendment made by this Act, or the application of the provision to any person or circumstance, is held to be unconstitutional, the re-

mainder of this Act and the amendments made by this Act, and the application of the provisions of this Act and the amendments made by this Act to any other person or circumstance, shall not be affected thereby.

SEC. 702. RULE OF CONSTRUCTION.

Nothing in this Act shall be construed as adding or subtracting from the authority the Commission may or may not have to regulate broadband Internet access service.

TITLE VIII—COMPLIANCE WITH STATUTORY PAY-AS-YOU-GO ACT

SEC. 801. BUDGET COMPLIANCE.

The budgetary effects of this Act, for the purpose of complying with the Statutory Pay-As-You-Go-Act of 2010, shall be determined by reference to the latest statement titled "Budgetary Effects of PAYGO Legislation" for this Act, submitted for printing in the Congressional Record by the Chairman of the Senate Budget Committee, provided that such statement has been submitted prior to the vote on passage.

II

112TH CONGRESS
1ST SESSION

S. 28

To amend the Communications Act of 1934 to provide public safety providers an additional 10 megahertz of spectrum to support a national, interoperable wireless broadband network and authorize the Federal Communications Commission to hold incentive auctions to provide funding to support such a network, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JANUARY 25 (legislative day, JANUARY 5), 2011

Mr. ROCKEFELLER (for himself, Mr. LAUTENBERG, Mr. NELSON of Florida, Ms. KLOBUCHAR, Mr. CARDIN, and Mr. HARKIN) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

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A BILL

To amend the Communications Act of 1934 to provide public safety providers an additional 10 megahertz of spectrum to support a national, interoperable wireless broadband network and authorize the Federal Communications Commission to hold incentive auctions to provide funding to support such a network, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Public Safety Spectrum and Wireless Innovation Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act:

(1) 700 MHZ BAND.—The term "700 MHz band" means the portion of the electromagnetic spectrum between the frequencies from 698 megahertz to 806 megahertz.

(2) 700 MHZ D BLOCK SPECTRUM.—The term "700 MHz D block spectrum" means the portion of the electromagnetic spectrum between the frequencies from 758 megahertz to 763 megahertz and between the frequencies from 788 megahertz to 793 megahertz.

(3) ASSISTANT SECRETARY.—The term "Assistant Secretary" means the Assistant Secretary of Commerce for Communications and Information.

(4) COMMISSION.—The term "Commission" means the Federal Communications Commission.

(5) CONSTRUCTION FUND.—The term "construction fund" means the fund established in section 201(a)(1)(A).

(6) EXISTING PUBLIC SAFETY BROADBAND SPECTRUM.—The term "existing public safety broadband spectrum" means the portion of the electromagnetic spectrum between the frequencies from 763 megahertz to 768 megahertz and between the frequencies from 793 megahertz to 798 megahertz.

(7) MAINTENANCE AND OPERATION FUND.—The term "maintenance and operation fund" means the fund established in section 201(a)(2)(A).

(8) NARROWBAND SPECTRUM.—The term "narrowband spectrum" means the portion of the electromagnetic spectrum between the frequencies from 769 megahertz to 775 megahertz and between the frequencies from 799 megahertz to 805 megahertz.

(9) NTIA.—The term "NTIA" means the National Telecommunications and Information Administration.

TITLE I—NATIONWIDE INTEROPERABLE PUBLIC SAFETY BROADBAND NETWORK

SEC. 101. ESTABLISHMENT OF NETWORK.

(a) IN GENERAL.—The Commission shall take all actions necessary to ensure the deployment of a nationwide public safety interoperable broadband network in the 700 MHz band, including—

(1) developing and implementing nationwide technical and operational requirements for the network;

(2) adopting any rules necessary to achieve interoperability in the network; and

(3) adopting user authentication and encryption requirements for the network.

(b) COVERAGE.—The Commission shall ensure that the network is deployed and interoperable in rural, as well as urban, areas, including necessary build out of communications infrastructure in rural areas to accommodate network access and functionality.

SEC. 102. REALLOCATION OF D BLOCK TO PUBLIC SAFETY.

(a) REALLOCATION OF D BLOCK.—

(1) IN GENERAL.—The Commission shall reallocate the 700 MHz D block spectrum for use by public safety entities in accordance with the provisions of this Act.

(2) SPECTRUM ALLOCATION.—Section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)) is amended—

(A) by striking "24" in paragraph (1) and inserting "34"; and

(B) by striking "36" in paragraph (2) and inserting "26".

(b) INTEGRATION WITH EXISTING PUBLIC SAFETY BROADBAND SPECTRUM.—The Commission shall—

(1) determine the licensing for the 700 MHz D block spectrum reallocated under section 337 of the Communications Act of 1934 (47 U.S.C. 337), as amended by subsection (a);

(2) determine how best to integrate the 700 MHz D block spectrum reallocated with the existing public safety spectrum; and

(3) determine whether the 20 megahertz of public safety broadband spectrum should be licensed on a nationwide, regional, or statewide basis, or some combination thereof, in accordance with the public interest.

SEC. 103. FLEXIBLE USE OF NARROWBAND SPECTRUM.

The Commission shall allow the narrowband spectrum to be used in a flexible manner, including usage for public safety broadband communications, subject to such technical and interference protection measures as the Commission may require.

SEC. 104. SECONDARY USE OF PUBLIC SAFETY SPECTRUM.

(a) IN GENERAL.—Notwithstanding section 337 of the Communications Act of 1934 (47 U.S.C. 337), the Commission may authorize any public safety licensee or licensees to allow access to spectrum licensed to such licensee or licensees to non-public safety governmental users, commercial users, utilities, including organizations providing or operating critical infrastructure, including electric, gas, and water utilities, and other Federal agencies and departments.

(b) LIMITATIONS AND CONDITIONS.—The Commission shall—

(1) authorize the provision of access to such spectrum only on a secondary basis;

(2) require secondary access agreements to be in writing and to be submitted to the Commission for review and approval;

(3) require that the public safety entity retain the right to use any such spectrum on a primary, preemptible basis;

(4) consider whether it is in the public interest to require multiple secondary leases per licensee; and

(5) require that all funds received from such secondary access pursuant to such written agreements be reinvested in the public safety interoperable broadband network by using such funds only for constructing, maintaining, improving, or purchasing equipment to be used in conjunction with the network, by deposit into the Mainteuance and Operation Fund established by section 201 or otherwise.

SEC. 105. INTEROPERABILITY.

(a) IN GENERAL.—The Commission shall ensure that the nationwide public safety broadband network is fully interoperable on a nationwide basis.

(b) TECHNICAL AND OPERATIONAL RULES.—

(1) INSURING INTEROPERABILITY.—The Commission shall establish technical and operational rules to ensure nationwide interoperability, including rules that—

(A) establish requirements for nationwide roaming ability among any licensee, licensees, lessees, and secondary users;

(B) will ensure the safety of State broadband public safety networks, including requirements for protecting and monitoring the network to protect against cyber-attack;

(C) will promote competition in the device market for public safety communications by requiring devices for use on a public safety network to be—

(i) built to open standards;

(ii) capable of being used by any vendor and across all public safety systems; and

(iii) backward-compatible with existing second and third generation commercial networks;

(D) authorize public safety entities to execute partnerships with other public or private entities to build or operate the State's public safety broadband network;

(E) encourage public safety entities to utilize, to the greatest extent possible, existing commercial, State, or Federal Government infrastructure;

(F) will ensure that the interoperability plan includes integration with 9–1–1 call centers; and

(G) require any licensee or licensees to file annual reports on—

(i) the status of public safety broadband network construction and interoperability; and

(ii) the status and deployment of existing public safety broadband and narrowband systems.

(2) FACTORS TO BE CONSIDERED.—In carrying out paragraph (1), the Commission shall, at a minimum, consider—

(A) the extent to which particular technologies and user equipment are, or are likely to be, available in the commercial marketplace;

(B) the availability of necessary technologies and equipment on reasonable and nondiscriminatory licensing terms; and

(C) the ability of particular technologies and equipment—

(i) to evolve with technological developments in the commercial marketplace; and

(ii) to accommodate prioritization for public safety transmissions.

(c) RFP STANDARDS.—

(1) IN GENERAL.—The Commission shall establish procedural and substantive requirements for requests for proposals related to the nationwide public safety broadband network that—

(A) require such requests to meet the technical requirements under subsection (b) that ensure interoperability of the broadband network to which it relates and ensure that nothing will interfere with such interoperability;

(B) limit the authority for issuing such requests to States or mnlti-State organizations, except to the extent delegated to an agency or political subdivision;

(C) will ensure that the request-for-proposals process is open, transparent, and competitive;

(D) require any such request—

(i) to be issued on a Statewide or multi-State basis and to be coordinated with the appropriate State chief executive or the executive's designee;

(ii) to demonstrate that the State has a plan for interoperability, with provision for both urban and rural build out; and

(iii) to cover any necessary relocation of incumbent narrowband operations in the existing public safety broadband spectrum;

(E) authorize States to issue requests for proposals that will build on a State broadband network; and

(F) require the term of any contract under the process to be reasonable and, in any event, for less than the term of the underlying license.

(2) MODEL RFPS.—The Commission may encourage the use of the requests-for-proposal model or form developed by the Government Accountability Office under section 207 of this Act.

(d) RURAL BUILD OUT REQUIREMENTS.—The Commission shall—

(1) establish rural build out targets for the public safety broadband network, including targets for States or smaller areas;

(2) require contracts awarded through the request-for-proposals process in connection with the network to include deployment phases with substantial rural coverage milestones as part of each phase where appropriate; and

(3) in collaboration with the Assistant Secretary, make funding for each build ont phase after

the first contingent on meeting build out targets for the preceding phase to the extent feasible.

(e) DEVELOPMENT AND MAINTENANCE OF INTEROPERABILITY, SECURITY, AND FUNCTIONALITY STANDARDS.—The Commission and through agreements executed with the National Institute of Standards and Technology, shall develop, maintain, and update such requirements and standards as may be necessary to ensure interoperability, security, and functionality.

(f) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Commission, for use by the Emergency Response and Interoperability Center in carrying out its responsibilities under this Act, $5,500,000 for each of fiscal years 2013 through 2018.

SEC. 106. COMMERCIAL NETWORK ROAMING AND PRIORITY ACCESS.

The Commission may adopt rules, if necessary in the public interest, to improve the ability of public safety networks to roam onto commercial networks and to gain priority access to commercial networks in an emergency if—

(1) the public safety entity equipment is technically compatible with the commercial network;

(2) the commercial network is reasonably compensated; and

(3) it is consistent with the public interest.

SEC. 107. PUBLIC SAFETY ADVISORY BOARD.

(a) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Commission shall establish a public safety advisory board to advise the Commission on—

(1) carrying out its duties under section 101; and

(2) the implementation of improvements to the public safety interoperable broadband network under that section.

(b) COMPOSITION.—The Commission shall determine the composition of the advisory board, which shall include, at a minimum, representatives from each of the following:

(1) State, local, and tribal governments.

(2) Public safety organizations.

(3) Providers of commercial mobile service.

(4) Manufacturers of communications equipment.

(c) REPORTS.—The Commission shall consult with the advisory board on any study or report on public safety spectrum.

(d) FACA INAPPLICABLE.—The Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to the advisory board.

(e) TERMINATION.—The advisory board shall terminate 10 years after the date of enactment of this Act.

TITLE II—FUNDING

SEC. 201. ESTABLISHMENT OF FUNDS.

(a) IN GENERAL.—

(1) CONSTRUCTION FUND.—

(A) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the Public Safety Interoperable Broadband Network Construction Fund.

(B) PURPOSE.—The Assistant Secretary shall establish and administer the grant program under section 202 using the funds deposited in the Construction Fund.

(C) CREDIT.—

(i) BORROWING AUTHORITY.—The Assistant Secretary may borrow from the general fund of the Treasury beginning on October 1, 2011, such sums as may be necessary, but not to exceed $2,000,000,000, to implement section 202.

(ii) REIMBURSEMENT.—The Secretary of the Treasury shall reimburse the general fund of the Treasury, without interest, for any amounts borrowed under clause (i) as funds are deposited into the Construction

Fund, but in no case later than December 31, 2015.

(2) MAINTENANCE AND OPERATION FUND.—

(A) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the Public Safety Interoperable Broadband Network Maintenance and Operation Fund.

(B) PURPOSE.—The Commission shall use the funds deposited in the Maintenance and Operation Fund to carry out section 203.

(b) TRANSFER OF FUNDS AT COMPLETION OF CONSTRUCTION.—The Secretary of the Treasury shall transfer to the Maintenance and Operation Fund any funds remaining in the Construction Fund after the date of the completion of the construction phase, as determined by the Assistant Secretary.

(c) TRANSFER OF FUNDS TO THE TREASURY.—The Secretary of the Treasury shall transfer to the general fund of the Treasury any funds remaining in the Maintenance and Operation Fund after the end of the 10-year period that begins after the date of the completion of the construction phase, as determined by the Assistant Secretary.

(d) AUTHORIZATION OF APPROPRIATIONS.—

(1) CONSTRUCTION FUND.—There are authorized to be appropriated to the Assistant Secretary for deposit in the Construction Fund in and after fiscal year 2013 such sums as necessary subject to paragraph (3).

(2) MAINTENANCE AND OPERATION FUND.—There are authorized to be appropriated to the Commission for deposit in the Maintenance and Operation Fund in and after fiscal year 2013 such sums as necessary subject to paragraph (3).

(3) LIMITATION.—The authorization of appropriations under paragraphs (1) and (2) may not exceed a total of $11,000,000,000.

SEC. 202. PUBLIC SAFETY INTEROPERABLE BROADBAND NETWORK CONSTRUCTION.

(a) CONSTRUCTION GRANT PROGRAM ESTABLISHMENT.—The Assistant Secretary, in consultation with the Commission, shall take such action as is necessary to establish a grant program to assist public safety entities to establish a nationwide public safety interoperable broadband network in the 700 MHz band.

(b) PROJECTS.—Grants may be made under this section for the construction of a public safety interoperable broadband network, including improvement of existing commercial and noncommercial networks and facilities and construction of new infrastructure to meet public safety requirements, as defined by the Commission, that operate as part of the public safety interoperable broadband network in the 700 MHz band.

(c) MATCHING REQUIREMENTS.—

(1) FEDERAL SHARE.—

(A) IN GENERAL.—The Federal share of the cost of carrying out a project under this section may not exceed 80 percent of the eligible costs of carrying out a project, as determined by the Assistant Secretary in consultation with the Commission.

(B) WAIVER.—The Assistant Secretary may waive, in whole or in part, the requirements of subparagraph (A) for good cause shown if it determines that such a waiver is in the public interest.

(2) NON-FEDERAL SHARE.—The non-Federal share of the cost of carrying out a project under this section may be provided through an in-kind contribution.

(d) REQUIREMENTS.—Not later than 6 months after the date of enactment of this Act, the Assistant Secretary, in consultation with the Commission, shall establish grant program requirements including the following:

(1) Demonstrated compliance with applicable Commission request-for-proposal and license terms and service rules, including interoperability and technical rules, construction requirements, and secondary use rules.

(2) Defining entities that are eligible to receive a grant under this section.

(3) Defining eligible costs for purposes of subsection (c)(1).

(4) Determining the scope of network infrastructure eligible for grant funding under this section.

(5) Prioritizing grants for projects that ensure coverage in rural as well as urban areas.

SEC. 203. PUBLIC SAFETY INTEROPERABLE BROADBAND MAINTENANCE AND OPERATION.

(a) MAINTENANCE AND OPERATION REIMBURSEMENT PROGRAM.—The Commission shall administer a program through which not more than 50 percent of maintenance and operational expenses associated with the public safety interoperable broadband network may be reimbursed from the Maintenance and Operation Fund for those expenses that are attributable to the maintenance, operation, and improvement of the public safety interoperable broadband network.

(b) REPORT.—Not later than 7 years after the date of enactment of this Act, the Commission shall submit to Congress a report on whether to continue to provide funding for the Maintenance and Operation Fund after the end of the 10-year period that begins after the date of the completion of the construction phase, as determined by the Assistant Secretary.

SEC. 204. AUCTION OF SPECTRUM.

(a) IN GENERAL.—

(1) IDENTIFICATION OF SPECTRUM.—Not later than 1 year after the date of enactment of this Act, the Assistant Secretary shall identify, at a minimum, 25 megahertz of contiguous spectrum at frequencies located between 1675 megahertz and 1710 megahertz, inclusive, to be made available for immediate reallocation.

(2) AUCTION.—Not later than January 31, 2014, the Commission shall conduct the auction of the licenses, by commencing the bidding, for the following:

(A) The spectrum between the frequencies of 2155 megahertz and 2180 megahertz, inclusive.

(B) The spectrum identified pursuant to paragraph (1).

(3) PROCEEDS.—The proceeds (including deposits and up front payments from successful bidders) from the auction shall be deposited in the Construction Fund.

(b) INCENTIVE SPECTRUM AUCTION AUTHORITY.—

(1) IN GENERAL.—Paragraph (8) of section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) is amended—

(A) by striking "(B), (D), and (E)," in subparagraph (A) and inserting "(B), (D), (E), and (F),"; and

(B) by adding at the end thereof the following:

"(F) INCENTIVE AUCTION AUTHORITY.—

"(i) AUTHORITY.—The Commission may if the Commission determines that it is consistent with the public interest in utilization of the spectrum for a licensee to relinquish voluntarily some or all of its licensed spectrum usage rights in order to permit the assignment of new initial licenses subject to new service rules, the Commission may disburse to that licensee a portion of the auction proceeds related to the new use that the Commission determines, in its discretion, are attributable to the licensee's relinquished spectrum usage.

"(ii) PROCEEDS FOR FUNDS.—Notwithstanding subparagraph (A), the proceeds (including deposits and up front payments from successful bidders) from the use of a competitive bidding system under this subsection with respect to relinquished spectrum, after deduction of any amounts disbursed to the relinquishing licensee, shall be deposited as follows:

"(I) All proceeds less than or equal to $5,500,000,000 shall be deposited in the Construction Fund and shall be made available to the Assistant Secretary without further appropriations.

"(II) Any proceeds exceeding $5,500,000,000 shall be deposited in the Maintenance and Operation Fund and shall be made available to the Commission without further appropriations.

"(III) Any proceeds exceeding $11,000,000,000 shall be made available, as provided by appropriation Acts, for growth-enhancing infrastructure projects, including the NextGen aviation navigation system, development of high-speed rail transportation, and Smart Grid electrical power transmission and management technology.''.

(c) EXTENSION OF AUCTION AUTHORITY.—Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking "2012" and inserting "2020".

(d) LIMITATION.—

(1) IN GENERAL.—The Commission may not reclaim frequencies licensed to broadcast television licensees or other licensees, directly or indirectly, on an involuntary basis for purposes of section 309(j)(8)(F) of the Communications Act of 1934.

(2) RULE OF CONSTRUCTION.—Nothing in this Act or in the amendments made by this Act shall be construed to permit the Commission to reclaim frequencies of broadcast television licensees or any other licensees directly or indirectly on an involuntary basis for the purpose that section.

SEC. 205. REPORT ON EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.

Not later than 5 years after the date of enactment of this Act and every 5 years thereafter, the Commission shall conduct a study and submit a report to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Energy and Commerce on the spectrum held by the public safety entities. In the report the Commission shall—

(1) examine how such spectrum is being used;

(2) provide a recommendation for whether more spectrum needs to be made available to meet the needs of public safety entities; and

(3) assess the opportunity for return of any spectrum to the Commission for auction to commercial providers to provide revenue to the Treasury of the United States.

SEC. 206. GAO REPORT ON SATELLITE BROADBAND.

Not later than 2 years after the date of enactment of this Act, the Comptroller General of the United States shall conduct a study and submit to Congress a report on the current and future capabilities of fixed and mobile satellite broadband to assist public safety entities during an emergency.

SEC. 207. ACCESS TO GSA SCHEDULES.

The Administrator of General Services shall—

(1) establish rules under which public safety entities may access and use the rates offered to the General Services Administration for communications services and devices;

(2) develop and furnish to the Commission a model request-for-proposals form for public safety use under section 105; and

(3) develop a procedure under which public safety entities are authorized to purchase from established GSA schedules.

SEC. 208. FEDERAL INFRASTRUCTURE SHARING.

The Administrator of General Services shall establish rules to allow any public safety licensee or licensees to have access to Federal infrastructure to construct and maintain the public safety interoperable broadband network.

SEC. 209. AUDITS.

(a) IN GENERAL.—Not later than 3 years after the date of enactment of this Act, and every 3 years thereafter, the Comptroller General of the United States shall perform an audit of the financial statements, records, and accounts of the—

(1) Public Safety Interoperable Broadband Network Construction Fund established under section 201(a)(1);

(2) Public Safety Interoperable Broadband Network Maintenance and Operation Fund established under section 201(a)(2);

(3) construction grant program established under section 202; and

(4) maintenance and operation program established under section 203.

(b) GAAP.—Each audit required under subsection (a) shall be conducted in accordance with generally acceptable accounting procedures.

(c) REPORT TO CONGRESS.—A copy of each audit required under subsection (a) shall be submitted to the appropriate committees of Congress.

SEC. 210. ANTIDIVERSION PROHIBITION.

Except as provided in section 309(j)(8)(F)(ii)(III) of the Communications Act of 1934, as added by this Act, no funds made available under this Act or any amendment made by this Act may be used for any purpose other than in support of the nationwide public safety interoperable broadband network to be deployed under this Act, including the acquisition, construction, or reconstruction of infrastructure and facilities, the purchase of equipment and services, including hardware, software, and training, in accordance with rules established by the Commission.

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112TH CONGRESS
1ST SESSION

S. 1040

To enhance public safety by making more spectrum available to public safety entities, to facilitate the development of a public safety broadband network, to provide standards for the spectrum needs of public safety entities, and for other purposes.

IN THE SENATE OF THE UNITED STATES

MAY 19, 2011

Mr. LIEBERMAN (for himself and Mr. MCCAIN) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

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A BILL

To enhance public safety by making more spectrum available to public safety entities, to facilitate the development of a public safety broadband network, to provide standards for the spectrum needs of public safety entities, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Broadband for First Responders Act of 2011".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

TITLE I—ALLOCATION AND ASSIGNMENT OF PUBLIC SAFETY LICENSES AND ESTABLISHMENT OF RULES

SEC. 101. DEFINITIONS RELATING TO PUBLIC SAFETY BROADBAND.

Section 337(f) of the Communications Act of 1934 (47 U.S.C. 337(f)) is amended—

(1) by redesignating paragraphs (1) and (2) as paragraphs (3) and (4), respectively; and

(2) by inserting before paragraph (3), as so redesignated, the following:

"(1) PUBLIC SAFETY BROADBAND LICENSEE.—The term 'public safety broadband licensee' means a licensee, as defined by the Commission in its Second Report and Order adopted July 31, 2007 (FCC 07–132), and selected in the Commission's Order adopted November 19, 2007 (FCC 07–199), by the Commission to be the licensee for the 763–768/793–798 MHz.

"(2) PUBLIC SAFETY BROADBAND SPECTRUM.—The term 'public safety broadband spectrum' means the electromagnetic spectrum between 758 megahertz and 768 megahertz, inclusive, and 788 megahertz and 798 megahertz, inclusive, and any additional electromagnetic frequencies allocated by the Commission for public safety broadband use.".

SEC. 102. ALLOCATION AND ASSIGNMENT OF PUBLIC SAFETY LICENSES.

(a) SPECTRUM ALLOCATION.—Section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)) is amended—

(1) in paragraph (1), by striking "24" and inserting "34"; and

(2) in paragraph (2), by striking "36" and inserting "26".

(b) ASSIGNMENT.—Section 337(b) of the Communications Act of 1934 (47 U.S.C. 337(b)) is amended to read as follows:

"(b) ASSIGNMENT.—

"(1) ALLOCATION OF PAIRED BANDS.—Not later than 30 days after the date of enactment of the Broadband for First Responders Act of 2011, the Commission shall allocate the paired electromagnetic spectrum bands of 758–763 megahertz and 788–793 megahertz for public safety broadband communications.

"(2) LICENSING OF PAIRED BANDS.—Not later than 60 days after the date of enactment of the Broadband for First Responders Act of 2011, the Commission shall license the paired electromagnetic spectrum bands described under subparagraph (A) to the public safety broadband licensee.".

SEC. 103. ESTABLISHMENT OF RULES GOVERNING PUBLIC SAFETY BROADBAND NETWORK.

(a) ESTABLISHMENT OF RULES.—Not later than 180 days after the date of enactment of this Act, the Federal Communications Commission shall establish the following rules:

(1) AUTHORIZING THE CONSTRUCTION AND OPERATION OF A PUBLIC SAFETY BROADBAND NET-

WORK.—The Commission shall permit the public safety broadband licensee to authorize providers of public safety services to construct and operate a wireless public safety broadband network in the public safety broadband spectrum.

(2) ESTABLISHING NETWORK REQUIREMENTS.—The Commission shall require that the wireless public safety broadband network described under paragraph (1) shall—

(A) be fully interoperable and remain interoperable with, and in conformance with the same broadband technology standards as all other public safety broadband systems deployed or authorized;

(B) provide for roaming by Federal, State, local, and tribal governments and other authorized users of the spectrum licensed to the public safety broadband licensee;

(C) provide priority access to public safety entities;

(D) be built to survive most disasters;

(E) ensure that networks of such systems have the appropriate level of cyber security; and

(F) ensure that authorized users have the ability to develop a local network, provided that the uses for such network are consistent with rules established by the Commission.

(3) ALLOWING FOR SHARED USE OF PUBLIC SAFETY BROADBAND SPECTRUM AND NETWORK INFRASTRUCTURE.—The Commission shall—

(A) authorize the shared use, sublicensing, or leasing of the public safety broadband spectrum and network infrastructure by entities that are not defined as public safety services, subject to the requirements that public safety services retain priority access to the spectrum, pursuant to procedures adopted by the Commission, provided that—

(i) the needs of other governmental entities are considered before commercial entities; and

(ii) such use is approved by the public safety broadband licensee;

(B) allow use of the public safety broadband spectrum by emergency response providers;

(C) ensure that any revenues derived from any such shared use, sublicensing, or lease are deposited in the Public Safety Interoperable Broadband Network Maintenance and Operation Fund established under section 202(a)(2); and

(D) ensure that the Commission retains, for the 60-day period following submission of a request for such shared use, sublicensing, or lease the right to review and approve of any such shared use, sublicensing, or lease.

(4) PROVIDING FOR INTEROPERABILITY AND ROAMING AGREEMENTS.—The Federal Communications Commission, in consultation with the Director of the National Institute of Standards and Technology, the Secretary of Homeland Security, the Attorney General, and Federal, State, local, and tribal public safety agencies, shall establish rules that enable—

(A) nationwide interoperability between wireless public safety broadband networks and commercial broadband networks; and

(B) roaming by public safety entities operating on a wireless public safety broadband network across any commercial network so as to gain guaranteed access to a resilient and reliable commercial network in times of an emergency.

(b) DEFINITIONS.—As nsed in this section—

(1) the term "emergency response provider" has the same meaning as in section 2 of the Homeland Security Act of 2002 (6 U.S.C. 101); and

(2) the terms "public safety broadband licensee", "public safety broadband spectrum", and "public safety services" shall have the same meaning as in section 337(f) of the Communications Act of 1934 (47 U.S.C. 337(f)).

SEC. 104. ESTABLISHMENT OF STANDARDS.

Not later than 180 days after the date of enactment of this Act, the Secretary of Homeland Security, in coordination with the Director of the National Institute of Standards and Technology, shall establish an appropriate set of public safety requirements for meeting the interoperability and roaming requirements developed under section 103(a)(4) taking into consideration—

(1) the extent to which particular technologies and user equipment are, or are likely to be, available in the commercial marketplace;

(2) the availability of necessary technologies and equipment on reasonable and nondiscriminatory licensing terms;

(3) the ability of such requirements to evolve with technological developments in the commercial marketplace;

(4) the ability of such requirements to accommodate prioritization for public safety transmissions;

(5) the ability of such requirements to accommodate appropriate security measures for public safety transmissions; and

(6) any other considerations the Federal Communications Commission deems appropriate.

SEC. 105. SUBMISSION AND APPROVAL OF INTEROPERABILITY COMMUNICATIONS PLANS BY STATES.

(a) IN GENERAL.—Not later than 6 months after the date of publication in the Federal Register of the rules required by section 103 and the date of release of the standards required by section 104, each State shall submit a plan to the Secretary of Homeland Security and the Federal Communications Commission detailing the terms and aspects of the phased deployment for the wireless public safety broadband network to be constructed in the public safety broadband spectrum pursuant to section 103(a)(1).

(b) APPROVAL.—Not later than 120 days after the submission of a plan under subsection (a), the Secretary of Homeland Security and the Federal Communications Commission shall either jointly approve or disapprove of the plan.

SEC. 106. RULE OF CONSTRUCTION FOR PUBLIC SAFETY BROADBAND LICENSEE.

Nothing in this Act, or the amendments made by this Act, shall be construed to overturn, supercede, or otherwise preempt the Federal Communications Commission's Order adopted on November 19, 2007 (FCC 07–199), setting forth the roles and responsibilities of the public safety broadband licensee (as such term is defined in section 337(f) of the Communications Act of 1934) and the Federal Communications Commission, except that the following shall, by rule or order, be modified by the Commission:

(1) Any organization seeking membership to the Board of Directors of the public safety broadband licensee shall be voted in by a simple majority of the then serving members of the Board of Directors.

(2) The Board of Directors of the public safety broadband licensee shall include the following organizations:

(A) International Association of Chiefs of Police.

(B) International Association of Fire Chiefs.

(C) National Sheriffs' Association.

(D) International Association of Fire Fighters.

(E) National Volunteer Fire Council.

(F) Fraternal Order of Police.

(G) Major Cities Chiefs Association.

(H) Metropolitan Fire Chiefs Association.

(I) Major County Sheriffs' Association.

(J) Association of Public-Safety Communications Officials, International.

(K) National Emergency Management Association.

(L) International Association of Emergency Managers.

(M) Police Executive Research Forum.

(N) National Criminal Justice Association.

(O) National Association of Police Organizations.

(P) National Organization of Black Law Enforcement Executives.

(Q) Association of Air Medical Services.

(R) Advocates for Emergency Medical Services.

(S) Emergency Nurses Association.

(T) National Association of Emergency Medical Services Physicians.

(U) National Association of Emergency Medical Technicians.

(V) National Association of State Emergency Medical Services Officials.

(W) National Emergency Medical Services Management Association.

(X) International Municipal Signal Association.

(Y) American Probation and Parole Association.

(Z) National Governors Association.

(AA) National Association of Counties.

(BB) National League of Cities.

(CC) United States Conference of Mayors.

(DD) Council of State Governments.

(EE) International City/County Management Association.

(FF) National Conference of State Legislatures.

(GG) National Association of Regional Councils.

(HH) Utilities Telecom Council.

(II) American Association of State Highway Transportation Officials.

(JJ) American Hospital Association.

(KK) Forestry Conservation Communications Association.

(LL) National Association of State 911 Administrators.

(MM) National Troopers Coalition.

(NN) National Emergency Number Association.

(OO) American Public Works Association.

TITLE II—FUNDING

SEC. 201. DEFINITIONS.

In this title—

(1) the term "appropriate committees of Congress" means—

(A) the Committee on Homeland Security and Governmental Affairs of the Senate;

(B) the Committee on Commerce, Science, and Transportation of the Senate;

(C) the Committee on Energy and Commerce of the House of Representatives; and

(D) the Committee on Homeland Security of the House of Representatives;

(2) the term "Assistant Secretary" means the Assistant Secretary of Commerce for Communications and Information;

(3) the term "Commission" means the Federal Communications Commission;

(4) the term "Construction Fund" means the Public Safety Interoperable Broadband Network Construction Fund established under section 202(a)(1);

(5) the term "Indian tribe" has the same meaning as in section 4 of the Indian Self Determination Act (25 U.S.C. 450b);

(6) the term "Maintenance and Operation Fund" means the Public Safety Interoperable Broadband Network Maintenance and Operation Fund established under section 202(a)(2);

(7) the term "NTIA" means the National Telecommunications and Information Administration;

(8) the term "public safety entity" means an entity that provides public safety services, including a State, municipality, or locality;

(9) the term "public safety services" has the same meaning as in section 337(f) of the Communications Act of 1934 (47 U.S.C. 337(f)); and

(10) the term "Secretary" means the Secretary of Homeland Security.

SEC. 202. FUNDING.

(a) ESTABLISHMENT OF FUNDS.—

(1) CONSTRUCTION FUND.—

(A) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the "Public Safety Interoperable Broadband Network Construction Fund".

(B) PURPOSE.—The Secretary shall establish and administer the grant program under section 203 using the funds deposited in the Construction Fund.

(C) CREDIT.—

(i) BORROWING AUTHORITY.—The Secretary may borrow from the general fund of the Treasury beginning on October 1, 2011, such sums as may be necessary, but not to exceed $2,000,000,000, to implement section 203.

(ii) REIMBURSEMENT.—The Secretary of the Treasury shall reimburse the general fund of the Treasury, without interest, for any amounts borrowed nnder clause (i) as funds are deposited into the Construction Fund, but in no case later than December 31, 2014.

(2) MAINTENANCE AND OPERATION FUND.—

(A) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the "Public Safety Interoperable Broadband Network Maintenance and Operation Fund".

(B) PURPOSE.—The Secretary shall use the funds deposited in the Maintenance and Operation Fund to carry out section 204.

(b) INITIAL DISTRIBUTION OF AUCTION PROCEEDS IN FUNDS.—Notwithstanding subparagraphs (A) and (D) of section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)), the Secretary of the Treasury shall deposit the proceeds (including deposits and up front payments from successful bidders) from the auction of the spectrum described in section 206 in the following manner:

(1) All proceeds less than or equal to $5,500,000,000 shall be deposited in the Construction Fund and shall be made available to the Secretary without further appropriations.

(2) All proceeds exceeding $5,500,000,000 but not more than $11,000,000,000 shall be deposited in the Maintenance and Operation Fund and shall be made available to the Secretary without further appropriations.

(3) Any proceeds in excess of $11,000,000,000 shall be deposited in the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(c) TRANSFER OF FUNDS AT COMPLETION OF CONSTRUCTION.—The Secretary of the Treasury shall transfer to the Maintenance and Operation Fund any funds remaining in the Construction Fund after the date of the completion of the construction phase of the nationwide public safety interoperable broadband network to be established under section 203, as such completion date is determined by the Secretary.

(d) TRANSFER OF FUNDS TO TREASURY.—Any funds remaining in the Maintenance and Operation Fund after the end of the 10-year period following the determination by the Secretary that construction of the nationwide public safety interoperable broadband network to be established under section 203 has been completed shall be transferred to the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(e) AUTHORIZATION OF APPROPRIATIONS.—

(1) CONSTRUCTION FUND.—There are authorized to be appropriated to the Secretary for deposit in the Construction Fund in and after fiscal year

2012 a total amount not to exceed $5,500,000,000 minus any amounts equal to the amount deposited in the Construction Fund pursuant to subsection (b)(1).

(2) MAINTENANCE AND OPERATION FUND.—There are authorized to be appropriated to the Secretary for deposit in the Maintenance and Operation Fund in and after fiscal year 2012 a total amount not to exceed $5,500,000,000 minus any amounts equal to the amount deposited in the Maintenance and Operation Fund pursuant to subsection (b)(2).

SEC. 203. PUBLIC SAFETY INTEROPERABLE BROADBAND NETWORK CONSTRUCTION.

(a) ESTABLISHMENT OF CONSTRUCTION GRANT PROGRAM.—The Secretary shall take such action as is necessary to establish a grant program to assist States, municipalities, and Indian tribes to establish a nationwide public safety interoperable broadband network in the 700 MHz band.

(b) PROJECTS.—The projects for which construction grants may be made under this section are the following:

(1) Construction of a new public safety interoperable broadband network using public safety infrastructure in the 700 MHz band.

(2) Improvement of the existing public safety networks and construction of new infrastructure to meet public safety requirements in the 700 MHz band, the 800 MHz band, or the 4.9 GHz band.

(3) Migration of public safety entity use to the 700 MHz band.

(c) MATCHING REQUIREMENTS.—

(1) FEDERAL SHARE.—The Federal share of the cost of carrying out a project under this section may not exceed 80 percent of the eligible costs of carrying out a project, as determined by the Secretary in consultation with the Chairman of the Commission.

(2) NON-FEDERAL SHARE.—The non-Federal share of the cost of carrying out a project under this section may be provided through an in-kind contribution.

(d) REQUIREMENTS.—Not later than 1 year after the date of enactment of this Act, the Secretary shall establish requirements for the grant program established under this section, including the following:

(1) Defining eligible costs for purposes of subsection (c)(1).

(2) Determining the scope of network infrastructure eligible for grant funding under this section.

(3) Conditioning grant funding on compliance with the licensing terms of the Commission.

(4) Ensuring that all grant funds are in compliance and support the goals of the National Emergency Communications Plan and the Statewide Communication Interoperability Plans for each State and territory.

(e) TECHNICAL ASSISTANCE.—The Secretary shall enhance the Office of Emergency Communications Technical Assistance Program to assist recipients of grant amounts under this section with best practices and guidance in implementing projects for which the recipient received a construction grant under this section.

SEC. 204. PUBLIC SAFETY INTEROPERABLE BROADBAND MAINTENANCE AND OPERATION.

(a) MAINTENANCE AND OPERATION REIMBURSEMENT PROGRAM.—The Secretary shall administer a program through which not more than 50 percent of maintenance and operational expenses associated with the public safety interoperable broadband network may be reimbursed from the Maintenance and Operation Fund for those expenses that are attributable to the maintenance, operation, and improvement of the public safety interoperable broadband network.

(b) REPORT.—Not later than 7 years after the commencement of the reimbursement program established under subsection (a), the Secretary shall submit to the appropriate committees of Congress a report on whether to continne to provide funding for the Maintenance and Operation Fund following completion of the period provided for nnder section 202(d).

SEC. 205. AUDITS.

(a) IN GENERAL.—Not later than 3 years after the date of enactment of this Act, and every 3 years thereafter, the Comptroller General of the United States shall perform an audit of the financial statements, records, and accounts of the—

(1) Construction Fund established under section 202(a)(1);

(2) Maintenance and Operation Fund established under section 202(a)(2);

(3) construction grant program established under section 203; and

(4) maintenance and operation grant program established under section 204.

(b) GAAP.—Each audit required under subsection (a) shall be conducted in accordance with generally acceptable accounting procedures.

(c) REPORT TO CONGRESS.—A copy of each audit required under subsection (a) shall be submitted to the appropriate committees of Congress.

SEC. 206. AUCTION OF SPECTRUM TO FUND THE CONSTRUCTION AND MAINTENANCE AND OPERATION FUNDS.

(a) IDENTIFICATION OF SPECTRUM.—Not later than 1 year after the date of enactment of this Act, the Assistant Secretary shall identify, at a minimum, 15 megahertz of contiguous spectrum at frequencies located between 1675 megahertz and 1710 megahertz, inclusive, to be made available for immediate reallocation.

(b) AUCTION.—Not later than January 31, 2014, the Commission shall conduct the auction of the following licenses, by commencing the bidding for:

(1) The spectrum between the frequencies of 1915 megahertz and 1920 megahertz, inclusive.

(2) The spectrum between the frequencies of 1995 megahertz and 2000 megahertz, inclusive.

(3) The spectrum between the frequencies of 2020 megahertz and 2025 megahertz, inclusive.

(4) The spectrum between the frequencies of 2175 megahertz and 2180 megahertz, inclusive.

(5) The spectrum between the frequencies of 2155 megahertz and 2175 megahertz, inclusive.

(6) The spectrum between the frequencies of 1755 megahertz and 1850 megahertz, inclusive.

(7) The spectrum identified pursuant to subsection (a).

(c) EXTENSION OF AUCTION AUTHORITY.—Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking "2012" and inserting "2020".

(d) ELIGIBILITY.—The Commission shall eusure that no bidder is deemed ineligible for or otherwise excluded from an auction specified in this Act, or any other competitive bidding process under section 309(j) of the Communications Act of 1934, on accouut of its size or amount of its other spectrum holdings.

SEC. 207. ACHIEVING LONG-TERM INTEROPERABILITY AND EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.

(a) MANDATING MIGRATION OF FEDERAL LAW ENFORCEMENT.—Not later than 10 years after the date of enactment of this Act, each Federal law enforcement agency shall move all of their communications not being carried on commercial networks to spectrum located in the 700 MHz and 800 MHz bands.

(b) SPECTRUM BELOW 512 MHZ.—

(1) IN GENERAL.—Beginning on the date of enactment of this Act, the Commission shall not renew any license to use spectrum located on frequencies above 170 megahertz and below 512 megahertz granted to a public safety licensee, unless the licensee is able to demonstrate—

(A) that migration to a different spectrum band will cause considerable economic hardship to the State or local government jurisdiction in which such licensee is located;

(B) migration to a different spectrum band would adversely impact the ability of the licensee to protect and serve the community in which such licensee is located; or

(C) there are an insufficient number of frequencies above the 700 MHz band to support the land-mobile communications needs of the licensee.

(2) RECOMMENDATION.—Not later than 5 years after date of enactment, the Commission, in consultation with the Secretary, the NTIA, and Federal, State, and local public safety agencies, shall

issue a recommendation to Congress on the feasibility of public safety entities ending their use of spectrum located on frequencies above 170 megahertz and below 512 megahertz, and moving all such use to the spectrum licensed to public safety services in the 700 MHz and 800 MHz bands.

(3) AVAILABILITY OF FUNDS.—The Secretary may make amounts available from the Maintenance and Operation Fund to facilitate the migration of public safety entity use of spectrum located on frequencies above 170 megahertz and below 512 megahertz to use of spectrum licensed to public safety services in the 700 MHz and 800 MHz bands.

(c) SPECTRUM IN THE 4.9 GHz BAND.—

(1) ELIGIBILITY FOR USE OF SPECTRUM.—The Commission shall modify section 90.1203(b) of subpart Y or part 90 of the Code of Federal Regulations (47 C.F.R. 90.1203(b)) (relating to eligibility of use of spectrum frequencies in the 4940–4990 MHz band) to ensure that—

(A) governmental entities providing public safety services retain primary authority to use such spectrum; and

(B) non-governmental entities may use the spectrum on a secondary basis, provided that—

(i) such secondary use does not cause harmful interference to public safety users of that spectrum;

(ii) the non-governmental entity seeking such secondary use demonstrates to the Commission that such secondary use will not cause interference to public safety users of that spectrum; and

(iii) if such secondary use causes any interference to a public safety user, such entity shall immediately cease such use uutil such interference has been mitigated to the satisfactiou of the public safety user.

(2) FEE FOR SECONDARY USE OF SPECTRUM.—

(A) IN GENERAL.—The Commission shall charge a recurring licensing fee to each non-governmental entity for any secondary use of spectrum hy such entity described under paragraph (1).

(B) TREATMENT OF REVENUES.—Any revenues generated from the recurring licensing fee charged under subparagraph (A) shall be deposited in Maintenance and Operation Fund nutil the date identified under section 202(d), after which all such revenues shall be deposited in the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(d) REPORTS ON EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.—

(1) GAO STUDY AND REPORT.—Not later than 3 years after the date of enactment of this Act, the Comptroller General of the United States shall conduct a study and submit a report to the appropriate committees of Congress that identifies—

(A) those parts of the radio spectrum above 174 MHz and below 512 MHz used by any public safety entity that could be returned to the Commission for auction in accordance with subsection (d); and

(B) the cost of migrating any such entity from use of the returned spectrum to use of alternative spectrum.

(2) FCC STUDY AND REPORT.—Not later than 3 years after the date of enactment of this Act, and every 3 years thereafter, the Commission shall conduct a study and submit to the appropriate committees of Congress a report—

(A) on the spectrum held by the public safety broadband licensee;

(B) on how efficiently such spectrum is being used; and

(C) that provides a recommendation for whether more spectrum needs to be made available to meet the needs of public safety entities.

SEC. 208. REPORT ON LONG-TERM INTEROPERABILITY USING IP-BASED SOLUTIONS.

Not later than 2 years after the date of enactment of this Act, the Commission, in consultation with the Secretary and the Assistant Secretary, shall issue a report and order, after allowing time for notice and comment, including comment from public safety users, and submit such report to the appropriate committees of Congress, on whether Internet Protocol-enabled solutions could aid interoperability.

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112TH CONGRESS
1ST SESSION

H. R. 607

To enhance public safety by making more spectrum available to public safety agencies, to facilitate the development of a wireless public safety broadband network, to provide standards for the spectrum needs of public safety agencies, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

FEBRUARY 10, 2011

Mr. KING of New York (for himself, Mr. THOMPSON of Mississippi, Mr. ROGERS of Alabama, Ms. CLARKE of New York, Mrs. MILLER of Michigan, Mr. LONG, and Mr. GRIMM) introduced the following bill; which was referred to the Committee on Energy and Commerce

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A BILL

To enhance public safety by making more spectrum available to public safety agencies, to facilitate the development of a wireless public safety broadband network, to provide standards for the spectrum needs of public safety agencies, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Broadband for First Responders Act of 2011".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

TITLE I—ALLOCATION AND ASSIGNMENT OF PUBLIC SAFETY LICENSES

SEC. 101. FINDINGS.

The Congress finds the following:

(1) The communications capabilities of first responders and other public safety agencies directly affect the public safety of the people of the United States and our national security.

(2) As events such as the terrorist attacks of September 11, 2001, and Hurricane Katrina revealed, the inability of local, State, tribal, and Fed-

eral first responders to communicate effectively during an emergency impairs operations to respond to terrorist acts and natural disasters.

(3) Many public safety communications systems rely on commercially available systems that lack broadband capabilities or otherwise fail to provide the level of service necessary to meet the mission-critical needs of public safety agencies.

(4) A wireless public safety broadband network is needed to guarantee priority access for public safety use and first responder interoperability across the United States.

(5) Allocating the paired electromagnetic spectrum bands of 758–763 megahertz and 788–793 megahertz, referred to as the D Block, to public safety agencies will fulfill public safety agencies needs for sufficient spectrum and would help reduce the complexity and future operating cost of public safety communications systems.

(6) Because the communications needs of public safety agencies may differ by geographic region (including whether they require a dedicated communications system or can rely on a system shared with commercial users), each region requires flexibility to develop a model that meets its local needs without

sacrificing the interoperability of the nationwide system.

(7) The most timely and cost-effective way to achieve nationwide interoperability in public safety communications will be to leverage commercial infrastructure without compromising the mission-critical needs of public safety ageucies.

(8) The use by public safety agencies of standardized technologies commonly employed in the commercial telecommunications sector will provide significant benefits, including improved capabilities, greater economies of scale, and more rapid adoption of technological innovations.

(9) When it is iu the interest of public safety, the Federal Communications Commission should encourage any public safety licensee or spectrum lessee to consider using existing or planned commercial infrastructure.

SEC. 102. ALLOCATION AND ASSIGNMENT OF PUBLIC SAFETY LICENSES.

(a) SPECTRUM ALLOCATION.—Section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)) is amended—

(1) in paragraph (1), by striking "24" and inserting "34"; and

(2) in paragraph (2), by striking "36" and inserting "26".

(b) ASSIGNMENT.—Section 337(b) of the Communications Act of 1934 (47 U.S.C. 337(b)) is amended to read as follows:

"(b) ASSIGNMENT.—

"(1) IN GENERAL.—Not later than 60 days after the date of enactment of the Broadband for First Responders Act of 2011, the Commission shall allocate the paired electromagnetic spectrum bands of 758–763 megahertz and 788–793 megahertz for public safety broadband communications and shall license such paired bands to the public safety broadband licensee.

"(2) ESTABLISHMENT OF RULES.—

"(A) IN GENERAL.—The Commission shall establish rules to permit the public safety broadband licensee to authorize providers of public safety services to construct and operate a wireless public safety broadband network in the spectrum licensed to the public safety broadband licensee if the public safety broadband licensee determines that such authorization would expedite the deployment of public safety broadband communications.

"(B) NETWORK REQUIREMENTS.—The Commission shall require that any such wireless public safety broadband network shall—

"(i) be fully interoperable and remain interoperable with, and in conformance with the same broadband technology standards as, all other public safety broadband systems deployed or authorized;

"(ii) provide for roaming by local, State, tribal, and Federal governments and other authorized users of the spectrum licensed to the public safety broadband licensee;

"(iii) provide priority access to public safety agencies;

"(iv) be built to survive most large-scale disasters;

"(v) ensure that networks of such systems have the appropriate level of cyber security;

"(vi) ensure that authorized users have control over all local network uses consistent with rules established by the Commission; and "(vii) be consistent with the Statewide Interoperable Communications Plans adopted by each State and the National Emergency Communications Plan, as adopted by the Department of Homeland Security.

"(C) DEADLINES.—

"(i) RULES.—The Commission shall establish rules under this paragraph not later than 9 months after the date of enactment of the Broadband for First Responders Act of 2011.

"(ii) REPORT.—

"(I) IN GENERAL.—Not later than 60 days after the date of enactment of the Broadband for First Responders Act of 2011, the public safety broadband licensee shall submit a report to the appropriate committees of Congress on the phased network deployment plan of such spectrum bands.

"(II) DEFINITIONS.—For purposes of subclause (I), the term 'appropriate committees of Congress' means—

"(aa) the Committee on Homeland Security and Governmental Affairs of the Senate;

"(bb) the Committee on Commerce, Science, and Transportation of the Senate;

"(cc) the Committee on Energy and Commerce of the House of Representatives; and

"(dd) the Committee on Homeland Security of the House of Representatives.".

(c) NETWORK-SHARING AGREEMENTS.—Section 337 of the Communications Act of 1934 (47 U.S.C. 337) is amended—

(1) by redesignating subsection (f) as subsection (g); and

(2) by inserting after subsection (e) the following:

"(f) RULEMAKING REQUIRED.—The Commission shall establish regulations to—

"(1) authorize the shared use of the public safety broadband spectrum and network infrastructure by entities that are not defined as public safety services in subsection (g)(1), subject to the requirement that public safety services retain priority access to the spectrum, pursuant to procedures adopted by the Commission, so long as the needs of other governmental entities needs are considered before commercial entities; and

"(2) allow use of the public safety broadband spectrum by emergency response providers, as defined in section 2 of the Homeland Security Act of 2002 (6 U.S.C. 101).".

(d) DEFINITION.—Section 337(g) of the Communications Act of 1934 (as so redesignated) is amended—

(1) by redesignating paragraphs (1) and (2) as paragraphs (3) and (4), respectively; and

(2) by inserting before paragraph (3), as so redesignated, the following:

"(1) PUBLIC SAFETY BROADBAND LICENSEE.—The term 'public safety broadband licensee' means a licensee as defined by the Commission in its Second Report and Order adopted July 31, 2007 (FCC 07–132), and selected in the Commission's Order adopted November 19, 2007 (FCC 07–199), by the Commission to be the licensee for spectrum between 763–768 and 793–798 megahertz.

"(2) PUBLIC SAFETY BROADBAND SPECTRUM.—The term 'public safety broadband spectrum' means the electromagnetic spectrum between 758 megahertz and 768 megahertz, inclusive, and 788 megahertz and 798 megahertz, inclusive, and any additional electromagnetic frequencies allocated by the Commission for public safety broadband use.".

SEC. 103. STANDARDS.

(a) INTEROPERABILITY REQUIREMENTS.—Not later than 180 days after the date of enactment of this Act, the Chairman of the Federal Communications Commission, in consultation with the Director of the National Institute of Standards and Technology, the Secretary of Homeland Security, the Attorney General, and local, State, tribal, and Federal public safety agencies, shall develop a public safety agency statement of requirements that enables nationwide interoperability and roaming across any communications system using public safety broadband spectrum, as defined in section 337(g) of the Communications Act of 1934.

(b) SPECIFICATIONS.—The Secretary of Homeland Security, in coordination with the Director of the National Institute of Standards and Technology, shall establish an appropriate standard, or set of standards, for meeting the public safety agency statement requirements developed under subsection (a), taking into consideration—

(1) the extent to which particular technologies and user equipment are, or are likely to be, available in the commercial marketplace;

(2) the availability of necessary technologies and equipment on reasonable and nondiscriminatory licensing terms;

(3) the ability to evolve with technological developments in the commercial marketplace;

(4) the ability to accommodate prioritization for public safety transmissions;

(5) the ability to accommodate appropriate security measures for public safety transmissions; and

(6) any other considerations the Federal Communications Commission deems appropriate.

SEC. 104. RULE OF CONSTRUCTION.

Nothing in this Act, or the amendments made by this Act, shall be construed to overturn, supersede, or otherwise preempt the Federal Communication Commission's Order adopted on November 19, 2007 (FCC 07–199), setting forth the roles and responsibilities of the public safety broadband licensee (as such term is defined in section 337(g) of the Communications Act of 1934) and the Federal Communications Commission, except that the following may, by rule or order, be modified by the Commission:

(1) Any organization seeking membership to the board of directors of the public safety broadband licensee may be voted in by a simple majority of the then serving members of the Board of Directors.

(2) The Board of Directors of the Public Safety Broadband Licensee shall include the following organizations:

(A) International Association of Chiefs of Police.

(B) International Association of Fire Chiefs.

(C) National Sheriffs' Association.

(D) International Association of Fire Fighters.

(E) National Volunteer Fire Council.

(F) Fraternal Order of Police.

(G) Major Cities Chiefs Association.

(H) Metropolitan Fire Chiefs Association.

(I) Major County Sheriffs' Association.

(J) Association of Public-Safety Communications Officials, International.

(K) National Emergency Management Association.

(L) International Association of Emergency Managers.

(M) Police Executive Research Forum.

(N) National Criminal Justice Association.

(O) National Association of Police Organizations.

(P) National Organization of Black Law Enforcement Executives.

(Q) Association of Air Medical Services.

(R) Advocates for Emergency Medical Services.

(S) Emergency Nurses Association.

(T) National Association of Emergency Medical Services Physicians.

(U) National Association of Emergency Medical Technicians.

(V) National Association of State Emergency Medical Service Officials.

(W) National Emergency Medical Services Management Association.

(X) International Municipal Signal Association.

(Y) American Probation and Parole Association.

(Z) National Governors Association.

(AA) National Association of Counties.

(BB) National League of Cities.

(CC) United States Conference of Mayors.

(DD) Council of State Governments.

(EE) International City/County Managers Association.

(FF) National Conference of State Legislatures.

(GG) National Association of Regional Councils.

(HH) Utilities Telecom Council.

(II) American Association of State Highway Transportation Officials.

(JJ) American Hospital Association.

(KK) Forestry Conservation Communications Association.

(LL) National Association of State 911 Administrators.

(MM) National Troopers Coalition.

(NN) National Emergency Numbers Association.

TITLE II—FUNDING

SEC. 201. DEFINITIONS.

In this title—

(1) the term "Assistant Secretary" means the Assistant Secretary of Commerce for Communications and Information;

(2) the term "appropriate committees of Congress" means—

(A) the Committee on Homeland Security and Governmental Affairs of the Senate;

(B) the Committee on Commerce, Science, and Transportation of the Senate;

(C) the Committee on Energy and Commerce of the House of Representatives; and

(D) the Committee on Homeland Security of the House of Representatives;

(3) the term "Construction Fund" means the Public Safety Interoperable Broadband Network Construction Fund established under section 202;

(4) the term "Maintenance and Operation Fund" means the Public Safety Interoperable Broadband Network Maintenance and Operation Fund established under section 202; and

(5) the term "Secretary" means the Secretary of Homeland Security.

SEC. 202. FUNDING.

(a) ESTABLISHMENT OF FUNDS.—

(1) CONSTRUCTION FUND.—

(A) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the Public Safety Interoperable Broadband Network Construction Fund.

(B) PURPOSE.—The Secretary shall establish and administer the grant program under section 203 using the funds deposited in the Construction Fund.

(C) CREDIT.—

(i) BORROWING AUTHORITY.—The Secretary may borrow from the general fund of the Treasury beginning October 1, 2011, such sums as may be necessary, but not to exceed $2,000,000,000, to implement section 203.

(ii) REIMBURSEMENT.—The Secretary of the Treasury shall reimburse the general fund of the Treasury, without interest, for any amounts borrowed under clause (i) as funds are deposited into the Construction Fund, but in no case later than December 31, 2014.

(2) MAINTENANCE AND OPERATION FUND.—

(A) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the Public Safety Interoperable Broadband Network Maintenance and Operation Fund.

(B) PURPOSE.—The Secretary shall use the funds deposited in the Maintenance and Operation Fund to carry out section 204.

(b) INITIAL DISTRIBUTION OF AUCTION PROCEEDS IN FUNDS.—Notwithstanding subparagraphs (A) and (D) of section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)), the Secretary of the Treasury shall deposit the proceeds (including deposits and upfront payments from successful bidders) from the auction of the spectrum described in section 205 in the following manner:

(1) All proceeds less than or equal to $5,500,000,000 shall be deposited in the Construction Fund and shall be made available to the Secretary without further appropriations.

(2) Any proceeds exceeding $5,500,000,000 shall be deposited in the Maintenance and Operation Fund and shall be made available to the Secretary without further appropriations.

(c) TRANSFER OF FUNDS AT COMPLETION OF CONSTRUCTION.—The Secretary of the Treasury shall transfer to the Maintenance and Operation Fund any funds remaining in the Construction Fund after the date of the completion of the construction phase, as determined by the Secretary.

(d) TRANSFER OF FUNDS TO TREASURY.—The Secretary of the Treasury shall transfer to the general fund of the Treasury any funds remaining in the Maintenance and Operation Fund after the end of the 10-year period following receipt of notice by the Secretary of Homeland Security that construction of the nationwide system has been completed.

(e) AUTHORIZATION OF APPROPRIATIONS.—

(1) CONSTRUCTION FUND.—There are authorized to be appropriated to the Secretary for deposit in the Construction Fund in and after fiscal year 2012 an amount not to exceed the amount set forth in paragraph (3).

(2) MAINTENANCE AND OPERATION FUND.—There are authorized to be appropriated to the Secretary for deposit in the Maintenance and Operation Fund in and after fiscal year 2012 an amount not to exceed the amount set forth in paragraph (3).

(3) LIMITATION.—The authorization of appropriations under paragraphs (1) and (2) may not exceed a total of $5,500,000,000.

SEC. 203. PUBLIC SAFETY INTEROPERABLE BROADBAND NETWORK CONSTRUCTION.

(a) CONSTRUCTION GRANT PROGRAM ESTABLISHMENT.—The Secretary shall take such action as is necessary to establish a grant program to assist public safety entities to establish a nationwide public safety interoperable broadband network in the 700 megahertz band.

(b) PROJECTS.—The projects for which construction grants may be made under this section are the following:

(1) Construction of a new public safety interoperable broadband network using public safety infrastructure or commercial infrastructure, or both, in the 700 megahertz band.

(2) Improvement of the existing public safety and commercial networks and construction of new infrastructure to meet public safety requirements.

(c) MATCHING REQUIREMENTS.—

(1) FEDERAL SHARE.—The Federal share of the cost of carrying out a project under this section may not exceed 80 percent of the eligible costs of carrying out a project, as determined by the Sec-

retary in consultation with the Chairman of the Federal Communications Commission.

(2) NON-FEDERAL SHARE.—The non-Federal share of the cost of carrying out a project under this section may be provided through an in-kind contribution.

(d) REQUIREMENTS.—Not later than 6 months after the date of enactment of this Act, the Secretary shall establish grant program requirements including the following:

(1) Defining entities that are eligible to receive a grant under this section.

(2) Defining eligible costs for purposes of subsection (c)(1).

(3) Determining the scope of network infrastructure eligible for grant funding under this section.

(4) Conditioning grant funding on compliance with the Federal Communications Commission's license terms.

(5) Ensuring that all grant funds are in compliance with and support the goals of the National Emergency Communications Plan and the Statewide Communication Interoperability Plans for each State and territory.

(e) TECHNICAL ASSISTANCE.—The Secretary will enhance the Office of Emergency Communications Technical Assistance Program to assist grantees with best practices and guidance in implementing these projects.

SEC. 204. PUBLIC SAFETY INTEROPERABLE BROADBAND MAINTENANCE AND OPERATION.

(a) MAINTENANCE AND OPERATION REIMBURSEMENT PROGRAM.—The Secretary shall administer a program through which not more than 50 percent of maintenance and operational expenses associated with the public safety interoperable broadband network may be reimbursed from the Maintenance and Operation Fund for those expenses that are attributable to the maintenance, operation, and improvement of the public safety interoperable broadband network.

(b) REPORT.—Not later than 7 years after the commencement of the reimbursement program established under subsection (a), the Secretary shall submit to Congress a report on whether to continue to provide funding for the Maintenance and Operation Fund following completion of the period provided for under section 202(d).

SEC. 205. AUDITS.

(a) IN GENERAL.—Not later than 3 years after the date of enactment of this Act, and every 3 years thereafter, the Comptroller General of the United States shall perform an audit of the financial statements, records, and accounts of the—

(1) Public Safety Interoperable Broadband Network Construction Fund established under section 202(a)(1);

(2) Public Safety Interoperable Broadband Network Maintenance and Operation Fund established under section 202(a)(2);

(3) construction grant program established under section 203; and

(4) maintenance and operation grant program established under sectiou 204.

(b) GAAP.—Each audit required uuder subsection (a) shall be conducted iu accordance with generally accepted accounting procedures.

(c) REPORT TO CONGRESS.—A copy of each audit required under subsection (a) shall be submitted to the appropriate committees of Congress.

SEC. 206. AUCTION OF SPECTRUM TO FUND THE INTEROPERABLE BROADBAND NETWORK CONSTRUCTION FUND, AND THE OPERATION AND MAINTENANCE FUND.

(a) IN GENERAL.—

(1) REALLOCATION OF SPECTRUM.—Not later than 1 year after the date of enactment of this Act,

the Assistant Secretary shall reallocate for commercial use electromagnetic spectrum at 1755–1780 megahertz.

(2) AUCTION.—Not later than 18 months after the date of enactment of this Act, the Federal Communications Commission shall establish rules for pairing electromagnetic spectrum bands at 1755–1780 megahertz and 2155–2180 megahertz, inclusive, and auction the licenses for such paired spectrum in accordance of section 309(j).

SEC. 207. ACHIEVING LONG-TERM INTEROPERABILITY BY CONSOLIDATING BAND USE BY PUBLIC SAFETY AGENCIES.

(a) MANDATING MIGRATION OF PUBLIC SAFETY ENTITIES AND FEDERAL LAW ENFORCEMENT.—

(1) REQUIRE MIGRATION BY PUBLIC SAFETY ENTITIES.—Not later than 8 years after the date of enactment of the Act, each public safety entities shall end their use of radio spectrum above 420 megahertz and below 512 megahertz and begin to use alternative radio spectrum licensed to public safety services in the 700 megahertz and 800 megahertz bands.

(2) REQUIRE USE BY FEDERAL LAW ENFORCEMENT.—Not later than 10 years after the date of

enactment of this Act, each Federal law enforcement agency shall move all of their communications, not being carried on commercial networks, to spectrum located in the 700 megahertz and 800 megahertz bands.

(b) GAO STUDY.—Not later than 3 years after the date of enactment of this Act, the Comptroller General of the United States shall conduct a study and submit a report to the appropriate committees of Congress that identifies those parts of the radio spectrum above 174 megahertz and below 512 megahertz used by public safety entities that should be returned to the Federal Communications Commission for auction in accordance with subsection (d).

(c) MIGRATION PLAN DEVELOPED BY FCC AND DHS.—

(1) IN GENERAL.—Not later than 6 years after the date of enactment of this Act, the Federal Communications Commission, in consultation with the Secretary, the Assistant Secretary, and Federal, State and local pnblic safety agencies, shall issue a report, detailing the plan for public safety entities to end their use of radio spectrum above 170 megahertz and below 512 megahertz and move all use to

the radio spectrum licensed to public safety services, in the 700 megahertz and 800 megahertz bands.

(2) FACILITATION OF MIGRATION.—The Secretary shall make amounts available out of the maintenance and operation grant program established under section 204 to facilitate the migration of public safety entity use of the radio spectrum licensed to public safety services in the 700 megahertz and 800 megahertz bands in accordance with the plan developed under paragraph (1).

(d) RECOVERED PUBLIC SAFETY SPECTRUM.—

(1) AUCTION.—Not later than 10 years after the date of enactment of this Act, the paired electromagnetic spectrum bands of 420–440 megahertz and 450–470 megahertz recovered as a result of the report and order required under subsection (c) shall be auctioned off by the Federal Communications Commission through a system of competitive bidding meeting the requirements of section 309 of the Communications Act of 1934.

(2) ENCOURAGED USE OF CERTAIN AUTHORITY.—In making the recovered spectrum identified under paragraph (1) available through auction, the Commission is encouraged to use its authority under sections 303 and 316 of the Act to configure the

spectrum in a manner that increases the value of the recovered spectrum for commercial use.

(3) PROCEEDS.—Notwithstanding any other provision of law, all proceeds (including deposits and upfront payments from successful bidders) from the auction required under this subsection shall be deposited in the Treasury in accordance with chapter 33 of title 31, United States Code.

SEC. 208. EXTENSION OF AUCTION AUTHORITY AND ASSURANCE OF OPEN AUCTIONS.

(a) EXTENSION OF AUCTION AUTHORITY.—Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking "2012" and inserting "2020".

(b) ELIGIBILITY.—The Commission shall ensure that no bidder is deemed ineligible for or otherwise excluded from an auction specified in this Act, or any other competitive bidding process under section 309(j) of the Communications Act, on account of its size or amount of its other spectrum holdings.

SEC. 209. REPORT ON EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.

Not later than 3 years after the date of enactment of this Act and every 3 years thereafter, the Federal Communications Commission shall conduct a study and submit to the appropriate committees of Congress a report—

(1) on the spectrum held by the public safety broadband licensee;

(2) on how efficiently such spectrum is being used; and

(3) that provide a recommendation for whether more spectrum needs to be made available to meet the needs of public safety entities.

SEC. 210. REPORT ON LONG-TERM INTEROPERABILITY USING IP-BASED SOLUTIONS.

Not later than 2 years after the date of enactment of this Act, the Federal Communications Commission, in consultation with the Secretary of Homeland Security and the Assistant Secretary, shall issue a report and order, after allowing time for notice and comment, including comment from public safety users, aud submit such report the appropriate committees of Congress, on whether Internet Protocol-enabled solutions could aid interoperability.

○

112TH CONGRESS
1ST SESSION

H. R. 2482

To establish the sense of Congress that Congress should enact, and the President should sign, bipartisan legislation to strengthen public safety and to enhance wireless communications, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JULY 11, 2011

Mr. DINGELL (for himself and Mr. GENE GREEN of Texas) introduced the following bill; which was referred to the Committee on Energy and Commerce, and in addition to the Committees on Science, Space, and Technology and Armed Services, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

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A BILL

To establish the sense of Congress that Congress should enact, and the President should sign, bipartisan legislation to strengthen public safety and to enhance wireless communications, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Public Safety Spectrum and Wireless Innovation Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act, the following definitions shall apply:

(1) 700 MHZ BAND.—The term "700 MHz band" means the portion of the electromagnetic spectrum between the frequencies from 698 megahertz to 806 megahertz.

(2) 700 MHZ D BLOCK SPECTRUM.—The term "700 MHz D block spectrum" means the portion of the electromagnetic spectrum between the fre-

quencies from 758 megahertz to 763 megahertz and between the frequencies from 788 megahertz to 793 megahertz.

(3) APPROPRIATE COMMITTEES OF CONGRESS.—Except as otherwise specifically provided, the term "appropriate committees of Congress" means—

(A) the Committee on Commerce, Science, and Transportation of the Senate; and

(B) the Committee on Energy and Commerce of the House of Representatives.

(4) ASSISTANT SECRETARY.—The term "Assistant Secretary" means the Assistant Secretary of Commerce for Communications and Information.

(5) COMMISSION.—The term "Commission" means the Federal Communications Commission.

(6) CORPORATION.—The term "Corporation" means the Public Safety Broadband Corporation established under subtitle A of title II.

(7) EXISTING PUBLIC SAFETY BROADBAND SPECTRUM.—The term "existing public safety broadband spectrum" means the portion of the electromagnetic spectrum between the frequencies—

(A) from 763 megahertz to 768 megahertz;

(B) from 793 megahertz to 798 megahertz;

(C) from 768 megahertz to 769 megahertz; and

(D) from 798 megahertz to 799 megahertz.

(8) FEDERAL ENTITY.—The term "Federal entity" has the same meaning as in section 113(i) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(i)).

(9) NARROWBAND SPECTRUM.—The term "narrowband spectrum" means the portion of the electromagnetic spectrum between the frequencies from 769 megahertz to 775 megahertz and between the frequencies from 799 megahertz to 805 megahertz.

(10) NIST.—The term "NIST" means the National Institute of Standards and Technology.

(11) NTIA.—The term "NTIA" means the National Telecommunications and Information Administration.

(12) PUBLIC SAFETY ENTITY.—The term "public safety entity" means an entity that provides public safety services.

(13) PUBLIC SAFETY SERVICES.—The term "public safety services"—

(A) has the meaning given the term in section 337(f) of the Communications Act of 1934 (47 U.S.C. 337(f)); and

(B) includes services provided by emergency response providers, as that term is defined in section 2 of the Homeland Security Act of 2002 (6 U.S.C. 101).

TITLE I—REALLOCATION OF PUBLIC SAFETY SPECTRUM

SEC. 101. REALLOCATION OF D BLOCK TO PUBLIC SAFETY.

(a) IN GENERAL.—The Commission shall reallocate the 700 MHz D block spectrum for use by public safety entities in accordance with the provisions of this Act.

(b) SPECTRUM ALLOCATION.—Section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)) is amended—

(1) by striking "24" in paragraph (1) and inserting "34"; and

(2) by striking "36" in paragraph (2) and inserting "26".

SEC. 102. FLEXIBLE USE OF NARROWBAND SPECTRUM.

The Commission may allow the narrowband spectrum to be used in a flexible manner, including usage for public safety broadband communications, subject to such technical and interference protection measures as the Commission may require.

TITLE II—GOVERNANCE OF PUBLIC SAFETY SPECTRUM

Subtitle A—Public Safety Broadband Corporation

SEC. 201. SINGLE PUBLIC SAFETY WIRELESS NETWORK LICENSEE.

(a) REALLOCATION AND GRANT OF LICENSE.—Notwithstanding any other provision of law, and subject to the provisions of this Act, the Commission shall reallocate and grant a license to the Public Safety Broadband Corporation established under section 202 for the use of the 700 MHz D block spectrum and existing public safety broadband spectrum.

(b) TERM OF LICENSE.—

(1) INITIAL LICENSE.—The license granted under subsection (a) shall be for an initial term of 10 years from the date of the initial issuance of the license.

(2) RENEWAL OF LICENSE.—Prior to expiration of the term of the initial license granted under subsection (a) or the expiration of any subsequent renewal of such license, the Corporation shall submit

to the Commission an application for the renewal of such license. Such renewal application shall demonstrate that, during the preceding license term, the Corporation has met the duties and obligations set forth under this Act. A renewal license granted under this paragraph shall be for a term of not to exceed 10 years.

(c) FACILITATION OF TRANSITION.—The Commission shall take all actions necessary to facilitate the transition of the existing public safety broadband spectrum to the Public Safety Broadband Corporation established under section 202.

SEC. 202. ESTABLISHMENT OF PUBLIC SAFETY BROADBAND CORPORATION.

(a) ESTABLISHMENT.—There is authorized to be established a private, nonprofit corporation, to be known as the "Public Safety Broadband Corporation", which is neither an agency nor establishment of the United States Government or the District of Columbia Government.

(b) APPLICATION OF PROVISIONS.—The Corporation shall be subject to the provisions of this Act, and, to the extent consistent with this Act, to the District of Columbia Nonprofit Corporation Act (sec. 29–301.01 et seq., D.C. Official Code).

(c) RESIDENCE.—The Corporation shall have its place of business in the District of Columbia and shall be considered, for purposes of venue in civil actions, to be a resident of the District of Columbia.

(d) POWERS UNDER DC ACT.—In order to carry out the duties and activities of the Corporation, the Corporation shall have the usual powers conferred upon a nonprofit corporation by the District of Columbia Nonprofit Corporation Act.

(e) INCORPORATION.—The members of the initial Board of Directors of the Corporation shall serve as incorporators and shall take whatever steps that are necessary to establish the Corporation under the District of Columbia Nonprofit Corporation Act.

SEC. 203. BOARD OF DIRECTORS OF THE CORPORATION.

(a) MEMBERSHIP.—The management of the Corporation shall be vested in a Board of Directors (referred to in this subtitle as the "Board"), which shall consist of the following members:

(1) FEDERAL MEMBERS.—The following individuals, or their respective designees, shall serve as Federal members:

(A) The Secretary of Commerce.

(B) The Secretary of Homeland Security.

(C) The Attorney General of the United States.

(D) The Director of the Office of Management and Budget.

(2) NON-FEDERAL MEMBERS.—

(A) IN GENERAL.—The Secretary of Commerce shall appoint 11 individuals to serve as non-Federal members of the Board.

(B) STATE AND LOCAL INTERESTS TO BE REPRESENTED.—In making appointments under subparagraph (A), the Secretary of Commerce, in consnltation with the Secretary of Homeland Security and the Attorney General of the United States, should—

(i) appoint at least 3 individnals to represent the collective interests of the States, localities, tribes, and territories;

(ii) seek to ensure geographic and regional representation of the United States in such appointments; and

(iii) seek to ensure rural and urban representation in such appointments.

(C) PUBLIC SAFETY INTERESTS TO BE REPRESENTED.—In making appointments under subparagraph (A), the Secretary of Commerce should appoint at least 3 individuals who have served or are currently serving as public safety professionals.

(D) REQUIRED QUALIFICATIONS.—

(i) IN GENERAL.—Each non-Federal member appointed under subparagraph (A) should meet at least 1 of the following criteria:

(I) PUBLIC SAFETY EXPERIENCE.—Knowledge and experience in the use of Federal, State, local, or tribal public safety or emergency response.

(II) TECHNICAL EXPERTISE.—Technical expertise and fluency regarding broadband communications, including public safety communications.

(III) NETWORK EXPERTISE.—Expertise in building, deploying, and operating commercial telecommunications networks.

(IV) FINANCIAL EXPERTISE.—Expertise in financing and funding telecommunications networks.

(ii) EXPERTISE TO BE REPRESENTED.—In making appointments under subparagraph (A), the Secretary of Commerce shall appoint—

(I) at least one individual who satisfies the requirement under subclause (II) of clause (i);

(II) at least one individual who satisfies the requirement under subclause (III) of clause (i); and

(III) at least one individual who satisfies the requirement under subclause (IV) of clause (i).

(E) INDEPENDENCE.—

(i) IN GENERAL.—Each non-Federal member of the Board shall be independent and neutral.

(ii) INDEPENDENCE DETERMINATION.—In order to be considered independent for purposes of this subparagraph, a member of the Board—

(I) may not, other than in his or her capacity as a member of the Board or any committee thereof—

(aa) accept any consulting, advisory, or other compensatory fee from the Corporation; or

(bb) be a person associated with the Corporation or with any affiliated company thereof; and

(II) shall be disqualified from any deliberation involving any transaction of the Corporation in which the Board member has a financial interest in the outcome of the transaction.

(F) NOT OFFICERS OR EMPLOYEES.—The non-Federal members of the Board shall not, by reason of such membership, be considered to be officers or employees of the United States Government or of the District of Columbia Government.

(G) CITIZENSHIP.—No individual other than a citizen of the United States may serve as a non-Federal member of the Board.

(b) TERMS OF APPOINTMENT.—

(1) INITIAL APPOINTMENT DEADLINE.—Members of the Board shall be appointed not later than 180 days after the date of the enactment of this Act.

(2) TERMS.—

(A) LENGTH.—

(i) FEDERAL MEMBERS.—Each Federal member of the Board shall serve as a member of the Board for the life of the Corporation.

(ii) NON-FEDERAL MEMBERS.—The term of office of each non-Federal member of the Board shall be 3 years. No non-Federal member of the Board may serve more than 2 consecutive full 3-year terms.

(B) EXPIRATION OF TERM.—Any member whose term has expired may serve until such member's successor has taken office, or until the end of the calendar year in which such member's term has expired, whichever is earlier.

(C) APPOINTMENT TO FILL VACANCY.—Any non-Federal member appointed to fill a vacancy occurring prior to the expiration of the term for which that member's predecessor was appointed shall be appointed for the remainder of the predecessor's term.

(D) STAGGERED TERMS.—With respect to the initial non-Federal members of the Board—

(i) 4 members shall serve for a term of 3 years;

(ii) 4 members shall serve for a term of 2 years; and

(iii) 3 members shall serve for a term of 1 year.

(3) VACANCIES.—A vacancy in the membership of the Board shall not affect the Board's powers, and shall be filled in the same manner as the original member was appointed.

(c) CHAIR.—

(1) SELECTION.—The Secretary of Commerce shall select, from among the non-Federal members of the Board, an individual to serve for a 2-year term as Chair of the Board.

(2) CONSECUTIVE TERMS.—An individual may not serve for more than 2 consecutive terms as Chair of the Board.

(3) REMOVAL FOR CAUSE.—The Secretary of Commerce may remove the Chair of the Board and any non-Federal member for good cause.

(d) REMOVAL.—All members of the Board may by majority vote—

(1) remove any non-Federal member of the Board from office for conduct determined by the Board to be detrimental to the Board or Corporation; and

(2) request that the Secretary of Commerce exercise his or her authority to remove the Chair of the Board for conduct determined by the Board to be detrimental to the Board or Corporation.

(e) MEETINGS.—

(1) FREQUENCY.—The Board shall meet in accordance with the bylaws of the Corporation—

(A) at the call of the Chairperson; and

(B) not less frequently than once each quarter.

(2) TRANSPARENCY.—Meetings of the Board, including any committee of the Board, shall be open to the public. The Board may, by majority vote, close any such meeting only for the time necessary to preserve the confidentiality of commercial or financial information that is privileged or confidential, to discuss personnel matters, or to discuss legal matters affecting the Corporation, including pending or potential litigation.

(f) QUORUM.—Eight members of the Board shall constitute a quorum, including at least 6 non-Federal members of the Board.

(g) BYLAWS.—A majority of the members of the Board of Directors may amend the bylaws of the Corporation.

(h) ATTENDANCE.—Members of the Board of Directors may attend meetings of the Corporation and vote in person, via telephone conference, or via video conference.

(i) PROHIBITION ON COMPENSATION.—A member of the Board of the Corporation shall serve without pay, and shall not otherwise benefit, directly or indirectly, as a result of their service to the Corporation, but shall be allowed a per diem allowance for travel expenses, at rates authorized for an employee of an agency under subchapter I of chapter 57 of title 5, United States Code, while away from the home or regular place of business of the member in the performance of the duties of the Corporation.

SEC. 204. OFFICERS, EMPLOYEES, AND COMMITTEES OF THE CORPORATION.

(a) OFFICERS AND EMPLOYEES.—

(1) IN GENERAL.—The Corporation shall have a Chief Executive Officer, and such other officers and employees as may be named and appointed by the Board for terms and at rates of compensation fixed by the Board pursuant to this subsection. The Chief Executive Officer may name and appoint such employees as are necessary. All officers and employees shall serve at the pleasure of the Board.

(2) LIMITATION.—No individual other than a citizen of the United States may be an officer of the Corporation.

(3) NONPOLITICAL NATURE OF APPOINTMENT.—No political test or qualification shall be used in selecting, appointing, promoting, or taking other personnel actions with respect to officers, agents, or employees of the Corporation.

(4) COMPENSATION.—

(A) IN GENERAL.—The Board may hire and fix the compensation of employees hired under this subsection as may be necessary to carry out the purposes of the Corporation.

(B) APPROVAL OF COMPENSATION BY FEDERAL MEMBERS.—Notwithstanding any other provision of law, or any bylaw adopted by the Corporation, all rates of compensation, including benefit plans and salary ranges, for officers and employees of the Board, shall be jointly approved by the Federal members of the Board.

(C) LIMITATION ON OTHER COMPENSATION.—No officer or employee of the Corporation may receive any salary or other compensation (except for compensation for services on boards of directors of other organizations that do not receive funds from the Corporation, on committees of such boards, and in similar activities for such organizations) from any sources other than the Corporation for services rendered during the period of the employment of the officer or employee by the Corporation.

(5) SERVICE ON OTHER BOARDS.—Service by any officer on boards of directors of other organizations, on committees of such boards, and in similar activities for such organizations shall be subject to annual advance approval by the Board and subject to the provisions of the Corporation's Statement of Ethical Conduct.

(6) RULE OF CONSTRUCTION.—No officer or employee of the Board or of the Corporation shall be considered to be an officer or employee of the United States Government or of the government of the District of Columbia.

(b) ADVISORY COMMITTEES.—The Board—

(1) shall establish a standing public safety advisory committee to assist the Board in carrying out its duties and responsibilities under this subtitle; and

(2) may establish additional standing or ad hoc committees, panels, or councils as the Board determines are necessary.

(c) SELECTION OF AGENTS, CONSULTANTS, AND EXPERTS.—

(1) IN GENERAL.—The Board shall select parties to serve as its agents, consultants, or experts in a fair, transparent, and objective manner.

(2) BINDING AND FINAL.—If the selection of an agent, consultant, or expert satisfies the requirements under paragraph (1), the selection of that agent, consultant, or expert shall be final and binding.

SEC. 205. NONPROFIT AND NONPOLITICAL NATURE OF THE CORPORATION.

(a) STOCK.—The Corporation shall have no power to issue any shares of stock, or to declare or pay any dividends.

(b) PROFIT.—No part of the income or assets of the Corporation shall inure to the benefit of any director, officer, employee, or any other individual associated with the Corporation, except as salary or reasonable compensation for services.

(c) POLITICS.—The Corporation may not contribute to or otherwise support any political party or candidate for elective public office.

(d) PROHIBITION ON LOBBYING ACTIVITIES.—The Corporation shall not engage in lobbying activities (as defined in section 3(7) of the Lobbying Disclosure Act of 1995 (5 U.S.C. 1602(7))).

SEC. 206. POWERS, DUTIES, AND RESPONSIBILITIES OF THE CORPORATION.

(a) GENERAL POWERS.—The Corporation shall have the authority to do the following:

(1) To adopt and use a corporate seal.

(2) To have succession until dissolved by an Act of Congress.

(3) To prescribe, through the actions of its Board, bylaws not inconsistent with Federal law and the laws of the District of Columbia, regulating the manner in which the Corporation's general business may be conducted and the manner in which the privileges granted to the Corporation by law may be exercised.

(4) To exercise, through the actions of its Board, all powers specifically granted by the provisions of this subtitle, and such incidental powers as shall be necessary.

(5) To hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as the Corporation considers necessary to carry out its responsibilities and duties.

(6) To obtain grants and funds from and make contracts with individuals, private companies, organizations, institutions, and Federal, State, regional, and local agencies.

(7) To accept, hold, administer, and utilize gifts, donations, and bequests of property, both real and personal, for the purposes of aiding or facilitating the work of the Corporation.

(8) To issue notes or bonds to purchasers of such instruments in the private capital markets.

(9) To incur indebtedness to carry out the purposes of this subtitle.

(10) To spend funds under paragraph (6) in a manner authorized by the Board, but only for purposes that will advance or enhance public safety communications consistent with this Act.

(11) To establish reserve accounts with funds that the Corporation may receive from time to time that exceed the amounts required by the Corporation to timely pay its debt service and other obligations.

(12) To expend the funds placed in any reserve accounts established under paragraph (11) (including interest earned on any such amounts) in a manner authorized by the Board, but only for purposes that—

(A) will advance or enhance public safety communications consistent with this Act; or

(B) are otherwise approved by an Act of Congress.

(13) To take such other actions as the Corporation (through its Board) may from time to time determine necessary, appropriate, or advisable to accomplish the purposes of this subtitle.

(b) DUTY AND RESPONSIBILITY TO DEPLOY AND OPERATE A NATIONWIDE PUBLIC SAFETY INTEROPERABLE BROADBAND NETWORK.—

(1) IN GENERAL.—The Corporation shall hold the single public safety wireless license granted under section 201 and take all actions necessary to ensure the building, deployment, and operation of a nationwide public safety interoperable broadband network in consultation with Federal, State, tribal, and local public safety entities, the Director of NIST, the Commission, and the public safety advi-

sory committee established in section 204(b)(1), including by, at a minimum—

(A) ensuring nationwide standards for use and access of the network;

(B) issuing open, transparent, and competitive requests for proposals to private sector entities for the purposes of building, operating, and maintaining the network;

(C) encouraging that such requests leverage, to the maximum extent economically desirable, existing commercial wireless infrastructure to speed deployment of the network; and

(D) managing and overseeing the implementation and execution of contracts or agreements with non-Federal entities to build, operate, and maintain the network.

(2) INTEROPERABILITY.—In carrying out the duties and responsibilities of this subsection, including issuing requests for proposals, the Corporation shall—

(A) ensure the safety, security, and resiliency of the network, including requirements for protecting and monitoring the network to protect against cyberattack;

(B) promote competition in the equipment market, including devices for public safety communications, by requiring that equipment for use on the network be—

(i) built to open, non-proprietary, commercially available standards;

(ii) capable of being used by any public safety entity and by multiple vendors across all public safety broadband networks operating in the 700 MHz band; and

(iii) backward-compatible with existing second and third generation commercial networks to the extent that such capabilities are necessary and technically and economically reasonable; and

(C) promote integration of the network with public safety answering points or their equivalent.

(3) RURAL COVERAGE.—In carrying out the duties and responsibilities of this subsection, including issuing requests for proposals, the Corporation, consistent with the license granted under section 201, shall require deployment phases with substantial rural coverage milestones as part of each phase of

the construction and deployment of the network. To the maximum extent economically desirable, such proposals shall include partnerships with existing commercial mobile providers to utilize cost-effective opportunities to speed deployment in rural areas.

(4) EXECUTION OF AUTHORITY.—In carrying out the duties and responsibilities of this subsection, the Corporation may—

(A) obtain grants from and make contracts with individuals, private companies, and Federal, State, regional, and local agencies;

(B) hire or accept voluntary services of consultants, experts, advisory boards, and panels to aid the Corporation in carrying out such duties and responsibilities;

(C) receive payment for use of—

(i) network capacity licensed to the Corporatiou; and

(ii) network infrastructure constructed, owned, or operated by the Corporation; and

(D) take such other actions as may be necessary to accomplish the purposes set forth in this subsection.

(c) OTHER SPECIFIC DUTIES AND RESPONSIBILITIES.—

(1) ESTABLISHMENT OF NETWORK POLICIES.—In carrying out the requirements under subsection (b), the Corporation shall develop—

(A) requests for proposals with appropriate—

(i) timetables for construction, including by taking into consideration the time needed to build out to rural areas and the advantages offered through partnerships with existing commercial providers under paragraph (3);

(ii) coverage areas, including coverage in rural and uonurban areas;

(iii) service levels;

(iv) performance criteria; and

(v) other similar matters for the construction and deployment of such network;

(B) the technical and operational requirements of the network;

(C) practices, procedures, and standards for the management and operation of such network;

(D) terms of service for the use of such network, including billing practices; and

(E) ongoing compliance review and monitoring of the—

(i) management and operation of such network;

(ii) practices and procedures of the entities operating on and the personnel using such network; and

(iii) necessary training needs of network operators and users.

(2) STATE AND LOCAL PLANNING.—

(A) REQUIRED CONSULTATION.—In developing requests for proposals and otherwise carrying out its responsibilities under this Act, the Corporation shall consult with regional, State, tribal, and local jurisdictions regarding the distribution and expenditure of any amounts required to carry out the policies established under paragraph (1), including with regard to the—

(i) construction of an Evolved Packet Core and any Radio Access Network build out;

(ii) placement of towers;

(iii) coverage areas of the network, whether at the regional, State, tribal, or local level;

(iv) adequacy of hardening, security, reliability, and resiliency requirements;

(v) assignment of priority to local users;

(vi) assignment of priority and selection of entities seeking access to or use of the nationwide public safety interoperable broadband network established under subsection (b); and

(vii) training needs of local users.

(B) METHOD OF CONSULTATION.—The consultation required under subparagraph (A) shall occur between the Corporation and the single officer or governmental body designated under section 222(d).

(3) LEVERAGING EXISTING INFRASTRUCTURE.—In carrying out the requirement under subsection (b), the Corporation shall enter into agreements to utilize, to the maximum extent economically desirable, existing—

(A) commercial or other communications infrastructure; and

(B) Federal, State, tribal, or local infrastructure.

(4) MAINTENANCE AND UPGRADES.—The Corporation shall ensure the maintenance, operation, and improvement of the nationwide public safety interoperable broadband network established under subsection (b), including by ensuring that the Corporation updates and revises any policies established under paragraph (1) to take into account new and evolving technologies.

(5) ROAMING AGREEMENTS.—The Corporation shall negotiate and enter into, as it determines appropriate, roaming agreements with commercial network providers to allow the nationwide public safety interoperable broadband network to roam onto commercial networks and gain prioritization of public safety communications over such networks in times of an emergency.

(6) NETWORK INFRASTRUCTURE AND DEVICE CRITERIA.—The Director of NIST, in consultation with the Corporation and the Commission, shall ensure the development of a list of certified devices and components meeting appropriate protocols and standards for public safety entities and commercial vendors to adhere to, if such entities or vendors seek

to have access to, use of, or compatibility with the nationwide public safety interoperable broadband network established under subsection (b).

(7) REPRESENTATION BEFORE STANDARD SETTING ENTITIES.—The Director of NIST, in consultatiou with the Corporation, the Commission, and the public safety advisory committee established under section 204(b)(1), shall represent the interests of pnblic safety users of the nationwide public safety interoperable broadband network established under subsection (b) before any proceeding, negotiation, or other matter in which a standards organization, standards body, standards development organization, or any other recognized standards-setting entity regarding the development of standards relating to interoperability.

(8) PROHIBITION ON NEGOTIATION WITH FOREIGN GOVERNMENTS.—The Corporation shall not have the anthority to negotiate or enter into any agreements with a foreign government on behalf of the United States.

(d) USE OF MAILS.—The Corporation may use the United States mails in the same manner and under the same conditions as the departments and agencies of the United States.

SEC. 207. INITIAL FUNDING FOR THE CORPORATION.

(a) NTIA LOANS TO THE CORPORATION.—

(1) IN GENERAL.—Prior to the commencement of incentive auctions to be carried out under section 309(j)(8)(F) of the Communications Act of 1934 or the auction of spectrum pursuant to section 302, the NTIA is authorized to make loans to the Corporation.

(2) CONDITION OF LOANS.—At the time of application for, and as a condition to, any such loan, the Corporation shall file with the NTIA a statement with respect to the anticipated use of the proceeds of the loan.

(3) NTIA APPROVAL.—If the NTIA determines that such loan is necessary for the Corporatiou to carry out its duties and responsibilities under this subtitle and that the Corporation has submitted a plan which provides as reasonable an assurance of prompt repayment as may be feasible under the circumstances, then the NTIA shall so certify to the Secretary of the Treasury, and issue notes or other obligations to the Secretary of the Treasury pursuant to subsection (b).

(b) NTIA NOTES ISSUED TO TREASURY.—

(1) IN GENERAL.—To enable the NTIA to make loans under subsection (a), the NTIA is au-

thorized to issue to the Secretary of the Treasury notes or other obligations, in such forms and denominations, bearing such maturities, and subject to such terms and conditions, as may be prescribed by the Secretary of the Treasury.

(2) INTEREST ON NOTES.—

(A) ESTABLISHMENT.—Any notes or other obligations issued pursuant to paragraph (1) shall bear interest at a rate determined by the Secretary of the Treasury, taking into consideration the current average market yield on outstanding marketable obligations of the United States of comparable maturities during the month preceding the issuance of the notes or other obligations.

(B) REDUCTION.—The Secretary of the Treasury may reduce the interest rate set forth under subparagraph (A) if he determines such reduction to be in the national interest.

(3) AUTHORITY OF THE TREASURY TO SELL NOTES.—The Secretary of the Treasury may at any time sell any of the notes or other obligations acquired by him under this subsection. All redemptions, purchases, and sales by the Secretary of the Treasury of such notes or other obligations shall be

treated as public debt transactions of the United States.

SEC. 208. PERMANENT SELF-FUNDING; DUTY TO ASSESS AND COLLECT FEES FOR NETWORK USE.

(a) IN GENERAL.—The Corporation is authorized to assess and collect the following fees:

(1) NETWORK USER FEE.—A user or subscription fee from each entity, including any public safety entity or secondary user, that seeks access to or use of the nationwide public safety interoperable broadband network established under this subtitle.

(2) LEASE FEES RELATED TO NETWORK CAPACITY.—

(A) IN GENERAL.—A fee from any entity that seeks to enter into a covered leasing agreement.

(B) COVERED LEASING AGREEMENT.—For purposes of subparagraph (A), a "covered leasing agreement" means a written agreement between the Corporation and secondary user to permit—

(i) access to network capacity on a secondary basis for non-public safety services; and

(ii) the spectrum allocated to such entity to be used for commercial transmissions along the dark fiber of the long-haul network of such entity.

(3) LEASE FEES RELATED TO NETWORK EQUIPMENT AND INFRASTRUCTURE.—A fee from any entity that seeks access to or use of any equipment or infrastructure, including antennas or towers, constructed or otherwise owned by the Corporation.

(b) ESTABLISHMENT OF FEE AMOUNTS; PERMANENT SELF-FUNDING.—The total amount of the fees assessed for each fiscal year pursuant to this section shall be sufficient, and shall not exceed the amount necessary, to recoup the total expenses of the Corporation in carrying out its duties and responsibilities described under this subtitle for the fiscal year involved.

(c) REQUIRED REINVESTMENT OF FUNDS.—The Corporation shall reinvest amounts received from the assessment of fees under this section in the nationwide public safety interoperable broadband network by using such funds only for constructing, maintaining, or improving the network.

SEC. 209. AUDIT AND REPORT.

(a) AUDIT.—

(1) IN GENERAL.—The financial transactions of the Corporation for any fiscal year during which Federal funds are available to finance any portion of its operations shall be audited by the Comptroller General of the United States annually in accordance with the principles and procedures applicable to commercial corporate transactions and under such rules and regulations as may be prescribed by the Comptroller General. Each audit conducted by the Comptroller General under this paragraph shall be made available to Congress.

(2) LOCATION.—Any audit conducted under paragraph (1) shall be conducted at the place or places where accounts of the Corporation are normally kept.

(3) ACCESS TO CORPORATION BOOKS AND DOCUMENTS.—

(A) IN GENERAL.—For purposes of an audit conducted under paragraph (1), the representatives of the Comptroller General shall—

(i) have access to all books, accounts, records, reports, files, and all other papers, things, or property belonging to or in use by the Corporation that pertain to the financial transactions of the Corporation and are necessary to facilitate the audit; and

(ii) be afforded full facilities for verifying transactions with the balances or securities held by depositories, fiscal agents, and custodians.

(B) REQUIREMENT.—All books, accounts, records, reports, files, papers, and property of the Corporation shall remain in the possession and custody of the Corporation.

(b) REPORT.—

(1) IN GENERAL.—The Comptroller General of the United States shall submit a report of each audit conducted under subsection (a) to—

(A) the appropriate committees of Congress;

(B) the President; and

(C) the Corporation.

(2) CONTENTS.—Each report submitted under paragraph (1) shall contain—

(A) such comments and information as the Comptroller General determines necessary to inform Congress of the financial operations and condition of the Corporation;

(B) any recommendations of the Comptroller General relating to the financial operations and condition of the Corporation; and

(C) a description of any program, expenditure, or other financial transaction or undertaking of the Corporation that was observed during the course of the audit, which, in the opinion of the Comptroller General, has been carried on or made without the authority of law.

SEC. 210. ANNUAL REPORT TO CONGRESS.

(a) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, and each year thereafter, the Corporation shall submit an annual report covering the preceding fiscal year to the appropriate committees of Congress.

(b) REQUIRED CONTENT.—The report required under subsection (a) shall include—

(1) a comprehensive and detailed report of the operations, activities, financial condition, and accomplishments of the Corporation under this section; and

(2) such recommendations or proposals for legislative or administrative action as the Corporation deems appropriate.

(c) AVAILABILITY TO TESTIFY.—The directors, officers, employees, and agents of the Corporation shall be available to testify before the appropriate committees of the Congress with respect to—

(1) the report required under subsection (a);

(2) the report of any audit made by the Comptroller General under section 209; or

(3) any other matter which such committees may determine appropriate.

SEC. 211. PUBLIC SAFETY ROAMING AND PRIORITY ACCESS.

The Commission may adopt rules, if necessary in the public interest, to improve the ability of public safety networks to roam onto commercial networks and to gain priority access to commercial networks in an emergency if—

(1) the public safety entity equipment is technically compatible with the commercial network;

(2) the commercial network is reasonably compensated; and

(3) such access does not preempt or otherwise terminate or degrade all existing voice conversations or data sessions.

SEC. 212. TRANSITIONAL ANALYSIS OF PUBLIC SAFETY NETWORK ATTRIBUTES.

(a) ESTABLISHMENT OF EVALUATION FRAMEWORK.—Not later than 180 days after the date of enactment of this Act, the Director of NIST, in consultation with the Secretary of Homeland Security, the Attorney General, and the Director of the Office of Management and Budget, shall develop an evaluation framework. The development of such an evaluation framework shall be informed by a study commissioned by the Director of NIST and completed by an independent and neutral agent, consultant, or expert, who has—

(1) at least 5 years of technical and economic experience in analyzing the costs and effectiveness of communications networks; and

(2) agreed not to contract or subcontract with the Corporation for at least 3 years from the date such study is completed other than for follow-on and related studies.

(b) CONSIDERATIONS.—The evaluation framework required to be developed under subsection (a) shall take into consideration the public safety network attributes identified in a report completed by the Visiting Committee on Advanced Technology of NIST. The report required under this subsection shall identify the desired attributes of the nationwide public safety interoperable broadband network to be established under this title, as well as any other attributes the Secretary of Commerce may request.

(c) REQUIRED EVALUATIONS.—The evaluation framework required to be developed under subsection (a) shall evaluate—

(1) the marginal cost of each public safety network attribute in developing, deploying, and operating the nationwide public safety interoperable broadband network to be established under this title;

(2) the benefit of each public safety network attribute to the nationwide public safety interoperable broadband network;

(3) the economic feasibility of requiring that each public safety attribute be required as part of the nationwide public safety interoperable broadband network;

(4) the resulting competitive vendor supply ecosystem created by each public safety attribute that is a part of the nationwide public safety interoperable broadband network; and

(5) the level of variability in regional requirements for each public safety attribute that is a part of the nationwide public safety interoperable broadband network.

(d) PROVISION OF FRAMEWORK TO THE CORPORATION.—The evaluation framework required to be developed under subsection (a) shall be provided to the Board of Directors of the Corporation, and the Corporation shall utilize the findings of such framework to develop a cost-benefit analysis to inform the building, deployment, and operation of the nationwide public safety interoperable broadband network to be established under this title.

(e) OMB RESPONSIBILITY.—The Director of the Office of Management and Budget, or his designee, as a member of the Board of Directors of the Corporation, shall have the responsibility to ensure that evaluation framework required to be developed under subsection (a) is appropriately utilized by the Corporation.

SEC. 213. PROHIBITION ON DIRECT OFFERING OF COMMERCIAL TELECOMMUNICATIONS SERVICE DIRECTLY TO CONSUMERS.

(a) IN GENERAL.—The Corporation shall not offer, provide, or market commercial telecommunications or information services directly to consumers.

(b) RULE OF CONSTRUCTION.—Nothing in this section shall be construed to prohibit the Corporation and a secondary user from entering into a covered leasing agreement pursuant to section 208(a)(2)(B). Nothing in this section shall be construed to limit the Corporation from collecting lease fees related to network equipment and infrastructure pursuant to section 208(a)(3).

SEC. 214. PROVISION OF TECHNICAL ASSISTANCE.

The Commission may provide technical assistance to the Corporation and may take any action necessary to assist the Corporation in effectuating its duties and responsibilities under this subtitle.

Subtitle B—Public Safety Commitments

SEC. 221. STATE AND LOCAL IMPLEMENTATION FUND.

(a) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the "State and Local Implementation Fund".

(b) PURPOSE.—The Assistant Secretary shall establish and administer the grant program under section 222 using the funds deposited in the State and Local Implementation Fund.

(c) CREDITING OF RECEIPTS.—There shall be deposited into or credited to the State and Local Implementation Fund—

(1) any amounts specified in section 401; and

(2) any amounts borrowed by the Assistant Secretary under subsection (d).

(d) BORROWING AUTHORITY.—

(1) IN GENERAL.—The Assistant Secretary may borrow from the general fund of the Treasury beginning on October 1, 2011, such sums as may be necessary, but not to exceed $250,000,000, to implement section 222.

(2) REIMBURSEMENT.—The Assistant Secretary shall reimburse the general fund of the Treasury, without interest, for any amounts borrowed under subparagraph (A) as funds are deposited into the State and Local Implementation Fund.

SEC. 222. STATE AND LOCAL IMPLEMENTATION.

(a) ESTABLISHMENT OF STATE AND LOCAL IMPLEMENTATION GRANT PROGRAM.—The Assistant Secretary, in consultation with the Corporation, shall take such action as is necessary to establish a grant program to make grants to States to assist State, regional, tribal, and local jurisdictions to identify, plan, and implement the most efficient and effective way for such jurisdictions to utilize and integrate the infrastructure, equipment, and other architecture associated with the nationwide public safety interoperable broadband network established under subtitle A to satisfy the wireless communications and data services needs of that jurisdiction, including with regards to coverage, siting, and other needs.

(b) MATCHING REQUIREMENTS; FEDERAL SHARE.—

(1) IN GENERAL.—The Federal share of the cost of any activity carried out using a grant under this section may not exceed 80 percent of the eligible costs of carrying out that activity, as determined by the Assistant Secretary, in consultation with the Corporation.

(2) WAIVER.—The Assistant Secretary may waive, in whole or in part, the requirements of paragraph (1) for good cause shown if the Assistant Secretary determines that such a waiver is in the public interest.

(c) PROGRAMMATIC REQUIREMENTS.—Not later than 6 months after the establishment of the bylaws of the Corporation pursuant to section 206, the Assistant Secretary, in consultation with the Corporation, shall establish requirements relating to the grant program to be carried out under this section, including the following:

(1) Defining eligible costs for purposes of subsection (b)(1).

(2) Determining the scope of eligible activities for grant funding under this section.

(3) Prioritizing grants for activities that ensure coverage in rural as well as urban areas.

(d) CERTIFICATION AND DESIGNATION OF OFFICER OR GOVERNMENTAL BODY.—In carrying out the grant program established under this section, the Assistant Secretary shall require each State to certify in its application for grant funds that the State has designated a single officer or governmental body to serve as the coordinator of implementation of the grant funds.

SEC. 223. PUBLIC SAFETY WIRELESS COMMUNICATIONS RESEARCH AND DEVELOPMENT.

(a) NIST DIRECTED RESEARCH AND DEVELOPMENT PROGRAM.—From amounts made available from the Public Safety Trust Fund established under section 401, the Director of NIST, in consultation with the Commission, the Secretary of Homeland Security, and the National Institute of Justice of the Department of Jnstice, as appropriate, shall conduct research and assist with the development of standards, technologies, and applications to advance wireless public safety communications.

(b) REQUIRED ACTIVITIES.—In carrying out the requirement under subsection (a), the Director of NIST, in consultation with the Corporation and the public safety advisory committee established under section 204(b)(1), shall—

(1) document pnblic safety wireless communications technical requirements;

(2) accelerate the development of the capability for communications between currently deployed pub-

lic safety narrowband systems and the nationwide public safety interoperable broadband network to be established under this title;

(3) establish a research plan, and direct research, that addresses the wireless communications needs of public safety entities beyond what can be provided by the current generation of broadband technology;

(4) accelerate the development of mission critical voice, including device-to-device "talkaround" capability over broadband networks, public safety prioritization, authentication capabilities, and standard application programing interfaces for the nationwide public safety interoperable broadband network to be established under this title, if necessary and practical;

(5) accelerate the development of communications technology and equipment that can facilitate the eventual migration of public safety narrowband communications to the nationwide public safety interoperable broadband network to be established under this title; and

(6) convene working groups of relevant government and commercial parties to achieve the requirements in paragraphs (1) through (5).

SEC. 224. ADVANCED INFORMATION AND COMMUNICATIONS TECHNOLOGY RESEARCH.

(a) ADVANCED COMMUNICATIONS SERVICES FOR ALL AMERICANS.—The Director of NIST shall continue to snpport research and support standards development in advanced information and communications technologies focused on enhancing or facilitating the availability and affordability of advanced communications services to all Americans, in order to implement the Institute's responsibilities under section 2(c)(12) of the National Institute of Standards and Technology Act (15 U.S.C. 272(c)(12)). The Director of NIST shall support intramural research and cooperative research with institutions of higher education (as defined in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a))) and indnstry.

(b) DARPA RESEARCH.—

(1) IN GENERAL.—From amounts made available from the Public Safety Trust Fund established under section 401, the Defense Advanced Research Projects Agency (referred to in this subsection as "DARPA") shall conduct wireless communications research to develop more secure, reliable, and flexible radio-frequency systems for Federal wireless users. Areas of research to be supported by this subsection include, but are not limited to—

(A) technologies to increase wireless data transmission speeds to enable the next generation of Federal networks;

(B) spectrum sharing and interference mitigation techniques to enable more efficient uses of wireless spectrum;

(C) technologies to allow and foster the reallocation of spectrum, if appropriate, for non-Federal use; and

(D) research that fosters the conversion of the Department of Defense's wireless communications systems, and those of other Federal users, to more advanced or more efficient systems.

(2) COOPERATION.—In carrying out this subsection, DARPA shall collaborate where appropriate with NTIA, NIST, NSF, and other interested Federal agencies.

(3) LIMITATION ON USE.—Not more than 5 percent of any amounts made available in a fiscal year from the Public Safety Trust Fund established under section 401 may be used by DARPA to cover the administrative expenses incurred in carrying out this subsection.

(4) OMB REVIEW.—Amounts appropriated to DARPA under this subsection shall be available upon approval by the Director of the Office of Management and Budget of an implementation plan that has been developed and submitted to the Director by the head of DARPA.

TITLE III—SPECTRUM AUCTION AUTHORITY

SEC. 301. EXTENSION OF AUCTION AUTHORITY.

Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking "2012" and inserting "2021".

SEC. 302. AUCTION OF SPECTRUM.

(a) IDENTIFICATION OF SPECTRUM.—Not later than 1 year after the date of enactment of this Act, the Assistant Secretary shall identify and make available for immediate reallocation, at a minimum, 15 megahertz of contiguous spectrum at frequencies located between 1675 megahertz and 1710 megahertz, inclusive, minus the geographic exclusion zones, or any amendment thereof, identified in NTIA's October 2010 report entitled "An Assessment of Near-Term Viability of Accommodating Wireless Broadband Systems in 1675–1710 MHz, 1755–1780 MHz, 3500–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands".

(b) AUCTION.—Not later than January 31, 2014, the Commission shall conduct the auctions of the following licenses, by commencing the bidding for:

(1) The spectrum between the frequencies of 1915 megahertz and 1920 megahertz, inclusive.

(2) The spectrum between the frequencies of 1995 megahertz and 2000 megahertz, inclusive.

(3) The spectrum between the frequencies of 2020 megahertz and 2025 megahertz, inclusive.

(4) The spectrum between the frequencies of 2155 megahertz and 2175 megahertz, inclusive.

(5) The spectrum between the frequencies of 2175 megahertz and 2180 megahertz, inclusive.

(6) The spectrum between the frequencies of 1755 megahertz and 1850 megahertz, inclusive.

(7) The spectrum identified pursuant to subsection (a).

(c) AUCTION ORGANIZATION.—The Commission may, if technically feasible and consistent with the public interest, combine the spectrum identified in paragraphs (4), (5), and the portion of paragraph (6) between the frequencies of 1755 megahertz and 1780 megahertz, inclusive, of subsection (b) in an auction of licenses for paired spectrum blocks.

(d) FURTHER REALLOCATION OF CERTAIN OTHER SPECTRUM.—

(1) COVERED SPECTRUM.—For purposes of this subsection, the term "covered spectrum" means the portion of the electromagnetic spectrum between the frequencies of 3550 to 3650 megahertz, inclusive, minus the geographic exclusion zones, or any amendment thereof, identified in NTIA's October 2010 report entitled "An Assessment of Near-Term Viability of Accommodating Wireless Broadband Systems in 1675–1710 MHz, 1755–1780 MHz, 3550–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands".

(2) IN GENERAL.—Consistent with requirements of section 309(j) of the Communications Act of 1934, the Commission shall reallocate covered spectrum for assignment by competitive bidding unless the President of the United States determines that—

(A) such spectrum cannot be reallocated due to the need to protect incumbent Federal systems from interference; or

(B) allocation of other spectrum—

(i) better serves the public interest, convenience, and necessity; and

(ii) can reasonably be expected to produce receipts comparable to what the covered spectrum might auction for without the geographic exclusion zones.

(3) ACTIONS REQUIRED IF COVERED SPECTRUM CANNOT BE REALLOCATED.—

(A) IN GENERAL.—If the President makes a determination under paragraph (2) that the covered spectrum cannot be reallocated, then the President shall, within 1 year after the date of such determination—

(i) identify alternative bands of frequencies totaling more than 20 megahertz and no more than 100 megahertz of spectrum used primarily by Federal agencies that satisfy the requirements of clauses (i) and (ii) of paragraph (2)(B);

(ii) report to the appropriate committees of Congress and the Commission an identification of such alternative spectrum for assignment by competitive bidding; and

(iii) make such alternative spectrum for assignment immediately available for reallocation.

(B) AUCTION.—If the President makes a determination under paragraph (2) that the covered spectrum cannot be reallocated, the Commission shall commence the bidding of the alternative spectrum identified pursuant to subparagraph (A) within 3 years of the date of enactment of this Act.

(4) ACTIONS REQUIRED IF COVERED SPECTRUM CAN BE REALLOCATED.—If the President does not make a determination under paragraph (1) that the covered spectrum cannot be reallocated, the Commission shall commence the competitive bidding for the covered spectrum within 3 years of the date of enactment of this Act.

(e) PROCEEDS.—Notwithstanding section 309(j)(8)(A) of the Communications Act of 1934, and except as provided in subparagraphs (B), (C), and (D) of such section 309(j)(8), all proceeds (including deposits and up front payments from successful bidders) from the auctions to be carried out pursuant to subsections (b) and (d) shall be deposited with the Public Safety Trust Fund established under section 401.

(f) AMENDMENTS TO DESIGN REQUIREMENTS RELATED TO COMPETITIVE BIDDING.—Section 309(j) of the

Communications Act of 1934 (47 U.S.C. 309(j)) is amended—

(1) in paragraph (3)—

(A) in subparagraph (E)(ii), by striking "; and" and inserting a semicolon;

(B) in subparagraph (F), by striking the period at the end and inserting a semicolon; and

(C) by adding at the end the following:

"(G) ensuring that there is an adequate opportunity for applicants to obtain licenses covering both large and small geographic areas, as such areas are determined by the Commission."; and

(2) by amending clause (i) of the second sentence of paragraph (8)(C) to read as follows:

"(i) the deposits—

"(I) of successful bidders of any auction conducted pursuant to subparagraph (F) or to section 302 of the Public Safety Spectrum and Wireless Innovation Act shall be paid to the Public Safety Trust Fund established under section 401 of such Act; and

"(II) of successful bidders of any other auction shall be paid to the Treasury;".

SEC. 303. INCENTIVE AUCTION AUTHORITY.

(a) IN GENERAL.—Paragraph (8) of section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) is amended—

(1) in subparagraph (A), by striking "(B), (D), and (E)," and inserting "(B), (D), (E), and (F),"; and

(2) by adding at the end the following:

"(F) INCENTIVE AUCTION AUTHORITY.—

"(i) AUTHORITY.—Notwithstanding any other provision of law, if the Commission determines that it is consistent with the pnblic interest in utilization of the spectrum for a licensee to relinquish voluntarily some or all of its licensed spectrum usage rights in order to permit the assignment of new initial licenses through a competitive bidding process subject to new service rules, or the designation of new spectrum for unlicensed use, the Commission may disburse to that licensee a portion of any auction proceeds that the Commission determines, in its discretion, are attributable to the licensee's relinquished spectrum usage rights, provided that television broadcast stations required to be carried pursuant to sections 338, 614, or 615 that voluntarily elect to share a channel shall retain the rights to carriage set forth in such sections and the rules of the Commission, as such rights apply to such station at its shared location.

"(ii) LIMITATION.—The Commission may not conduct more than one incentive auction of frequencies licensed to television stations pursuant to the provisions of section 303 of this Act.

"(iii) PROHIBITION.—

"(I) IN GENERAL.—The Commission may not reclaim spectrum licensed on a primary basis to a television broadcast station, directly or indirectly, on an involuntary basis for purposes of providing spectrum to carry out an incentive auction under this subparagraph.

"(II) MODIFICATION OR REVOCATION.—Notwithstanding the provisions in sections 303 and 304, the Commission shall have no authority to modify or revoke a license or take any action if the effect of such modification, revocation, or other action is to compel a licensee to participate in an incentive auction as authorized in this section or otherwise make frequencies available for such an auction.

"(III) REPACKING PERMITTED.—The Commission may reassign the frequency which a television broadcast station licensee is permitted to utilize, or a portion thereof in accordance with the provisions of this section, only if such reassignment—

"(aa) consists of a 6 MHz channel, located between channels 14 and 50, inclusive, in the same geographic market and with the same city of license, to each such licensee, and "(bb) preserves such licensee's—

"(AA) signal power level;

"(BB) tower height or transmission architecture; and

"(CC) interference levels with respect to such licensee's signal.

"(IV) LOW-POWER TELEVISION.—

"(aa) IN GENERAL.—The Commission may not reclaim spectrum licensed to a low-power television licensee, directly or indirectly, on an involuntary basis, unless the Commission finds the low-power television licensee a replacement channel with similar population coverage in the UHF television band of frequencies.

"(bb) EXCEPTION.—If the Commission or the licensee cannot locate a suitable channel within the UHF band, after an explanation to the licensee showing the basis for the determination that no channel is available, the Commission shall—

"(AA) collocate multiple low-power television licensees in a channel in the UHF band, by using channel sharing, with each licensee assigned half of the total bandwidth; or

"(BB) if no space exists for collocation of low-power television licensees in the UHF band as described in item (aa), assign a low-power television licensee a full channel between channels seven and 13, inclusive, in the VHF band.

"(V) PROHIBITION.—The Commission may not require any television station licensee involuntarily to collocate its facilities with the facilities of any other television broadcast station licensee in order to transmit on the same frequency.

"(VI) COLLOCATION PERMITTED.—Notwithstanding the requirement of subclause (III)(aa) that a frequeucy reassignment must consist of a 6 MHz channel, in any given market any 2 television broadcast station licensees shall be permitted to collocate their facilities in order to transmit on the same frequency.

"(VII) TREATMENT OF TRANSMISSION FROM COLLOCATED FACILITIES.—The transmission of any television broadcast stations voluntarily electing to share a 6 MHz channel shall each be treated as a 'primary channel' for purposes of the Commission's regulations implementing sections 338, 614, and 615 as in effect on the date of enactment of this subclause.

"(VIII) REIMBURSEMENT OF COSTS.—Any liceusee that is affected, directly or indirectly, by the Commission reassigning a licensee to a different channel shall be reimbursed for the costs resulting from such reassignment, including—

"(aa) those associated with the modification or replacement of broadcast signal transmission facilities and equipment, including the cost of temporary facilities;

"(bb) those associated with the construction, replacement, or relocation of a broadcast transmission tower, to the extent that those costs are related either to the reassignment to a different channel that a licensee is authorized to utilize, or to mitigate interference resulting from the reassignment of another licensee;

"(cc) those associated with the npgrade, replacement, or relocation of translator or booster stations affiliated with the relevant full-power licensee;

"(dd) those associated with consumer education efforts concerning the effect of a Commission reassignment of channels in a designated market area; and

"(ee) any other costs directly or indirectly resulting from the reassignment of channels in a designated market area.

"(IX) UNLICENSED SPECTRUM.—With respect to frequency bands between 54 and 72 MHz, 76 and 88 MHz, 174 and 216 MHz, 470 and 698 MHz, 84 MHz shall be assigned via a competitive bidding process. A portion of the proceeds from the competitive bidding of the frequency bands identified in the prior sentence may, if consistent with the public interest, be disbursed to other licensees, for the purpose of ensuring that unlicensed spectrum remains available in these frequency bands, nationwide, and in each local market.

"(iv) TREATMENT OF REVENUES.—Notwithstanding subparagraph (A), and except as provided in subparagraphs (B), (C), and (D), all proceeds (including deposits and up front payments from successful bidders) from the auction of spectrum under this subparagraph shall be deposited with the Public Safety Trust Fund established under section 401 of the Public Safety Spectrum and Wireless Innovation Act.

"(G) ESTABLISHMENT OF INCENTIVE AUCTION RELOCATION FUND.—

"(i) IN GENERAL.—There is established in the Treasury of the United States a fund to be known as the 'Incentive Auction Relocation Fund'.

"(ii) ADMINISTRATION.—The Assistant Secretary shall administer the Incentive Auction Relocation Fund using the amounts deposited pursuant to this section.

"(iii) CREDITING OF RECEIPTS.—There shall be deposited into or credited to the Incentive Auction Relocation Fund any amounts specified in section 401 of the Public Safety Spectrum and Wireless Innovation Act.

"(iv) AVAILABILITY.—Amounts in the Incentive Auction Relocation Fund shall be available to the NTIA for use—

"(I) for a period not to exceed 18 months following the later of—

"(aa) the completion of incentive auction from which such amounts were derived; or

"(bb) the date on which the Commission issues all the new channel assignments pursuant to any repacking required under subparagraph (F)(iii)(III); and

"(II) without further appropriation.

"(v) USE OF FUNDS.—Amounts in the Incentive Auction Relocation Fund may only be used by the NTIA, in consultation with the Commission, to cover—

"(I) the costs identified in subparagraph (F)(iii)(VIII); and

"(II) the costs incurred by multichannel video programming distributors for new equipment, installation, and construction related to the carriage of such relocated stations or the carriage of stations that voluntarily elect to share a channel, but retain their existing rights to carriage pursuant to sections 338, 614, and 615.".

(b) INCENTIVE AUCTIONS TO REPURPOSE CERTAIN MOBILE SATELLITE SERVICES SPECTRUM FOR TERRESTRIAL BROADBAND USE.—To the extent that the Commission makes available spectrum licenses on some or all of the frequencies between 2000 and 2020 MHz and 2180 and 2200 MHz for terrestrial broadband use, such licenses shall be assigned pursuant to the authority provided in section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)), including, as appropriate, subparagraph (F) of such section.

(c) SENSE OF CONGRESS.—It is the sense of Congress that any spectrum identified for auction under this section should be licensed—

(1) on a flexible use basis to the extent technologically feasible; and

(2) consistent with the public interest, convenience, and necessity.

SEC. 304. EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.

(a) STUDY AND REPORT.—Not later than 180 days after the date of enactment of this Act and not later than every 2 years thereafter, the Commission shall conduct a study and submit a report to the appropriate committees of Congress and to the Corporation on the spectrum used by public safety licensees or for public safety services pursuant to section 337(f) of the Communications Act of 1934 (47 U.S.C. 337).

(b) REQUIREMENTS.—The report required under subsection (a) shall—

(1) inventory the spectrum assigned to public safety use; and

(2) include—

(A) the amount of spectrum allocated to public safety use;

(B) the number of licensees and amount of spectrum assigned to each licensee;

(C) a general description of technologies and systems in each band;

(D) an approximation of network coverage, as appropriate, of major systems (such as an estimation of land mobile radio coverage by population) in major metropolitan areas; and

(E) an approximate number of users of major systems, such as the number of first responders using land mobile radio, in major metro areas;

(3) assess if spectrum is adequate to meet the current and future needs for public safety services; and

(4) assess the opportunity for return of any additional spectrum to the Commission for reallocation.

SEC. 305. REPORT ON SATELLITE BROADBAND.

Not later than 2 years after the date of enactment of this Act, the Comptroller General of the United States shall conduct a study and submit to the appropriate committees of Congress a report on the current and future capabilities of fixed and mobile satellite broadband to assist pnblic safety entities during an emergency.

SEC. 306. FEDERAL INFRASTRUCTURE SHARING.

The Administrator of General Services shall establish rules to allow public safety entities licensed or otherwise permitted to use spectrum allocated to the Public Safety

Broadband Corporation to have access to those components of Federal infrastructure appropriate for the construction and maintenance of the nationwide public safety interoperable broadband network to be established under title II.

SEC. 307. REPORT ON UNLICENSED SPECTRUM.

Not later than 5 years after the date of enactment of this Act, the Commission shall submit to the appropriate committees of Congress a report on—

(1) the status of development of any spectrum designated as unlicensed spectrum by the Commission under this Act; and

(2) the nse of any unlicensed spectrum described in paragraph (1).

TITLE IV—PUBLIC SAFETY TRUST FUND

SEC. 401. PUBLIC SAFETY TRUST FUND.

(a) ESTABLISHMENT OF PUBLIC SAFETY TRUST FUND.—

(1) IN GENERAL.—There is established in the Treasury of the United States a trust fund to be known as the "Public Safety Trust Fund".

(2) CREDITING OF RECEIPTS.—

(A) IN GENERAL.—There shall be deposited into or credited to the Public Safety Trust

Fund the proceeds from the auction of spectrum carried out pursuant to—

(i) section 302 of this Act; and

(ii) section 309(j)(8)(F) of the Communications Act of 1934, as added by section 303 of this Act.

(B) AVAILABILITY.—Amounts deposited into or credited to the Public Safety Trust Fund in accordance with subparagraph (A) shall remain available until the end of fiscal year 2021. Upon the expiration of the period described in the prior sentence such amounts shall be deposited in the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(b) USE OF FUND.—Amounts deposited in the Public Safety Trust Fund shall be used in the following manner:

(1) PAYMENT OF AUCTION INCENTIVE.—

(A) REQUIRED DISBURSALS.—Amounts in the Public Safety Trust Fund shall be used to make any required disbursal of payments to licensees required pursuant to—

(i) clause (i) and subclause (VIII) of clause (iii) of section 309(j)(8)(F) of the Communications Act of 1934; and

(ii) section 303(b) of this Act.

(B) NOTIFICATION TO CONGRESS.—

(i) IN GENERAL.—At least 3 months in advance of any incentive auction conducted pursuant to subparagraph (F) of section 309(j)(8) of the Communications Act of 1934, the Chairman of the Commission, in consultation with the Director of the Office of Management and Budget, shall notify the appropriate committees of Congress—

(I) of the methodology for calculating the disbursal of payments to certain licensees required pursuant to clause (i) and subclause (VIII) of clause (iii) of such subparagraph; and

(II) that such methodology considers the value of the spectrum voluntarily relinquished in its current use and the timeliness with which the licensee will clear its use of such spectrum.

(ii) DEFINITION.—In this clause, the term "appropriate committees of Congress" means—

(I) the Committee on Commerce, Science, and Transportation of the Senate;

(II) the Committee on Appropriations of the Senate;

(III) the Committee on Energy and Commerce of the House of Representatives; and

(IV) the Committee on Appropriations of the House of Representatives.

(2) INCENTIVE AUCTION RELOCATION FUND.—Not less than 5 percent of the amounts in the Public Safety Trust Fund but not more than $1,500,000,000 shall be deposited in the Incentive Auction Relocation Fund established under section 309(j)(8)(G) of the Communications Act of 1934.

(3) STATE AND LOCAL IMPLEMENTATION FUND.—$250,000,000 shall be deposited in the State and Local Implementation Fund established under section 221.

(4) PUBLIC SAFETY BROADBAND CORPORATION.—$11,750,000,000 shall deposited with the Public Safety Broadband Corporation established under section 202, of which pursuant to its respon-

sibilities and duties set forth under section 206 to deploy and operate a nationwide public safety interoperable broadband network—

(A) not less than $10,500,000,000 shall be made available for any Radio Access Network build out; and

(B) not less than $1,250,000,000 shall be made available to develop an Evolved Packet Core.

(5) PUBLIC SAFETY RESEARCH AND DEVELOPMENT.—$100,000,000 per year for each of the fiscal years 2012 through 2016 shall be made available for use by the Director of NIST to carry out the research program established under section 223.

(6) ADVANCED INFORMATION AND TECHNOLOGY RESEARCH.—$70,000,000 per year for each of the fiscal years 2012 through 2016 shall be made available to carry out the research program established under section 224(b).

(7) DEFICIT REDUCTION.—Any amounts remaining after the deduction of the amounts required under paragraphs (1) through (6) shall be deposited in the General Fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(c) INVESTMENT.—Amounts in the Public Safety Trust Fund shall be invested in accordance with section 9702 of title 31, United States Code, and any interest on, and proceeds from, any such investment shall be credited to, and become a part of, the Fund.

TITLE V—SPECTRUM POLICY

Subtitle A—Inventory and Planning

SEC. 501. RADIO SPECTRUM INVENTORY.

(a) SPECTRUM INVENTORY.—Part I of title III of the Communications Act of 1934 (47 U.S.C. 301 et seq.) is amended by adding at the end the following:

"SEC. 342. SPECTRUM INVENTORY.

"(a) RADIO SPECTRUM INVENTORY.—Not later than 180 days after the date of enactment of the Public Safety Spectrum and Wireless Innovation Act, and biennially thereafter, the Commission, in consultation with the NTIA and the Office of Science and Technology Policy, shall carry out the following activities:

"(1) REPORT.—Prepare a report that includes an inventory of each radio spectrum band, from 300 MHz to 3.5 GHz, at a minimum, managed by each such agency. Except as provided in subsection (b), the report shall include—

"(A) the licensee or government user authorized in the band;

"(B) the total spectrum authorized for each licensee or government nser (in percentage terms and in sum) in the band;

"(C) the approximate number of transmitters, end-user terminals, or receivers, excluding unintended radiators, that have been deployed or authorized, for each licensee or government user, in the band; and

"(D) if such information is available—

"(i) the type of transmitters, end-user terminals, or receivers, excluding unintended radiators, operating in the band and whether they are space-, air-, or ground-based;

"(ii) the type of transmitters, end-user terminals, or receivers, excluding unintended radiators, authorized to operate in the band and whether they are space-, air-, or ground-based;

"(iii) contour maps or other information that illustrate the coverage area, receiver performance, and other parameters relevant to an assessment of the availability of spectrum in each band;

"(iv) the approximate geolocation of base stations or fixed transmitters;

"(v) the approximate extent of use, by geography, of each band of frequencies, such as the amount and percentage of time of use, number of end-users, or other measures as appropriate to the particular band;

"(vi) the activities, capabilities, functions, or missions supported by the transmitters, end-user terminals, or receivers; and

"(vii) the types of unlicensed devices authorized to operate in the band.

"(2) PUBLIC ACCESS.—Create a centralized portal or website utilizing data from the Commission and the NTIA to make a centralized inventory of the bands of each agency available to the public via an Internet-accessible website.

"(3) UPDATES.—Make all reasonable efforts to maintain and update the information required under paragraph (2) no less frequently than quarterly to reflect, at a minimum, any transfer or auction of licenses or change in allocation, assignment, or authorization.

"(4) FCC TO BEAR COSTS.—Notwithstanding any other provision of law, all costs incurred by the Commission and the NTIA in establishing and maintaining the centralized inventory and the centralized portal or website shall be borne exclusively by the Commission.

"(5) PAPERWORK REDUCTION ACT EXEMPTION.—Any forms prescribed by the Commission under this section, and any information-gathering activities of the Commission under this section, shall not be subject to the provisions of sections 3507 or 3512 of title 44, United States Code (44 U.S.C. 3507, 3512).

"(b) NATIONAL SECURITY; CLASSIFIED INFORMATION.—

"(1) IN GENERAL.—If the head of a Federal agency determines that disclosure of information required by subsection (a) would be harmful to the national security of the United States, the agency shall—

"(A) notify the NTIA of its determination; and

"(B) provide to the NTIA—

"(i) the other publicly releasable information required by subsection (a);

"(ii) to the maximum extent practicable, a summary description of the information with respect to which the determination was made; and

"(iii) an annex containing the information with respect to which the determination was made.

"(2) CLASSIFIED INFORMATION.—If the head of a Federal agency determines that any information required by subsection (a) is classified in accordance with Executive Order 13526 of December 29, 2009, or any successor Executive Order establishing or modifying the uniform system for classifying, safeguarding, and declassifying national security information, the agency shall—

"(A) notify the NTIA of its determination; and

"(B) provide to the NTIA—

"(i) the information required by subsection (a)(1) that is not classified;

"(ii) to the maximum extent practicable, a summary description of the information that is classified; and "(iii) an annex containing the information that is classified.

"(3) ANNEX RESTRICTION.—The NTIA shall make an annex described in paragraph (1)(B)(iii) or (2)(B)(iii) available to the Commission. Neither the NTIA nor the Commission may make any such annex available to the public pursuant to subsection (a)(2) or to any unauthorized person through any other means.

"(c) PUBLIC SAFETY NONDISCLOSURE.—

"(1) IN GENERAL.—If a licensee of non-Federal spectrum determines that public disclosure of certain information held by that licensee and required to be included in the report under subsection (a) would reveal information for which public disclosure would be detrimental to public safety, or that the licensee is otherwise prohibited by law from disclosing, the licensee may petition the Commission for a partial or total exemption from inclusion on the centralized portal or website under subsection (a)(2) and in the reports required under subsection (d).

"(2) BURDEN.—A licensee seeking an exemption under this subsection bears the burden of justifying the exemption and shall provide clear and convincing evidence to support the requested exemption.

"(3) INFORMATION REQUIRED.—If the Commission grants an exemption under this subsection, the licensee shall provide to the Commission—

"(A) the publicly releasable information required by subsection (a)(1) for the inventory;

"(B) to the maximum extent practicable, a summary description, suitable for public release, of the information for which public disclosure would be detrimental to public safety or that the licensee is prohibited by law from disclosing; and

"(C) an annex, under appropriate cover, containing the information that the Commission has determined should be withheld from public disclosure.

"(d) INFORMING THE CONGRESS.—

"(1) IN GENERAL.—Except as provided in paragraph (3), the NTIA and the Commission shall submit each report required by subsection (a)(1) to the appropriate committees of Congress.

"(2) NONDISCLOSURE OF ANNEXES.—Each such report shall be submitted in unclassified form, but may include 1 or more annexes as provided for by subsections (b)(1)(B)(iii), (b)(2)(B)(iii), and (c)(3)(C). No Congressional committee may make any such annex available to the public or to any unauthorized person.

"(3) CLASSIFIED ANNEXES.—If a report includes a classified annex as provided for by subsection (b)(2)(B)(iii), the NTIA and the Commission shall—

"(A) submit the classified annex only to the appropriate committees of Congress with primary oversight jurisdiction for the user agencies or licensees concerned; and

"(B) provide notice of the submission to the other appropriate committees of Congress.

"(e) DEFINITIONS.—In this section:

"(1) APPROPRIATE COMMITTEES OF CONGRESS.—The term 'appropriate committees of Congress' means the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Energy and Commerce of the House of Representatives, and any other congressional committee with primary oversight jurisdiction for the user agencies or licensees concerned.

"(2) NTIA.—The term 'NTIA' means the National Telecommunications and Information Administration.".

(b) PROGRESS REPORT.—Within 180 days after the date of enactment of this title, the Commission and the NTIA shall provide an update as to the status of the inventory and report required by section 342(a) of the Communications Act of 1934, as added by subsection (a), to the appropriate committees of Congress.

SEC. 502. FEDERAL SPECTRUM PLANNING.

(a) REVIEW OF EVALUATION PROCESS.—Not later than 6 months after the date of enactment of this title, the Comptroller General of the United States shall—

(1) conduct a review of the processes that Federal entities utilize to evaluate their spectrum needs and manage their spectrum resources;

(2) make recommendations on how to improve such processes; and

(3) submit a written report to the appropriate committees of Congress on the review, analysis, and recommendations made pursuant to paragraphs (1) and (2).

(b) REVISION OF EVALUATION PROCESS.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this title, each Federal entity shall establish, update, or revise the process used by such entity to evaluate their proposed spectrum needs, taking into account any applicable rec-

ommendations made in the report required under subsection (a).

(2) REQUIRED INCLUSIONS.—

(A) ANALYSIS OF OPTIONS.—Each process described under paragraph (1), whether newly established or otherwise revised, shall include an analysis and assessment of—

(i) the options available to a Federal entity to obtain associated communications services that are the most spectrum-efficient; and

(ii) the effective alternatives available to such entity that will permit the entity to continue to satisfy the mission requirements of the entity.

(B) ANALYSIS SUBMITTED TO NTIA.—The analysis and assessment carried out pursuant to subparagraph (A) shall be submitted by the Federal entity to the NTIA at the same time that the entity seeks certification or recertification, if applicable, of spectrum support from the NTIA pursuant to the requirements of the National Telecommunications and Information Administration Organization Act and OMB Circular A–11.

(c) SPECTRUM PLANS OF FEDERAL ENTITIES.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this title, and every 2 years thereafter, each Federal entity shall provide an entity-specific strategic spectrum plan to the Assistant Secretary and the Director of the Office of Management and Budget.

(2) REQUIRED INCLUSIONS.—Each strategic spectrum plan submitted pursuant to paragraph (1) shall include—

(A) the spectrum requirements of the entity;

(B) the planned uses of new technologies or expanded services requiring spectrum over a period of time agreed to by the entity;

(C) suggested spectrum-efficient approaches to meeting the spectrum requirements identified under subparagraph (A); and

(D) progress reports on what the entity is doing to improve its spectrum management.

(d) NATIONAL SECURITY; CLASSIFIED INFORMATION.—

(1) IN GENERAL.—If the head of a Federal entity determines that disclosure of information required by subsection (c) would be harmful to the na-

tional security of the United States, the entity shall—

(A) notify the NTIA of its determination; and

(B) provide to the NTIA—

(i) the other publicly releasable information required by subsection (c);

(ii) to the maximum extent practicable, a summary description of the information with respect to which the determination was made; and

(iii) an annex containing the information with respect to which the determination was made.

(2) CLASSIFIED INFORMATION.—If the head of a Federal entity determines that any information required by subsection (c) is classified in accordance with Executive Order 13526 of December 29, 2009, or any successor Executive Order establishing or modifying the uniform system for classifying, safeguarding, and declassifying national security information, the entity shall—

(A) notify the NTIA of its determination; and

(B) provide to the NTIA—

(i) the information required by subsection (c) that is not classified;

(ii) to the maximum extent practicable, a summary description of the information that is classified; and

(iii) an annex containing the information that is classified.

(3) ANNEX RESTRICTION.—The NTIA shall make an annex described in paragraph (1)(B)(iii) or (2)(B)(iii) available to the Secretary of Commerce and the Director of the Office of Management and Budget. Neither the NTIA, the Secretary of Commerce, nor the Director of the Office of Management and Budget may make any such annex available to the public or to any unauthorized person through any other means.

(e) FEDERAL STRATEGIC SPECTRUM PLAN.—

(1) DEVELOPMENT AND SUBMISSION.—

(A) IN GENERAL.—Not later than 6 months after the receipt of the iuitial entity-specific strategic spectrum plans required under subsection (c), the Secretary of Commerce shall develop a Federal Strategic Spectrum Plan, in coordination with the Assistant Secretary and the Director of the Office of Management and Budget.

(B) SUBMISSION TO CONGRESS.—Consistent with the requirements set forth in subsection (d)(3), the Secretary of Commerce shall submit the Federal Strategic Spectrum Plan developed under subparagraph (A) to the appropriate committees of Congress.

(C) NONDISCLOSURE OF ANNEXES.—The Federal Strategic Spectrum Plan required to be submitted under subparagraph (B) shall be submitted in unclassified form, but shall include, if appropriate, 1 or more annexes as provided for by subsections (d)(1)(B)(iii) and (d)(2)(B)(iii). No Congressional committee may make any such annex available to the public or to any unauthorized person.

(D) CLASSIFIED ANNEXES.—If the Federal Strategic Spectrum Plan includes a classified annex as provided for by subsection (d)(2)(B)(iii), the Secretary of Commerce shall—

(i) submit the classified annex only to the appropriate committees of Congress with primary oversight jurisdiction for the user entities or licensees concerned; and

(ii) provide notice of the submission to the other appropriate committees of Congress.

(E) DEFINITION.—In this subsection, the term "appropriate committees of Congress" means the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Energy and Commerce of the House of Representatives, and any other congressional committee with primary oversight jurisdiction for the user entity or licensees concerned.

(2) INCORPORATION OF ENTITY PLANS.—The Federal Strategic Spectrum Plan developed under paragraph (1) shall incorporate, consistent with the requirements of subsection (d), the initial entity-specific strategic spectrum plans submitted under subsection (c).

(3) REQUIRED INCLUSIONS.—The Federal Strategic Spectrum Plan developed under paragraph (1) shall include—

(A) information on how spectrum assigned and used by Federal entities is being used;

(B) opportunities to increase efficient use of infrastructure and spectrum assigned and used by Federal entities;

(C) an assessment of the future spectrum needs of the Federal Government; and

(D) plans to incorporate such needs in the NTIA's frequency assignment, equipment certification, and review processes.

(4) UPDATES.—The Secretary of Commerce shall revise and update the Federal Strategic Spectrum Plan developed under paragraph (1) accordingly pursuant to the biennial submission of the entity-specific strategic spectrum plans submitted under subsection (c).

(f) NATIONAL STRATEGIC SPECTRUM PLAN.—

(1) IN GENERAL.—Not later than 2 years after the date of enactment of this title, the NTIA and the Commission, in consultation with other Federal, State, local, and tribal governments and commercial spectrum interests, shall develop a quadrennial National Strategic Spectrum Plan.

(2) REQUIRED INCLUSION.—The National Strategic Spectrum Plan shall include the following:

(A) The Federal Strategic Spectrum Plan developed under subsection (e).

(B) Long-range spectrum planning of both commercial, State and local government, and Federal Government users.

(C) New technologies or expanded services requiring spectrum.

(D) The nature and characteristics of the new radio communication systems required and the nature and characteristics of the spectrum required.

(E) Efficient approaches to meeting the future spectrum requirements of all users, including—

(i) requiring certain standards-based technologies that improve spectrum efficiencies;

(ii) spectrum sharing and reuse opportunities;

(iii) possible reallocation; and

(iv) any other approaches that promote efficient use of spectrum.

(F) An evaluation of current auction processes to determine the effectiveness of such processes in—

(i) promoting competition;

(ii) improving spectrum use efficiency; and

(iii) maximizing the full economic value to customers, industry, and the taxpayer of the spectrum.

Subtitle B—Markets

SEC. 511. PROMOTING SECONDARY SPECTRUM MARKETS.

(a) In General.—Not later than 18 months after the date of enactment of this title, the Commission shall conduct a rulemaking proceeding to determine how to further promote a more robust secondary spectrum market.

(b) Consideration.—In carrying out the rulemaking required under subsection (a), the Commission shall consider the feasability and value of establishing a national database to collect and disseminate information on secondary spectrum market opportunities.

SEC. 512. UNLICENSED USE IN 5 GHZ.

(a) Modification of Regulations.—

(1) In general.—Not later than 1 year after the date of enactment of this title, the Commission shall modify part 15 of title 47, Code of Federal Regulations, to allow unlicensed devices intended and marketed for indoor use to operate in the 5350–5470 MHz band.

(2) CONCERNS AND CONSIDERATIONS.—In carrying out the modification requirement set forth under paragraph (1), the Commission shall allow the unlicensed devices described in paragraph (1) to operate in the 5350–5470 MHz band, on an indoor basis only, if it—

(A) finds that technical solutions will protect licensed users, including use of existing, modified, or new spectrum sharing technologies and solutions, such as dynamic frequency selection; and

(B) determines that the primary mission of Federal spectrum users in the 5350–5470 MHz band will not be compromised by the introduction of unlicensed devices in the 5350–5470 MHz band.

(b) NTIA STUDY.—

(1) IN GENERAL.—Not later than 8 months after the date of enactment of this title, and in consultation with the Commission, the NTIA shall conduct and submit a study as provided in paragraph (2) evaluating known and proposed sharing technologies and the risk to Federal users if unlicensed U–NII devices were allowed to operate indoors in the 5350–5470 MHz band.

(2) SUBMITTING STUDY.—The study required by paragraph (1) shall be submitted to the appropriate committees of Congress and the Commission.

SEC. 513. EXPERIMENTAL LICENSES.

Not later than 9 months after the date of enactment of this title, the Commission shall revise part 5 of chapter I of title 47, Code of Federal Regulations, to—

(1) streamline such regulations to promote greater experimentation;

(2) broaden opportunities for market trials;

(3) promote advancements in health care;

(4) establish innovation zones; and

(5) establish a process by which qualified entities, including colleges, universities, public and private companies, and non-profit research organizations, will be permitted to use a broad range of radio frequencies for research and experimentation on a non-interference basis without having to obtain prior authorization from the Commission for the use of specific frequencies.

SEC. 514. REPURPOSING FEDERAL SPECTRUM FOR COMMERCIAL PURPOSES AND FEDERAL SPECTRUM SHARING.

(a) ELIGIBLE FEDERAL ENTITIES.—Section 113(g)(1) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(1)) is amended to read as follows:

"(1) ELIGIBLE FEDERAL ENTITIES.—Any Federal entity that operates a Federal Government station authorized to use a band of frequencies specified in paragraph (2) and that incurs relocation costs because of planning for a potential auction of spectrum frequencies, a planned auction of spectrum frequencies, or the reallocation of spectrum frequencies from Federal use to exclusive non-Federal use, or shared Federal and non-Federal use shall receive payment for such costs from the Spectrum Relocation Fund, in accordance with section 118 of this Act. For purposes of this paragraph, Federal power agencies exempted under subsection (c)(4) that choose to relocate from the frequencies identified for reallocation pursuant to subsection (a), are eligible to receive payment under this paragraph.".

(b) ELIGIBLE FREQUENCIES.—Section 113(g)(2)(B) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(2)(B)) is amended to read as follows:

"(B) any other band of frequencies reallocated from Federal use to non-Federal or shared use, whether for licensed or unlicensed use, after January 1, 2003, that is assigned—

"(i) by competitive bidding pursuant to section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)); or

"(ii) as a result of an Act of Congress or any other administrative or executive direction.".

(c) DEFINITION OF RELOCATION AND SHARING COSTS.—Section 113(g)(3) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(3)) is amended to read as follows:

"(3) DEFINITION OF RELOCATION AND SHARING COSTS.—For purposes of this subsection, the terms 'relocation costs' and 'sharing costs' mean the costs incurred by a Federal entity to plan for a potential or planned auction or sharing of spectrum frequencies and to achieve comparable capability of systems, regardless of whether that capability is achieved by relocating to a new frequency assignment, relocating a Federal Government station to a different geographic location, modifying Federal Government equipment to mitigate interference or use less spectrum, in terms of bandwidth, geography, or time, and thereby permitting spectrum sharing (including sharing among relocated Federal entities and incumbents to make spectrum available for non-Federal use) or relocation, or by utilizing an alternative technology. Comparable capability of systems includes the acquisition of state-of-the art replacement systems intended to meet comparable operational scope, which may include incidental increases in functionality, including those necessary to achieve security, reliability, and resiliency. Such costs include—

"(A) the costs of any modification or replacement of equipment, spares, associated ancillary equipment, software, facilities, operating manuals, training costs, or regulations that are attributable to relocation or sharing;

"(B) the costs of all engineering, equipment, software, site acquisition, and construction costs, as well as any legitimate and prudent transaction expense, including term-limited Federal civil servant and contractor staff necessary to carry out the relocation activities of an eligible Federal entity, and reasonable additional costs incurred by the Federal entity that are attributable to relocation or sharing, including increased recurring costs associated with the replacement of facilities;

"(C) the costs of research, engineering studies, economic analyses, or other expenses reasonably incurred in connection with—

"(i) calculating the estimated relocation costs that are provided to the Commission pursuant to paragraph (4) of this subsection, or in calculating the estimated sharing costs;

"(ii) determining the technical or operational feasibility of relocation to 1 or more potential relocation bands; or

"(iii) planning for or managing a relocation or sharing project (including spectrum coordination with auction winners) or potential relocation or sharing project;

"(D) the one-time costs of any modification of equipment reasonably necessary to accommodate commercial use of shared frequencies or, in the case of frequencies reallocated to exclusive commercial use, prior to the termination of the Federal entity's primary allocation or protected status, when the eligible frequencies as defined in paragraph (2) of this subsection are made available for private sector uses by competitive bidding and a Federal entity retains primary allocation or protected status in those frequencies for a period of time after the completion of the competitive bidding process;

"(E) the costs associated with the accelerated replacement of systems and equipment if such acceleration is necessary to ensure the timely relocation of systems to a new frequency assignment or the timely accommodation of sharing of Federal frequencies; and

"(F) the costs of the use of commercial systems (including systems not utilizing spectrum) to replace Federal systems discontinued or relocated pursuant to this Act, including lease (including lease of land), subscription, and equipment costs over an appropriate period, such as the anticipated life of an equivalent Federal system or other period determined by the Director of the Office of Management and Budget.".

(d) SPECTRUM SHARING.—Section 113(g) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)) is amended by adding at the end the following:

"(7) SPECTRUM SHARING.—A Federal entity is permitted to allow access to its frequency assignments by a non-Federal entity upon approval of NTIA, in consultation with the Director of the Office of Management and Budget. Such non-Federal entities shall comply with all applicable rules of the Commission and the NTIA, including any regulations promulgated pursuant to this section. Any remuneration associated with such access shall be deposited into the Spectrum Relocation Fund established under section 118. A Federal entity that incurs costs as a result of such access is eligible for payment from the Fund for the purposes specified in paragraph (3) of this section. The revenue associated with such access shall be at least 110 percent of the estimated Federal costs.".

(e) SPECTRUM RELOCATION FUND.—Section 118 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 928) is amended—

(1) in subsection (b), by inserting before the period at the end the following: "and any payments made by non-Federal entities for access to Federal

spectrum pursuant to section 113(g)(7) (47 U.S.C. 113(g)(7))";

(2) by amending subsection (c) to read as follows:

"(c) USE OF FUNDS.—

"(1) FUNDS FROM AUCTIONS.—The amounts in the Fund from auctions of eligible frequencies are authorized to be used to pay relocation costs, as such costs are defined in section 113(g)(3), of an eligible Federal entity incurring such costs with respect to relocation from any eligible frequency.

"(2) FUNDS FROM PAYMENTS BY NON-FEDERAL ENTITIES.—The amounts in the Fund from payments by non-Federal entities for access to Federal spectrum are authorized to be used to pay the sharing costs, as such costs are defined in section 113(g)(3), of an eligible Federal entity incurring such costs.

"(3) TRANSFER OF FUNDS.—

"(A) IN GENERAL.—Subject to subparagraph (B), the Director of OMB may transfer at any time (including prior to any auction or contemplated auction, or sharing initiative) such sums as may be available in the Fund to an eligible Federal entity to pay eligible relocation or sharing costs related to pre-auction estimates or research, as such costs are described in section 113(g)(3)(C).

"(B) NOTIFICATION.—No funds may be transferred pursuant to subparagraph (A) unless the notification provided under subsection (d)(2)(B) of this section includes a certification from the Director of OMB that—

"(i) funds transferred before an auction will likely allow for a timely relocation, thereby increasing net expected auction proceeds by an amount equal to or greater than the time value of the amount of funds transferred; and

"(ii) the auction is intended to occur within 5 years of transfer of funds.

"(C) APPLICABILITY.—

"(i) PRIOR COSTS INCURRED.—The Director of OMB may transfer up to $10,000,000 to eligible Federal entities for eligible relocation or sharing costs related to pre-auction estimates or research, as such costs are described in section 113(g)(3)(C), for costs incurred prior to the date of the enactment of the Public

Safety Spectrum and Wireless Innovation Act, but after June 28th, 2010.

"(ii) SUPPLEMENT NOT SUPPLANT.—Any amounts transferred by the Director of OMB pursuant to clause (i) shall be in addition to any amounts that the Director of OMB may transfer after the date of the enactment of the Public Safety Spectrum and Wireless Innovation Act.";

(3) in subsection (d)—

(A) in paragraph (1), by inserting "and sharing" before "costs";

(B) in paragraph (2)(B)—

(i) by inserting "and sharing" before "costs"; and

(ii) by inserting "and sharing" before the period at the end; and

(C) by amending paragraph (3) to read as follows:

"(3) REVERSION OF UNUSED FUNDS.—

"(A) IN GENERAL.—Any amounts in the Fund that are remaining after the payment of the relocation and sharing costs that are payable from the Fund shall revert to and be deposited in the General Fund of the Treasury not later than 8 years after the date of the deposit of such proceeds to the Fund, unless within 60 days in advance of the reversion of such funds, the Director of OMB, in consultation with the Assistant Secretary for Communications and Information, notifies the appropriate committees of Congress that such funds are needed to complete or to implement current or future relocations or sharing initiatives.

"(B) DEFINITION.—In this paragraph, the term 'appropriate committees of Congress' means—

"(i) the Committee on Appropriations of the Senate;

"(ii) the Committee on Commerce, Science, and Transportation of the Senate;

"(iii) the Committee on Appropriations of the House of Representatives; and

"(iv) the Committee on Energy and Commerce of the House of Representatives.";

(4) in subsection (e)(2)—

(A) by inserting "and sharing" before "costs";

(B) by inserting "or sharing" before "is complete"; and

(C) by inserting "or sharing" before "in accordance"; and

(5) by adding at the end the following:

"(f) ADDITIONAL PAYMENTS FROM THE FUND.—Notwithstanding subsections (c) through (e), after the date of the enactment of the Public Safety Spectrum and Wireless Innovation Act, and following the credit of any amounts specified in subsection (b), there are hereby appropriated from the Fund and available to the Director of the OMB up to 10 percent of the amounts deposited in the Fund from the auction of licenses for frequencies of spectrum vacated by Federal entities, or up to 10 percent of the amounts deposited in the Fund by non-Federal entities for sharing of Federal spectrum. The Director of OMB, in consultation with the Assistant Secretary for Communications and Information, may use such amounts to pay eligible Federal entities for the purpose of encouraging timely access to such spectrum, provided that—

"(1) any such payment by the Director of OMB is based on the market value of the spectrum, the timeliness with which the licensee cleared its use of such spectrum, and the need for such spectrum in order for the Federal entity to conduct its essential missions;

"(2) any such payment by the Director of OMB is used to carry out the purposes specified in subparagraphs (A) through (F) of paragraph (3) of subsection 113(g) to achieve enhanced capability for those systems affected by reallocation of Federal spectrum to commercial use, or by sharing of Federal frequencies with non-Federal entities;

"(3) the amount remaining in the Fund after any such payment by the Director is not less than 10 percent of the winning bids in the relevant auction, or is not less than 10 percent of the payments from non-Federal entities in the relevant sharing agreement; and

"(4) any such payment by the Director shall not be made until 30 days after the Director has notified the Committees on Appropriations and Commerce, Science, and Transportation of the Senate, and the Committees on Appropriations and Energy and Commerce of the House of Representatives.".

(f) COMPETITIVE BIDDING; TREATMENT OF REVENUES.—Subparagraph (D) of section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)) is amended by inserting "excluding frequencies identified by the Federal Communications Commission to be auctioned in conjunction with eligible frequencies described in section 113(g)(2)" before "shall be deposited".

(g) PUBLIC DISCLOSURE AND NONDISCLOSURE.—If the head of an executive agency of the Federal Government determines that public disclosure of any information contained in notifications and reports required by sections 113 or 118 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923 and 928) would reveal classified national security information or other information for which there is a legal basis for nondisclosure and such public disclosure would be detrimental to national security, homeland security, public safety, or jeopardize law enforcement investigations, the head of the executive agency shall notify the NTIA of that determination prior to release of such information. In that event, such classified information shall be included in a separate annex, as needed. These annexes shall be provided to the appropriate subcommittee in accordance with appropriate national security stipulations, but shall not be disclosed to the public or provided to any unauthorized person through any other means.

SEC. 515. REPORT ON SPECTRUM SHARING.

(a) IDENTIFICATION OF SPECTRUM; REPORT TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, the NTIA shall conduct a study and submit a report to the appropriate committees of Congress—

(1) that identifies spectrum between 225 MHz and 3700 MHz operated or licensed by a Federal entity that the NTIA, in consultation with the Commission, determines appropriate for sharing with non-government entities or non-Federal government entities, including, after taking into account any spectrum identified by the NTIA in its October 2010 report entitled "An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675–1710 MHz, 1755–1780 MHz, 3500–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands", the additional 100 MHz most likely to be appropriate for wireless broadband operations; and

(2) on how Federal entities can utilize dynamic spectrum sharing technologies to allow non-government entities or non-Federal government entities to share underutilized spectrum without interference to the primary usage by the Federal Government of that spectrum, including through use of cognitive radio and sensing technologies and database and geolocation approaches.

(b) CONSIDERATIONS.—In carrying out the study and report required under subsection (a), the NTIA should consider—

(1) radio systems that are utilized in fixed or predictable geographic locations;

(2) radio systems that are only utilized intermittently at fixed or predictable times;

(3) spectrum allocations in which radio systems are currently not deployed; and

(4) spectrum that is harmonized regionally or globally.

(c) PUBLIC CONSULTATION AND RULE CHANGES.—

(1) IN GENERAL.—Not later than 6 months after the report required under subsection (a) is submitted, the NTIA shall conduct a public consultation and, with the Interdepartment Radio Advisory Committee, develop rules for Federal users to increase spectrum sharing by Federal entities.

(2) CONSIDERATIONS.—In carrying out the rulemaking required under paragraph (1), the NTIA shall consider—

(A) the findings of the report required under subsection (a); and

(B) the recommendations in the Final Report, dated November 8, 2010, issued by the

Interference and Dynamic Spectrum Access Subcommittee of the Commerce Spectrum Management Advisory Committee.

Subtitle C—Efficiency and Management

SEC. 521. FUNCTIONAL RESPONSIBILITY OF THE NTIA TO ENSURE EFFICIENT USE OF SPECTRUM.

Section 103(b)(2) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 902(b)(2)) is amended—

(1) by redesignating subparagraphs (B) through (T) as subparagraphs (C) through (U), respectively; and

(2) by inserting after subparagraph (A) the following:

"(B) The responsibility to promote the best possible and most efficient use of electromagnetic spectrum resources across the Federal Government, subject to and consistent with the needs and missions of Federal agencies.".

SEC. 522. SPECTRUM EFFICIENCY ANALYTIC TOOLS.

(a) IN GENERAL.—Not later than 18 months after the date of enactment of this title, the NTIA, in consultation with NIST and the Commission, as appropriate, shall develop analytic tools or metrics for the NTIA and Federal entities to measure the spectrum efficiency of Federal spectrum systems used by such entities.

(b) REQUIRED CONSIDERATION.—In developing the tools or metrics to measure spectrum efficiency pursuant to subsection (a)(1), the NTIA shall consider the conclusions reached in the report entitled "Definitions of Efficiency in Spectrum Use", authored by the Commerce Spectrum Management Advisory Committee and dated October 1, 2008.

SEC. 523. STUDY ON RECEIVER PERFORMANCE AND SPECTRUM EFFICIENCY.

(a) IN GENERAL.—The Comptroller General of the United States shall conduct a study to consider efforts to ensure that each transmission system that employs radio spectrum is designed and operated so that reasonable use of adjacent spectrum does not excessively impair the functioning of such system.

(b) REQUIRED CONSIDERATIONS.—At a minimum, the study required under subsection (a) shall consider—

(1) the value of—

(A) improving receiver performance as it relates to increasing spectral efficiency;

(B) improving operation of services in adjacent frequencies; and

(C) narrowing the guard bands between adjacent spectrum use.

(2) the role of manufacturers, commercial licensees, and government users with respect to their transmission systems and use of adjacent spectrum described in snbsection (a);

(3) the feasibility of industry self-compliance with respect to the design and operational requirements of transmission systems and the reasonable nse of adjacent spectrum described in subsection (a); and

(4) the value of Commission and NTIA action to establish, by rule, technical requirements or standards for non-Federal or Federal use, respectively, with respect to the reasonable use of adjacent spectrum described in subsection (a).

(c) DEFINITION.—For purposes of this section, the term "transmission system" means any telecommunications, broadcast, satellite, commercial mobile service, or other communications system that employs radio spectrum.

(d) REPORT.—Not later than 1 year after the date of enactment of this Act, the Comptroller General of the United States shall submit a report to the appropriate committees of Congress on the results of the study required under subsection (a).

SEC. 524. FREQUENCY ASSIGNMENT.

(a) EXAMINATION.—Not later than 6 months after the date of enactment of this title, the NTIA, in consultation with the Interdepartment Radio Advisory Committee, shall—

(1) examine its freqnency assignment processes, including the 5-year frequency assignment review program, and

(2) consider best practices to determine if the current approach for collecting and validating data from Federal entities can be streamlined or improved to help ensure that such entities are managing current and future spectrum assignments efficiently.

(b) REQUIRED CONSIDERATIONS.—In carrying out the requirements of subsection (a), the NTIA shall consider—

(1) providing Federal entities with specific guidance or requirements on how to justify to the NTIA that requested spectrum frequency assignments would fulfill an established mission need and that other means of communication are not appropriate or available;

(2) requiring Federal entities to submit documentation, as part of the spectrum frequency assignment process;

(3) verifying that such entity has completed an analysis to support the use and need of the requested assignment; and

(4) requiring managers of spectrum resources at each Federal entity to validate, verify, or attest to the accuracy of spectrum information submitted by their entity to the NTIA.

SEC. 525. SPECTRUM OPPORTUNITY COST TRANSPARENCY.

(a) ANALYSIS OF ECONOMIC OPPORTUNITY COST.—

(1) DEVELOPMENT OF FRAMEWORK.—

(A) IN GENERAL.—Not later than 1 year after the date of enactment of this title, the NTIA, in consultation with the Commission and the Director of the Office of Management and Budget, shall develop a framework for determining the annual economic opportunity cost of each specific Federal spectrum band assigned or otherwise allocated for use by Federal entities.

(B) CONSIDERATIONS.—In developing the framework required under subparagraph (A), the NTIA shall take into account the spectrum pricing methodologies adopted by other countries which utilize administered incentive pricing of spectrum for government users.

(2) SCOPE.—The framework developed under paragraph (1) shall cover all federally allocated spectrum bands between 150 MHz and 6000 MHz, inclusive.

(3) GOALS.—The goal of the framework developed under paragraph (1) is—

(A) to provide Federal entities with a sustained long-term signal of spectrum value to inform the spectrum management decisions of such entities; and

(B) to provide the public with increased transparency about how Federal entities use a scarc physical resource.

(4) REQUIREMENTS.—The framework developed under paragraph (1) shall—

(A) define the term "opportunity cost" as the value of the spectrum, in dollar terms, as if such spectrum were to be reallocated to the highest commercial alternative use that currently does uot have access to that spectrum;

(B) be updated, on an annual basis, to take into account observed market valuations from spectrum auctions, secondary spectrum trading, and other market indicators of spectrum value;

(C) determine the opportunity costs borne by each Federal entity for each spectrum band that is entirely nnder the control of a single agency; and

(D) determine the opportunity costs for spectrum assigned or otherwise allocated to Federal entities for both primary use and secondary use.

(b) REPORT ON OPPORTUNITY COSTS.—Each Federal entity that has beeu assigned or otherwise allocated use of a Federal spectrum band shall report, as an off-budget item, the opportunity cost borne by the entity for each spectrum band the entity nses—

(1) in the budget of the entity to be included in the budget of the United States Government submitted by the President under section 1105 of title 31, United States Code; and

(2) in the annual financial statement of the entity required to be filed under section 3515 of title 31, Uuited States Code.

(c) SPECTRUM VALUE ANALYSIS.—Not later than 5 years after the date of the enactment of this title, and every 5 years thereafter, each Federal entity that has been assigned or otherwise allocated use of a Federal spectrum band, or otherwise utilizes such spectrum, shall engage in an analysis comparing the opportunity cost of that spectrum, as such cost is determined by the framework developed by the NTIA under subsection (a), to the projected costs of the entity relocating to other government spectrum holdings, co-locating with other government agencies, leasing other non-Federal spectrum, or contracting out for its spectrum activities.

(d) SPECTRUM TECHNOLOGY STUDY.—

(1) IN GENERAL.—Not later than 18 months after the date of the enactment of this title, and every 5 years thereafter, the Comptroller General of the United States, in consultation with NTIA, shall examine the technologies and equipment used by Federal entities operating on Federal spectrum allocations and determine if such technologies and equipment are the most spectrum efficient available.

(2) CERTAIN DETERMINATIONS MADE.—If the results of any study required under paragraph (1) determines that the technologies and equipment of Federal entities operating on Federal spectrum allocations are not the most spectrum efficient available, the Comptroller General shall determine—

(A) what the costs would be to upgrade such systems to more up-to-date and readily available systems;

(B) what benefits would be gained from upgrading, particularly any cost savings or increases in spectrum utilization efficiency; and

(C) if there are any possible problems with upgrading to more up-to-date systems.

SEC. 526. SYSTEM CERTIFICATION.

Not later than 6 months after the date of enactment of this title, the Director of the Office of Management and Budget shall update and revise section 33.4 of OMB Circular A–11 to reflect the recommendations regarding such Circular made in the Commerce Spectrum Management Advisory Committee Incentive Subcommittee report, adopted January 11, 2011.

SEC. 527. REPORT TO CONGRESS ON IMPROVING SPECTRUM MANAGEMENT.

Not later than 3 months after the date of enactment of this title, the NTIA shall submit to the appropriate committees of Congress a report on the status of the NTIA's plan to implement the recommendations contained in the "President's Memorandum on Improving Spectrum Management for the 21st Century", 49 Weekly Comp. Pres. Doc. 2875, Nov. 29, 2004.

SEC. 528. WIRELESS FACILITIES DEPLOYMENT.

(a) FACILITY MODIFICATIONS.—

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 or any other provision of law, a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower that does not substantially change the physical dimensions of such tower.

(2) ELIGIBLE FACILITIES REQUEST.—For purposes this subsectiou, the term "eligible facilities request" means any request for modification of an existing wireless tower that involves—

(A) collocation of new transmission equipment;

(B) removal of transmission equipment; and

(C) replacement of transmission equipment.

(b) FEDERAL EASEMENTS AND RIGHTS-OF-WAY.—

(1) GRANT.—If an executive agency, a State, a political subdivision or agency of a State, or a person, firm, or organization applies for the grant of an easement or rights-of-way to, in, over, or on a building owned by the Federal Government for the right to install, construct, and maintain wireless service

antenna structures and equipment, and backhaul transmission, the executive agency having control of the building may grant to the applicant, on behalf of the Federal Government, an easement or rights-of-way to perform such installation, construction, and maintenance.

(2) APPLICATION.—The Administrator of the General Services Administration shall develop a common form for rights-of-way applications required under paragraph (1) for all executive agencies that shall be used by applicants with respect to the buildings or property of each such agency.

(3) FEE.—

(A) IN GENERAL.—Notwithstanding any other provision of law, in making a grant of an easement or rights-of-way pursuant to paragraph (1), the Administrator of the General Services Administration shall establish a fee for the award of such grant that is based on direct cost recovery.

(B) EXCEPTIONS.—The Administrator of the General Services Administration may establish exceptions to the fee amount required under subparagraph (A)—

(i) in consideration of the public benefit provided by a grant of an easement or rights-of-way; and

(ii) in the interest of expanding wireless and broadband coverage.

(4) USE OF FEES COLLECTED.—Any fee amounts collected by an executive agency pursuant to paragraph (2) shall be made available, without further appropriation, to such agency for purposes of the agency's telecommunications and information technology needs and any excess funds shall then be deposited into the Federal Building Fund.

(c) MASTER CONTRACTS FOR WIRELESS TOWER SITINGS.—

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 or any other provision of law, and not later than 60 days after the date of enactment of this Act, the Administrator of the General Services Administration shall—

(A) develop 1 or more master contracts that shall govern the placement of wireless service antenna structures on buildings and property owned by the Federal Government; and

(B) in developing the master contract, with respect to the siting of wireless service antenna structures, standardize the treatment of the placement of wireless service antenna structures on rooftop or building facades, the placement of equipment on rooftops or inside buildings, and technology, and any other key issues that the Administrator determines appropriate.

(2) APPLICABILITY.—The master contract developed by the Administrator of the General Services Administration under paragraph (1) shall apply to all publicly accessible property owned by the Federal Government, unless the Administrator decides that issues with respect to the siting of a wireless service antenna structure on a specific building or property warrant nonstandard treatment of a specific property.

(3) APPLICATION.—The Administrator of the General Services Administration shall develop a common form or set of forms for wireless service antenna structure siting applications required under this section for all executive agencies that shall be used by applicants with respect to the buildings of each such agency.

TITLE VI—STUDIES ON NEXT GENERATION 9–1–1 SERVICES

SEC. 601. DEFINITIONS.

As used in this title, the following definitions shall apply:

(1) 9–1–1 SERVICES.—The term "9–1–1 services" includes both E9–1–1 services and Next Generation 9–1–1 services.

(2) E9–1–1 SERVICES.—The term "E9–1–1 services" means both phase I and phase II enhanced 9–1–1 services, as described in section 20.18 of the Commission's regulations (47 C.F.R. 20.18), as in effect on the date of enactment of this title, or as subsequently revised by the Commission.

(3) NEXT GENERATION 9–1–1 SERVICES.—The term "Next Generation 9–1–1 services" means an IP-based system comprised of hardware, software, data, and operational policies and procedures that—

(A) provides standardized interfaces from emergency call and message services to support emergency communications;

(B) processes all types of emergency calls, including voice, data, and multimedia information;

(C) acquires and integrates additional emergency call data useful to call routing and handling;

(D) delivers the emergency calls, messages, and data to the appropriate public safety answering point and other appropriate emergency entities;

(E) supports data or video communications needs for coordinated incident response and management; or

(F) provides broadband service to public safety answering points or other first responder entities.

(4) PUBLIC SAFETY ANSWERING POINT.—The term "public safety answering point" has the meaning given the term in section 222 of the Communications Act of 1934 (47 U.S.C. 222).

SEC. 602. NHTSA REPORT ON COSTS FOR REQUIREMENTS AND SPECIFICATIONS OF NEXT GENERATION 9-1-1 SERVICES.

(a) IN GENERAL.—Not later than 1 year after the date of enactment of this title, the Administrator of the National Highway Traffic Safety Administration, in consultation with the Commission and the Secretary of Homeland Security, shall prepare and submit a report to Congress that analyzes and determines detailed costs for specific Next Generation 9–1–1 service requirements and specifications.

(b) PURPOSE OF REPORT.—The purpose of the report required under subsection (a) is to serve as a resource for Congress as it considers creating a coordinated, long-term funding mechanism for the deployment and operation, accessibility, application development, equipment procurement, and training of personnel for Next Generation 9–1–1 services.

(c) REQUIRED INCLUSIONS.—The report required under subsection (a) shall include the following:

(1) How costs would be broken out geographically and/or allocated among public safety answering points, broadband service providers, and third-party providers of Next Generation 9–1–1 services.

(2) An assessment of the current state of Next Generation 9–1–1 service readiness among public safety answering points.

(3) How differences in public safety answering points' access to broadband across the country may affect costs.

(4) A technical analysis and cost study of different delivery platforms such as wireline, wireless, and satellite.

(5) An assessment of the architectural characteristics, feasibility, and limitations of Next Generation 9–1–1 service delivery.

(6) An analysis of the needs for Next Generation 9–1–1 service of persons with disabilities.

(7) Standards and protocols for Next Generation 9–1–1 service and for incorporating Voice over Internet Protocol and "Real-Time Text" standards.

SEC. 603. FCC RECOMMENDATIONS FOR LEGAL AND STATUTORY FRAMEWORK FOR NEXT GENERATION 9–1–1 SERVICES.

Not later than 1 year after the date of enactment of this title, the Commission, in coordination with the Secretary of Homeland Security and the Administrator of the National Highway Traffic Safety Administration, shall prepare and submit a report to Congress that contains recommendations for the legal and statutory framework for Next Generation 9–1–1 services, consistent with recommendations in the National Broadband Plan developed by the Commission pursuant to Public Law 111–5, including the following:

(1) A legal and regulatory framework for the development of Next Generation 9–1–1 services and the transition from legacy 9–1–1 to Next Generation 9–1–1 networks.

(2) Legal mechanisms to ensure efficient and accurate transmission of 9–1–1 caller information to emergency response agencies.

(3) Recommendations for removing jurisdictional barriers and inconsistent legacy regulations including—

(A) proposals that would require States to remove regulatory roadblocks to Next Generation 9–1–1 services development, while recognizing existing State authority over 9–1–1 services;

(B) eliminating outdated 9–1–1 regulations at the Federal level; and

(C) preempting inconsistent State regulations.

TITLE VII—MISCELLANEOUS

SEC. 701. SEVERABILITY.

If any provision of this Act or an amendment made by this Act, or the application of the provision to any person or circumstance, is held to be unconstitutional, the remainder of this Act and the amendments made by this Act, and the application of the provisions of this Act and the amendments made by this Act to any other person or circumstance, shall not be affected thereby.

SEC. 702. RULE OF CONSTRUCTION.

Nothing in this Act shall be construed as adding or subtracting from the authority the Commission may or may not have to regulate broadband Internet access service.

○

[DISCUSSION DRAFT]

112TH CONGRESS
1ST SESSION

H. R. ______

To provide for the creation of a public safety broadband network, to ensure a more efficient and innovative allocation of the electromagnetic spectrum, to permit the Federal Communications Commission to conduct incentive auctions, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

M__. ____________ introduced the following bill; which was referred to the Committee on ____________________________

A BILL

To provide for the creation of a public safety broadband network, to ensure a more efficient and innovative allocation of the electromagnetic spectrum, to permit the Federal Communications Commission to conduct incentive auctions, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Public Safety Broadband and Wireless Innovation Act of 2011".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act:

(1) 700 MHZ D BLOCK SPECTRUM.—The term "700 MHz D block spectrum" means the portion of the electromagnetic spectrum between the frequencies from 758 megahertz to 763 megahertz and between the frequencies from 788 megahertz to 793 megahertz.

(2) APPROPRIATE COMMITTEES OF CONGRESS.—Except as otherwise specifically provided, the term "appropriate committees of Congress" means—

(A) the Committee on Commerce, Science, and Transportation of the Senate; and

(B) the Committee on Energy and Commerce of the House of Representatives.

(3) ASSISTANT SECRETARY.—The term ''Assistant Secretary'' means the Assistant Secretary of Commerce for Communications and Information.

(4) COMMERCIAL MOBILE DATA SERVICE.—The term ''commercial mobile data service'' means any mobile service (as defined in section 3 of the Communications Act of 1934 (47 U.S.C. 153))—

(A) that is—

(i) a data service, which may include Internet Protocol-based applications;

(ii) provided for profit; and

(iii) available to the public or to such classes of eligible users as to be effectively available to the public; and

(B) that is not interconnected with the public switched network.

(5) COMMERCIAL MOBILE SERVICE.—The term ''commercial mobile service'' has the meaning given such term in section 332(d)(1) of the Communications Act of 1934 (47 U.S.C. 332(d)(1)).

(6) COMMERCIAL STANDARDS.—The term ''commercial standards'' means the technical standards followed by the commercial mobile service and commercial mobile data service industries for network, device, and Internet Protocol connectivity.

Such term includes standards developed by the Third Generation Partnership Project (3GPP), the Institute of Electrical and Electronics Engineers (IEEE), the Alliance for Telecommunications Industry Solutions (ATIS), and the Internet Engineering Task Force (IETF).

(7) COMMISSION.—The term ''Commission'' means the Federal Communications Commission.

(8) CORE NETWORK.—The term ''core network'' means the core network described in section 202(b)(1).

(9) FEDERAL ENTITY.—The term ''Federal entity'' has the meaning given such term in section 113(i) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(i)).

(10) GOVERNOR.—The term ''Governor'' means the Governor or other chief executive officer of a State.

(11) GUARD BAND SPECTRUM.—The term ''guard band spectrum'' means the portion of the electromagnetic spectrum between the frequencies from 768 megahertz to 769 megahertz and between the frequencies from 798 megahertz to 799 megahertz.

(12) INDIAN TRIBE.—The term ''Indian tribe'' has the meaning given such term in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b).

(13) NARROWBAND SPECTRUM.—The term ''narrowband spectrum'' means the portion of the electromagnetic spectrum between the frequencies from 769 megahertz to 775 megahertz and between the frequencies from 799 megahertz to 805 megahertz.

(14) NIST.—The term ''NIST'' means the National Institute of Standards and Technology.

(15) NTIA.—The term ''NTIA'' means the National Telecommunications and Information Administration.

(16) PROGRAM MANAGEMENT OFFICE.—The term ''Program Management Office'' means the office established under section 203(a).

(17) PUBLIC SAFETY ANSWERING POINT.—The term ''public safety answering point'' has the meaning given such term in section 222 of the Communications Act of 1934 (47 U.S.C. 222).

(18) PUBLIC SAFETY BROADBAND NETWORK.—The term ''public safety broadband network'' means the network described in section 202.

(19) PUBLIC SAFETY BROADBAND NETWORK CORPORATION.—The term "Public Safety Broadband Network Corporation" or "Corporation" means the corporation established under section 201(a)(1).

(20) PUBLIC SAFETY BROADBAND SPECTRUM.—The term "public safety broadband spectrum" means—

(A) the portion of the electromagnetic spectrum between the frequencies from 763 megahertz to 768 megahertz and between the frequencies from 793 megahertz to 798 megahertz; and

(B) the 700 MHz D block spectrum.

(21) PUBLIC SAFETY COMMUNICATIONS RESEARCH PROGRAM.—The term "Public Safety Communications Research Program" means the program that is housed within the Department of Commerce Labs in Boulder, Colorado, and that is a joint effort between the Office of Law Enforcement Standards of NIST and the Institute for Telecommunication Sciences of the NTIA.

(22) PUBLIC SAFETY ENTITY.—The term "public safety entity" means an entity that provides public safety services.

(23) PUBLIC SAFETY SERVICES.—The term "public safety services" has the meaning given such term in section 337(f)(1) of the Communications Act of 1934 (47 U.S.C. 337(f)(1)).

(24) RADIO ACCESS NETWORK.—The term "radio access network" means a radio access network described in section 202(b)(2).

(25) STATE.—The term "State" means any of the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

(26) STATE PUBLIC SAFETY BROADBAND OFFICE.—The term "State Public Safety Broadband Office" means an office established under section 212(d).

(27) TRIBAL.—The term "tribal" means, when used with respect to any entity, that such entity is a tribal organization (as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b)).

SEC. 3. RULE OF CONSTRUCTION.

Each range of frequencies described in this Act shall be construed to be inclusive of the upper and lower frequencies in the range.

SEC. 4. ENFORCEMENT.

(a) IN GENERAL.—The Commission shall enforce this Act as if this Act were a part of the Communications Act of 1934 (47 U.S.C. 151 et seq.). A violation of this Act, or a regulation promulgated under this Act, shall be considered to be a violation of the Communications Act of 1934, or a regulation promulgated under such Act, respectively.

(b) EXCEPTION.—Subsection (a) does not apply in the case of a provision of this Act that is expressly required to be carried out by an agency (as defined in section 551 of title 5, United States Code) other than the Commission.

TITLE I—ALLOCATION AND ASSIGNMENT OF PUBLIC SAFETY BROADBAND SPECTRUM

SEC. 101. REALLOCATION OF 700 MHZ D BLOCK SPECTRUM FOR PUBLIC SAFETY USE.

(a) IN GENERAL.—The Commission shall reallocate the 700 MHz D block spectrum for use by public safety entities in accordance with the provisions of this Act.

(b) QUANTITY OF SPECTRUM ALLOCATED FOR PUBLIC SAFETY USE.—Section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)) is amended—

(1) by striking "Not later than January 1, 1998, the" and inserting "The";

(2) in paragraph (1), by striking "24" and inserting "34"; and

(3) in paragraph (2), by striking "36" and inserting "26".

SEC. 102. ASSIGNMENT OF LICENSE TO CORPORATION.

(a) IN GENERAL.—Not later than the date that is 30 days after the date of the incorporation of the Public Safety Broadband Network Corporation under section 201(a), the Commission shall assign a single license for the public safety broadband spectrum and the guard band spectrum to the Corporation for the purpose of ensuring the construction, management, maintenance, and operation of the public safety broadband network.

(b) TERM.—

(1) INITIAL LICENSE.—The initial license assigned under subsection (a) shall be for a term of 10 years.

(2) RENEWAL OF LICENSE.—Prior to the expiration of the term of the initial license assigned under subsection (a) or the expiration of any renewal of such license, the Corporation shall submit to the Commission an application for the renewal of such license in accordance with the Communications Act of 1934 (47 U.S.C. 151 et seq.) and any applicable Commission regulations. Such renewal applica-

tion shall demonstrate that, during the term of the license that the Corporation is seeking to renew, the Corporation has fulfilled its duties and obligations under this Act and the Communications Act of 1934 and has complied with all applicable Commission regulations. A renewal of the initial license granted under subsection (a) or any renewal of such license shall be for a term not to exceed 10 years.

(c) DEFINITION OF PUBLIC SAFETY SERVICES.—Section 337(f)(1)(B) of the Communications Act of 1934 (47 U.S.C. 337(f)(1)(B)) is amended to read as follows:

"(B) that are provided by emergency response providers, as such term is defined in section 2 of the Homeland Security Act of 2002 (6 U.S.C. 101), except that such term—

"(i) shall include personnel, agencies, and authorities of tribal organizations (as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b)); and

"(ii) shall not include personnel, agencies, or authorities of the Federal Government; and".

SEC. 103. ENSURING EFFICIENT AND FLEXIBLE USE OF 700 MHZ PUBLIC SAFETY NARROWBAND SPECTRUM.

(a) LICENSE RENEWAL REQUIREMENTS.—The Commission may not renew any license to use the narrowband spectrum after the date of the enactment of this Act unless the licensee demonstrates that failure of the Commission to renew such license will—

(1) cause considerable economic hardship; or

(2) adversely impact the ability of the licensee to provide public safety services.

(b) INVENTORY.—Not later than 6 months after the date of the enactment of this Act, the Commission shall complete and submit to the appropriate committees of Congress a State-by-State inventory of the use of the narrowband spectrum, current as of such date of enactment, including the numbers of base stations that are deployed and in day-to-day operation, the approximate number of users, the extent of interoperability among the deployed stations, and the approximate per-unit costs of mobile equipment.

(c) FLEXIBLE USE.—In order to promote efficient spectrum use, the Commission may allow the narrowband spectrum and the guard band spectrum to be used in a flexible manner, including for public safety broadband communications, subject to such technical and interference protection measures as the Commission may require.

SEC. 104. SHARING OF PUBLIC SAFETY BROADBAND SPECTRUM AND NETWORK.

(a) EMERGENCY ACCESS BY NON-PUBLIC SAFETY ENTITIES.—

(1) IN GENERAL.—Upon the request of a State Public Safety Broadband Office, the Corporation may enter into agreements with entities in such State that are not public safety entities to permit such entities to obtain access on a secondary, preemptible basis to the public safety broadband spectrum in order to facilitate interoperability between such entities and public safety entities in protecting the safety of life, health, and property during emergencies and during preparation for and recovery from emergencies, including during emergency drills, exercises, and tests.

(2) PREEMPTION.—The Corporation shall ensure that, under any agreements entered into under paragraph (1), public safety entities may preempt use of the public safety broadband spectrum by the entities with which the Corporation has entered into such agreements.

(b) PUBLIC-PRIVATE PARTNERSHIPS.—The Corporation may permit a private entity with which the Corporation contracts on behalf of public safety entities to construct, manage, maintain, or operate the core network or a radio access network, upon the request of such private entity, to—

(1) obtain access on a secondary basis to the public safety broadband spectrum for services that are not public safety services; or

(2) share equipment or infrastructure of the public safety broadband network, including antennas and towers.

(c) APPROVAL BY COMMISSION.—The Corporation may not enter into an agreement under subsection (a) or (b)(1) without the approval of the Commission.

(d) REINVESTMENT.—The Corporation shall use any funds the Corporation receives under the agreements entered into under subsections (a) and (b) to cover the administrative expenses of the Corporation for the fiscal year in which such funds are received and shall use any excess for the construction, management, maintenance, and operation of the public safety broadband network.

(e) ACCESS BY FEDERAL DEPARTMENTS AND AGENCIES.—The Corporation shall enter into such written agreements as are necessary to permit Federal departments and agencies to have shared access to the public safety broadband spectrum in order to protect the safety of life, health, and property.

(f) PROHIBITION ON OFFERING COMMERCIAL SERVICES.—The Corporation may not offer, provide, or market commercial telecommunications services or information services directly to the public.

SEC. 105. COMMISSION RULES.

(a) IN GENERAL.—In order to carry out the provisions of this Act, the Commission shall—

(1) adopt technical rules necessary to sufficiently manage spectrum use in bands adjacent to the public safety broadband spectrum;

(2) adopt rules requiring commercial mobile service providers and commercial mobile data service providers to offer roaming and priority access services to public safety entities at commercially reasonable terms and conditions if—

(A) the equipment of the public safety entity is technically compatible with the network of the commercial provider;

(B) the commercial provider is reasonably compensated; and

(C) such access does not unreasonably preempt or otherwise terminate or degrade existing voice conversations or data sessions;

(3) adopt technical rules governing the operation of the public safety broadband network in areas near the international borders of the United States;

(4) adopt rules ensuring the commercial availability of devices capable of operating in the public safety broadband spectrum, known as Band Class 14, at costs comparable to those of similar devices that are designed to operate in spectrum allocated for commercial use; and

(5) consider the adoption of such other rules as the Commission determines are necessary.

(b) DEADLINE.—The Commission shall adopt the rules required by paragraphs (1) through (4) of subsection (a) not later than 180 days after the date of the enactment of this Act.

(c) CONSULTATION.—In adopting rules under subsection (a) (or considering the adoption of rules under paragraph (5) of such subsection), the Commission shall consult with the Director of the Office of Emergency Communications in the Department of Homeland Security, the

Assistant Secretary, the Director of NIST, and the Public Safety Communications Research Program.

SEC. 106. FCC REPORT ON EFFICIENT USE OF PUBLIC SAFETY SPECTRUM.

(a) IN GENERAL.—Not later than 180 days after the date of the enactment of this Act and every 2 years thereafter, the Commission shall, in consultation with the Assistant Secretary and the Director of NIST, conduct a study and submit to the appropriate committees of Congress a report on the spectrum allocated for public safety use.

(b) CONTENTS.—The report required by subsection (a) shall include—

(1) an examination of how such spectrum is being used;

(2) recommendations on how such spectrum may be used more efficiently;

(3) an assessment of the feasibility of public safety entities relocating from other bands to the public safety broadband spectrum; and

(4) an assessment of whether any spectrum made available by the relocation described in paragraph (3) could be returned to the Commission for reassignment through auction, including through use of incentive auction authority under subparagraph

(G) of section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)), as added by section 302(a).

TITLE II—ADVANCED PUBLIC SAFETY COMMUNICATIONS

Subtitle A—Public Safety Broadband Network

SEC. 201. ESTABLISHMENT AND OPERATION OF PUBLIC SAFETY BROADBAND NETWORK CORPORATION.

(a) ESTABLISHMENT.—

(1) IN GENERAL.—There is authorized to be established a private, nonprofit corporation to be known as the Public Safety Broadband Network Corporation, which will not be an agency or establishment of the United States Government or the District of Columbia government.

(2) GOVERNING LAW.—The Corporation shall be subject to the provisions of this Act, and to the extent consistent with this Act, to the District of Columbia Nonprofit Corporation Act (sec. 29–301.01 et seq., D.C. Official Code). The Corporation shall have the usual powers conferred upon a nonprofit corporation by the District of Columbia Nonprofit Corporation Act.

(3) INCORPORATION.—The members of the initial Board of Directors of the Corporation shall serve as the incorporators of the Corporation and shall take the necessary steps to establish the Corporation under the District of Columbia Nonprofit Corporation Act.

(4) INITIAL BYLAWS.—The members of the initial Board of Directors of the Corporation shall establish the initial bylaws of the Corporation.

(5) RESIDENCE.—The Corporation shall have its place of business in the District of Columbia and shall be considered, for purposes of venue in civil actions, to be a resident of the District of Columbia.

(b) BOARD OF DIRECTORS.—

(1) MEMBERSHIP AND APPOINTMENT.—The management of the Corporation shall be vested in a Board of Directors, which shall consist of 15 members, as follows:

(A) FEDERAL MEMBERS.—Four Federal members, or their designees, as follows:

(i) The Secretary of Commerce.

(ii) The Secretary of Homeland Security.

(iii) The Director of NIST.

(iv) The Attorney General of the United States.

(B) NON-FEDERAL PUBLIC-SECTOR MEMBERS.—Seven non-Federal public-sector members, representing both urban and rural interests, appointed by the Secretary of Commerce, as follows:

(i) STATE GOVERNORS.—Two members, each of whom is the Governor of a State, or their designees.

(ii) LOCAL AND TRIBAL GOVERNMENT MEMBERS.—Two members, each of whom is the chief executive officer of a political subdivision of a State or an Indian tribe, or their designees.

(iii) PUBLIC SAFETY ENTITY EMPLOYEES.—Three members, each of whom is employed by a public safety entity and possesses one or more of the following qualifications:

(I) Experience with emergency preparedness and response.

(II) Technical expertise with public safety radio communications.

(III) Operational experience with 9–1–1 emergency services.

(IV) Training in hospital or urgent medical care.

(C) PRIVATE-SECTOR MEMBERS.—Four private-sector members, appointed by the Secretary of Commerce, each of whom is employed by a private entity that has extensive experience implementing commercial standards in the design, development, and operation of commercial mobile data service networks.

(2) INDEPENDENCE OF NON-FEDERAL PUBLIC-SECTOR AND PRIVATE-SECTOR MEMBERS.—

(A) IN GENERAL.—Each non-Federal public-sector member and each private-sector member of the Board of Directors appointed under paragraph (1) shall be independent and neutral.

(B) INDEPENDENCE DETERMINATION.—In order to be considered independent for purposes of this paragraph, a member of the Board—

(i) may not, other than in the capacity of such member as a member of the Board or a committee thereof, accept any consulting, advisory, or other compensatory fee from the Corporation; and

(ii) shall be disqualified from any deliberation involving any transaction of the Corporation in which such member has a financial interest in the outcome.

(3) FEDERAL EMPLOYMENT STATUS.—The non-Federal public-sector members and the private-sector members of the Board of Directors shall not, by reason of membership on the Board, be considered to be officers or employees of the United States Government or the District of Columbia government.

(4) CITIZENSHIP.—Each non-Federal public-sector member and each private-sector member of the Board of Directors shall be a citizen of the United States.

(5) TERMS OF APPOINTMENT.—

(A) INITIAL APPOINTMENT DEADLINE.—The initial non-Federal public-sector members and the initial private-sector members of the Board of Directors shall be appointed not later than 180 days after the date of the enactment of this Act.

(B) TERMS.—

(i) LENGTH.—

(I) FEDERAL MEMBERS.—Each Federal member of the Board of Directors shall serve as a member of the Board for the life of the Corporation.

(II) NON-FEDERAL PUBLIC-SECTOR AND PRIVATE-SECTOR MEMBERS.—The term of office of each non-Federal public-sector member and each private-sector member of the Board of Directors shall be 3 years. Such a member may not serve more than 2 consecutive full 3-year terms.

(ii) EXPIRATION OF TERM.—Any non-Federal public-sector member or private-sector member of the Board of Directors whose term has expired may serve until such member's successor has taken office, or until the end of the calendar year in which such member's term has expired, whichever is earlier.

(iii) APPOINTMENT TO FILL VACANCY.—A non-Federal public-sector member or private-sector member of the Board of Directors appointed to fill a vacancy occurring prior to the expiration of the term for which that member's predecessor was appointed shall be appointed for the remainder of the predecessor's term.

(iv) STAGGERED TERMS.—With respect to the initial non-Federal public-sector members and the initial private-sector members of the Board of Directors—

(I) four members shall serve for a term of 3 years;

(II) four members shall serve for a term of 2 years; and

(III) three members shall serve for a term of 1 year.

(C) EFFECT OF VACANCIES.—A vacancy in the membership of the Board of Directors shall not affect the Board's powers and shall be filled in the same manner as the original member was appointed.

(6) CHAIR.—

(A) SELECTION.—The Chair of the Board of Directors shall be selected by the Secretary of Commerce from among the non-Federal public-sector members and the private-sector members of the Board.

(B) TERM.—The term of office of the Chair of the Board of Directors shall be 2 years, and an individual may not serve more than 2 consecutive terms.

(7) REMOVAL.—

(A) BY SECRETARY OF COMMERCE.—The Secretary of Commerce may remove, for good cause—

(i) the Chair of the Board of Directors; or

(ii) any non-Federal public-sector member or private-sector member of the Board of Directors.

(B) BY BOARD.—The members of the Board of Directors may, by majority vote—

(i) remove any non-Federal public-sector member or private-sector member of the Board for conduct determined by the Board to be detrimental to the Board or to the Corporation; or

(ii) request that the Secretary of Commerce exercise his or her authority to remove the Chair of the Board for conduct determined to be detrimental to the Board or to the Corporation.

(8) MEETINGS.—

(A) FREQUENCY.—The Board of Directors shall meet in accordance with the bylaws of the Corporation—

(i) at the call of the Chair of the Board; and

(ii) not less frequently than once each quarter.

(B) TRANSPARENCY.—Meetings of the Board of Directors, and meetings of any committees of the Board, shall be open to the public. The Board may, by majority vote, close any such meeting only for the time necessary to preserve the confidentiality of commercial or financial information that is privileged or confidential, to discuss personnel matters, or to discuss legal matters affecting the Corporation, including pending or potential litigation.

(9) QUORUM.—Eight members of the Board of Directors, including not fewer than 6 non-Federal public-sector members or private-sector members, shall constitute a quorum.

(10) ATTENDANCE.—Members of the Board of Directors may attend meetings of the Corporation and vote in person, via telephone conference, or via video conference.

(11) BYLAWS.—A majority of the members of the Board of Directors may amend the bylaws of the Corporation.

(12) PROHIBITION AGAINST COMPENSATION.—A member of the Board of Directors shall serve without pay, and shall not otherwise benefit, directly or indirectly, as a result of the member's service to the Corporation, but shall be allowed a per diem allowance for travel expenses, at rates authorized for an employee of an agency under subchapter I of chapter 57 of title 5, United States Code, while away from the home or regular place of business of the member in the performance of the duties of the Corporation.

(c) CHIEF EXECUTIVE OFFICER AND EMPLOYEES.—

(1) IN GENERAL.—The Corporation shall have 1 officer, a Chief Executive Officer, and such employees as may be necessary to carry out the duties and responsibilities of the Corporation under this title and title I, for such terms, and at such rates of compensation in accordance with paragraph (5), as the Board of Directors of the Corporation considers appropriate. The Chief Executive Officer and the employees shall serve at the pleasure of the Board of Directors.

(2) QUALIFICATIONS OF CEO.—The Chief Executive Officer shall have extensive experience in the deployment, management, or design of commercial mobile data service networks.

(3) CITIZENSHIP.—The Chief Executive Officer and the employees of the Corporation shall be citizens of the United States.

(4) NONPOLITICAL NATURE OF APPOINTMENT.—No political test or qualification may be used in selecting, appointing, promoting, or taking other personnel actions with respect to the Chief Executive Officer or the agents or employees of the Corporation.

(5) COMPENSATION.—

(A) IN GENERAL.—The Board of Directors may fix the compensation of the Chief Executive Officer and the employees hired under this subsection, as necessary to carry out the duties and responsibilities of the Corporation under this title and title I, except that—

(i) the rate of compensation for the Chief Executive Officer or any employee may not exceed the maximum rate of basic pay established under section 5382 of title

5, United States Code, for a member of the Senior Executive Service; and

(ii) notwithstanding any other provision of law except clause (i), or any bylaw of the Corporation, all rates of compensation, including benefit plans and salary ranges, for the Chief Executive Officer and the employees shall be jointly approved by a majority of the Federal members of the Board.

(B) LIMITATION ON OTHER COMPENSATION.—Neither the Chief Executive Officer nor any employee of the Corporation may receive any salary or other compensation (except for compensation for services on boards of directors of other organizations that do not receive funds from the Corporation, on committees of such boards, and in similar activities for such organizations) from any sources other than the Corporation for services rendered during the period of the employment of the Chief Executive Officer or employee, respectively, by the Corporation.

(C) SERVICE ON OTHER BOARDS.—Service by the Chief Executive Officer or any employee of the Corporation on a board of directors of another organization, on a committee of such a board, or in a similar activity for such an organization shall be subject to annual advance approval by the Board of Directors.

(D) FEDERAL EMPLOYMENT STATUS.—Neither the Chief Executive Officer nor any employee of the Corporation shall be considered to be an officer or employee of the United States Government or the District of Columbia government.

(d) SELECTION OF AGENTS, CONSULTANTS, AND EXPERTS.—

(1) IN GENERAL.—The Board shall select parties to serve as its agents, consultants, and experts in a fair, transparent, and objective manner.

(2) FINAL AND BINDING.—If the selection of an agent, consultant, or expert satisfies the requirements of paragraph (1), the selection of such agent, consultant, or expert shall be final and binding.

(e) NONPROFIT AND NONPOLITICAL NATURE OF CORPORATION.—

(1) STOCK.—The Corporation shall have no power to issue any shares of stock, or to declare or pay any dividends.

(2) PROFIT.—No part of the income or assets of the Corporation shall inure to the benefit of any director, officer, employee, or any other individual associated with the Corporation, except as salary or reasonable compensation for services.

(3) POLITICS.—The Corporation may not contribute to or otherwise support any political party or candidate for elective public office.

(4) PROHIBITION ON LOBBYING ACTIVITIES.—The Corporation may not engage in lobbying activities (as defined in section 3(7) of the Lobbying Disclosure Act of 1995 (2 U.S.C. 1602(7))).

(f) GENERAL POWERS.—In addition to the powers granted to the Corporation by any other provision of law, the Corporation shall have the authority to do the following:

(1) To adopt and use a corporate seal.

(2) To have succession until dissolved by an Act of Congress.

(3) To prescribe, through the actions of the Board of Directors, bylaws not inconsistent with Federal law and the laws of the District of Columbia, regulating the manner in which the Corporation's general business may be conducted and the

manner in which the privileges granted to the Corporation by law may be exercised.

(4) To exercise, through the actions of the Board of Directors, all powers specifically granted to the Corporation by the provisions of this title and title I, and such incidental powers as shall be necessary.

(5) To hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as the Corporation considers necessary to carry out its responsibilities and duties.

(6) To obtain grants and funds from and make contracts with individuals, private companies, organizations, institutions, and Federal, State, regional, and local agencies.

(7) To accept, hold, administer, and utilize gifts, donations, and bequests of property, both real and personal, for the purposes of aiding or facilitating the work of the Corporation.

(8) To spend amounts obtained under paragraph (6) in a manner authorized by the Board, but only for purposes that will advance or enhance public safety communications consistent with this Act.

(9) To establish reserve accounts with funds that the Corporation may receive from time to time

that exceed the amounts required by the Corporation to timely pay its debt service and other obligations.

(10) To expend the funds placed in any reserve accounts established under paragraph (9) (including interest earned on any such amounts) in a manner authorized by the Board, but only for purposes that—

(A) will advance or enhance public safety communications consistent with this Act; or

(B) are otherwise approved by an Act of Congress.

(11) To take such other actions as the Corporation, through the Board of Directors, may from time to time determine necessary, appropriate, or advisable to accomplish the purposes of this title and title I.

(g) PRINCIPAL POWERS.—In addition to the powers granted to the Corporation by any other provision of law, the Corporation shall have the power—

(1) to hold the single license for the public safety broadband spectrum and the guard band spectrum assigned by the Commission under section 102(a);

(2) to take all actions necessary to ensure the construction, management, maintenance, and oper-

ation of the public safety broadband network, in consultation with Federal users of the network, public safety entities, the Commission, and the Technical and Operations Advisory Body established under subsection (h), including by—

(A) ensuring the use of commercial standards;

(B) issuing open, transparent, and competitive requests for proposals to private-sector entities for the purpose of constructing, managing, maintaining, and operating the public safety broadband network;

(C) entering into and overseeing the performance of contracts or agreements with private-sector entities to construct, manage, maintain, and operate the public safety broadband network;

(D) leveraging, to the maximum extent possible, existing commercial, private, and public wireless network infrastructure to reduce costs, supplement network capacity, and speed deployment of the network;

(E) entering into roaming and priority access agreements with providers of commercial mobile service and commercial mobile data service to allow users of the public safety broadband network to obtain such services across the networks of such providers;

(F) entering into sharing agreements under section 104; and

(G) exercising discretion in using and disbursing the funds received under section 401(b)(5); and

(3) to establish the Program Management Office and delegate functions to such Office, in accordance with section 203.

(h) TECHNICAL AND OPERATIONS ADVISORY BODY.—

(1) ESTABLISHMENT.—In addition to such other standing or ad hoc committees, panels, or councils as the Board of Directors considers necessary, the Corporation shall establish a Technical and Operations Advisory Body, which shall provide advice to the Corporation with respect to operational and technical matters related to public safety communications and commercial mobile data service.

(2) MEMBERSHIP.—The Technical and Operations Advisory Body shall be composed of such representatives as the Board of Directors considers appropriate, including representatives of the following:

(A) Public safety entities.

(B) State, local, and tribal entities that use the public safety broadband network.

(C) Public safety answering points.

(D) One or more of the 10 regional organizational units of the Federal Emergency Management Agency.

(E) The Bureau of Indian Affairs.

(F) The Office of Science and Technology Policy.

(G) The Public Safety Communications Research Program.

(H) Providers of commercial mobile data service and vendors of equipment, devices, and software used to provide and access such service.

(i) AUDITS AND REPORTS BY GAO.—

(1) AUDITS.—

(A) IN GENERAL.—The financial transactions of the Corporation for any fiscal year during which Federal funds are available to finance any portion of its operations shall be audited annually by the Comptroller General of the United States in accordance with the principles and procedures applicable to commercial corporate transactions and under such rules and regulations as may be prescribed by the Comptroller General.

(B) LOCATION.—Any audit conducted under subparagraph (A) shall be conducted at the place or places where accounts of the Corporation are normally kept.

(C) ACCESS TO CORPORATION BOOKS AND DOCUMENTS.—

(i) IN GENERAL.—For purposes of an audit conducted under subparagraph (A), the representatives of the Comptroller General shall—

(I) have access to all books, accounts, records, reports, files, and all other papers, things, or property belonging to or in use by the Corporation that pertain to the financial transactions of the Corporation and are necessary to facilitate the audit; and

(II) be afforded full facilities for verifying transactions with the balances or securities held by depositories, fiscal agents, and custodians.

(ii) REQUIREMENT.—All books, accounts, records, reports, files, papers, and property of the Corporation shall remain in the possession and custody of the Corporation.

(2) REPORTS.—

(A) IN GENERAL.—The Comptroller General of the United States shall submit a report of each audit conducted under paragraph (1)(A) to—

(i) the appropriate committees of Congress;

(ii) the President; and

(iii) the Corporation.

(B) CONTENTS.—Each report submitted under subparagraph (A) shall contain—

(i) such comments and information as the Comptroller General determines necessary to inform Congress of the financial operations and condition of the Corporation;

(ii) any recommendations of the Comptroller General relating to the financial operations and condition of the Corporation; and

(iii) a description of any program, expenditure, or other financial transaction or undertaking of the Corporation that was observed during the course of the audit, which, in the opinion of the Comptroller General, has been carried on or made without the authority of law.

(j) ANNUAL REPORT TO CONGRESS.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, and each year thereafter, the Corporation shall submit an annual report covering the preceding fiscal year to the appropriate committees of Congress.

(2) REQUIRED CONTENT.—The report required under paragraph (1) shall include—

(A) a comprehensive and detailed report of the operations, activities, financial condition, and accomplishments of the Corporation under this section;

(B) an analysis of the continued need for the Program Management Office and opportunities for reductions in staffing levels or scope of work in light of progress made in network deployment, including the requests for proposals process; and

(C) such recommendations or proposals for legislative or administrative action as the Corporation considers appropriate.

(3) AVAILABILITY TO TESTIFY.—The directors, employees, and agents and the Chief Executive Officer of the Corporation shall be available to testify before the appropriate committees of the Congress with respect to—

(A) the report required under paragraph (1);

(B) the report of any audit made by the Comptroller General under subsection (i); or

(C) any other matter which such committees may consider appropriate.

(k) PROHIBITION AGAINST NEGOTIATION WITH FOREIGN GOVERNMENTS.—The Corporation may not negotiate or enter into any agreements with a foreign government on behalf of the United States.

(l) USE OF MAILS.—The Corporation may use the United States mails in the same manner and under the same conditions as the departments and agencies of the United States.

SEC. 202. PUBLIC SAFETY BROADBAND NETWORK.

(a) ESTABLISHMENT.—The Corporation shall ensure the establishment of a public safety broadband network.

(b) NETWORK COMPONENTS.—The public safety broadband network shall consist of the following:

(1) A core network that—

(A) consists of national and regional data centers and elements and nodes based on commercial standards; and

(B) provides the connectivity between—

(i) the radio access networks; and

(ii) the public Internet or the public switched network, or both.

(2) Radio access networks—

(A) that consist of all cell site equipment, antennas, and backhaul equipment, based on commercial standards, that are required to enable wireless communications with devices using the public safety broadband spectrum; and

(B) each of which shall be developed, constructed, managed, maintained, and operated taking into account the plans developed in the State, local, and tribal planning and implementation grant program under section 212.

(c) DEPLOYMENT STANDARDS.—The Corporation shall, through the administration of the requests-for-proposals process and oversight of contracts delegated to the Program Management Office—

(1) ensure that the core network and the radio access networks are deployed as networks are typically deployed by commercial mobile data service providers;

(2) promote competition in the public safety equipment market by requiring that equipment for use on the public safety broadband network be—

(A) built to open, non-proprietary, commercial standards;

(B) capable of being used by any public safety entity and accessed by devices manufactured by multiple vendors; and

(C) backward-compatible with prior generations of commercial mobile service and commercial mobile data service networks to the extent typically deployed by providers of commercial mobile service and commercial mobile data service; and

(3) ensure that the public safety broadband network is integrated with public safety answering points, or the equivalent of public safety answering points, and with networks for the provision of Next Generation 911 services (as defined in section 233).

(d) PROCUREMENTS.—All procurements for the public safety broadband network shall be made through an open, competitive bidding process, and may not include, except in the case of minor upgrades—

(1) sole-source contracts;

(2) the use of contract vehicles existing at the time of the procurement involved; or

(3) requirements for design proprietary to any individual vendor.

(e) NETWORK INFRASTRUCTURE AND DEVICE CRITERIA.—The Director of NIST, in consultation with the Corporation and the Commission, shall develop a list of certified devices and components meeting appropriate protocols and standards. A device or component may not be used on the public safety broadband network unless it appears on such list.

SEC. 203. PROGRAM MANAGEMENT OFFICE.

(a) ESTABLISHMENT.—The Corporation shall establish and staff a Program Management Office within the Corporation, or award a network management services contract to a private entity to establish and staff such an office. Any such contract shall be awarded through an open, competitive bidding process.

(b) ACCOUNTABILITY.—The actions of the Program Management Office shall be subject to review by the Corporation.

(c) INDEPENDENCE.—For the duration of any contract between the Program Management Office and the Corporation, the Program Management Office may not have a financial interest in the outcome of any request for proposals of the Corporation or a financial interest in any contract or agreement entered into by the Corporation.

(d) DUTIES.—The Program Management Office shall—

(1) be responsible for the day-to-day management of the public safety broadband network, including ensuring uniformity of deployments and upgrades to preserve nationwide interoperability and economies of scale in network equipment and device costs;

(2) create a template for use by a State Public Safety Broadband Office receiving a grant under section 212(a) in transmitting the plans developed under such section to the Program Management Office;

(3) create a standard format for requests for proposals with respect to the construction, management, maintenance, and operation of the core network and the radio access networks;

(4) in consultation with State Public Safety Broadband Offices, evaluate responses to the requests for proposals described in paragraph (3) and recommend to the Corporation which proposals the Corporation should accept;

(5) administer and oversee contracts entered into by the Corporation with entities the proposals of which the Corporation accepts as described in paragraph (4);

(6) develop templates for agreements that the Corporation may enter into with providers of commercial mobile service and commercial mobile data service for roaming and priority access services offered by such providers;

(7) develop templates for agreements for emergency access to the public safety broadband spectrum that the Corporation may enter into upon the request of a State Public Safety Broadband Office, as provided in section 104(a);

(8) in consultation with the Office of Emergency Communications in the Department of Homeland Security and with the Commission, implement an awareness campaign in order to stimulate nationwide adoption of the public safety broadband network by public safety entities;

(9) assess the progress of the construction and adoption of the public safety broadband network and report to the Corporation regarding such progress at such intervals as the Corporation requests, but no less frequently than biannually; and

(10) in consultation with State Public Safety Broadband Offices, advise the Corporation on the distribution of public funding provided under section 401(b)(5) for the construction, management, maintenance, and operation of the public safety broadband network.

(e) DEVELOPMENT AND EVALUATION OF REQUESTS FOR PROPOSALS.—

(1) PROCEDURAL REQUIREMENTS.—In all procurement related to the core network and the radio access networks, the Program Management Office shall use an open, competitive bidding process that—

(A) details the required framework and architecture of such networks, the general specifications of the work requested, and the service-delivery responsibilities of successful bidders;

(B) provides for the award of subcontracts; and

(C) prohibits, except in the case of minor upgrades—

(i) sole-source contracts;

(ii) the use of contract vehicles existing at the time of the procurement involved; and

(iii) requirements for design proprietary to any individual vendor.

(2) REQUIRED CRITERIA.—In developing requests for proposals with respect to the core network and the radio access networks, the Program Management Office shall, on a State-by-State or multi-State basis, seek proposals and recommend for acceptance by the Corporation proposals that—

(A) are based on commercial standards and are backward-compatible with existing commercial mobile service and commercial mobile data service networks;

(B) maximize use of existing infrastructure of commercial entities and of Federal, State, and tribal entities, including existing public safety infrastructure;

(C) incorporate deployable network assets, vehicular repeaters, and other equipment as a means to provide additional coverage and capacity as may be required;

(D) ensure a nationwide level of interoperability;

(E) provide economies of scale in equipment and device costs comparable to those in the commercial marketplace, including the costs of devices capable of operating in Band Class 14;

(F) promote competition in the network equipment and device markets;

(G) ensure coverage of rural and underserved areas;

(H) enable technology upgrades at a pace comparable to that occurring in the commercial mobile service and commercial mobile data service marketplaces;

(I) ensure the safety, security, and resiliency of the network, including requirements for protecting and monitoring the cybersecurity of the network; and

(J) incorporate results from the 700 MHz demonstration network managed by the Public Safety Communications Research Program.

(f) CONSULTATION WITH TECHNICAL AND OPERATIONS ADVISORY BODY.—In carrying out its responsibilities, the Program Management Office shall regularly meet and consult with the Technical and Operations Advisory Body established under section 201(h).

SEC. 204. ANALYSIS OF PUBLIC SAFETY NETWORK ATTRIBUTES.

(a) ESTABLISHMENT OF EVALUATION FRAMEWORK.—Not later than 180 days after the date of the enactment of this Act, the Director of NIST, in consultation with the Secretary of Homeland Security, the Commission, the Attorney General, and the Director of the Office of Management and Budget, shall develop and provide to the Corporation an evaluation framework for use by the Corporation in evaluating attributes for possible inclusion in the public safety broadband network.

(b) CONSIDERATIONS.—In developing the evaluation framework under subsection (a), the Director of NIST shall take into consideration the public safety network attributes identified in the report completed by the Visiting Committee on Advanced Technology of NIST.

(c) REQUIRED EVALUATIONS.—The evaluation framework developed under subsection (a) shall permit the Corporation to evaluate—

(1) the marginal cost of each public safety network attribute in developing, deploying, and operating the public safety broadband network;

(2) the benefit of each public safety network attribute to the public safety broadband network;

(3) the economic feasibility of requiring each public safety attribute to be included as part of the public safety broadband network;

(4) the resulting competitive vendor supply ecosystem that would be created by including each public safety attribute as part of the public safety broadband network; and

(5) the level of variability in regional requirements for each public safety attribute, if such attribute were to be included as part of the public safety broadband network.

(d) DEVELOPMENT OF COST-BENEFIT ANALYSIS.—The Corporation shall use the evaluation framework developed under subsection (a) to evaluate attributes for possible inclusion in the public safety broadband network and, based on such evaluation, shall develop a cost-benefit analysis to inform the construction, management, maintenance, and operation of the network.

SEC. 205. REPRESENTATION BEFORE STANDARDS SETTING ENTITIES.

The Director of NIST, in consultation with the Corporation, the Commission, and the Technical and Operations Advisory Body established under section 201(h), shall represent the interests of Federal departments and agencies and public safety entities using the public safety broadband network before any appropriate standards development organizations that address issues that in the judgment of the Director are relevant and important to the public safety broadband network.

SEC. 206. GAO REPORT ON SATELLITE BROADBAND.

Not later than 2 years after the date of the enactment of this Act, the Comptroller General of the United States shall conduct a study and submit to the appropriate committees of Congress a report on the current and future capabilities of fixed and mobile satellite broadband for use by public safety entities.

SEC. 207. ACCESS TO FEDERAL SUPPLY SCHEDULES.

Section 502 of title 40, United States Code, is amended—

(1) by redesignating subsection (f) as subsection (g); and

(2) by inserting after subsection (e) the following new subsection:

"(f) USE OF SUPPLY SCHEDULES BY PUBLIC SAFETY BROADBAND NETWORK CORPORATION FOR CERTAIN GOODS AND SERVICES.—

"(1) IN GENERAL.—The Administrator may provide, to the extent practicable, for the use by the Public Safety Broadband Network Corporation of Federal supply schedules for the following:

"(A) Roaming and priority access services offered by providers of commercial mobile service and commercial mobile data service.

"(B) Broadband network equipment, devices, and applications that are suitable for use on the public safety broadband network.

"(2) DEFINITIONS.—In this subsection—

"(A) the terms 'commercial mobile data service' and 'public safety broadband network' have the meanings given such terms in section 2 of the Public Safety Broadband and Wireless Innovation Act of 2011;

"(B) the term 'commercial mobile service' has the meaning given such term in section 332(d)(1) of the Communications Act of 1934 (47 U.S.C. 332(d)(1)); and

"(C) the term 'Public Safety Broadband Network Corporation' means the corporation established under section 201(a)(1) of the Public Safety Broadband and Wireless Innovation Act of 2011.''.

SEC. 208. FEDERAL INFRASTRUCTURE SHARING.

The Administrator of General Services shall establish rules to allow the Corporation, on behalf of public safety entities, to have access to such components of Federal infrastructure as are appropriate for the construction and maintenance of the public safety broadband network.

SEC. 209. INITIAL FUNDING FOR THE CORPORATION.

(a) NTIA LOANS TO THE CORPORATION.—

(1) IN GENERAL.—Prior to the commencement of incentive auctions to be carried out under subparagraph (G) of section 309(j)(8) of the Communications Act of 1934, as added by section 302(a), or the auction of spectrum pursuant to subsection (a)(2) or (b) of section 301, the Assistant Secretary is authorized to make loans to the Corporation.

(2) CONDITION.—At the time of application for, and as a condition to, any such loan, the Corporation shall file with the Assistant Secretary—

(A) an estimated budget for the period between such application and the beginning of the1st fiscal year for which the Corporation projects that the fees collected under section

210 will be sufficient to cover the total expenses of the Corporation for such fiscal year; and

(B) a statement with respect to the anticipated use of the proceeds of the loan.

(3) NTIA APPROVAL.—If the Assistant Secretary determines that such loan is necessary for the Corporation to carry out its duties and responsibilities under this title and title I and that the Corporation has submitted a plan which provides as reasonable an assurance of prompt repayment as may be feasible under the circumstances, then the Assistant Secretary shall so certify to the Secretary of the Treasury, and issue notes or other obligations to the Secretary of the Treasury pursuant to subsection (b).

(b) NTIA NOTES ISSUED TO TREASURY.—

(1) IN GENERAL.—To enable the Assistant Secretary to make loans under subsection (a), the Assistant Secretary is authorized to issue to the Secretary of the Treasury notes or other obligations, in such forms and denominations, bearing such maturities, and subject to such terms and conditions, as may be prescribed by the Secretary of the Treasury.

(2) INTEREST ON NOTES.—

(A) ESTABLISHMENT.—Any notes or other obligations issued pursuant to paragraph (1) shall bear interest at a rate determined by the Secretary of the Treasury, taking into consideration the current average market yield on outstanding marketable obligations of the United States of comparable maturities during the month preceding the issuance of the notes or other obligations.

(B) REDUCTION.—The Secretary of the Treasury may reduce the interest rate set forth under subparagraph (A) if the Secretary of the Treasury determines the reduction to be in the national interest.

(3) AUTHORITY OF TREASURY TO SELL NOTES.—The Secretary of the Treasury may at any time sell any of the notes or other obligations acquired by the Secretary of the Treasury under this subsection. All redemptions, purchases, and sales by the Secretary of the Treasury of such notes or other obligations shall be treated as public debt transactions of the United States.

SEC. 210. PERMANENT SELF-FUNDING OF CORPORATION AND DUTY TO COLLECT CERTAIN FEES.

(a) IN GENERAL.—The Corporation is authorized to assess and collect the following fees:

(1) NETWORK USER FEES.—A user or subscription fee from each public safety entity that seeks access to or use of the public safety broadband network.

(2) SHARING ARRANGEMENT FEES.—A fee from each entity with which the Corporation enters into a sharing arrangement under section 104.

(b) ESTABLISHMENT OF FEE AMOUNTS.—The total amount of the fees assessed for each fiscal year pursuant to this section shall be sufficient, and to the extent practicable shall not exceed the amount necessary, to cover the total expenses of the Corporation in carrying out its duties and responsibilities under this title and title I for such fiscal year.

(c) REQUIRED REINVESTMENT OF EXCESS FUNDS.—If the Corporation receives fees assessed for a fiscal year pursuant to this section in excess of the total expenses of the Corporation in carrying out its duties and responsibilities under this title and title I for such fiscal year, the Corporation shall use the excess only to ensure the construction, management, maintenance, and operation of the public safety broadband network.

Subtitle B—State, Local, and Tribal Planning and Implementation

SEC. 211. STATE, LOCAL, AND TRIBAL PLANNING AND IMPLEMENTATION FUND.

(a) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the State, Local, and Tribal Planning and Implementation Fund.

(b) PURPOSE.—The Assistant Secretary shall establish and administer the grant program under section 212 using the funds deposited in the State, Local, and Tribal Planning and Implementation Fund.

(c) CREDITING OF RECEIPTS.—There shall be deposited into or credited to the State, Local, and Tribal Planning and Implementation Fund—

(1) any amounts specified in section 401; and

(2) any amounts borrowed by the Assistant Secretary under subsection (d).

(d) BORROWING AUTHORITY.—

(1) IN GENERAL.—The Assistant Secretary may borrow from the general fund of the Treasury beginning on October 1, 2011, such sums as may be necessary, but not to exceed $250,000,000, to implement section 212.

(2) REIMBURSEMENT.—The Assistant Secretary shall reimburse the general fund of the Treasury, without interest, for any amounts borrowed under paragraph (1) as funds are deposited into the State, Local, and Tribal Planning and Implementation Fund.

SEC. 212. STATE, LOCAL, AND TRIBAL PLANNING AND IMPLEMENTATION GRANT PROGRAM.

(a) ESTABLISHMENT OF GRANT PROGRAM.—The Assistant Secretary, in consultation with the Corporation, shall take such action as is necessary to establish a grant program to make grants to each State Public Safety Broadband Office established under subsection (d) to assist State, local, and tribal public safety entities within such State in carrying out the following activities:

(1) Identifying and planning the most efficient and effective way for such entities to utilize and integrate the infrastructure, equipment, and other architecture associated with the public safety broadband network to satisfy the wireless communications and data services needs of such entities.

(2) Identifying opportunities for creating a consortium with one or more other States to assist the Program Management Office in developing a single

request for proposals to serve the common network requirements of the States in the consortium.

(3) Identifying the particular assets and specialized needs of the public safety entities located within such State for inclusion in requests for proposals with respect to the radio access networks. Such assets and needs may include the projected number of users, preferred buildout timeframes, special coverage needs, special hardening, security, reliability, and resiliency needs, local user priority assignments, integration needs of public safety answering points and emergency operations centers, and available towers and other infrastructure.

(4) Transmitting the plans developed under this subsection to the Program Management Office using the template developed under section 203(d)(2).

(b) MATCHING REQUIREMENTS; FEDERAL SHARE.—

(1) IN GENERAL.—The Federal share of the cost of any activity carried out using a grant under this section may not exceed 80 percent of the eligible costs of carrying out that activity, as determined by the Assistant Secretary, in consultation with the Corporation.

(2) WAIVER.—The Assistant Secretary may waive, in whole or in part, the requirements of para-

graph (1) for good cause shown if the Assistant Secretary determines that such a waiver is in the public interest.

(c) PROGRAMMATIC REQUIREMENTS.—Not later than 6 months after the date of the incorporation of the Corporation under section 201(a), the Assistant Secretary, in consultation with the Corporation, shall establish requirements relating to the grant program to be carried out under this section, including the following:

(1) Defining eligible costs for purposes of subsection (b)(1).

(2) Determining the scope of eligible activities for grant funding under this section.

(3) Prioritizing grants for activities that ensure coverage in rural as well as urban areas.

(d) STATE PUBLIC SAFETY BROADBAND OFFICES.—A State wishing to receive a grant under this section shall establish a State Public Safety Broadband Office to carry out the activities described in subsection (a). The Assistant Secretary may not accept a grant application unless such application certifies that the State has established such an office.

SEC. 213. PUBLIC SAFETY WIRELESS FACILITIES DEPLOYMENT.

(a) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 (Public Law 104–104) or any other provision of law, a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower that does not substantially change the physical dimensions of such tower.

(b) ELIGIBLE FACILITIES REQUEST.—In this section, the term ''eligible facilities request'' means a request that—

(1) is for a modification of an existing wireless tower that involves—

(A) collocation of new transmission equipment;

(B) removal of transmission equipment; or

(C) replacement of transmission equipment; and

(2) is made by an entity that enters into a contract with the Corporation to construct, manage, maintain, or operate the public safety broadband network for purposes of performing work under such contract.

Subtitle C—Public Safety Communications Research and Development

SEC. 221. NIST-DIRECTED PUBLIC SAFETY WIRELESS COMMUNICATIONS RESEARCH AND DEVELOPMENT.

(a) IN GENERAL.—From amounts made available from the Public Safety Trust Fund established under section 401, the Director of NIST, in consultation with the Commission, the Secretary of Homeland Security, and the National Institute of Justice of the Department of Justice, as appropriate, shall conduct research and assist with the development of standards, technologies, and applications to advance wireless public safety communications.

(b) REQUIRED ACTIVITIES.—In carrying out subsection (a), the Director of NIST, in consultation with the Corporation and the Technical and Operational Advisory Body established under section 201(h) shall—

(1) document public safety wireless communications requirements;

(2) accelerate the development of the capability for communications between currently deployed public safety narrowband systems and the public safety broadband network;

(3) establish a research plan, and direct research, that addresses the wireless communications needs of public safety entities beyond what can be provided by the current generation of broadband technology;

(4) accelerate the development of mission critical voice communications, including device-to-device talkaround capability over broadband networks, public safety prioritization, authentication capabilities, and standard application programming interfaces, if necessary and practical;

(5) accelerate the development of communications technology and equipment that can facilitate the eventual migration of public safety narrowband communications to the public safety broadband network;

(6) ensure the development and testing of new, interoperable, nonproprietary broadband technologies (including applications, devices, and device components) that are designed to open standards to meet the needs of public safety entities; and

(7) convene working groups of relevant government and commercial parties in carrying out paragraphs (1) through (6).

Subtitle D—Next Generation 911 Services

SEC. 231. NHTSA REPORT ON COSTS FOR REQUIREMENTS AND SPECIFICATIONS OF NEXT GENERATION 911 SERVICES.

(a) IN GENERAL.—Using amounts made available from the Public Safety Trust Fund under section 401, not later than 1 year after the date of enactment of this Act, the Administrator of the National Highway Traffic Safety Administration, in consultation with the Commission, the Secretary of Homeland Security, and the Office, shall prepare and submit to Congress a report that analyzes and determines detailed costs for specific Next Generation 911 service requirements and specifications.

(b) CONTENTS.—The report required under subsection (a) shall include the following:

(1) How costs would be allocated geographically or among public safety answering points, broadband service providers, and third-party providers of Next Generation 911 services.

(2) An assessment of the current state of Next Generation 911 service readiness among public safety answering points.

(3) How differences in public safety answering points' access to broadband across the United States may affect costs.

(4) A technical analysis and cost study of different delivery platforms, such as wireline, wireless, and satellite.

(5) An assessment of the architectural characteristics, feasibility, and limitations of Next Generation 911 service delivery.

(6) An analysis of the needs for Next Generation 911 service of persons with disabilities.

(7) Standards and protocols for Next Generation 911 service and for incorporating Voice over Internet Protocol and real time text standards.

SEC. 232. FCC RECOMMENDATIONS FOR LEGAL AND STATUTORY FRAMEWORK FOR NEXT GENERATION 911 SERVICES.

Not later than 1 year after the date of enactment of this Act, the Commission, in coordination with the Secretary of Homeland Security, the Administrator of the National Highway Traffic Safety Administration, and the Office, shall prepare and submit a report to Congress that contains recommendations for the legal and statutory framework for Next Generation 911 services, consistent with recommendations in the National Broadband Plan developed by the Commission pursuant to the American Recovery and Reinvestment Act of 2009, including the following:

(1) A legal and regulatory framework for the development of Next Generation 911 services and the transition from legacy 9–1–1 to Next Generation 911 services.

(2) Legal mechanisms to ensure efficient and accurate transmission of 9–1–1 caller information to emergency management or response agencies.

(3) Recommendations for removing jurisdictional barriers and inconsistent legacy regulations, including—

(A) proposals that would require States to remove regulatory impediments to Next Generation 911 services development, while recognizing the appropriate role of the States;

(B) eliminating outdated 9–1–1 regulations at the Federal level; and

(C) preempting inconsistent State regulations.

SEC. 233. DEFINITIONS.

In this subtitle:

(1) EMERGENCY CALL.—The term ''emergency call'' means any real-time communication with a

public safety answering point or other emergency management or response agency, including—

(A) through voice, text, or video and related data; and

(B) nonhuman-initiated automatic event alerts, such as alarms, telematics, or sensor data, which may also include real-time voice, text, or video communications.

(2) NEXT GENERATION 911 SERVICES.—The term "Next Generation 911 services" means an Internet Protocol-based system comprised of hardware, software, data, and operational policies and procedures that—

(A) provides standardized interfaces from emergency call and message services to support emergency communications;

(B) processes all types of emergency calls, including voice, data, and multimedia information;

(C) acquires and integrates additional emergency call data useful to call routing and handling;

(D) delivers the emergency calls, messages, and data to the appropriate public safety answering point and other appropriate emergency entities;

(E) supports data or video communications needs for coordinated incident response and management; and

(F) provides broadband service to public safety answering points or other first responder entities.

(3) OFFICE.—The term "Office" has the meaning given such term in section 158 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 942).

TITLE III—SPECTRUM AUCTION AUTHORITY

SEC. 301. DEADLINES FOR REALLOCATION AND AUCTION OF CERTAIN SPECTRUM.

(a) IN GENERAL.—

(1) IDENTIFICATION OF SPECTRUM.—Not later than 1 year after the date of the enactment of this Act—

(A) the Assistant Secretary shall identify for immediate reallocation, at a minimum—

(i) 15 megahertz of contiguous spectrum at frequencies located from 1675 megahertz to 1710 megahertz, except for the geographic exclusion zones (as such zones may be amended) identified in the report of the NTIA published in October 2010 and entitled "An Assessment of Near-Term Viability of Accommodating Wireless Broadband Systems in 1675–1710 MHz, 1755–1780 MHz, 3500–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands"; and

(ii) 25 megahertz of contiguous spectrum at frequencies located from 1755 megahertz to 1850 megahertz, unless—

(I) the President determines that such spectrum cannot be reallocated due to the need to protect incumbent Federal operations from interference or that reallocation must be delayed or undertaken in phases to ensure protection or continuity of Federal operations; and

(II) the President identifies other spectrum for reallocation that can reasonably be expected to produce comparable auction receipts; and

(B) the Commission shall identify for immediate reallocation, at a minimum, 15 megahertz of contiguous spectrum to pair with spectrum identified under subparagraph (A)(i).

(2) AUCTION OF IDENTIFIED SPECTRUM AND CERTAIN OTHER SPECTRUM.—

(A) IN GENERAL.—The Commission shall assign licenses for the use of the spectrum identified under paragraph (1) and the spectrum between the frequencies from 2155 megahertz to 2180 megahertz through competitive bidding under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) in accordance with the timetable set forth in subparagraph (B).

(B) TIMETABLE.—Notwithstanding paragraph (15)(A) of such section, the Commission shall complete all actions necessary in order to—

(i) in the case of licenses for the use of the spectrum between the frequencies from 2155 megahertz to 2180 megahertz and the spectrum identified under subparagraphs (A)(i) and (B) of paragraph (1)—

(I) commence the bidding process not later than January 31, 2014; and

(II) deposit the available proceeds in accordance with paragraph (8) of such section not later than June 30, 2014; and

(ii) in the case of licenses for the use of the spectrum identified under subparagraph (A)(ii) of paragraph (1)—

(I) commence the bidding process not later than January 31, 2018; and

(II) deposit the available proceeds in accordance with paragraph (8) of such section not later than June 30, 2018.

(b) REALLOCATION AND AUCTION OF CERTAIN OTHER SPECTRUM.—

(1) IN GENERAL.—In accordance with the timetable set forth in paragraph (2), the Commission shall reallocate and assign through a system of competitive bidding under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)), or reallocate for unlicensed use, the portion of the electromagnetic spectrum between the frequencies from 3550 megahertz to 3650 megahertz, except for the

geographic exclusion zones (as such zones may be amended) identified in the report of the NTIA published in October 2010 and entitled ''An Assessment of Near-Term Viability of Accommodating Wireless Broadband Systems in 1675–1710 MHz, 1755–1780 MHz, 3500–3650 MHz, and 4200–4220 MHz, 4380–4400 MHz Bands''.

(2) TIMETABLE.—Notwithstanding paragraph (15)(A) of such section, the Commission shall complete all actions necessary in order to—

(A) commence the bidding process not later than 3 years after the date of the enactment of this Act; and

(B) deposit the available proceeds in accordance with paragraph (8) of such section not later than 6 months thereafter.

(c) AUCTION PROCEEDS.—Section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)) is amended—

(1) in subparagraph (A), by striking ''(B), (D), and (E),'' and inserting ''(B), (D), (E), (F), and (G),'';

(2) in subparagraph (C)(i), by striking ''subparagraph (E)(ii)'' and inserting ''subparagraphs (D)(ii), (E)(ii), (F), and (G)(iv)'';

(3) in subparagraph (D)—

(A) by striking the heading and inserting "PROCEEDS FROM REALLOCATED FEDERAL SPECTRUM";

(B) by striking "Cash" and inserting the following:

"(i) IN GENERAL.—Except as provided in clause (ii), cash";

(C) by adding at the end the following:

"(ii) CERTAIN OTHER PROCEEDS.—Except as provided in subparagraph (B), in the case of proceeds (including deposits and upfront payment from successful bidders) attributable to the auction of eligible frequencies described in paragraph (2) of section 113(g) of the National Telecommunications and Information Administration Organization Act that are required to be auctioned by subsection (a)(2) or (b) of section 301 of the Public Safety Broadband and Wireless Innovation Act of 2011, such portion of such proceeds as is necessary to cover the relocation costs and sharing costs (as defined in paragraph (3) of such section 113(g)) of Federal entities relocated from or sharing such eligible frequencies shall be deposited in the Spectrum Relocation Fund. The remainder of such proceeds shall be deposited in the Public Safety Trust Fund established by section 401(a)(1) of such Act.''; and

(4) by adding at the end the following new subparagraph:

''(F) CERTAIN PROCEEDS DESIGNATED FOR PUBLIC SAFETY TRUST FUND.—Except as provided in subparagraphs (B) and (D), the proceeds (including deposits and upfront payments from successful bidders) from the use of a system of competitive bidding under this subsection pursuant to subsections (a)(2) and (b) of section 301 of the Public Safety Broadband and Wireless Innovation Act of 2011 shall be deposited in the Public Safety Trust Fund established by section 401(a)(1) of such Act.''.

(d) EXTENSION OF AUCTION AUTHORITY.—Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking ''2012'' and inserting ''2021''.

SEC. 302. INCENTIVE AUCTION AUTHORITY.

(a) IN GENERAL.—Section 309(j)(8) of the Communications Act of 1934, as amended by section 301(c), is further amended by adding at the end the following new subparagraph:

"(G) INCENTIVE AUCTION AUTHORITY.—

"(i) IN GENERAL.—If the Commission determines that it is consistent with the public interest in utilization of the spectrum for a licensee to voluntarily relinquish some or all of its licensed rights for the use of spectrum in order to permit—

"(I) through competitive bidding under this subsection, the assignment of new initial licenses subject to new service rules, on a flexible-use basis to the extent technologically feasible; or

"(II) the allocation of spectrum for unlicensed use;

the Commission may disburse to such licensee, from the proceeds from competitive bidding for any spectrum usage rights made available by reason of relinquishments under this subparagraph, an amount that the Commission considers appropriate, based on the value of the rights relinquished by such licensee.

"(ii) FACTORS FOR CONSIDERATION.—In considering whether to accept the voluntary relinquishment of licensed spectrum usage rights of a licensee and share proceeds with such licensee under clause (i), the Commission shall consider the following factors:

"(I) The conditions under which such licensee could maintain the license and whether such licensee is in compliance with the license terms.

"(II) The extent to which such relinquishment would serve the public interest, convenience, and necessity.

"(iii) COVERAGE AREA REQUIREMENTS.—In assigning licenses under this subparagraph, the Commission shall make all reasonable efforts to ensure that there is an adequate opportunity for applicants to submit bids for licenses covering both large and small geographic areas, as such areas are determined by the Commission.

"(iv) TREATMENT OF REVENUES.—Except as provided in subparagraph (B), all proceeds (including deposits and upfront payments from successful bidders) from the auction of spectrum usage rights made available by relinquishments under this subparagraph shall be deposited in the Public Safety Trust Fund established by section 401(a)(1) of the Public Safety Broadband and Wireless Innovation Act of 2011.".

(b) SPECIAL RULES FOR TELEVISION BROADCAST SPECTRUM.—

(1) GENERAL AUTHORITY TO REORGANIZE.—In order to create a geographically contiguous band of spectrum across the United States, the Commission may—

(A) create a framework to make available such portions of the television broadcast spectrum as the Commission considers appropriate; and

(B) require full-power television broadcast station licensees and other licensees, as the Commission considers appropriate, to relocate to the portion of the television broadcast spectrum located between the frequencies from 54 megahertz to 608 megahertz.

(2) VOLUNTARY NATURE OF INCENTIVE AUCTIONS.—Except as provided in paragraphs (3) and (4), reclamation of spectrum usage rights from a television broadcast station licensee for the purpose of providing spectrum usage rights to carry out an incentive auction under subparagraph (G) of section 309(j)(8) of the Communications Act of 1934, as added by subsection (a), shall be on a voluntary basis.

(3) RECLAMATION IN EXCHANGE FOR RIGHTS TO SUBSTANTIALLY EQUIVALENT SPECTRUM.—

(A) IN GENERAL.—The Commission may reclaim the spectrum usage rights of a television broadcast station licensee for the purpose of providing spectrum usage rights to carry out an incentive auction under section 309(j)(8)(G) of the Communications Act of 1934 if the Commission assigns to such licensee the rights to use an identical amount of contiguous spectrum, in the same geographic market, that is located in the range of frequencies—

(i) from 54 megahertz to 608 megahertz, if the rights reclaimed were for the use of spectrum located in the range from 54 megahertz to 88 megahertz;

(ii) from 174 megahertz to 608 megahertz, if the rights reclaimed were for the use of spectrum located in the range from 174 megahertz to 216 megahertz; and

(iii) from 470 megahertz to 608 megahertz, if the rights reclaimed were for the use of spectrum located in the range from 470 megahertz to 698 megahertz.

(B) SUBSTANTIAL EQUIVALENCE.—The Commission shall make reasonable efforts to ensure, to the extent technically feasible and in the public interest, that spectrum usage rights assigned under subparagraph (A) enable a licensee to offer service that is substantially similar in service contour and amount of harmful interference to the service offered by such licensee on the spectrum the rights to which are reclaimed by the Commission under such subparagraph.

(C) RELOCATION COSTS.—The costs incurred by a licensee in relocating to an identical amount of spectrum under subparagraph (A), without any modification of usage rights as described in paragraph (4), shall be paid from the Incentive Auction Relocation Fund established by paragraph (5), but the proceeds from an incentive auction under section 309(j)(8)(G) of the Communications Act of 1934 shall not otherwise be disbursed to such licensee by reason of the relocation.

(D) RELOCATION FROM VHF TO UHF.—In conducting the reclamation and reassignments under subparagraph (A), the Commission shall, to the extent technically feasible and in the public interest, allow each television broadcast station licensee holding a license to use a portion of the broadcast television spectrum located in the range of frequencies from 54 megahertz to 216 megahertz to relocate to a portion in the range from 470 megahertz to 608 megahertz.

(4) MODIFICATION OF RIGHTS AND COMPENSATION.—

(A) MODIFICATION.—If the Commission determines that it is in the public interest to modify the spectrum usage rights of a television broadcast station licensee for the purpose of providing spectrum usage rights to carry out an incentive auction under section 309(j)(8)(G) of the Communications Act of 1934, the Commission may make the modification and disburse to such licensee a portion of the auction proceeds that compensates such licensee for the reduction in spectrum usage rights.

(B) LEAST MODIFICATION TECHNICALLY FEASIBLE.—To the extent technically feasible and in the public interest, in making a modification of the spectrum usage rights of a television broadcast station licensee under subparagraph (A), the Commission shall make reasonable efforts to—

(i) preserve the amount of population covered by the signal of such licensee within the service area of such licensee; and

(ii) avoid any substantial increase in harmful interference to the signal of such licensee as a result of the modification.

(C) ADDITIONAL LIMITATIONS.—With respect to any modification under subparagraph (A)—

(i) the Commission may not involuntarily co-locate multiple television broadcast station licensees on the same channel; and

(ii) television broadcast station licensees voluntarily electing to be co-located on the same channel shall—

(I) retain the same carriage rights under sections 338, 614, and 615 of the Communications Act of 1934 (47 U.S.C. 338; 534; 535) as before the co-location; and

(II) receive payment from the Incentive Auction Relocation Fund established by paragraph (5) for any costs of relocation to another channel incurred in connection with the co-location arrangement, in addition to disbursements as compensation for the modification of spectrum usage rights under subparagraph (A).

(5) ESTABLISHMENT OF INCENTIVE AUCTION RELOCATION FUND.—

(A) IN GENERAL.—There is established in the Treasury of the United States a fund to be known as the Incentive Auction Relocation Fund.

(B) DEPOSITS.—There shall be deposited in the Incentive Auction Relocation Fund the amounts specified in section 401(b)(2).

(C) AVAILABILITY.—Amounts in the Incentive Auction Relocation Fund shall be available to the Assistant Secretary for use—

(i) without fiscal year limitation;

(ii) for a period not to exceed 18 months following the later of—

(I) completion of the incentive auction under section 309(j)(8)(G) of the Communications Act of 1934 from which such amounts were derived; or

(II) with respect to availability for payment of the relocation costs of a particular relocating licensee, notification by the Commission to the Assistant Secretary of such costs; and

(iii) without further appropriation.

(D) USE OF FUNDS.—

(i) IN GENERAL.—Amounts in the Incentive Auction Relocation Fund may only be used by the Assistant Secretary, in consultation with the Commission, to cover—

(I) the relocation costs of television broadcast station licensees that are relocated to different channels or geographic locations in the reorganization of television broadcast spectrum under this subsection, including the costs of new equipment, installation, and construction (including the costs of tower, antenna, transmitter, and transmission line upgrades) incurred as a result of the relocation;

(II) the costs incurred by multichannel video programming distributors (as defined in section 602(13) of the Communications Act of 1934 (47 U.S.C. 522(13))) in order to comply with the carriage obligations under sections 338, 614, and 615 of such Act (47 U.S.C. 338; 534; 535) with respect to television broadcast station licensees voluntarily electing to be co-located on the same channel as described in paragraph (4)(C); and

(III) the expenses incurred by the Assistant Secretary in administering the Fund.

(ii) PROHIBITION.—Amounts in the Incentive Auction Relocation Fund may not be used to cover lost revenues attributable to relocation or costs associated with a voluntary relinquishment of rights.

(iii) REASONABLENESS.—The Assistant Secretary may only make payments under clause (i) to cover costs that were reasonably incurred, as determined by the Assistant Secretary, in consultation with the Commission.

(6) CONFIDENTIALITY.—The Commission shall protect the confidentiality of the identity of a television broadcast station licensee offering to relinquish spectrum usage rights under section 309(j)(8)(G) of the Communications Act of 1934 until the relinquishment becomes effective.

(7) UNLICENSED USE.—After assigning, through competitive bidding under section 309(j)(8)(G) of the Communications Act of 1934, licenses for the use of 84 megahertz of the television broadcast spectrum made available through the reor-

ganization under this subsection, the Commission may, if consistent with the public interest, disburse a portion of the proceeds of such bidding to other licensees for the purpose of ensuring that portions of the television broadcast spectrum remain available for unlicensed use on a nationwide basis and in each local market.

(8) DEADLINE FOR AUCTION OF CLEARED TELEVISION BROADCAST SPECTRUM.—The Commission shall take all actions necessary in order to, with respect to the portions of the television broadcast spectrum made available through the reorganization under this subsection—

(A) not later than January 31, 2016—

(i) commence the bidding process under section 309(j)(8)(G) of the Communications Act of 1934 to assign new initial licenses subject to new service rules, on a flexible-use basis to the extent technologically feasible; or

(ii) allocate such spectrum for unlicensed use; and

(B) not later than June 30, 2016, deposit the available proceeds in accordance with such section.

(9) LIMITATION.—During the period beginning on the date of the enactment of this Act and ending on June 30, 2016, the Commission may conduct only 1 process involving reorganization of the television broadcast spectrum under this subsection and the auction of such spectrum under section 309(j)(8)(G) of the Communications Act of 1934.

(10) CERTAIN PROVISIONS INAPPLICABLE.—The following provisions of the Communications Act of 1934 shall not apply in the case of the reorganization of television broadcast spectrum under this subsection or the auction under section 309(j)(8)(G) of such Act of the spectrum made available through such reorganization: section 307(b), the 2nd and 3rd sentences and subparagraphs (A) and (F) of section 309(j)(3), subparagraphs (A), (C), and (D) of section 309(j)(4), section 309(j)(15)(A), section 316, and section 331.

(11) TELEVISION BROADCAST SPECTRUM DEFINED.—In this subsection, the term "television broadcast spectrum" means the portions of the electromagnetic spectrum between the frequencies from 54 megahertz to 72 megahertz, from 76 megahertz to 88 megahertz, from 174 megahertz to 216 mega-

hertz, from 470 megahertz to 608 megahertz, and from 614 megahertz to 698 megahertz.

(12) EXPIRATION.—The preceding paragraphs of this subsection, except paragraphs (5) and (11), shall not apply after June 30, 2016.

(c) INCENTIVE AUCTIONS TO REPURPOSE CERTAIN MOBILE SATELLITE SERVICE SPECTRUM FOR TERRESTRIAL BROADBAND USE.—To the extent that the Commission makes available spectrum licenses for the use of some or all of the spectrum between the frequencies from 2000 megahertz to 2020 megahertz and from 2180 megahertz to 2200 megahertz for terrestrial broadband use, such licenses shall be assigned using a system of competitive bidding under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)), including, as appropriate, paragraph (8)(G) of such section.

TITLE IV—PUBLIC SAFETY TRUST FUND

SEC. 401. PUBLIC SAFETY TRUST FUND.

(a) ESTABLISHMENT OF PUBLIC SAFETY TRUST FUND.—

(1) IN GENERAL.—There is established in the Treasury of the United States a trust fund to be known as the Public Safety Trust Fund.

(2) DEPOSIT OF RECEIPTS.—

(A) IN GENERAL.—There shall be deposited in the Public Safety Trust Fund the proceeds from the auction of spectrum required to be deposited in the Fund by subparagraphs (D)(ii), (F), and (G) of section 309(j)(8) of the Communications Act of 1934, as added by sections 301(c)(3)(C), 301(c)(4), and 302(a), respectively.

(B) AVAILABILITY.—Amounts deposited in the Public Safety Trust Fund in accordance with subparagraph (A) shall remain available through fiscal year 2021. After the end of such fiscal year, such amounts shall be deposited in the general fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(b) USE OF FUND.—Amounts deposited in the Public Safety Trust Fund shall be used in the following manner:

(1) PAYMENT OF INCENTIVE AMOUNTS.—

(A) DISBURSALS.—Amounts in the Public Safety Trust Fund shall be used to make the following disbursals:

(i) Disbursals permitted by section 309(j)(8)(G)(i) of the Communications Act of 1934 to licensees who voluntarily relinquished licensed spectrum usage rights under such section.

(ii) Disbursals required by section 302(b)(4)(A) to television broadcast station licensees whose spectrum usage rights have been modified under such section for the purpose of providing spectrum usage rights to carry out an incentive auction under section 309(j)(8)(G) of the Communications Act of 1934.

(B) NOTIFICATION TO CONGRESS.—

(i) IN GENERAL.—At least 3 months before any incentive auction conducted under section 309(j)(8)(G) of the Communications Act of 1934, the Chairman of the Commission, in consultation with the Director of the Office of Management and Budget, shall notify the appropriate committees of Congress—

(I) of the methodology for calculating any disbursals described in clause (i) or (ii) of subparagraph (A) that will be made from the proceeds of such auction; and

(II) that such methodology considers the value of the spectrum voluntarily relinquished in its current use and the timeliness with which the licensee cleared its use of such spectrum.

(ii) DEFINITION.—In this subparagraph, the term "appropriate committees of Congress" means—

(I) the Committee on Commerce, Science, and Transportation of the Senate;

(II) the Committee on Appropriations of the Senate;

(III) the Committee on Energy and Commerce of the House of Representatives; and

(IV) the Committee on Appropriations of the House of Representatives.

(2) INCENTIVE AUCTION RELOCATION FUND.—Not less than 5 percent but not more than $2,000,000,000 of the amounts in the Public Safety Trust Fund shall be deposited in the Incentive Auc-

tion Relocation Fund established by section 302(b)(5)(A).

(3) DISBURSALS TO ENSURE AVAILABILITY FOR UNLICENSED USE.—Amounts in the Public Safety Trust Fund shall be used to make the disbursals permitted by section 302(b)(7) for the purpose of ensuring that certain portions of the electromagnetic spectrum remain available for unlicensed use.

(4) STATE, LOCAL, AND TRIBAL PLANNING AND IMPLEMENTATION FUND.—$250,000,000 shall be deposited in the State, Local, and Tribal Planning and Implementation Fund established by section 211(a).

(5) PUBLIC SAFETY BROADBAND CORPORATION.—$11,000,000,000 shall deposited with the Public Safety Broadband Corporation established under section 201(a) for ensuring the construction, management, maintenance, and operation of the public safety broadband network.

(6) PUBLIC SAFETY RESEARCH AND DEVELOPMENT.—$100,000,000 per year for each of the fiscal years 2012 through 2016 shall be made available for use by the Director of NIST to carry out the research program established under section 221.

(7) NHTSA REPORT ON NEXT GENERATION 911 SERVICES.—$2,000,000 shall be made available for fiscal years 2012 and 2013 for use by the Administrator of the National Highway Traffic Safety Administration to prepare the report on Next Generation 911 services required by section 231.

(8) DEFICIT REDUCTION.—Any amounts remaining in the Public Safety Trust Fund after the deduction of the amounts required by paragraphs (1) through (7) shall be deposited in the general fund of the Treasury, where such amounts shall be dedicated for the sole purpose of deficit reduction.

(c) INVESTMENT.—Amounts in the Public Safety Trust Fund shall be invested in accordance with section 9702 of title 31, United States Code, and any interest on, and proceeds from, any such investment shall be credited to, and become a part of, the Fund.

TITLE V—SPECTRUM POLICY

SEC. 501. SPECTRUM INVENTORY.

Part B of title I of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 921 et seq.) is amended by adding at the end the following:

"SEC. 119. SPECTRUM INVENTORY.

"(a) RADIO SPECTRUM INVENTORY.—In order to promote the efficient use of the electromagnetic spectrum, the Assistant Secretary and the Commission shall coordinate and carry out each of the following activities not later than 1 year after the date of enactment of this section:

"(1) Except as provided in subsection (e), create an inventory of each radio spectrum band of frequencies listed in the United States Table of Frequency Allocations, from 225 megahertz to, at a minimum, 3.7 gigahertz, and to 10 gigahertz unless the Assistant Secretary and the Commission determine that the burden of expanding the inventory outweighs the benefit, that includes—

"(A) the radio services authorized to operate in each band of frequencies;

"(B) the identity of each Federal or non-Federal user within each such radio service authorized to operate in each band of frequencies;

"(C) the activities, capabilities, functions, or missions (including whether such activities, capabilities, functions, or missions are space-based, air-based, or ground-based) supported by the transmitters, end-user terminals or receivers, or other radio frequency devices authorized to operate in each band of frequencies;

"(D) the total amount of spectrum, by band of frequencies, assigned or licensed to each Federal or non-Federal user (in percentage terms and in sum) and the geographic areas covered by their respective assignments or licenses;

"(E) the approximate number of transmitters, end-user terminals or receivers, or other radio frequency devices authorized to operate, as appropriate to characterize the extent of use of each radio service in each band of frequencies;

"(F) an approximation of the extent to which each Federal or non-Federal user is using, by geography, each band of frequencies, such as the amount and percentage of time of use, number of end users, or other measures as appropriate to the particular band and radio service; and

"(G) to the greatest extent possible—

"(i) contour maps or other information that illustrates the coverage area, receiver performance, and other parameters relevant to an assessment of the availability of spectrum in each band;

"(ii) for each band or range of frequencies, the identity of each entity offering unlicensed services and the types and approximate number of unlicensed intentional radiators verified or certified by the Commission that are authorized to operate; and

"(iii) for non-Federal users, any commercial names under which facilities-based service is offered to the public using the spectrum of the non-Federal user, including the commercial names under which the spectrum is being offered through resale.

"(2) Except as provided in subsection (e), create a centralized portal or Web site to make the inventory of the bands of frequencies required under paragraph (1) available to the public.

"(b) USE OF AGENCY RESOURCES.—In creating the inventory described in subsection (a)(1), the Assistant Secretary and the Commission shall first use agency resources, including existing databases, field testing, and recordkeeping systems, and only request information from Federal and non-Federal users if such information cannot be obtained using such agency resources.

"(c) REPORTS.—

"(1) IN GENERAL.—Except as provided in subsection (e), not later than 2 years after the date of enactment of this section and biennially thereafter, the Assistant Secretary and the Commission shall submit a report to the Committee on Commerce, Science, and Transportation of the Senate and to the Committee on Energy and Commerce of the House of Representatives containing—

"(A) the results of the inventory created under subsection (a)(1), including any update to the information in the inventory pursuant to subsection (d);

"(B) a description of any information the Assistant Secretary or the Commission determines is necessary for such inventory but that is unavailable; and

"(C) a description of any information not provided by any Federal or non-Federal user in accordance with subsections (e)(1)(B)(ii) and (e)(2)(C)(ii).

"(2) RELOCATION REPORT.—

"(A) IN GENERAL.—Except as provided in subsection (e), the Assistant Secretary and the Commission shall submit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Energy and Commerce of the House of Representatives containing a recommendation of which spectrum, if any, should be reallocated or otherwise made available for shared access and an explanation of the basis for that recommendation.

"(B) DEADLINES.—The report required under subparagraph (A) shall be submitted not later than 2 years after the date of enactment of this section and every 2 years thereafter.

"(3) INVENTORY REPORT.—If the Assistant Secretary and the Commission have not conducted an inventory under subsection (a) to 10 gigahertz at least 90 days before the third report required under paragraph (1) is submitted, the Assistant Secretary and the Commission shall include an evaluation in such report and in every report thereafter of whether the burden of expanding the inventory to 10 gigahertz outweighs the benefit until such time as the Assistant Secretary and the Commission have conducted the inventory to 10 gigahertz.

"(d) MAINTENANCE AND UPDATING OF INFORMATION.—After the creation of the inventory required by subsection (a)(1), the Assistant Secretary and the Commission shall make all reasonable efforts to maintain and update the information required under such subsection on a quarterly basis, including when there is a transfer or auction of a license or a change in a permanent assignment or license.

"(e) NATIONAL SECURITY AND PUBLIC SAFETY INFORMATION.—

"(1) NONDISCLOSURE.—

"(A) IN GENERAL.—If the head of an executive agency of the Federal Government determines that public disclosure of certain information held by that agency or a licensee of non-Federal spectrum and required by subsection (a), (c), or (d) would reveal classified national security information or other information for which there is a legal basis for nondisclosure and such public disclosure would be detrimental to national security, homeland security, or public safety, the agency head shall notify the Assistant Secretary of that determination and shall include descriptions of the activities, capabilities, functions, or missions (including whether they are space-based, air-based, or ground-based) supported by the information being withheld.

"(B) INFORMATION PROVIDED.—The agency head shall provide to the Assistant Secretary—

"(i) the publicly releasable information required by subsection (a)(1);

"(ii) to the maximum extent practicable, a summary description, suitable for public release, of the classified national security information or other information for which there is a legal basis for nondisclosure; and

"(iii) a classified annex, under appropriate cover, containing the classified national security information or other information for which there is a legal basis for nondisclosure that the agency head has determined must be withheld from public disclosure.

"(2) PUBLIC SAFETY NONDISCLOSURE.—

"(A) IN GENERAL.—If a licensee of non-Federal spectrum determines that public disclosure of certain information held by that licensee and required to be submitted by subsection (a), (c), or (d) would reveal information for which public disclosure would be detrimental to public safety, or the licensee is otherwise prohibited by law from disclosing the information, the licensee may petition the Commission for a partial or total exemption from inclusion on the centralized portal or Web site under subsection (a)(2) and in the report required by subsection (c).

"(B) BURDEN.—The licensee seeking an exemption under this paragraph bears the burden of justifying the exemption and shall provide clear and convincing evidence to support such an exemption.

"(C) INFORMATION REQUIRED.—If an exemption is granted under this paragraph, the licensee shall provide to the Commission—

"(i) the publicly releasable information required by subsection (a)(1) for the inventory;

"(ii) to the maximum extent practicable, a summary description, suitable for public release, of the information for which public disclosure would be detrimental to public safety or the licensee is otherwise prohibited by law from disclosing; and

"(iii) an annex, under appropriate cover, containing the information that the

Commission has determined should be withheld from public disclosure.

"(3) ADDITIONAL DISCLOSURE.—The annexes required under paragraphs (1)(B)(iii) and (2)(C)(iii) shall be provided to the congressional committees listed in subsection (c), but shall not be disclosed to the public under subsection (a) or subsection (d) or provided to any unauthorized person through any other means.

"(4) NATIONAL SECURITY COUNCIL CONSULTATION.—Prior to the release of the inventory under subsection (a), any updates to the inventory resulting from subsection (d), or the submission of a report under subsection (c)(1), the Assistant Secretary and the Commission shall consult with the National Security Council for a period not to exceed 30 days for the purposes of determining what additional information, if any, shall be withheld from the public.

"(f) PROPRIETARY INFORMATION.—In creating and maintaining the inventory, centralized portal or Web site, and reports under this section, the Assistant Secretary and the Commission shall follow their rules and practice regarding confidential and proprietary information. Nothing in this subsection shall be construed to compel the

Commission to make publicly available any confidential or proprietary information.''.

SEC. 502. FEDERAL SPECTRUM PLANNING.

(a) REVIEW OF EVALUATION PROCESS.—Not later than 6 months after the date of enactment of this Act, the Comptroller General of the United States shall—

(1) conduct a review of the processes that Federal entities utilize to evaluate the spectrum needs of such entities;

(2) make recommendations on how to improve such processes; and

(3) submit to the appropriate committees of Congress a report on the review and recommendations made pursuant to paragraphs (1) and (2).

(b) REVISION OF EVALUATION PROCESS.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, each Federal entity shall update or revise the process used by such entity to evaluate the proposed spectrum needs of such entity, or establish such a process, taking into account any applicable recommendations made in the report required by subsection (a).

(2) REQUIRED INCLUSIONS.—

(A) ANALYSIS OF OPTIONS.—Each process described in paragraph (1), whether newly established, updated, or revised, shall include an analysis and assessment of—

(i) the options available to the Federal entity to obtain communications services that are the most spectrum-efficient; and

(ii) the effective alternatives available to such entity that will permit the entity to continue to satisfy the mission requirements of the entity.

(B) ANALYSIS SUBMITTED TO NTIA.—The analysis and assessment carried out under subparagraph (A) shall be submitted by the Federal entity to the Assistant Secretary at the same time that the entity seeks certification or recertification, if applicable, of spectrum support from the NTIA pursuant to the requirements of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 901 et seq.) and OMB Circular A–11.

(c) SPECTRUM PLANS OF FEDERAL ENTITIES.—

(1) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, and every 2 years thereafter, each Federal entity shall provide an entity-specific strategic spectrum plan to the Assistant

Secretary and the Director of the Office of Management and Budget.

(2) REQUIRED INCLUSIONS.—Each strategic spectrum plan submitted under paragraph (1) shall include—

(A) the spectrum requirements of the entity;

(B) the planned uses of new technologies or expanded services requiring spectrum over a period of time to be determined by the entity;

(C) suggested spectrum-efficient approaches to meeting the spectrum requirements identified under subparagraph (A); and

(D) progress reports on the activities of the entity to improve its spectrum management.

(d) CLASSIFIED NATIONAL SECURITY INFORMATION AND CERTAIN OTHER INFORMATION.—

(1) IN GENERAL.—The head of a Federal entity shall take the actions described in paragraph (2) if such head determines that disclosure of information required by subsection (c) would reveal—

(A) information that is classified in accordance with Executive Order 13526 (50 U.S.C. 425 note) or any successor Executive order establishing or modifying the uniform system for classifying, safeguarding, and declassifying national security information; or

(B) other information for which there is a legal basis for nondisclosure and the public disclosure of which would be detrimental to national security, homeland security, or public safety.

(2) ACTIONS DESCRIBED.—The actions described in this paragraph are the following:

(A) Notification to the Assistant Secretary of the determination under paragraph (1).

(B) Provision to the Assistant Secretary of—

(i) the publicly releasable information required by subsection (c);

(ii) to the maximum extent practicable, a summary description, suitable for public release, of the classified information or other information for which there is a legal basis for nondisclosure; and

(iii) a classified annex, under appropriate cover, containing the classified information or other information for which there is a legal basis for nondisclosure that the head of the Federal entity has determined must be withheld from public disclosure.

(3) ANNEX RESTRICTION.—The Assistant Secretary shall make an annex described in paragraph (2)(B)(iii) available to the Secretary of Commerce and the Director of the Office of Management and Budget. Neither the Assistant Secretary, the Secretary of Commerce, nor the Director of the Office of Management and Budget may make any such annex available to the public or to any unauthorized person through any other means.

(e) FEDERAL STRATEGIC SPECTRUM PLAN.—

(1) DEVELOPMENT AND SUBMISSION.—

(A) IN GENERAL.—The Secretary of Commerce shall develop a Federal Strategic Spectrum Plan, in coordination with the Assistant Secretary and the Director of the Office of Management and Budget.

(B) SUBMISSION TO CONGRESS.—Not later than 6 months after the date by which the initial entity-specific strategic spectrum plans are required to be submitted to the Assistant Secretary under subsection (c)(1), the Secretary of Commerce shall, consistent with the requirements set forth in subsection (d)(3), submit the

Federal Strategic Spectrum Plan developed under subparagraph (A) to the appropriate committees of Congress.

(C) NONDISCLOSURE OF ANNEXES.—The Federal Strategic Spectrum Plan required to be submitted under subparagraph (B) shall be submitted in unclassified form, but shall include, if appropriate, 1 or more annexes as provided for by subsection (d)(2)(B)(iii). No congressional committee may make any such annex available to the public or to any unauthorized person.

(D) CLASSIFIED ANNEXES.—If the Federal Strategic Spectrum Plan includes a classified annex as provided for by subsection (d)(2)(B)(iii), the Secretary of Commerce shall—

(i) submit the classified annex only to the appropriate committees of Congress with primary oversight jurisdiction for the user entities or licensees concerned; and

(ii) provide notice of the submission to the other appropriate committees of Congress.

(E) DEFINITION.—In this subsection, the term 'appropriate committees of Congress' means the Committee on Commerce, Science, and Transportation of the Senate, the Committee on Energy and Commerce of the House of Representatives, and any other congressional committee with primary oversight jurisdiction for the user entity or licensees concerned.

(2) INCORPORATION OF ENTITY PLANS.—The Federal Strategic Spectrum Plan developed under paragraph (1)(A) shall incorporate, consistent with the requirements of subsection (d)(3), the initial entity-specific strategic spectrum plans submitted under subsection (c)(1).

(3) REQUIRED INCLUSIONS.—The Federal Strategic Spectrum Plan developed under paragraph (1)(A) shall include—

(A) information on how spectrum assigned to and used by Federal entities is being used;

(B) opportunities to increase efficient use of infrastructure and spectrum assigned to and used by Federal entities;

(C) an assessment of the future spectrum needs of the Federal Government; and

(D) plans to incorporate such needs in the frequency assignment, equipment certification, and review processes of the Assistant Secretary.

(4) UPDATES.—The Secretary of Commerce shall revise and update the Federal Strategic Spectrum Plan developed under paragraph (1)(A) to take into account the biennial submission of the entity-specific strategic spectrum plans submitted under subsection (c)(1).

(f) NATIONAL STRATEGIC SPECTRUM PLAN.—

(1) IN GENERAL.—Not later than 4 years after the date of enactment of this Act, and every 4 years thereafter, the Assistant Secretary and the Commission, in consultation with other Federal departments and agencies, State, local, and tribal entities, and commercial spectrum interests, shall develop a quadrennial National Strategic Spectrum Plan.

(2) REQUIRED INCLUSION.—A National Strategic Spectrum Plan developed under paragraph (1) shall include the following:

(A) The Federal Strategic Spectrum Plan developed under paragraph (1)(A) of subsection (e), as updated under paragraph (4) of such subsection.

(B) Long-range spectrum planning for both Federal and non-Federal users, including commercial users and State and local government users.

(C) An identification of new technologies or expanded services requiring spectrum.

(D) An identification and analysis of the nature and characteristics of the new radio communication systems required and the nature and characteristics of the spectrum required.

(E) An identification and analysis of efficient approaches to meeting the future spectrum requirements of all users, including—

(i) requiring certain standards-based technologies that improve spectrum efficiencies;

(ii) spectrum sharing and reuse opportunities;

(iii) possible reallocation; and

(iv) any other approaches that promote efficient use of spectrum.

(F) An evaluation of current spectrum auction processes to determine the effectiveness of such processes in—

(i) promoting competition;

(ii) improving the efficiency of spectrum use; and

(iii) maximizing the full economic value of the spectrum to consumers, industry, and taxpayers.

SEC. 503. REALLOCATING FEDERAL SPECTRUM FOR COMMERCIAL PURPOSES AND FEDERAL SPECTRUM SHARING.

(a) ELIGIBLE FEDERAL ENTITIES.—Section 113(g)(1) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(1)) is amended to read as follows:

"(1) ELIGIBLE FEDERAL ENTITIES.—Any Federal entity that operates a Federal Government station authorized to use a band of frequencies specified in paragraph (2) and that incurs relocation costs or sharing costs because of planning for a potential auction of spectrum frequencies, a planned auction of spectrum frequencies, or the reallocation of spectrum frequencies from Federal use to exclusive non-Federal use or to shared use shall receive payment for such relocation costs or sharing costs from the Spectrum Relocation Fund, in accordance with section 118. For purposes of this paragraph, Federal power agencies exempted under subsection (c)(4) that choose to relocate from the frequencies identified for reallocation pursuant to subsection (a) are eligible to receive payment under this paragraph.''.

(b) ELIGIBLE FREQUENCIES.—Section 113(g)(2)(B) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(2)(B)) is amended to read as follows:

"(B) any other band of frequencies reallocated from Federal use to non-Federal or shared use, whether for licensed or unlicensed use, after January 1, 2003, that is assigned—

"(i) by competitive bidding pursuant to section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)); or

"(ii) as a result of an Act of Congress or any other administrative or executive direction.''.

(c) RELOCATION COSTS AND SHARING COSTS DEFINED.—Section 113(g)(3) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(3)) is amended to read as follows:

"(3) RELOCATION COSTS AND SHARING COSTS DEFINED.—

"(A) IN GENERAL.—For purposes of this subsection, the term 'relocation costs' or 'sharing costs' means the costs incurred by a Federal entity in connection with the auction (or a potential or planned auction) of spectrum frequencies previously assigned to such entity, or the sharing of spectrum frequencies assigned to such entity (including the auction or a potential or planned auction of the rights to use spectrum frequencies on a shared basis with such entity), respectively, in order to achieve comparable capability of systems as before the relocation or the sharing arrangement. Such term includes, with respect to relocation or sharing, as the case may be—

"(i) the costs of any modification or replacement of equipment, spares, associated ancillary equipment, software, facilities, operating manuals, training costs, or regulations that are attributable to relocation or sharing;

"(ii) the costs of all engineering, equipment, software, site acquisition, and construction, as well as any legitimate and prudent transaction expense, including term-limited Federal civil servant and contractor staff necessary to carry out the relocation or sharing activities of an eligible Federal entity, and reasonable additional costs incurred by the Federal entity that are attributable to relocation or sharing, including increased recurring costs associated with the replacement of facilities;

"(iii) the costs of research, engineering studies, economic analyses, or other expenses reasonably incurred in connection with—

"(I) calculating the estimated relocation costs or sharing costs that are provided to the Commission pursuant to paragraph (4);

"(II) determining the technical or operational feasibility of relocation to 1 or more potential relocation bands; or

"(III) planning for or managing a relocation or sharing project (including spectrum coordination with auction winners) or potential relocation or sharing project;

"(iv) the one-time costs of any modification of equipment reasonably necessary—

"(I) to accommodate commercial use of shared frequencies; or

"(II) in the case of eligible frequencies reallocated for exclusive commercial use and assigned through a competitive bidding process under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) but with respect to which a Federal entity retains primary allocation or protected status for a period of time after the completion of the competitive bidding process, to accommodate shared Federal and non-Federal use of such frequencies for such period;

"(v) the costs associated with the accelerated replacement of systems and equipment if such acceleration is necessary to ensure the timely relocation of systems to a new frequency assignment or the timely accommodation of sharing of Federal frequencies; and "(vi) the costs of the use of commercial systems (including systems not utilizing spectrum) to replace Federal systems discontinued or relocated pursuant to this Act, including lease (including lease of land), subscription, and equipment costs over an appropriate period, such as the anticipated life of an equivalent Federal system or other period determined by the Director of the Office of Management and Budget.

"(B) COMPARABLE CAPABILITY OF SYSTEMS.—For purposes of subparagraph (A), comparable capability of systems—

"(i) may be achieved by relocating a Federal Government station to a new frequency assignment, by relocating a Federal Government station to a different geographic location, by modifying Federal Government equipment to mitigate interference or use less spectrum, in terms of bandwidth, geography, or time, and thereby permitting spectrum sharing (including sharing among relocated Federal entities and incumbents to make spectrum available for non-Federal use) or relocation, or by utilizing an alternative technology; and

"(ii) includes the acquisition of state-of-the-art replacement systems intended to meet comparable operational scope, which may include incidental increases in functionality.".

(d) CERTAIN PROCEDURAL REQUIREMENTS.—Section 113(g) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)) is amended—

(1) in paragraph (4)(A)—

(A) by inserting "or sharing costs" after "relocation costs"; and

(B) by inserting "or sharing" after "such relocation";

(2) in paragraph (5)—

(A) by inserting "or sharing costs" after "relocation costs"; and

(B) by inserting "or sharing" after "for relocation"; and

(3) in paragraph (6)—

(A) in the 1st sentence, by inserting "and the timely implementation of arrangements for the sharing of such frequencies'' before the period at the end;

(B) in the 2nd sentence—

(i) by striking ''by relocating to a new frequency assignment or by utilizing an alternative technology'';

(ii) by inserting ''or limit'' after ''terminate''; and

(iii) by inserting ''or sharing arrangement has been implemented'' before the period at the end; and

(C) in the 3rd sentence, by inserting ''or sharing'' after ''relocation''.

(e) SPECTRUM SHARING AGREEMENTS.—Section 113(g) of the National Telecommunications and Information Administration Organization Act, as amended by subsection (d), is further amended by adding at the end the following:

''(7) SPECTRUM SHARING AGREEMENTS.—A Federal entity is permitted to allow access to its frequency assignments by a non-Federal entity upon approval of the NTIA, in consultation with the Director of the Office of Management and Budget. Such non-Federal entities shall comply with all applicable rules of the Commission and the NTIA, including any regulations promulgated pursuant to this section. Any remuneration associated with such access shall be deposited into the Spectrum Relocation Fund established under section 118. The costs incurred by a Federal entity as a result of allowing such access are sharing costs for which the entity is eligible for payment from the Fund for the purposes specified in paragraph (3). The revenue associated with such access shall be at least 110 percent of the estimated Federal costs.''.

(f) SPECTRUM RELOCATION FUND.—Section 118 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 928) is amended—

(1) in subsection (b), by inserting before the period at the end the following: ''and any payments made by non-Federal entities for access to Federal spectrum pursuant to section 113(g)(7)'';

(2) by amending subsection (c) to read as follows:

''(c) USE OF FUNDS.—

''(1) FUNDS FROM AUCTIONS.—The amounts in the Fund from auctions of eligible frequencies are authorized to be used to pay relocation costs or sharing costs, as defined in section 113(g)(3), of an eligible Federal entity incurring such costs with respect to relocation from any eligible frequency or the sharing of such frequency.

"(2) FUNDS FROM PAYMENTS BY NON-FEDERAL ENTITIES.—The amounts in the Fund from payments by non-Federal entities for access to Federal spectrum pursuant to section 113(g)(7) are authorized to be used to pay the sharing costs, as defined in section 113(g)(3), of an eligible Federal entity incurring such costs with respect to such access.

"(3) TRANSFER OF FUNDS.—

"(A) IN GENERAL.—Subject to subparagraph (B), the Director of OMB may transfer at any time (including prior to any auction or contemplated auction or sharing initiative) such sums as may be available in the Fund to an eligible Federal entity to pay eligible relocation costs or sharing costs related to pre-auction estimates or research, as such costs are described in section 113(g)(3)(A)(iii).

"(B) NOTIFICATION.—No funds may be transferred pursuant to subparagraph (A) unless the notification provided under subsection (d)(2)(B) includes a certification from the Director of OMB that—

"(i) funds transferred before an auction will likely allow for timely implementation of relocation or sharing, thereby increasing net expected auction proceeds by an amount equal to or greater than the time value of the amount of funds transferred; and

"(ii) the auction is intended to occur not later than 5 years after transfer of funds.

"(C) APPLICABILITY.—

"(i) PRIOR COSTS INCURRED.—The Director of OMB may transfer up to $10,000,000 from the Fund to eligible Federal entities for eligible relocation costs or sharing costs related to pre-auction estimates or research, as such costs are described in section 113(g)(3)(A)(iii), for costs incurred prior to the date of the enactment of the Public Safety Broadband and Wireless Innovation Act of 2011, but after June 28, 2010.

"(ii) SUPPLEMENT NOT SUPPLANT.—Any amounts transferred by the Director of OMB pursuant to clause (i) shall be in addition to any amounts that the Director of OMB may transfer for costs incurred after the date of the enactment of the Public Safety Broadband and Wireless Innovation Act of 2011.'';

(3) in subsection (d)—

(A) in paragraph (1), by inserting ''and sharing costs'' after ''relocation costs'';

(B) in paragraph (2)—

(i) in subparagraph (A), by inserting ''or sharing'' before the semicolon; and

(ii) in subparagraph (B)—

(I) by inserting ''or sharing costs'' after ''relocation costs''; and

(II) by inserting ''or sharing'' before the period at the end; and

(C) by amending paragraph (3) to read as follows:

''(3) REVERSION OF UNUSED FUNDS.—

''(A) IN GENERAL.—Any amounts in the Fund that are remaining after the payment of the relocation costs and sharing costs that are payable from the Fund shall revert to and be deposited in the general fund of the Treasury not later than 8 years after the date of the deposit of such proceeds to the Fund, unless within 60 days in advance of the reversion of such funds, the Director of OMB, in consultation with the NTIA, notifies the appropriate committees of Congress that such funds are needed to complete or to implement current or future relocations or sharing initiatives.

"(B) DEFINITION.—In this paragraph, the term 'appropriate committees of Congress' means—

"(i) the Committee on Appropriations of the Senate;

"(ii) the Committee on Commerce, Science, and Transportation of the Senate;

"(iii) the Committee on Appropriations of the House of Representatives; and

"(iv) the Committee on Energy and Commerce of the House of Representatives.";

(4) in subsection (e)(2)—

(A) by inserting "or sharing costs" after "relocation costs";

(B) by striking "entity's relocation" and inserting "relocation of the entity or implementation of the sharing arrangement by the entity''; and

(C) by inserting ''or the implementation of such arrangement'' after ''such relocation''; and

(5) by adding at the end the following:

''(f) ADDITIONAL PAYMENTS FROM THE FUND.—

''(1) AMOUNTS AVAILABLE.—Notwithstanding subsections (c) through (e), after the date of the enactment of the Public Safety Broadband and Wireless Innovation Act of 2011, and following the credit of any amounts specified in subsection (b), there are hereby appropriated from the Fund and available to the Director of OMB—

''(A) up to 10 percent of the amounts deposited in the Fund from the auction of licenses for frequencies of spectrum vacated by Federal entities; and

''(B) up to 10 percent of the amounts deposited in the Fund by non-Federal entities for sharing of Federal spectrum.

''(2) USE OF AMOUNTS.—The Director of OMB, in consultation with the NTIA, may use such amounts to make payments to eligible Federal entities for the purpose of encouraging timely access to such spectrum, provided that—

"(A) any such payment by the Director of OMB is based on the market value of the spectrum, the timeliness with which the Federal entity cleared its use of such spectrum, and the need for such spectrum in order for the Federal entity to conduct its essential missions;

"(B) any such payment by the Director of OMB is used to carry out—

"(i) the purposes specified in clauses (i) through (vi) of section 113(g)(3)(A) to achieve enhanced capability for those systems affected by reallocation of Federal spectrum for commercial use, or by sharing of Federal frequencies with non-Federal entities; and

"(ii) other communications, radar, and spectrum-using investments not directly affected by such reallocation or sharing but essential for the missions of the Federal entity that is relocating its systems or sharing frequencies;

"(C) the amount remaining in the Fund after any such payment by the Director of OMB is not less than 10 percent of the winning bids in the relevant auction, or is not less than

10 percent of the payments from non-Federal entities in the relevant sharing agreement;

"(D) any such payment by the Director of OMB shall not be made until 30 days after the Director has notified the Committees on Appropriations and Commerce, Science, and Transportation of the Senate, and the Committees on Appropriations and Energy and Commerce of the House of Representatives; and

"(E) the Director of OMB shall make available from such amounts not more than $3,000,000 per year for each of the fiscal years 2012 through 2016 for use by the Assistant Secretary in carrying out the spectrum management activities of the Assistant Secretary under title V of the Public Safety Broadband and Wireless Innovation Act of 2011.".

(g) PUBLIC DISCLOSURE AND NONDISCLOSURE.—If the head of an executive agency of the Federal Government determines that public disclosure of any information contained in a notification or report required by section 113 or 118 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923; 928) would reveal classified national security information or other information for which there is a legal basis for nondisclosure and such public disclosure would be detrimental to national security, homeland security, public safety, or jeopardize law enforcement investigations, the head of the executive agency shall notify the Assistant Secretary of that determination prior to release of such information. In that event, such classified information shall be included in a separate annex, as needed. These annexes shall be provided to the subcommittee of primary jurisdiction of the congressional committee of primary jurisdiction in accordance with appropriate national security stipulations but shall not be disclosed to the public or provided to any unauthorized person through any other means.

SEC. 504. STUDY ON SPECTRUM EFFICIENCY THROUGH RECEIVER STANDARDS.

(a) IN GENERAL.—The Comptroller General of the United States shall conduct a study on efforts to ensure that each transmission system that employs radio spectrum is designed and operated so that reasonable use of adjacent spectrum does not excessively impair the functioning of such system.

(b) REQUIRED CONSIDERATIONS.—At a minimum, the study required by subsection (a) shall consider—

(1) the value of—

(A) improving receiver standards as it relates to increasing spectral efficiency;

(B) improving operation of services in adjacent frequencies;

(C) narrowing the guard bands between adjacent spectrum use; and

(D) improving overall receiver performance for the end user;

(2) the role of manufacturers, commercial licensees, and government users with respect to their transmission systems and use of adjacent spectrum described in subsection (a);

(3) the feasibility of industry self-compliance with respect to the design and operational requirements of transmission systems and the reasonable use of adjacent spectrum described in subsection (a); and

(4) the value of action by the Commission and the Assistant Secretary to establish, by rule, technical requirements or standards for non-Federal and Federal use, respectively, with respect to the reasonable use of adjacent spectrum described in subsection (a).

(c) REPORT.—Not later than 1 year after the date of enactment of this Act, the Comptroller General of the

United States shall submit a report to the appropriate committees of Congress on the results of the study required by subsection (a).

(d) DEFINITION.—For purposes of this section, the term "transmission system" means any telecommunications, broadcast, satellite, commercial mobile service, or other communications system that employs radio spectrum.

SEC. 505. UNLICENSED USE IN THE 5 GHZ BAND.

(a) MODIFICATION OF FCC REGULATIONS TO ALLOW CERTAIN UNLICENSED USE.—

(1) IN GENERAL.—Subject to paragraph (2), not later than 1 year after the date of the enactment of this Act, the Commission shall modify part 15 of title 47, Code of Federal Regulations, to allow unlicensed U-NII devices to operate in the 5350-5470 MHz band and the 5850-5925 MHz band.

(2) REQUIRED DETERMINATIONS.—The Commission may make the modification described in paragraph (1) only if the Commission determines that—

(A) licensed users will be protected by technical solutions, including use of existing, modified, or new spectrum-sharing technologies and solutions, such as dynamic frequency selection; and

(B) the primary mission of Federal spectrum users in the 5350–5470 MHz band and the 5850-5925 MHz band will not be compromised by the introduction of unlicensed devices.

(b) STUDY BY NTIA.—

(1) IN GENERAL.—The Assistant Secretary, in consultation with the Commission, shall conduct a study evaluating known and proposed spectrum-sharing technologies and the risk to Federal users if unlicensed U-NII devices were allowed to operate in the 5350-5470 MHz band and the 5850-5925 MHz band.

(2) SUBMISSION.—Not later than 8 months after the date of the enactment of this Act, the Assistant Secretary shall submit the study required by paragraph (1) to—

(A) the Commission; and

(B) the appropriate committees of Congress.

(c) DEFINITIONS.—In this section:

(1) 5350-5470 MHZ BAND.—The term "5350-5470 MHz band" means the portion of the electro-

magnetic spectrum between the frequencies from 5350 megahertz to 5470 megahertz.

(2) 5850-5925 MHZ BAND.—The term ''5850-5925 MHz band'' means the portion of the electromagnetic spectrum between the frequencies from 5850 megahertz to 5925 megahertz.

(3) U-NII DEVICES.—The term ''U-NII devices'' has the meaning given such term in section 15.403(s) of title 47, Code of Federal Regulations, except for the frequency bands specified in such section.

SEC. 506. REPORT ON AVAILABILITY OF WIRELESS EQUIPMENT FOR THE 700 MHZ BAND.

(a) IN GENERAL.—Not later than 90 days after the date of the enactment of this Act, and every 6 months thereafter until January 1, 2016, the Commission shall prepare and submit to the appropriate committees of Congress a report on—

(1) the availability of wireless equipment capable of operating over all spectrum between the frequencies from 698 megahertz to 806 megahertz that is allocated by the Commission for paired commercial use; and

(2) the potential availability of wireless equipment capable of operating over spectrum made avail-

able through reorganization of the television broadcast spectrum under section 302(b) and the auction of such spectrum under subparagraph (G) of section 309(j)(8) of the Communications Act of 1934, as added by section 302(a).

(b) CONTENTS.—The Commission shall seek input from the commercial mobile data service industry and include in the report required by subsection (a) an assessment of—

(1) the technical feasibility, and the potential impact on costs, size, battery consumption, and any other factor the Commission considers appropriate, of making equipment capable of operating over some or all of the spectrum described in paragraph (1) of such subsection;

(2) the timeframe for when wireless equipment capable of operating over some or all of such spectrum will be available; and

(3) the feasibility of and progress towards making available wireless equipment that is capable of operating over some or all of the spectrum described in paragraph (2) of such subsection.

[DISCUSSION DRAFT]

112TH CONGRESS
1ST SESSION

H. R. _____

To promote nationwide deployment of an interoperable public safety broadband network, to make available additional spectrum for wireless broadband services, to reduce the deficit, to promote job growth, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

M__. ____________ introduced the following bill; which was referred to the Committee on ______________________________

A BILL

To promote nationwide deployment of an interoperable public safety broadband network, to make available additional spectrum for wireless broadband services, to reduce the deficit, to promote job growth, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Spectrum Innovation Act of 2011".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act:

(1) ADMINISTRATOR.—The term “Administrator” means the entity awarded a contract by the Commission under section 203(a) to serve as Administrator of the National Public Safety Communications Plan.

(2) BOARD.—The term “Board” means the Public Safety Communications Planning Board established under section 202(a)(1).

(3) BROADCAST TELEVISION LICENSEE.—The term “broadcast television licensee” means a person holding a license to use a portion of the broadcast

television spectrum to operate a full-power television station.

(4) BROADCAST TELEVISION SPECTRUM.—The term ‘‘broadcast television spectrum’’ means the portions of the electromagnetic spectrum between the frequencies from 54 megahertz to 72 megahertz, from 76 megahertz to 88 megahertz, from 174 megahertz to 216 megahertz, and from 470 megahertz to 698 megahertz.

(5) COMMERCIAL MOBILE BROADBAND SERVICE.—The term ‘‘commercial mobile broadband service’’ means broadband service (as defined by the Commission) that is provided by a provider of commercial mobile service (as defined in section 332 of the Communications Act of 1934 (47 U.S.C. 332)).

(6) COMMISSION.—The term ‘‘Commission’’ means the Federal Communications Commission.

(7) FEDERAL ENTITY.—The term ‘‘Federal entity’’ has the meaning given such term in section 113 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923).

(8) FORWARD AUCTION.—The term ‘‘forward auction’’ means the portion of an incentive auction of broadcast television spectrum under section

103(c), in which the Commission assigns licenses for the use of or allocates for unlicensed use the spectrum usage rights with respect to which the Commission accepts bids for voluntary relinquishment in a reverse auction under section 103(a).

(9) INCENTIVE AUCTION.—The term ''incentive auction'' means a system of competitive bidding under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) in which spectrum auctioned is attributable to the voluntary relinquishment of spectrum usage rights by licensees, with whom a portion of auction proceeds may be shared in accordance with subparagraph (F) of paragraph (8) of such section, as added by section 102(3).

(10) LOCAL MARKET.—The term ''local market'' has the meaning given such term in section 338 of the Communications Act of 1934 (47 U.S.C. 338).

(11) MULTICHANNEL VIDEO PROGRAMMING DISTRIBUTOR.—The term ''multichannel video programming distributor'' has the meaning given such term in section 602 of the Communications Act of 1934 (47 U.S.C. 522).

(12) NATIONAL PUBLIC SAFETY COMMUNICATIONS PLAN.—The term ''National Public Safety

Communications Plan'' or ''Plan'' means the plan adopted under section 202(c).

(13) NTIA.—The term ''NTIA'' means the National Telecommunications and Information Administration.

(14) PUBLIC SAFETY ANSWERING POINT.—The term ''public safety answering point'' has the meaning given such term in section 222 of the Communications Act of 1934 (47 U.S.C. 222).

(15) PUBLIC SAFETY COMMUNICATIONS.—The term ''public safety communications'' means communications by providers of public safety services.

(16) PUBLIC SAFETY SERVICES.—The term ''public safety services'' has the meaning given such term in section 337 of the Communications Act of 1934 (47 U.S.C. 337).

(17) PUBLIC SAFETY SPECTRUM.—The term ''public safety spectrum'' means the portion of the electromagnetic spectrum allocated for public safety services under section 337(a) of the Communications Act of 1934 (47 U.S.C. 337(a)).

(18) REVERSE AUCTION.—The term ''reverse auction'' means the portion of an incentive auction of broadcast television spectrum under section 103(a), in which a broadcast television licensee may

submit bids stating the amount it would accept for voluntarily relinquishing some or all of its broadcast television spectrum usage rights.

(19) STATE.—The term "State" has the meaning given such term in section 3 of the Communications Act of 1934 (47 U.S.C. 153).

(20) STATE PUBLIC SAFETY BROADBAND COMMUNICATIONS NETWORK.—The term "State public safety broadband communications network" means a broadband network for public safety communications established by a State using the public safety spectrum.

(21) ULTRA HIGH FREQUENCY.—The term "ultra high frequency" means, with respect to a television channel, that the channel is located in the portion of the electromagnetic spectrum between the frequencies from 470 megahertz to 698 megahertz.

(22) VERY HIGH FREQUENCY.—The term "very high frequency" means, with respect to a television channel, that the channel is located in the portion of the electromagnetic spectrum between the frequencies from 54 megahertz to 72 megahertz, from 76 megahertz to 88 megahertz, or from 174 megahertz to 216 megahertz.

SEC. 3. RULE OF CONSTRUCTION.

Each range of frequencies described in this Act shall be construed to be inclusive of the upper and lower frequencies in the range.

SEC. 4. ENFORCEMENT.

(a) IN GENERAL.—The Commission shall enforce this Act as if this Act were a part of the Communications Act of 1934 (47 U.S.C. 151 et seq.). A violation of this Act, or a regulation promulgated under this Act, shall be considered to be a violation of the Communications Act of 1934, or a regulation promulgated under such Act, respectively.

(b) EXCEPTION.—Subsection (a) does not apply in the case of a provision of this Act that is expressly required to be carried out by an agency (as defined in section 551 of title 5, United States Code) other than the Commission.

TITLE I—SPECTRUM AUCTION AUTHORITY

SEC. 101. DEADLINE FOR AUCTION OF CERTAIN SPECTRUM.

(a) IN GENERAL.—Notwithstanding paragraph (15)(A) of section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)), not later than 10 years after the date of the enactment of this Act, subject to subsection (c), the Commission shall, through a system of competitive bidding under such section, grant licenses for the use of or allocate for unlicensed use (as described in paragraph (17) of such section, as added by section 104(a)(3)) the portions of the electromagnetic spectrum described in subsection (b).

(b) SPECTRUM DESCRIBED.—The portions of the electromagnetic spectrum described in this subsection are the following:

(1) The frequencies between 1915 megahertz and 1920 megahertz and between 2020 megahertz and 2025 megahertz (the AWS-2 H Block).

(2) The frequencies between 1755 megahertz and 1780 megahertz and between 2155 megahertz and 2180 megahertz (the AWS-3 band).

(3) The frequencies between 5350 megahertz and 5470 megahertz and between 5850 megahertz and 5925 megahertz.

(4) The frequencies between 1670 megahertz and 1710 megahertz and between 2070 megahertz and 2110 megahertz.

(5) The frequencies between 1780 megahertz and 1800 megahertz and between 2180 megahertz and 2200 megahertz.

(c) INCUMBENT FEDERAL USE.—

(1) IN GENERAL.—Not later than a date that will allow the Commission to meet the deadline in subsection (a), the NTIA shall—

(A) except as provided in subparagraph (B), withdraw any assignment to a Federal entity of a portion of the electromagnetic spectrum described in paragraph (3), (4), or (5) of subsection (b);

(B) if the NTIA determines that Federal use of such a portion is necessary to the critical communications related to the mission of the Federal entity and that Federal and non-Federal use of such portion may be coordinated by means of the database established under paragraph (2)(A), modify the terms under which the Federal entity is permitted to use such portion so that such use is subject to coordination by means of the database; and

(C) notify the Commission of each withdrawal under subparagraph (A) and each determination and modification under subparagraph (B).

(2) DATABASE.—

(A) IN GENERAL.—The NTIA, in consultation with the Commission, shall establish and maintain a database to coordinate Federal and non-Federal use of any portions of the electromagnetic spectrum with respect to which the NTIA has made a determination under paragraph (1)(B).

(B) COORDINATION.—The database established under subparagraph (A) may be used to coordinate the use of such portions of the electromagnetic spectrum by Federal and non-Federal users based on usage parameters that include geographic area, time, and specific frequencies within such portions.

(C) NTIA REGULATIONS.—The NTIA, in coordination with the Commission, shall promulgate regulations to govern use of such portions of the electromagnetic spectrum by Federal entities.

(D) COMMISSION REGULATIONS.—The Commission, in coordination with the NTIA, shall promulgate regulations to govern use of such portions of the electromagnetic spectrum by entities that are not Federal entities.

(3) LIMITATIONS ON NON-FEDERAL ASSIGNMENT OR ALLOCATION.—In conducting the competitive bidding required by subsection (a), the Commis-

sion may only grant licenses for the use of or allocate for unlicensed use a portion of the electromagnetic spectrum described in paragraph (3), (4), or (5) of subsection (b) that is assigned to a Federal entity—

(A) after receiving from the NTIA a notification under paragraph (1)(C) with respect to such portion; and

(B) in the case of a portion with respect to which the NTIA has made a determination under paragraph (1)(B), subject to coordination with use by Federal entities by means of the database established under paragraph (2)(A).

SEC. 102. GENERAL AUTHORITY FOR INCENTIVE AUCTIONS.

Section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)) is amended—

(1) in subparagraph (A), by striking "(D), and (E)," and inserting "(D), (E), and (F),";

(2) in subparagraph (C)(i), by striking "subparagraph (E)(ii)" and inserting "subparagraphs (E)(ii) and (F)"; and

(3) by adding at the end the following:

"(F) INCENTIVE AUCTIONS.—

"(i) IN GENERAL.—Notwithstanding subparagraph (A) and except as provided in subparagraph (B), the Commission may encourage a licensee to relinquish voluntarily some or all of its licensed spectrum usage rights in order to permit the assignment of new initial licenses or allocation of spectrum for unlicensed use (as described in paragraph (17)) by sharing with such licensee a portion of the proceeds (including deposits and upfront payments from successful bidders) from the use of a competitive bidding system under this subsection.

"(ii) LIMITATIONS.—The Commission may not enter into a relinquishment and sharing agreement with a licensee under this subparagraph unless—

"(I) the Commission conducts a reverse auction to determine the amount of compensation that licensees would accept in return for voluntarily relinquishing spectrum usage rights; and

"(II) at least one other licensee bids in the reverse auction.".

SEC. 103. SPECIAL REQUIREMENTS FOR INCENTIVE AUCTION OF BROADCAST TV SPECTRUM.

(a) REVERSE AUCTION TO IDENTIFY INCENTIVE AMOUNT.—

(1) IN GENERAL.—The Commission may conduct a reverse auction to determine the amount of compensation that each broadcast television licensee would accept in return for voluntarily relinquishing some or all of its broadcast television spectrum usage rights for assignment or reallocation for unlicensed use through a system of competitive bidding under subparagraph (F) of section 309(j)(8) of the Communications Act of 1934, as added by section 102(3).

(2) ELIGIBLE RELINQUISHMENTS.—Only the following shall be considered a relinquishment of usage rights for purposes of paragraph (1):

(A) Relinquishing all usage rights with respect to a particular television channel without receiving in return any usage rights with respect to another television channel.

(B) Relinquishing all usage rights with respect to an ultra high frequency television channel in return for receiving usage rights with respect to a very high frequency television channel.

(C) Relinquishing usage rights in order to share a television channel with another licensee.

(D) Any other voluntary relinquishment of usage rights that the Commission considers to be in the interest of the auction.

(3) WINNING BIDS.—

(A) DETERMINATION BY COMMISSION.— The Commission shall examine the bids in a reverse auction under paragraph (1) and determine the amount of compensation that achieves the proper balance between the spectrum usage rights that will be freed and the amount that the Commission must pay in order for the licensees to relinquish such rights.

(B) ACCEPTANCE.—The Commission may accept a bid of a licensee that is less than or equal to such amount of compensation, and the relinquishment shall be binding on the licensee, subject to subsection (c)(2)(B).

(4) CONFIDENTIALITY.—The Commission shall take all steps necessary to protect the confidentiality of a licensee participating in a reverse auction under paragraph (1), including withholding the identity of such licensee until the reassignments and realloca-

tions under subsection (b)(1) become effective, as described in subsection (f)(2).

(5) PROTECTION OF CARRIAGE RIGHTS OF LICENSEES SHARING A CHANNEL.—A broadcast television licensee the signal of which was required to be carried pursuant to section 338, 614, or 615 of the Communications Act of 1934 (47 U.S.C. 338; 534; 535) on November 30, 2010, and that voluntarily relinquishes spectrum usage rights under this subsection in order to share a television channel with another licensee shall retain the same rights to carriage under such section that the licensee would have had if not sharing a channel.

(b) REORGANIZATION OF BROADCAST TV SPECTRUM.—

(1) IN GENERAL.—The Commission may evaluate the broadcast television spectrum and may—

(A) make such reassignments of television channels as the Commission considers appropriate; and

(B) reallocate for other use such portions of the broadcast television spectrum as the Commission determines are available for reallocation.

(2) FACTORS FOR CONSIDERATION.—In making reassignments and reallocations under paragraph (1), the Commission shall make reasonable efforts to preserve viewer access to the over-the-air signals of broadcast television licensees and replicate the station service areas and covered populations of such licensees, as in existence before the reassignments and reallocations.

(3) NO INVOLUNTARY RELOCATION FROM UHF TO VHF.—In making reassignments under paragraph (1)(A), the Commission may not reassign a broadcast television licensee from an ultra high frequency television channel to a very high frequency television channel unless the Commission accepts a bid for such relinquishment from such licensee under subsection (a)(3)(B).

(4) LOW-POWER BROADCAST TELEVISION STATIONS.—

(A) IN GENERAL.—The Commission may require a low-power broadcast television station that is impacted by reorganization of the broadcast television spectrum under this subsection to relocate from an ultra high frequency television channel to a very high frequency television channel, to the extent that any suitable very high frequency television channels remain available after any reassignments or reallocations under paragraph (1).

(B) FACTORS FOR CONSIDERATION.—In deciding whether to require a low-power broadcast television station to relocate under subparagraph (A), the Commission shall consider market factors including—

(i) the number of over-the-air viewers of such station; and

(ii) the presence of other broadcast television stations in the community served.

(5) PAYMENT OF RELOCATION COSTS.—

(A) IN GENERAL.—Except as provided in subparagraph (B), from amounts made available under subsection (d)(2)(A), the Commission shall reimburse costs reasonably incurred by—

(i) a broadcast television licensee that was reassigned under paragraph (1)(A) from one ultra high frequency television channel to a different ultra high frequency television channel or from one very high frequency television channel to a different very high frequency television channel, in order for the licensee to relocate its television service from one channel to the other; or

(ii) a multichannel video programming distributor that is required by section 338, 614, or 615 of the Communications Act of 1934 (47 U.S.C. 338; 534; 535) to carry the signal of a broadcast television licensee described in clause (i) or a broadcast television licensee that voluntarily relinquishes spectrum usage rights under subsection (a) to share a television channel with another licensee, in order for the multichannel video programming distributor to continue complying with such section with respect to the licensee after the reassignment or sharing arrangement.

(B) REGULATORY RELIEF.—In lieu of reimbursement for relocation costs under subparagraph (A), a broadcast television licensee [or multichannel video programming distributor] may accept, and the Commission may grant as it considers appropriate, a waiver or modification of the application to such licensee [or distributor] of any provision of law administered by the Commission, or any regulation of the Commission promulgated under any such provision.

(C) LIMITATION.—The Commission may not make reimbursements under subparagraph (A) of revenues lost—

(i) by a broadcast television licensee in connection with relocation; or

(ii) by a multichannel video programming distributor in connection with continued compliance with carriage obligations.

(D) DEADLINE.—The Commission shall make all reimbursements required by subparagraph (A) not later than the date that is 3 years after the completion of a forward auction under subsection (c)(1).

(c) FORWARD AUCTION.—

(1) IN GENERAL.—The Commission may conduct a forward auction in which the Commission—

(A) assigns licenses for the use of or allocates for unlicensed use the spectrum that the Commission determines is available under subsection (b)(1)(B);

(B) shares with each licensee whose bid the Commission accepts under subsection (a)(3)(B) an amount of the proceeds that is equal to the amount of such bid; and

(C) notwithstanding section 309(j)(8) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)), deposits in the TV Broadcaster Relocation Fund established under subsection (d)(1) an amount of the proceeds from such forward auction that is sufficient to cover the costs for which the Commission is required to make reimbursements under subsection (b)(5)(A).

(2) RESERVE PRICES.—

(A) IN GENERAL.—In conducting a forward auction under paragraph (1), the Commission shall set such reserve prices as are necessary in order for the proceeds to be greater than or equal to the sum of—

(i) the total amount of the bids the Commission accepts under subsection (a)(3)(B);

(ii) the costs of conducting such forward auction that the salaries and expenses account of the Commission is required to retain under section 309(j)(8)(B) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)(B)); and

(iii) the estimated costs for which the Commission is required to make reimbursements under subsection (b)(5)(A).

(B) INSUFFICIENT PROCEEDS.—If the amount of the proceeds from a forward auction under paragraph (1) is not greater than or equal to the sum described in subparagraph (A), no licenses shall be assigned or spectrum allocated for unlicensed use through such forward auction, any reassignments or reallocations under subsection (b)(1) shall not become effective, and the Commission may not revoke any spectrum usage rights by reason of a bid that the Commission accepts under subsection (a)(3)(B).

(C) ADMINISTRATIVE COSTS.—The amount of the proceeds from a forward auction under paragraph (1) that the salaries and expenses account of the Commission is required to retain under section 309(j)(8)(B) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)(B)) shall be sufficient to cover the costs incurred by the Commission in conducting a reverse auction under subsection (a)(1) and making any reassignments or reallocations under subsection (b)(1), in addition to the costs incurred by the Commission in conducting such forward auction.

(3) FACTOR FOR CONSIDERATION.—In conducting a forward auction under paragraph (1), the Commission shall consider assigning licenses that cover geographic areas of a variety of different sizes.

(d) TV BROADCASTER RELOCATION FUND.—

(1) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the TV Broadcaster Relocation Fund.

(2) BORROWING AUTHORITY AND REIMBURSEMENT.—

(A) BORROWING AUTHORITY.—Beginning on [________________] and ending on the date that is 3 years after the completion of a forward auction under subsection (c)(1), the Commission may borrow from the Treasury of the United States an amount not to exceed [$______________] to make the reimbursements required by subsection (b)(5)(A).

(B) REIMBURSEMENT.—The Commission shall reimburse the Treasury, without interest, for amounts borrowed under subparagraph (A) as funds are deposited into the TV Broadcaster Relocation Fund.

(3) TRANSFER OF UNUSED FUNDS.—If there is a balance remaining in the TV Broadcaster Relocation Fund on the date that is 3 years after the completion of a forward auction under subsection (c)(1), the Secretary of the Treasury shall transfer such balance to the general fund of the Treasury of the United States, where such balance shall be dedicated for the sole purpose of deficit reduction.

(e) ONE REVERSE AUCTION AND ONE FORWARD AUCTION.—The Commission may not conduct more than one reverse auction under subsection (a)(1) or more than one forward auction under subsection (c)(1).

(f) TIMING.—

(1) CONTEMPORANEOUS AUCTIONS AND REORGANIZATION PERMITTED.—The Commission may conduct a reverse auction under subsection (a)(1), any reassignments or reallocations under subsection (b)(1), and a forward auction under subsection (c)(1) on a contemporaneous basis.

(2) EFFECTIVENESS OF REASSIGNMENTS AND REALLOCATIONS.— Notwithstanding paragraph (1), any reassignments or reallocations under subsection (b)(1) shall not become effective until the completion of a reverse auction under subsection (a)(1) and a forward auction under subsection (c)(1).

(3) DEADLINE.—The Commission may not conduct a reverse auction under subsection (a)(1) or a forward auction under subsection (c)(1) after the date that is 5 years after the date of the enactment of this Act.

(4) LIMIT ON DISCRETION REGARDING AUCTION TIMING.—Section 309(j)(15)(A) of the Communications Act of 1934 (47 U.S.C. 309(j)(15)(A)) shall not apply in the case of an auction conducted under this section.

(g) LIMITATION ON REORGANIZATION AUTHORITY.— During the 5-year period beginning on the date of the enactment of this Act, the Commission may not curtail the spectrum usage rights of a broadcast television licensee or reassign such a licensee to another television channel except—

(1) in accordance with this section; or

(2) in the case of a violation by such licensee of the terms of its license or a specific provision of

a statute administered by the Commission, or a regulation of the Commission promulgated under any such provision.

(h) PROTEST RIGHT INAPPLICABLE.—The right of a licensee to protest a proposed order of modification of its license under section 316 of the Communications Act of 1934 (47 U.S.C. 316) shall not apply in the case of a broadcast television licensee—

(1) during the period beginning on the date of the enactment of this Act and ending on the earlier of—

(A) the completion of a reverse auction under subsection (a)(1), any reassignments or reallocations under subsection (b)(1), and a forward auction under subsection (c)(1); or

(B) the date that is 5 years after such date of enactment; or

(2) after the expiration of the period described in paragraph (1), to a modification made in connection with such a reverse auction, any such reassignments or reallocations, or such a forward auction.

SEC. 104. USE OF AUCTIONS TO ALLOCATE SPECTRUM FOR UNLICENSED USE.

(a) IN GENERAL.—Section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) is amended—

(1) in paragraph (6)(A), by inserting "except as provided in paragraph (17)," before "alter spectrum allocation criteria";

(2) in paragraph (7)(A), by inserting "(except as provided in paragraph (17))" before ", and in prescribing"; and

(3) by adding at the end the following new paragraph:

"(17) ALLOCATION OF SPECTRUM FOR UNLICENSED USE.—The Commission may only exercise its authority under this Act to allocate a portion of the spectrum for unlicensed use if—

"(A) the Commission conducts a system of competitive bidding under this subsection in which bids may be placed—

"(i) for the allocation of such portion for unlicensed use; and

"(ii) for a license for the use of such portion; and

"(B) the bids for unlicensed use, in the aggregate, exceed the highest bid for such license.".

(b) COORDINATION OF UNLICENSED USE THROUGH DATABASE.—

(1) ESTABLISHMENT OF DATABASE.—The Commission shall establish and maintain a database to coordinate the unlicensed use of the portions of the electromagnetic spectrum allocated for such use through a system of competitive bidding under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) (as described in paragraph (17) of such section) by devices designed to use such portions on an unlicensed basis. The database shall be established and functioning not later than [__________] after the date of the enactment of this Act.

(2) DEVICE REQUIREMENTS.—

(A) IN GENERAL.—Section 303 of the Communications Act of 1934 (47 U.S.C. 303) is amended by adding at the end the following new subsection:

''(cc) Require that a device designed to use a portion of the electromagnetic spectrum allocated for unlicensed use through a system of competitive bidding under section 309(j) (as described in paragraph (17) of such section) coordinate its use of such portion with that of other such devices through the database established under section 104(b)(1) of the Spectrum Innovation Act of 2011, if such device is shipped in interstate commerce or manufactured in the United States, for sale or resale to the public.''.

(B) EFFECTIVE DATE.—The amendment made by subparagraph (A) shall apply with respect to devices shipped or manufactured after the date that is [__________] after the date of the enactment of this Act.

SEC. 105. ADMINISTRATION OF AUCTIONS BY COMMISSION.

Section 309(j) of the Communications Act of 1934, as amended by section 104(a), is further amended by adding at the end the following new paragraph:

''(18) CERTAIN BIDDING AND LICENSING CONDITIONS PROHIBITED.—In assigning licenses or allocating spectrum for unlicensed use through a system of competitive bidding under this subsection, the Commission may not—

''(A) impose any condition on the licenses assigned through such system that—

''(i) limits the ability of a licensee to manage the use of its network, including management of the use of applications, services, or devices on its network, or to prioritize the traffic on its network as it chooses; or "(ii) requires a licensee to sell access to its network on a wholesale basis;

"(B) limit participation in such system on the basis of the total amount of spectrum licenses held by a person seeking such participation; or

"(C) impose any other condition on eligibility for participation in such system or for the holding of a license granted through such system that is not related to [the qualifications of an applicant under subsection (a) or section 308(b) or 310].".

SEC. 106. EXTENSION OF AUCTION AUTHORITY.

Section 309(j)(11) of the Communications Act of 1934 (47 U.S.C. 309(j)(11)) is amended by striking "2012" and inserting "2021".

SEC. 107. DEFICIT REDUCTION AND FUNDING PRIORITIZATION.

(a) IN GENERAL.—Notwithstanding section 309(j)(8)(A) of the Communications Act of 1934 (47 U.S.C. 309(j)(8)(A)), from so much of the proceeds from auctions specified in subsection (b) as exceed the deposits and payments specified in subsection (c), the Commission shall deposit [$________________] in the Public Safety

Broadband Communications Implementation Fund established by section 204(g)(1).

(b) SPECIFIED AUCTIONS.—The auctions specified in this subsection are auctions under section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) that are—

(1) required by section 101(a); or

(2) conducted under paragraph (8)(F) of such section 309(j).

(c) SPECIFIED DEPOSITS AND PAYMENTS.—The deposits and payments specified in this subsection are—

(1) with respect to each auction specified in subsection (b), the deposits and payments required by paragraph (8) of such section 309(j), except subparagraph (A) of such paragraph, and section 103(c); and

(2) deposits in the Treasury of the United States under such subparagraph totaling [$________________].

TITLE II—PUBLIC SAFETY COMMUNICATIONS

SEC. 201. REASSIGNMENT OF PUBLIC SAFETY SPECTRUM TO STATES.

(a) PUBLIC SAFETY BROADBAND SPECTRUM.—

(1) IN GENERAL.—Subject to paragraph (2), not later than [____________], the Commission shall assign to each State a license for the exclusive use within such State of the portion of the electromagnetic spectrum between the frequencies from 763 megahertz to 768 megahertz and from 793 megahertz to 798 megahertz.

(2) EXISTING PUBLIC SAFETY BROADBAND NETWORKS.—

(A) SPECIAL TEMPORARY AUTHORITY FOR CONTINUED OPERATIONS.—The Commission may permit a public safety broadband network operating in the portion of the electromagnetic spectrum described in paragraph (1) [on the day before the deadline described in such paragraph] to continue operating in such portion of the spectrum under special temporary authority.

(B) CHANGES IN OPERATIONS.—Any changes in the operations of a public safety broadband network operating under special temporary authority under subparagraph (A) shall be approved by the Administrator and in compliance with the Plan.

(b) PUBLIC SAFETY NARROWBAND SPECTRUM.—

(1) NO FURTHER NARROWBAND DEVELOPMENT.—The Commission may not permit the public safety spectrum to be used by a narrowband land mobile radio system unless such system was purchased before September 1, 2011.

(2) REALLOCATION FOR BROADBAND USE.—The Commission, in consultation with the Administrator, shall develop a plan for reallocating for broadband public safety communications the portion of the electromagnetic spectrum between the frequencies from 768 megahertz to 775 megahertz and from 798 megahertz to 805 megahertz.

(3) ISSUANCE OF LICENSES.—Not later than 10 years after the date of the enactment of this Act, the Commission shall reissue the licenses described in subsection (a)(1) to include the spectrum described in paragraph (2).

(c) LICENSE TERMS AND CONDITIONS.—

(1) IN GENERAL.—A license for the use of the public safety spectrum issued to a State under this section shall include the following terms and conditions:

(A) The State shall, subject to the approval of the Administrator and in accordance with the Plan, contract for the construction and operation of a broadband network for public safety communications using such spectrum.

(B) The State may not partition or disaggregate the license or otherwise transfer control of the license, or any part thereof, to any other entity, including a political subdivision of the State.

(2) SERVICE AND TECHNICAL RULES.—The Commission shall by regulation establish service and technical rules consistent with this title for the licenses issued under this section.

(d) USE BY INDIAN TRIBES.—Notwithstanding subsection (a)(1), the Commission may assign a license for the use of the public safety spectrum to ⟦an Indian tribe⟧/⟦a tribal organization⟧ (as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b)) for public safety communications in accordance with such terms and conditions as the Commission considers appropriate. For purposes of the preceding sentence, ⟦an Indian tribe⟧/⟦a tribal organization⟧ shall be considered a State or local government entity for purposes of section 337(f)(1)(B) of the Communications Act of 1934 (47 U.S.C. 337(f)(1)(B)).

(e) CONFORMING AMENDMENTS.—Section 337(d)(3) of the Communications Act of 1934 (47 U.S.C. 337(d)(3)) is amended—

(1) in the matter preceding subparagraph (A), by striking ''public safety services licensees and commercial licensees'';

(2) in subparagraph (A), by inserting ''public safety services licensees and commercial licensees'' before ''to aggregate''; and

(3) in subparagraph (B), by inserting ''commercial licensees'' before ''to disaggregate''.

SEC. 202. NATIONAL PUBLIC SAFETY COMMUNICATIONS PLAN.

(a) ESTABLISHMENT OF PUBLIC SAFETY COMMUNICATIONS PLANNING BOARD.—

(1) IN GENERAL.—Not later than 180 days after the date of the enactment of this Act, the Commission shall establish a board to be known as the Public Safety Communications Planning Board.

(2) MEMBERSHIP.—The membership of the Board shall be as follows:

(A) FEDERAL MEMBERS.—

(i) IN GENERAL.—Four Federal members as follows:

(I) The Chairman of the Commission, or a designee, who shall be the Chair of the Board.

(II) The Assistant Secretary of Commerce for Communications and Information, or a designee.

(III) The Director of the Office of Emergency Communications in the Department of Homeland Security, or a designee.

(IV) The Director of the National Institute of Standards and Technology, or a designee.

(ii) DESIGNEES.—If a Federal official designates a designee under clause (i), such designee shall be an officer or employee of the agency of the official, except that the Chairman of the Commission may designate another Commissioner of the Commission or an officer or employee of the Commission.

(B) NON-FEDERAL MEMBERS.—Nine non-Federal members as follows:

(i) Two members who represent providers of commercial mobile broadband service, with one representing providers that have nationwide coverage areas and one representing providers that have regional coverage areas.

(ii) Two members who represent manufacturers of mobile wireless network equipment.

(iii) Five members who represent the interests of State and local governments, chosen to reflect geographic and population density differences across the United States, as follows:

(I) Two members who represent the public safety interests of the States.

(II) One member who represents State and local public safety employees.

(III) Two members who represent other interests of State and local governments, to be determined by the Chairman of the Commission.

(3) SELECTION OF NON-FEDERAL MEMBERS.—

(A) NOMINATION.—For each non-Federal member of the Board, the group that is represented by such member shall, by consensus, nominate an individual to serve as such member and submit the name of the nominee to the Chairman of the Commission.

(B) APPOINTMENT.—The Chairman of the Commission shall appoint the non-Federal members of the Board from the nominations submitted under subparagraph (A). If a group fails to reach consensus on a nominee or to submit a nomination for a member that represents such group[, or if the nominee is not qualified under subparagraph (C)], the Chairman shall select a member to represent such group.

(C) QUALIFICATIONS.—Each non-Federal member appointed under subparagraph (B) shall meet at least 1 of the following criteria:

(i) PUBLIC SAFETY EXPERIENCE.—Knowledge of and experience in Federal, State, local, or tribal public safety or emergency response.

(ii) TECHNICAL EXPERTISE.—Technical expertise and fluency regarding broadband communications, including public safety communications.

(iii) NETWORK EXPERTISE.—Expertise in building, deploying, and operating commercial telecommunications networks.

(iv) FINANCIAL EXPERTISE.—Expertise in financing and funding telecommunications networks.

(4) ANNUAL MEETINGS.—In addition to any other meetings necessary to carry out the duties of the Board under this section, the Board shall meet annually to consider the most recent report submitted by the Administrator under section 203(f)(1).

(5) RESOURCES.—The Commission shall provide the Board with the staff, administrative support, and facilities necessary to carry out the duties of the Board under this section.

(6) NO COMPENSATION OF BOARD MEMBERS.—The members of the Board may not receive any compensation for service on the Board.

(7) FEDERAL ADVISORY COMMITTEE ACT INAPPLICABLE.—The Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to the Board.

(b) DEVELOPMENT OF PLAN BY BOARD.—

(1) IN GENERAL.—Not later than 18 months after the date on which the Board is established under subsection (a)(1), the Board shall submit to

the Commission a detailed proposal for a National Public Safety Communications Plan to govern the use of the public safety spectrum by States in order to meet long-term public safety communications needs.

(2) LIMITATION ON RECOMMENDATIONS.—The Board may not make any recommendations for requirements generally applicable to providers of commercial mobile service or private mobile service (as such terms are defined in section 332 of the Communications Act of 1934 (47 U.S.C. 332)).

(c) ADOPTION OF PLAN BY COMMISSION.—Not later than [__________] after the date of the submission of the proposal by the Board under subsection (b)(1), the Commission shall complete a single proceeding to adopt a plan based on such proposal, with such modifications as the Commission considers appropriate, to be known as the National Public Safety Communications Plan.

(d) PUBLIC SAFETY COMMUNICATIONS PRINCIPLES.—The proposal submitted by the Board under subsection (b)(1) and the Plan adopted by the Commission under subsection (c) shall be based on the following principles:

(1) Not later than 10 years after the date of the enactment of this Act, the public safety spec-

trum shall be used exclusively for broadband communications.

(2) Each State public safety broadband communications network shall conform to—

(A) standards used by providers of commercial mobile broadband service, in order to leverage the innovation and economies of scale in commercial markets;

(B) standards that ensure the safety, security, and resiliency of the network, including standards for protecting and monitoring the network to protect against cyberattack; and

(C) national interoperability requirements, including requirements that the equipment used to provide and access service on the network be—

(i) built to open standards;

(ii) capable of being used on every other such network; and

(iii) backward-compatible with second and third generation commercial networks for a period of not less than 5 years after the date of the adoption of the Plan by the Commission under subsection (c).

(3) Each State public safety broadband communications network shall be integrated with public safety answering points or the equivalent of public safety answering points.

(4) Each State shall include in requests for proposals for the construction and operation of the State public safety broadband communications network of such State—

(A) specifications for the construction and deployment of such network, including—

(i) build timetables, which shall take into consideration the time needed to build out to rural areas;

(ii) required coverage areas, including rural and nonurban areas;

(iii) minimum service levels; and

(iv) specific performance criteria;

(B) the technical and operational requirements for such network;

(C) the practices, procedures, and standards for the management and operation of such network;

(D) the terms of service for the use of such network; and

(E) specifications for ongoing compliance review and monitoring of—

(i) the management and operation of such network;

(ii) the practices and procedures of the entities operating on such network; and

(iii) the necessary training needs of network users.

(5) The infrastructure of a State public safety broadband communications network shall, where practicable and efficient, be co-located with the infrastructure of commercial mobile broadband service networks and other public safety communications networks.

(6) The equipment used to provide and access service on a State public safety broadband communications network may not be obtained through sole-source contracts.

(7) A State public safety broadband communications network shall be well-maintained and upgraded to take into account new and evolving technologies.

(8) In establishing and operating a State public safety broadband communications network, a State shall use, to the maximum extent practicable, public-

private partnerships between the State and providers of commercial mobile broadband service.

SEC. 203. PLAN ADMINISTRATION.

(a) SELECTION OF ADMINISTRATOR.—

(1) IN GENERAL.—The Commission shall, through an open, transparent request-for-proposals process, select an entity to serve as the Administrator of the Plan. The Commission shall commence such process not later than [________] after the date of the adoption of the Plan under section 202(c).

[(2) REPLACEMENT.—If an entity ceases to serve as Administrator under a contract awarded under paragraph (1) or this paragraph, the Commission shall, through an open, transparent request-for-proposals process, award another contract for service as Administrator.]

(b) POWERS AND DUTIES OF ADMINISTRATOR.—The Administrator shall—

(1) oversee the implementation of the Plan and the construction and operation of the State public safety broadband communications networks under contracts entered into by the States in accordance with the Plan, and in the case of a State receiving a grant under section 204, in accordance with the

State plan approved under subsection (b)(2) of such section;

(2) set standards for requests for proposals to be used by States in procuring services and equipment for the construction and operation of the State public safety broadband communications networks, including measures to ensure that costs incurred by the States are reasonable;

(3) review and approve or disapprove each contract entered into by a State for the construction or operation of a State public safety broadband communications network;

(4) review and approve or disapprove the State plans submitted under section 204(b)(1);

(5) take such actions as are necessary to link the State public safety broadband communications networks together into a national network of networks; and

(6) conduct such audits as are necessary to ensure—

(A) with respect to contracts described in paragraph (3), the integrity of the contracting process and the adequate performance of such contracts; and

[(B) that the State public safety broadband communications networks are constructed and operated in accordance with the Plan, and in the case of a State receiving a grant under section 204, in accordance with the State plan approved under subsection (b)(2) of such section]

(c) APPEAL TO COMMISSION.—

(1) IN GENERAL.—A decision of the Administrator may be appealed to the Commission in accordance with regulations to be established by the Commission.

(2) NO DELEGATION.—The Commission may not delegate the review of or the decision on an appeal under this subsection.

(d) ROLE OF THE STATES.—

(1) IN GENERAL.—Each State shall be responsible for contracting for the construction and operation, in accordance with the Plan and with the requirements included in the license of the State to use the public safety spectrum, of a State public safety broadband communications network.

(2) ACTIVITIES SUBJECT TO APPROVAL OF ADMINISTRATOR.—The activities of a State in contracting for the construction and operation of a

State public safety broadband communications network shall be subject to the approval of the Administrator.

(e) AUDITS OF USE OF FEDERAL FUNDS BY ADMINISTRATOR.—Not later than 1 year after entering into a contract to serve as Administrator, and annually thereafter, the Administrator shall provide to the Commission a statement, audited by an independent auditor, that details the use during the preceding fiscal year of [any Federal funds received by the Administrator in connection with its service as Administrator].

(f) ANNUAL REPORT BY ADMINISTRATOR.—

(1) IN GENERAL.—Not later than 1 year after entering into a contract to serve as Administrator, and annually thereafter, the Administrator shall submit a report covering the preceding fiscal year to—

(A) the Committee on Energy and Commerce of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate; and

(B) the Board.

(2) REQUIRED CONTENT.—The report required by paragraph (1) shall include—

(A) a comprehensive and detailed description of—

(i) progress on the construction of the State public safety broadband communications networks;

(ii) the activities of the Administrator in its capacity as Administrator; and

(iii) the financial condition of the Administrator; and

(B) such recommendations or proposals for legislative or administrative action as the Administrator considers appropriate.

SEC. 204. GRANTS TO STATES.

(a) ESTABLISHMENT.—Subject to the availability of appropriations, the Commission shall make grants to States for contracting for the construction and operation of State public safety broadband communications networks.

(b) APPLICATION.—The Commission may only make a grant under this section to a State—

(1) that submits an application at such time, in such form, and containing such information and assurances as the Commission may require, including a State plan developed in accordance with subsection (c); and

(2) the State plan of which is approved by the Administrator.

(c) STATE PLAN.—A State wishing to receive a grant under this section shall develop a State plan for the development of a State public safety broadband communications network in accordance with the National Public Safety Communications Plan and the terms of the license of the State to use the public safety spectrum.

(d) USE OF FUNDS.—

(1) IN GENERAL.—A State receiving a grant under this section shall use the grant funds to contract for the construction and operation of a State public safety broadband communications network in accordance with the State plan approved by the Administrator under subsection (b)(2).

(2) APPROVAL OF CONTRACTS.—A State may not use grant funds received under this section for payments under a contract unless such contract has been approved by the Administrator.

(e) ADMINISTRATION BY NTIA.—The Commission and the NTIA **[**may**]** enter into an agreement for the NTIA to administer this section**[**, without reimbursement**]** **[**and subject to the approval of the Commission**]**.

(f) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Commission to carry out this section **[**for fiscal years ____________**]**/**[**, to remain available until expended,**]** **[**$______________**]** from the Public Safety Broadband Communications Implementation Fund established by subsection (g)(1).

(g) PUBLIC SAFETY BROADBAND COMMUNICATIONS IMPLEMENTATION FUND.—

(1) ESTABLISHMENT.—There is established in the Treasury of the United States a fund to be known as the Public Safety Broadband Communications Implementation Fund.

(2) TRANSFER OF UNUSED FUNDS.—If there is a balance remaining in the Public Safety Broadband Communications Implementation Fund on [______________], the Secretary of the Treasury shall transfer such balance to the general fund of the Treasury of the United States, where such balance shall be dedicated for the sole purpose of deficit reduction.

SEC. 205. WIRELESS FACILITIES DEPLOYMENT.

(a) FACILITY MODIFICATIONS.—

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 (Public Law 104–104) or any other provision of law, a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower that does not substantially change the physical dimensions of such tower.

(2) ELIGIBLE FACILITIES REQUEST.—For purposes this subsection, the term ''eligible facilities request'' means any request for modification of an existing wireless tower that involves—

(A) collocation of new transmission equipment;

(B) removal of transmission equipment; [and]/[or]

(C) replacement of transmission equipment.

(b) FEDERAL EASEMENTS AND RIGHTS-OF-WAY.—

(1) GRANT.—If an executive agency, a State, a political subdivision or agency of a State, or a person, firm, or organization applies for the grant of an easement or right-of-way to, in, over, or on a building [or other property] owned by the Federal Government for the right to install, construct, and maintain wireless service antenna structures and equipment, and backhaul transmission [equipment], the executive agency [having control of]/[occupying] the building [or other property] may grant to the applicant, on behalf of the Federal Government, an easement or right-of-way to perform such installation, construction, and maintenance.

(2) APPLICATION.—The Administrator of General Services shall develop a common form for applications for ⟦easements and⟧ rights-of-way under paragraph (1) for all executive agencies that shall be used by applicants with respect to the buildings or other property of each such agency.

(3) FEE.—

(A) IN GENERAL.—Notwithstanding any other provision of law, the Administrator of General Services shall establish a fee for the grant of an easement or right-of-way pursuant to paragraph (1) that is based on direct cost recovery.

(B) EXCEPTIONS.—The Administrator of General Services may establish exceptions to the fee amount required under subparagraph (A)—

(i) in consideration of the public benefit provided by a grant of an easement or right-of-way; and

(ii) in the interest of expanding wireless and broadband coverage.

(4) USE OF FEES COLLECTED.—Any fee amounts collected by an executive agency pursuant to paragraph (3) shall be made available, without

further appropriation, to such agency for the telecommunications and information technology needs of such agency. Any excess funds shall be deposited in the Federal Buildings Fund established under section 592 of title 40, United States Code.

(c) MASTER CONTRACTS FOR WIRELESS TOWER SITINGS.—

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 or any other provision of law, and not later than 60 days after the date of enactment of this Act, the Administrator of General Services shall—

(A) develop 1 or more master contracts that shall govern the placement of wireless service antenna structures on buildings and other property owned by the Federal Government; and

(B) in developing the master contract or contracts, standardize the treatment of the placement of wireless service antenna structures on building rooftops or facades, the placement of [wireless service antenna] equipment on rooftops or inside buildings, [the] technology [used in connection with wireless service antenna structures or equipment placed on Federal buildings and other property], and any other key issues the Administrator considers appropriate.

(2) APPLICABILITY.—The master contract or contracts developed by the Administrator of General Services under paragraph (1) shall apply to all publicly accessible buildings and other property owned by the Federal Government, unless the Administrator decides that issues with respect to the siting of a wireless service antenna structure on a specific building or other property warrant nonstandard treatment of such building or other property.

(3) APPLICATION.—The Administrator of General Services shall develop a common form or set of forms for wireless service antenna structure siting applications under this subsection for all executive agencies that shall be used by applicants with respect to the buildings [and other property] of each such agency.

(d) EXECUTIVE AGENCY DEFINED.—In this section, the term "executive agency" has the meaning given such term in section 102 of title 40, United States Code.

SEC. 206. STUDY ON EMERGENCY COMMUNICATIONS BY AMATEUR RADIO AND IMPEDIMENTS TO AMATEUR RADIO COMMUNICATIONS.

(a) IN GENERAL.—Not later than 180 days after the date of the enactment of this Act, the Commission, in consultation with the Office of Emergency Communications in the Department of Homeland Security, shall—

(1) complete a study on the uses and capabilities of amateur radio service communications in emergencies and disaster relief; and

(2) submit to Congress a report on the findings of such study.

(b) CONTENTS.—The study required by subsection (a) shall include—

(1)(A) a review of the importance of emergency amateur radio service communications to homeland security missions relating to disasters, severe weather, and other threats to lives and property in the United States; and

(B) recommendations for—

(i) enhancements in the voluntary deployment of amateur radio operators in disaster and emergency communications and disaster relief efforts; and

(ii) improved integration of amateur radio operators in the planning and furtherance of initiatives of the Department of Homeland Security; and

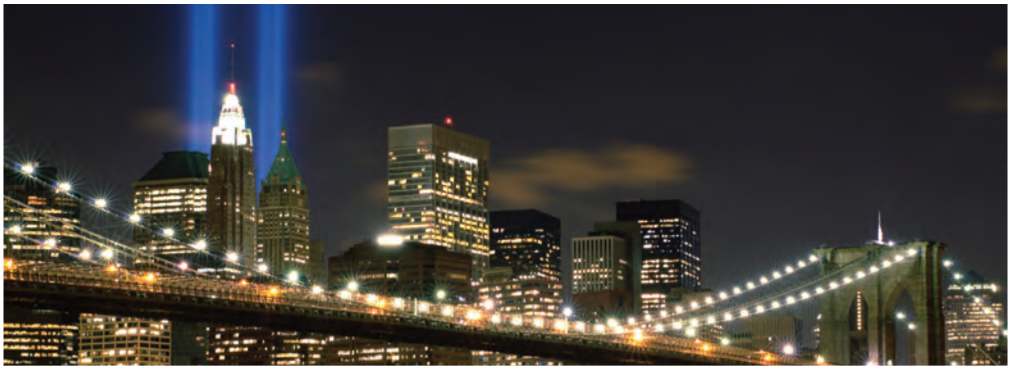
(2)(A) an identification of impediments to enhanced amateur radio service communications, such as the effects of unreasonable or unnecessary private land use restrictions on residential antenna installations; and

(B) recommendations regarding the removal of such impediments for consideration by other Federal departments and agencies and by Congress.

(c) EXPERTISE.—In conducting the study required by subsection (a), the Commission shall use the expertise of stakeholder entities and organizations, including the amateur radio, emergency response, and disaster communications communities.

Appendix F – Commentary and Policy Statements

National Security
Preparedness Group



Tenth Anniversary Report Card: The Status of the 9/11 Commission Recommendations

September 2011

BIPARTISAN POLICY CENTER

DISCLAIMER

This report is the product of the Bipartisan Policy Center's National Security Preparedness Group. The findings and recommendations expressed herein do not necessarily represent the views or opinions of the Bipartisan Policy Center, its founders, or its board of directors.

National Security Preparedness Group

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National Security Preparedness Group

Foreword

We serve as co-chairs of the Bipartisan Policy Center's National Security Preparedness Group (NSPG), which is a follow-on to the 9/11 Commission. NSPG monitors the implementation of the 9/11 Commission's recommendations and focuses on emerging security threats to our nation.

Ten eventful years have now passed since violent Islamist extremists, members of the terrorist organization al Qaeda, hijacked four commercial airplanes and flew them into the twin towers of the World Trade Center in New York City, the Pentagon in Washington, D.C., and a field in Pennsylvania. These horrific attacks killed nearly 3,000 of our fellow Americans and citizens of foreign countries, altering our society forever.

Over the course of nearly 20 months, the 9/11 Commission investigated the facts and circumstances surrounding the attacks. The 9/11 Commission Report, issued in July 2004, made 41 recommendations for keeping our country safe. These recommendations were endorsed by both presidential candidates at the time and almost every member of Congress.

We have reflected often on why the 9/11 Commission was successful. First, because of the great damage and trauma the 9/11 attacks produced, the American public demanded action and had high expectations for measures and reforms that would improve the nation's security. Importantly, the statutory mandate for the Commission was limited, precise, and clear – the Commission was authorized to investigate the facts and circumstances surrounding the attacks and to make recommendations to keep the country safe; the Commission had an extraordinary non-partisan staff, the members of which possessed deep expertise and conducted their work with thoroughness and professionalism; the Commissioners had deep experience in government and political credibility with different constituencies; the final report was unanimous and bipartisan; families of the victims of 9/11 provided solid and sophisticated support throughout the life of the Commission and in the years since; and following the Commission, the Commissioners and staff continue to work closely with Congress and the executive branch to implement and monitor reform.

The success of the Commission's work was due to political leadership embracing its findings and recommendations, pushing hard to enact them, and continuing to drive reform. That support and leadership have been critical in improving the nation's security.

Now, on the solemn occasion of the 10th anniversary of the attacks, is an appropriate time to reflect and evaluate where we are in national security reform – and what we have yet to achieve.

Sincerely,

Tom Kean

Lee Hamilton

National Security Preparedness Group

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Chapter 1: Introduction

Effect of the 9/11 Attacks

The terrorist attacks of September 11, 2001 exacted a devastating toll on so many of our families, profoundly and dramatically transforming government, the private sector, and our daily lives. The suddenness of the attacks on American soil and the loss of so many lives made us feel vulnerable in our homes, and caused us to question whether our government was properly organized to protect us from this lethal threat. The economic damage resulting from the attacks was severe. In short order, we shifted from a "peace dividend" at the end of the Cold War to massive expenditures of taxpayer dollars on new security measures.

The human tragedy was, of course, the greatest loss. Nothing can replace the loved ones lost to that act of terrorism. But the consequences for our economy and the private sector have been striking. More than 80 percent of our nation's critical infrastructure is owned by the private sector, and protecting it from terrorist operations has become an urgent priority. Working together, the government and private sector have improved their information sharing and, therefore, our security posture.

Businesses in all sectors have adapted to this new reality. They have focused on how best to protect personnel as well as food and water supplies; they have developed continuity plans to prepare for possible disruptions; and they have adopted innovative safety features into building construction. U.S. importers, working with the Department of Homeland Security, have pioneered new ways to ensure the integrity of shipping containers that bring goods into the country. The insurance industry's risk analysis has evolved to reflect new realities. These necessary innovations have increased the costs of doing business, and future innovations may raise costs even higher.

The Government's Response

Over the past 10 years, our government's response to the challenge of transnational terrorism has been dramatic. At the federal level, we have created major new institutions. The Department of Homeland Security itself was a massive reconfiguration of government, combining 22 agencies into a new department, with a workforce of 230,000 people and an annual budget of more than $50 billion. In total, some 263 organizations have been established or redesigned.

The intelligence community has also adapted. In response to the recommendations of the 9/11 Commission, Congress created the Office of the Director of National Intelligence (DNI) and the National Counterterrorism Center in 2004 to advance a unified effort across the intelligence community. Four DNIs in six years have worked with the Intelligence Community (IC), sometimes with difficulty, to establish appropriate and effective roles and responsibilities. Today, key IC relationships in the new order appear to be improving and moving in a constructive direction.

At the same time, the intelligence budget has surged to more than $80 billion – more than double what was spent in 2001. And throughout the national security community, a flexible and resilient workforce has been trained to protect the American people in a new environment. The FBI, CIA, and the broader intelligence community have implemented significant reforms, disrupting many plots and bringing to justice many terrorist operatives.

Despite this considerable progress, some major 9/11 Commission recommendations remain unfulfilled, leaving the U.S. not as safe as we could or should be. These unfulfilled recommendations require urgent attention because the threat from al Qaeda, related terrorist groups, and individual adherents to violent Islamist extremism persists. In late July, a U.S. soldier was arrested on suspicion of plotting to murder U.S. soldiers at Fort Hood, Texas. Other brands of extremism are also highly lethal and threaten all of us, as the recent events in Norway so painfully remind us.

Evolving Terrorist Threat to the U.S.

Former CIA Director and current Secretary of Defense, Leon Panetta, declared that we are "within reach of strategically defeating al Qaeda." Only the future will tell whether that is accurate, but certainly the death of Osama bin Laden is our most significant advancement to date in our efforts to defeat al Qaeda.

The bin Laden raid resulted from years of hard work, cooperation, vigilance, and tenacity. It involved surveillance, the analysis of many bits of information, and seamless interaction between the CIA and the military. Bin Laden's capture reflected the highest level of collaboration among IC agencies and the military.

Although Osama bin Laden is dead, al Qaeda is not; it is a network, not a hierarchy. Over a period of years, al Qaeda has been very adaptive and resilient. Al Qaeda and its affiliates will almost certainly attempt to avenge his death, however, they will not necessarily attack soon.

Al Qaeda's capabilities to implement large-scale attacks are less formidable than they were 10 years ago, but al Qaeda and its affiliates continue to have the intent and reach to kill dozens, or even hundreds, of Americans in a single attack.

Al Qaeda has been marked by rapid decentralization. The most significant threats to American national security come from affiliates of core al Qaeda, such as al Qaeda in the Arabian Peninsula where U.S.-born Anwar al-Awlaki has played a prominent role. Al Qaeda's influence is also on the rise in South Asia and continues to extend into failing or failed states such as Yemen and Somalia.

In assessing terrorist threats to the American homeland, senior U.S. counterterrorism officials now call attention to al Qaeda's strategy of "diversification" – attacks mounted by a wide variety of perpetrators of different national and ethnic backgrounds that cannot easily be "profiled" as threats.

Most troubling, we have seen a pattern of increasing terrorist recruitment of American citizens and residents to act as "lone wolves." In 2009, there were two actual terrorist attacks on our soil. The Fort Hood shooting claimed the lives of 13 people, and a U.S. military recruiter was killed in Little Rock, Arkansas. Today, we know that Americans are playing increasingly prominent roles in al Qaeda's movement. Muslim-American youth are being recruited in Somali communities in Minneapolis and Portland, Oregon, in some respects moving the front lines to the interior of our country.

Alarmingly, we have discovered that individuals in the U.S. are engaging in "self-radicalization." This process is often influenced by blogs and other online content advocating violent Islamist extremism. While there are methods to monitor some of this activity, it is simply impossible to know the inner thinking of every at-risk person. Thus, self-radicalization poses a serious emerging threat in the U.S.

Because al Qaeda and its affiliates will not give up, we cannot let our guard down. Our terrorist adversaries and the tactics and techniques they employ are evolving rapidly. We will see new attempts, and likely successful attacks.

Our enemy continues to probe our vulnerabilities and design innovative ways to attack us. Such innovation is best exemplified by the discovery in October 2010 of explosives packed in toner cartridges addressed to synagogues in Chicago and shipped on Fed Ex and UPS cargo flights from Yemen. This plot constituted an assault on our international transportation and commerce delivery systems and it was committed without the terrorists ever having to set foot within the U.S. Although the plot failed, terrorists will not abandon efforts to develop new ways to inflict great harm on us.

Another way that terrorists can attack without ever physically crossing our borders is through a cyber attack. Successive DNIs have warned that the cyber threat to critical infrastructure systems – to electrical, financial, water, energy, food supply, military, and telecommunications networks – is grave. Earlier this month, senior DHS officials described a “nightmare scenario” of a terrorist group hacking into U.S. computer systems and disrupting our electric grid, shutting down power to large swathes of the country, perhaps for a period as long as several weeks. As the current crisis in Japan demonstrates, disruption of power grids and basic infrastructure can have devastating effects on society.

This is not science fiction. It is possible to take down cyber systems and trigger cascading disruptions and damage. Defending the U.S. against such attacks must be an urgent priority.

All of these continued and nascent threats mean that we must not become complacent, but remain vigilant and resolute. We have significantly improved our security since 9/11, but the work is not complete. We should begin by tackling the unfinished recommendations of the 9/11 Commission.

This is not science fiction. It is possible to take down cyber systems and trigger cascading disruptions and damage. Defending the U.S. against such attacks must be an urgent priority.

National Security Preparedness Group

Chapter 2: Nine Major Unfinished 9/11 Commission Recommendations

To be sure, substantial progress has been made in fulfilling many of the 9/11 Commission's 41 recommendations. Dedicated men and women in government and private sector should be credited for their tireless efforts and accomplishments in improving our national security during the last decade. This report does not chronicle all of their successes here, but highlights the transformation of the intelligence community and improvements to screening airline passengers.

Primary Responsible Entity

Recommendation	DHS	State and Local Governments	Executive Office of the President	Congress
Unity of Command and Effort	🟡	🟡		
Radio Spectrum and Interoperability		🟡		🟡
Civil Liberties and Executive Power			🔴	
Congressional Reform				🟡
Director of National Intelligence			🟡	🟡
Transportation Security	🟡			
Biometric Entry-Exit Screening System	🔴			
Standardize Secure Identifications	🔴	🔴		
Develop Coalition Standards for Terrorist Detention			🟡	🟡

🟡 Improvement Needed 🔴 Unfulfilled

Success Highlights

Intelligence Community Transformation

Legal, policy, and cultural barriers between agencies created serious impediments to information sharing that prevented disruption of the 9/11 attacks. Therefore, the 9/11 Commission made a number of specific recommendations to improve information sharing across our government. Information sharing within the federal government, and among federal, state, local authorities, and with allies, while not perfect, has considerably improved since 9/11.

Progress among national agencies, and between the IC and the military in the field, has been striking. The degree of interagency collaboration in Afghanistan and Iraq is unprecedented. On the domestic side, however, there has been less unity of effort and much slower progress among multiple agencies that are either new or have new counterterrorism missions.

The level of cooperation among all levels of government is higher than ever. There are now 105 Joint Terrorism Task Forces throughout the nation, and 72 Fusion Centers in which federal, state, local authorities investigate terrorism leads and share information. State and local officials have a far greater understanding not only of threats and how to respond to them, but also of their communities and those who may be at risk of radicalization.

The FBI has gone through dramatic change and continues to transform from an agency overwhelmingly focused on law enforcement to one that prioritizes preventing terrorism. This is a significant cultural change that can be furthered by placing the status of intelligence analysts on par with special agents, who have traditionally risen to management at the Bureau.

The CIA has improved its intelligence analysis and removed barriers between its analysts and operations officers. Recruiting well-placed sources, however, remains difficult and the CIA has had difficulty recruiting qualified officers with necessary language skills.

Airline Passenger Screening

On September 11, 2001, 19 terrorists turned airplanes into weapons. Some of those hijackers were flagged for additional screening, but the follow-up was lackluster. Others would have been flagged had better information sharing been in place. Along with information sharing improvements, the procedures for identifying airline passengers who should be prevented from boarding an airplane, or be subjected to additional screening, have been greatly enhanced.

The Transportation Security Administration (TSA) now screens the names of all airline passengers against the “no fly” and “automatic selectee” terrorist watchlists before they board an airplane. This is known as the Secure Flight program. Until last year, the airlines had the responsibility of comparing passengers against these watchlists, but that process resulted in numerous errors in missing individuals on the no fly list as well as incorrectly identifying passengers as being the particular individual on the list. It also placed sensitive information in the hands of far too many people, including officials at foreign government-owned airlines. This is an important improvement to our security.

A decade after 9/11, the nation is not yet prepared for a truly catastrophic disaster.

Unity of Command and Effort

Recommendation: "Emergency response agencies nationwide should adopt the Incident Command System (ICS). When multiple agencies or multiple jurisdictions are involved, they should adopt a unified command. Both are proven frameworks for emergency response. Regular joint training at all levels is … essential to ensuring close coordination during an actual incident."

The 9/11 attacks demonstrated that robust and well-rehearsed emergency response capabilities can be overwhelmed by a significant terrorist attack. In 2005, Hurricane Katrina revealed that a catastrophic natural disaster could produce a chaotic and disorganized response by all levels of government, causing large-scale human suffering. A decade after 9/11, the nation is not yet prepared for a truly catastrophic disaster.

Teamwork, collaboration, and cooperation at an incident site are critical to a successful response, and can save many lives in the face of massive casualties. We therefore recommended that federal, state, and local emergency response agencies nationwide adopt the Incident Command System (ICS); an essential element of this is a unified command with one person in charge of directing the efforts of multiple agencies. This overall commander, we believed, would be best suited to advance the goal of unity of effort.

Following 9/11, DHS incorporated ICS into the National Incident Management System (NIMS). NIMS provides nationwide guidance to clarify the roles of federal, state, and local governments, non-profit organizations, and the private sector in protecting against, responding to, and recovering from disasters, and it is an essential part of the National Response Framework. DHS has trained first responders throughout the country in the operation of NIMS.

All levels of government have concentrated on planning and exercising for disaster response to an extent rarely seen before the 9/11 attacks. Over the last several years, the federal government has coordinated massive National Level Exercises (NLE), knitting together agencies across the country and around the world. The purpose of the congressionally-mandated, DHS-managed NLE is to prepare and coordinate a multiple-jurisdictional, integrated response to a national catastrophic event. The NLE 2011 scenario took place in May and involved thousands of players representing federal, state, and local agencies at 50 sites across the country. Dozens of foreign countries participated and the private sector played a prominent role in the exercise.

While this represents important progress, the nation's ability to establish unity of command and effort were put to the test during the 2010 Gulf Coast oil spill. The goal was to provide a unified, coordinated response under the leadership of DHS, with the Coast Guard as lead agency and British Petroleum as the responsible party. The response was divided into four main categories of effort: command, planning, operations, and logistics. This structure allowed each team to grow rapidly as more people arrived to respond to the spill; tens of thousands were ultimately involved.

Management of the crisis was an improvement over the often seriously fragmented approaches taken in response to previous disasters but the response was not without flaws. The Coast Guard Commandant was placed in overall command of the incident, but state and local officials, responding to political pressures, at times focused their efforts on what they judged to be priorities for their constituents. State and local authorities set up their own local command centers and were often at odds with the overall plan for strategic response and clean up, creating resource demands in conflict with the overarching program. The complexity of the problem highlights the difficulty of establishing strong central command and control, and integrating incident response across all levels of government.

Progress continues to be made on unity of effort, but it is far from complete. In order to ensure unity of effort, there

Our discussions with community leaders and first responders indicate that many metropolitan areas, with multiple agencies responding to a disaster, still have not solved the problem of a unified command structure.

must be comprehensive planning across federal agencies and with state and local authorities. The Department of Homeland Security's Inspector General found that the federal government had not adequately developed catastrophic disaster operations plans to address "specific roles, responsibilities, and actions for each federal department and agency responding to an incident." Without sufficient planning by the federal government to determine appropriate agency roles and responsibilities, it is impossible for state and local governments to develop operational plans that sync up with the federal government's plans. As a result, at the site of a catastrophic disaster there could be confusion about who is responsible for which actions, particularly between the federal government and state and local governments.

In 2008, the Federal Emergency Management Agency (FEMA) implemented a pilot program in five states to integrate state and federal catastrophic planning efforts. The program helped the states fill gaps in catastrophic planning and build relationships with FEMA, other states, local governments, and the private sector. However, an April 2011 report by the Government Accountability Office (GAO), found continuing gaps in catastrophic planning in these states. Some states lacked a section on "direction, control, and coordination" in their catastrophic incident plans, and one state estimated that it would take five years before it could complete its catastrophic incident plan. The GAO also found that states had not exercised their catastrophic operational plans to determine effectiveness or clarify change of command. These planning and exercises are essential elements of establishing unity of effort before a disaster strikes.

While the FEMA pilot program that GAO reviewed has been discontinued, states may use grant funding for catastrophic planning. Federal support in the form of grants and direct technical assistance for planning has repeatedly been cited by states and major urban areas as critical and should be a continued focus area for limited federal preparedness resources.

The executive branch also must ensure that all federal departments and agencies relevant to disaster mitigation and response be involved in disaster planning. Just this year, the administration adopted a major course change to its government-wide approach to catastrophic disaster planning. In March 2011, the president issued a revised directive on disaster preparedness that requires all federal departments and agencies with disaster-response capabilities to develop operational plans in support of interagency planning frameworks. The directive tasks DHS with the responsibility for revising the national preparedness system, in coordination with other federal agencies and all levels of government, in order to provide new guidance "for planning, organization, equipment, training, and exercises to build and maintain domestic capabilities." As this guidance is released, all levels of government will need to redouble their engagement in planning and exercises to ensure unity of effort.

In addition to the practical implementation of establishing unity of effort planning and exercises, there remain political challenges. Our discussions with community leaders and first responders indicate that many metropolitan areas, with multiple agencies responding to a disaster, still have not solved the problem of a unified command structure. This is a political problem that in most cases must be addressed by state and local government.

While the government has made substantial progress, our recommendation is still a long way from being fully implemented.

Despite the lives at stake, the recommendation to improve radio interoperability for first responders has stalled because of a political fight over whether to allocate 10 MHz of radio spectrum – the D-block – directly to public safety for a nationwide network.

Radio Spectrum and Interoperability

Recommendation: "Congress should support pending legislation which provides for the expedited and increased assignment of radio spectrum for public safety purposes."

The inability of first responders to communicate with each other on demand was a critical failure on 9/11. Incompatible and inadequate communications led to needless loss of life. To remedy this failure, the Commission recommended legislation to provide for the expedited and increased assignment of radio spectrum for public safety purposes.

To date, this recommendation continues to languish. Despite the lives at stake, the recommendation to improve radio interoperability for first responders has stalled because of a political fight over whether to allocate 10 MHz of radio spectrum – the D-block – directly to public safety for a nationwide network, or auction it off to a commercial wireless bidder who would then be required to provide priority access on its network dedicated to public safety during emergencies.

Since 9/11, faltering advances were made as some radio spectrum in the 700 MHz band were allocated to public safety, but it remains largely unused by first responders. The overwhelming majority of our nation's police chiefs and leaders of first responder agencies support the allocation of the D-block to the existing dedicated public safety spectrum in order to construct a nationwide, interoperable public safety broadband network. This network would allow diverse public safety agencies to communicate with each other, and support mission critical voice, video, text, and other data transmissions.

In his February 2011 State of the Union address, President Obama called for allocating the D-block spectrum to public safety. He also supports allocating $7 billion in federal funding to support a build-out of the broadband network for cash-strapped localities and rural communities. The U.S. Senate Commerce Committee voted in June to report legislation to the full Senate that would allocate this spectrum to public safety, but this bill has not passed the Senate and the House has not yet considered similar legislation.

We support the immediate allocation of the D-block spectrum to public safety and the construction of a nationwide, interoperable broadband network. Because we don't know when the next attack or disaster will strike, we urge the Congress to act swiftly.

Following the allocation of spectrum for public safety use, heavy lifting is needed to deploy an operational nationwide interoperable network. Standards must be established for the public safety broadband network to ensure nationwide interoperability of wireless devices on the network. In addition, wireless devices that operate on the public safety broadband network should be interoperable with devices on other portions of spectrum. This interoperability is important so that a first responder's public safety network device could also operate on a commercial wireless network if the public safety broadband network transmitter is disrupted, or a first responder moves into an area where the public safety broadband network transmitters have not been deployed, as is likely to be the case in many rural areas.

The public safety broadband network and devices must be integrated with existing narrowband emergency communications technology, procedures, and interoperability plans. To save money, where possible, the public safety broadband network deployment should leverage existing communications infrastructure the federal government has already procured, such as Department of Justice's Integrated Wireless Network or Customs and Border Protection's (CBP) Tactical Communications System, and the radio towers that state and local governments have constructed or leased. For example, CBP's radio towers provide an existing infrastructure base for communications in remote rural areas where there is no other existing communications infrastructure.

The 9/11 Commission recommended creating a Privacy and Civil Liberties Oversight Board to monitor actions across the government. Congress and the president enacted legislation to establish this Board but it has, in fact, been dormant for more than three years.

Finally, the public safety broadband network construction process should be managed carefully to avoid cost overruns and ensure that taxpayers get the most value for their dollars. Rigorous oversight by Congress and the administration is needed to monitor progress in establishing the network.

Challenges to the interoperability of other first responder communications networks also require greater attention. Statewide communications interoperability plans and the creation of a national emergency communications plan have advanced emergency coordination across jurisdictions. In addition, DHS has worked with 60 urban areas to successfully demonstrate emergency communications among primary operational leadership, allowing them to manage resources and make timely decisions – within one hour of a routine incident involving multiple agencies.

While this represents progress, taking one hour to establish emergency communications between agency leadership should not be the final goal. That would still be inadequate for an attack on the scale of 9/11, resulting in loss of life. In particular, first responders, not just leadership, need to have the ability to communicate with one another immediately during a disaster.

Across urban areas, regions, and states, coordination and planning must be improved in the areas of technology deployment, standard operating procedures, training, and exercises. Several grant programs at different federal agencies can be used to enhance interoperability, but further efforts are needed to ensure the most effective use of these grants on the highest priority projects, especially with deployment of the public safety broadband network. While expanding the spectrum and resources available to first responders is critical to improving interoperability, these additional issues must be addressed to achieve real-time interoperable communications for catastrophic disasters.

Civil Liberties and Executive Power

Recommendation: "[T]here should be a board within the executive branch to oversee adherence to the [privacy] guidelines we recommend and the commitment the government makes to defend our civil liberties."

An array of security-related policies and programs present significant privacy and civil liberty concerns. In particular, as the FBI and the rest of the intelligence community have dramatically expanded their surveillance of potential terrorists, they have used tools such as National Security Letters that may implicate the privacy of Americans. Privacy protections are also important in cyber security where the government must work with the private sector to prevent attacks that could disrupt information technology systems and critical infrastructure. The same Internet that contains private correspondence and personal information can also be used as a conduit for devastating cyber attacks.

To ensure that privacy and liberty concerns are addressed, the 9/11 Commission recommended creating a Privacy and Civil Liberties Oversight Board to monitor actions across the government. Congress and the president enacted legislation to establish this Board but it has, in fact, been dormant for more than three years.

The Obama administration recently nominated two members for the Board, but they have not yet been confirmed by the Senate. We take the administration at its word that this Board is important: in its May 2009 review of cyber security policy, the administration noted the Board's importance for evaluating cyber security policies. We urge the president to appoint individuals for the remaining three positions on the board, including the chairman, immediately, and for the Senate to evaluate their nominations expeditiously.

Despite the faltering progress on the Board, some agencies have established chief privacy officers. We commend

The rules governing congressional organization reflect the needs and economy of the 19th century, not the challenges of the 21st century.

the dedicated efforts of privacy officers in each of the respective agencies with national security responsibilities; they are doing their work with professionalism. In particular, assessments they have authored on the impact of policies, regulations, and directives issued by their respective departments on civil liberties have been strong.

If we were issuing grades, the implementation of this recommendation would receive a failing mark. A robust and visible Board can help reassure Americans that these programs are designed and executed with the preservation of our core values in mind. Board review can also give national security officials an extra degree of assurance that their efforts will not be perceived later as violating civil liberties.

Congressional Reform

Recommendation: "Congress should create a single, principal point of oversight and review for homeland security. Congressional oversight for intelligence – and counterterrorism – is now dysfunctional."

When we issued our 2004 report, we believed that congressional oversight of the homeland security and intelligence functions of government was dysfunctional. It still is. So long as oversight is governed by current congressional rules and resolutions, we believe the American people will not get the security they want and need. The rules governing congressional organization reflect the needs and economy of the 19th century, not the challenges of the 21st century.

We recommended that Congress create a single, principal point of oversight and review for homeland security. This has not been done. The homeland security committees in the House and Senate do not have sufficient jurisdiction over important agencies within the Department of Homeland Security. Instead, jurisdiction has been carved up to accommodate antiquated committee structures. As a result, too many committees have concurrent and overlapping jurisdiction. This is a recipe for confusion.

This is not just a theoretical problem; it has already produced unclear security policies. The Senate Commerce Committee has jurisdiction over the TSA and has used this authority to set security standards for screening cargo shipped from abroad on airplanes. But cargo shipped on maritime vessels is governed by the security policies of U.S. Customs and Border Protection (CBP), which falls under the jurisdiction of the Senate Homeland Security Committee. Those CBP policies were significantly enhanced by the SAFE Port Act of 2006 in legislation that the Homeland Security Committee produced. The security of cargo should not depend on whether it moves by air or sea and the committee that has jurisdiction over the agency that regulates that method of transit. Both TSA and CBP are part of the Department of Homeland Security and oversight should be with the Senate Homeland Security Committee.

The unwieldy jurisdictional divisions result in the inefficient allocation of limited resources needed to secure our nation. The Department of Homeland Security responds to the inquiries of more than 100 committees and subcommittees. In 2009 and 2010, DHS provided more than 3,900 briefings and DHS witnesses testified more than 285 times. This amounted to many thousands of hours of work, often duplicating efforts, and cost taxpayers tens of millions of dollars.

The result is that DHS receives conflicting guidance and Congress lacks one picture of how that enormous organization is functioning. Congress should be helping integrate the sprawling DHS; a fragmented oversight approach defeats that purpose.

We also recommended that Congress create a Joint Committee for Intelligence or create House and Senate committees with combined authorizing and appropriating powers. Agencies listen to the people who

It still is not clear, however, that the DNI is the driving force for intelligence community integration that we had envisioned.

control their purse, but appropriations for the CIA, for example, come under an already overburdened House Appropriations Subcommittee on Defense. The thrust of our recommendation is to ensure that there is credible, robust expert oversight of the intelligence community's funding and other activities. Our recommendation would ensure that the intelligence appropriations process is not an appendage to the massive defense budget. The House Permanent Select Committee on Intelligence announced a decision this year to include three Members of the House Appropriations Committee to participate in Intelligence Committee hearings and briefings. This is a positive step, but there is more to do here.

We firmly reinforce what we said in our final report: That it is in our country's security interest that Congress make committee reform a priority.

Director of National Intelligence

Recommendation: "The current position of Director of Central Intelligence should be replaced by a National Intelligence Director with two main areas of responsibility: (1) to oversee national intelligence centers on specific subjects of interest across the U.S. government and (2) to manage the national intelligence program and oversee the agencies that contribute to it."

As recommended by the 9/11 Commission, Congress created the position of Director of National Intelligence (DNI) as the principal intelligence advisor to the president, responsible for directing and coordinating the efforts of the 16 agencies of the intelligence community. In the six years since the creation of this post, the DNI has increased information sharing, improved coordination among agencies, sharpened collection priorities, brought additional expertise into the analysis of intelligence, and further integrated the FBI into the overall intelligence effort. These are significant achievements.

It still is not clear, however, that the DNI is the driving force for intelligence community integration that we had envisioned. Some ambiguity appears to remain with respect to the DNI's authority over budget and personnel. Strengthening the DNI's position in these areas would advance the unity of effort in intelligence, whether through legislation or with repeated declarations from the president that the DNI is the unequivocal leader of the intelligence community.

We are also concerned that there have been four DNIs in six years. Short tenures detract from the goals of building strong authority in the office and the confidence essential for the president to rely on the DNI as his chief intelligence advisor.

Transportation Security

Recommendation: "The TSA and the Congress must give priority attention to improving the ability of screening checkpoints to detect explosives on passengers. The TSA should expedite the installation of advanced (in-line) baggage-screening equipment."

While the TSA's implementation of airline passenger screening against the "no fly" and "automatic selectee" lists is a major success, we are still highly vulnerable to aviation security threats. We know that al Qaeda and its affiliates are committed to attacking U.S. aviation as evidenced by Umar Farouk Abdulmutallab's attempt to detonate an explosive on Northwest flight 253 in the skies over Detroit, as well as the insertion of bombs into printer cartridges shipped on airplanes from Yemen to the United States. We also know that Osama bin Laden aspired to attack U.S. rail transportation in New York.

We are not satisfied with improvements to TSA's explosives screening capability. With significant federal funding, TSA has deployed large numbers of enhanced screening

Despite 10 years of working on the problem, the aviation screening system still falls short in critical ways with respect to detection.

equipment used at passenger checkpoints and baggage check screening. Unfortunately, explosives detection technology lacks reliability and lags in its capability to automatically identify concealed weapons and explosives. The next generation of whole body scanning machines also are not effective at detecting explosives hidden within the body and raise privacy and health concerns that DHS has not fully addressed. Our conclusion is that despite 10 years of working on the problem, the aviation screening system still falls short in critical ways with respect to detection.

The Government Accountability Office (GAO) has cited flaws in the way that the TSA and the DHS Science and Technology Directorate conduct research, development, testing, and evaluation of new technology. GAO has found weaknesses in developing and articulating technology program requirements. Ill-defined requirements make it difficult for the private sector to design cost-effective screening equipment that meets DHS's needs. In addition, GAO faults TSA for not conducting and completing testing and evaluation of new technologies to ensure that they work in an operational environment, as well as not incorporating cost and benefit information while making technology acquisition decisions. As a result, significant amounts of money have been wasted and the GAO continues to identify serious holes in virtually every security layer. Given the threat we face to our transportation systems, we cannot afford to perpetuate these mistakes.

Biometric Entry-Exit Screening System

Recommendation: "The Department of Homeland Security, properly supported by the Congress, should complete, as quickly as possible, a biometric entry-exit screening system."

One area of great progress in securing our borders is the deployment of the biometric entry system known as US-VISIT. This system checks all individuals who arrive at U.S. borders, ensures they are who they say they are, and helps prevent known terrorists from entering the country. Data collected by US-VISIT are also used by homeland security, defense, law enforcement, and intelligence agencies for other important national security functions. US-VISIT has proven its value as a national security tool.

Despite the successful deployment of the entry component of US-VISIT, however, there still is no comprehensive exit system in place. As important as it is to know when foreign nationals arrive, it is also important to know when they leave. Full deployment of the biometric exit component of US-VISIT should be a high priority. Such a capability would have assisted law enforcement and intelligence officials in August and September 2001 in conducting a search for two of the 9/11 hijackers that were in the U.S. on expired visas.

Standardize Secure Identifications

Recommendation: "The federal government should set standards for the issuance of birth certificates and sources of identification, such as drivers licenses."

Eighteen of the nineteen 9/11 hijackers obtained 30 state-issued IDs that enabled them to more easily board planes on the morning of 9/11. Due to the ease with which fraud was used to obtain legitimate IDs that helped the hijackers carry out a terrorist act, the 9/11 Commission recommended that "the federal government should set standards for the issuance of birth certificates and sources of identification, such as driver's licenses."

The REAL ID Act established these standards by statute. In 2008, detailed regulations were issued setting standards and benchmarks for issuing driver's licenses. While nearly one-third of the states have complied with the first tier of benchmarks, the deadlines for compliance have been pushed back twice to May 2011, and a recent announcement pushed back compliance again until January 2013. The delay in compliance creates vulnerabilities and makes us less safe. No further delay should be authorized; rather, compliance should be accelerated.

The federal government should set standards for the issuance of birth certificates and sources of identification, such as driver's licenses.

In addition, there are still no minimum standards for birth certificates in place, as required by the Intelligence Reform and Terrorism Prevention Act of 2004. These standards are needed to close a back door that terrorists could use to obtain driver's licenses.

Develop Coalition Standards for Terrorist Detention

Recommendation: "The United States should engage its friends to develop a common coalition approach toward the detention and humane treatment of captured terrorists" and that "[n]ew principles might draw upon Common Article 3 of the Geneva Conventions on the law of armed conflict."

Within days of his inauguration, President Obama signed a series of executive orders on the treatment of detainees and barring the CIA from using any interrogation methods not already authorized in the U.S. Army Field Manual. This ended the CIA's authority to use harsh interrogation methods, but the administration is still grappling with how to close the Guantanamo prison facilities.

By bringing the U.S. into compliance with the Geneva Conventions as well as international and customary law on the treatment of prisoners, these executive orders have substantially fulfilled our recommendation. Looking forward, however, we are concerned that the issue of prisoner treatment has become highly politicized.

This is not good for the country or our standing in the world. Showing that bipartisan agreement is possible, and intending to reaffirm our values, the five Republicans and five Democrats on the Commission unanimously agreed on this recommendation. Together, we believed that our country's values require adherence to the rule of law and a commitment to human rights and humane treatment.

A lingering problem that two presidents have confronted is reconciling the rule of law with indefinitely detaining alleged terrorists. For too long, the president and Congress have delayed resolving this difficult problem. In some cases we lack sufficient evidence against the detainees, or the evidence we have is problematic because of the way it was obtained. We regard as positive the Executive Order that requires periodic review of the status of prisoners at Guantanamo. Congress and the president, however, must decide on a comprehensive approach that spells out clearly the rules of evidence and procedures and the forums in which they will be applied. Congress should anchor these decisions in a firm statutory basis.

Chapter 3: Conclusion

Today, our country is undoubtedly safer and more secure than it was a decade ago. We have damaged our enemy, but the ideology of violent Islamist extremism is alive and attracting new adherents, including right here in our own country. With important 9/11 Commission recommendations outlined in this report still unfulfilled, we fail to achieve the security we could or should have.

The terrorist threat will be with us far into the future, demanding that we be ever vigilant. Changing circumstances require that we regularly reassess our priorities and expenditures to determine what is needed to defend our country and people.

Our terrorist adversaries and the tactics and techniques they employ are evolving rapidly. We will see new attempts, and likely successful attacks. One of our major deficiencies before the 9/11 attacks was a failure by national security agencies to adapt quickly to new and different kinds of enemies. We must not make that mistake again.

Our national security departments require strong leadership and attentive management at every level to ensure that all parts are working well together, and that innovation and imagination are championed. Our agencies and their dedicated workforces enacted much change and we commend their achievements in protecting the American people. But there is a tendency toward inertia in all bureaucracies. Vigorous congressional oversight is imperative to ensure sustained vigilance and continued reforms.

Our task is difficult. We must constantly assess our vulnerabilities and anticipate new lines of attack. We have done much, but there is much more to do.

National Security Preparedness Group

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THE BENEFITS OF TRANSITIONING TO A NATIONWIDE WIRELESS BROADBAND NETWORK FOR PUBLIC SAFETY

JUNE 2011

THE WHITE HOUSE
WASHINGTON

The Benefits of Transitioning to a Nationwide Wireless Broadband Network for Public Safety

At a recent hearing before the Senate Commerce Committee, New York City Police Commissioner Raymond Kelly remarked that a 16-year-old with a smartphone has "more advanced communications capability than a police officer or deputy carrying a radio."[1] The failings of public safety communications systems include both interoperability—with the limitations of current systems becoming tragically apparent on 9/11 and in the aftermath of Hurricane Katrina[2]—and operability—with the cost-effectiveness and performance of traditional public safety devices trailing well behind those provided by modern commercial cellular operators.

With the emerging rollout of commercial services marketed as 4G, LTE-based wireless services, there is a once-in-a-generation opportunity to transform the effectiveness of our first responders through a national strategy to develop and deploy a nationwide wireless broadband network for public safety. Such a broadband service promises to enhance the effectiveness of public safety agencies and, if developed appropriately, can also ultimately replace their legacy (and very expensive) communications infrastructure and devices.

This report explains how the President's Wireless Innovation and Infrastructure Initiative can facilitate the transition away from the traditional, fragmented world of public safety communications to a next generation system. It begins by providing the relevant context, explaining, among other things, the drawbacks of today's systems, and it concludes by discussing benefits and opportunities made possible by a successful transition to an LTE-based nationwide network. In so doing, it recognizes that this transition will take some time and, in order for it to be successful, it must planned carefully, coordinated effectively, and begin as soon as possible.

I. The Legacy of Land Mobile Radio Systems and the Rise of the Modern Cellular Industry

Public safety agencies were the original pioneers of wireless technology. Indeed, public safety's use of Land Mobile Radio ("LMR") services dates back almost a century.[3] The Detroit Police Department, for example, used an early form of LMR in 1921, experimenting with a one-way (base-to-vehicle) system.

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1. Police Commissioner Raymond W. Kelly: Testimony on "Safeguarding Our Future: Building a Nationwide Network for First Responders," U.S. Senate Committee on Commerce, Science, & Transportation, at 1 (Feb. 16, 2011) *available at* http://commerce.senate.gov/public/?a=Files.Serve&File_id=04981480-8117-4289-905d-c1498aa72ee1.

2. *The 9-11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States,* (July 22, 2004), *available at* http://www.gpoaccess.gov/911/Index.html; "The Federal Response to Hurricane Katrina: Lessons Learned" (Feb. 2006), available at http://www.whitehouse.gov/reports/katrina-lessons-learned.pdf.

3. This historical discussion is drawn from Dale N. Hatfield, *The Technology Basis for Wireless Communications, in* THE EMERGING WORLD OF WIRELESS COMMUNICATIONS 49 (1996).

Based on the technology available at the time, systems like this one used Amplitude Modulation ("AM") located in the frequency range just above the AM broadcast band. Later, public safety agencies began to use systems in the Very High Frequency ("VHF") band, using the more effective Frequency Modulation ("FM") band.

Over time, as public safety communications technology advanced, the FCC authorized new spectrum allocations for these services. In the mid-1970s, for example, the FCC allocated additional spectrum in the 800 MHz band for private LMR (including public safety entities), making spectrum available not only for the traditional and conventional, single-channel dispatch systems described above, but also "multi-channel trunked systems."[4] Building on the increasing interest in developing such systems and encouraging "interoperability" among them, the public safety community launched a standards development effort that evolved into the Project 25 Initiative (P25).[5]

While the P25 effort made progress in facilitating greater levels of interoperability among first responders, there remains no national, interoperable LMR network and equipment costs remain very high. Several challenges hindered the progress of the P25 effort. Notably, over a decade after P25 got moving, the GAO concluded that "ambiguities in the published standards [for the Project 25 initiative] have led to incompatibilities among products made by different vendors, and no compliance testing has been conducted to ensure that vendors' products are interoperable…As a result, state and local agencies have purchased fewer, more expensive radios, which still may not be interoperable and thus may provide them with minimal additional benefits."[6] Since that GAO report, the Federal government has created a compliance assessment program for P25 equipment, and while successful, the program has limitations based on the level of industry participation and standards development progress.

Beyond P25 specifically, the lack of better-coordinated public safety communications reflects two basic historical facts. First, as a general matter, first responders are supported by state and local revenue bases and have always bought equipment from their own local budgets. As such, efforts to improve interoperability involved the difficult work of coaxing agencies that traditionally operated on their own to begin working with one another. Second, because for decades public safety was forced to provision its own services, public safety communications grew up in an environment in which being a "smart controller" of services provided by another entity was not an option. In the modern broadband world, by contrast, public safety agencies are generally not operating their own networks. They either procure such services from commercial providers (such as Verizon or Sprint) or they contract with a vendor to operate a network on their behalf (as Northrop Grumman has for New York City).

Over the last 25 years, the modern cellular industry has expanded exponentially. By the late 1980s, the commercial cellular industry was just beginning to outgrow the public safety community in terms of size and significance as a user of wireless technologies. From around 340,000 U.S. subscribers in 1985,

4. An Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz; and Amendment of Parts 2, 18, 21, 73, 74, 89, 91, and 93 of the Rules Relative to Operations in the Land Mobile Service Between 806 and 906 MHz, *Second Report and Order,* 46 F.C.C. 2d 752, ¶¶ 16-17 (May 1, 1974).

5. Telecommunications Industry Association, Project 25, Public Safety Communications Interoperability—Frequently Asked Questions Available on TIA Web Site, PulseOnline, Oct. 2004, http://pulse.tiaonline.org/article.cfm?id=2057.

6. U.S. Gov't Accountability Office, First Responders: Much Work Remains to Improve Communications Interoperability 4 (2007).

commercial wireless grew nearly tenfold over the next 25 years, reaching over 300 million subscribers in 2010. Public safety, however, has largely continued to use wireless services outside this evolving commercial ecosystem. As such, it has failed to benefit from the economies of scale and the ongoing innovation that has taken place in that sector.

II. A Next Generation Public Safety Communications System

The success of the modern cellular industry has enabled its users to reap enormous benefits in operability—including ongoing innovation and cost-performance capabilities—and interoperability—where all users can access one another (for both voice and text communications). The requirements for public safety differ from commercial wireless users, however, making conventional commercial services generally unsuitable for public safety's mission-critical communications.

The traditional LMR systems and devices developed for public safety have served public safety agencies well with regard to meeting their unique requirements. Most notably, such systems are developed to provide rapid voice call-setup and group-calling capabilities. (Ordinary cellular systems, by contrast, can allow for seconds to go by before a call is delivered and answered.) When time is of the essence, as is often the case when public safety agencies need to communicate, it is important to have access to systems that achieve fast call-setup times. Similarly, unlike ordinary cellular systems, dispatch systems like those used by public safety allow for large talk groups to communicate either among individual units or by broadcast messages (think: "calling all cars").

Above and beyond rapid call-setup and group-calling capabilities, public safety agencies also depend on a number of other important functionalities. Most notably, public safety relies on devices that allow for a handset feature known as "talk-around," which enables two or more mobile or portable units to communicate without the aid of network infrastructure. In the case of emergency situations where such infrastructure is not available, a peer-to-peer mode of communications is crucial. Similarly, modern public safety dispatch networks provide queuing and priority access capabilities that traditional cellular networks were not designed to provide. In short, despite their operability and interoperability limitations, traditional LMR systems have provided public safety agencies with mission-critical capabilities that conventional cellular systems have not generally offered. These systems will continue to be essential for public safety communications until broadband systems are able to meet public safety requirements, particularly for mission-critical voice.

While maintaining their traditional LMR systems, public safety agencies are increasingly using commercial broadband systems to support their missions. Such agencies are adopting modern broadband systems in different shapes and forms, including using laptop computers in vehicles, as secondary communications devices (e.g., a smartphone), or for remote video monitoring. In many cases, agencies have relied on commercial off-the-shelf services. In some cases, jurisdictions have procured services directly, such as New York City's relationship with Northrop Grumman to build and operate a broadband wireless network.[7]

7. Press Release, Northrop Grumman, Northrop Grumman Wins $500 Million New York City Broadband Mobile Wireless Contract (Sept. 12, 2006), *available at* http://www.it.northropgrumman.com/pressroom/press/2006/pr31.html.

The development and deployment of LTE systems represent a new opportunity for public safety communications. For starters, public safety can develop and deploy a nationwide network that will enable greater levels of operability and interoperability in the mobile broadband arena than public safety has ever achieved in the world of traditional LMR systems. Moreover, this opportunity holds the promise of public safety systems that could be developed based on commercial standards to generate significant economies of scale, competition in equipment as well as services, and ongoing innovation of the kind experienced in the modern cellular industry. With the move to LTE, public safety can seize this very opportunity.

Given the growth of commercial services, the opportunity to leverage such assets promises to make the development and deployment of an LTE wireless broadband network for public safety far less expensive than it would if public safety were to own and operate such a network itself. In 1991, such a model (with less than 10,000 sites nationwide) was far from appealing. By contrast, the situation in 2011 (with more than cell sites in service) makes this a compelling opportunity.

The challenges of using commercial infrastructure are not dissimilar to those of adapting the commercially developed LTE standard and ordinary services to meet the requirements of public safety. In particular, public safety communications systems must be survivable and able to function in the midst of a natural or man-made disaster. To that end, such systems require a degree of "hardening" and backup power capability that can ensure that they are available during times of emergency. As with the development of lower cost devices, the opportunity to use infrastructure that can be shared between public safety and other users can greatly lower the cost for public safety communications. Notably, basic infrastructure—towers, high capacity lines, and electricity costs—can be shared in an environment where public safety has its own spectrum and network that meets its particular needs.[8] And as Part III explains, the President's Wireless Initiative provides a framework to make such a network possible.

III. The President's Wireless Initiative and Public Safety Communications

In his 2011 State of the Union address, President Obama announced his Wireless Innovation and Infrastructure Initiative,[9] specifically referencing the opportunity for a firefighter to use a handheld device to download the floor plans of a building before arriving at the scene of an emergency. Such technology, which could enhance the effectiveness of our first responders, is routinely used by enterprises like Federal Express to enhance their mission.[10] For our first responders, however, the best they can do in the current environment is to adopt ad hoc solutions based on commercial technology. Given the appropriate federal leadership, public safety can shape the development of emerging broadband solutions to specifically meet its needs, thereby providing a transition path away from its legacy equipment and networks.

8. Access to back-up satellite systems might well be another requirements for certain public safety systems, insofar as such a capability provides another backup network as well as an ability to communicate in remote areas.

9. The White House. "President Obama details plan to win the future through expanded wireless access." February 2011. http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access.

10. Hamblen, Matt. "FedEx to adopt rugged handhelds from Motorola." *Computerworld*. September 2009. http://www.computerworld.com/s/article/9138071/FedEx_to_adopt_rugged_handhelds_from_Motorola.

As President Obama outlined, the Wireless Initiative pays for itself and would reduce the deficit by enabling more efficient use of wireless spectrum and by freeing up spectrum for auction. This initiative catalyzes investment and innovation in the wireless broadband ecosystem by freeing up 500 MHz of spectrum over ten years through more efficient federal government and private sector use of this resource. This effort is expected not only to drive investment and innovation, but also to generate almost $28 billion in revenue. Obtaining such revenue, for which President Obama has reserved almost $10 billion in his 2012 Budget for deficit reduction, depends on Congress acting to authorize the FCC to conduct "voluntary incentive auctions" as well as an updated framework to facilitate the more efficient use of government spectrum (i.e., an update of the Commercial Spectrum Enhancement Act).

After using the proceeds from spectrum auctions to reduce the deficit, President Obama proposed four related measures to spur investment and innovation in next generation wireless technologies for public safety purposes. In two related steps, President Obama called for an investment in a nationwide wireless network for public safety communications based on 4G technology, and for the rollout of 4G services to at least 98% of the American population. These two steps are related because the construction of 4G services to otherwise unserved parts of the country will enable both public safety agencies to use those services and for citizens living in those areas to obtain service. Third, President Obama called for the D Block, which is a band of spectrum in the 700 Megahertz band that is required to be auctioned, to be reallocated for public safety. Finally, President Obama has championed the creation of a Wireless Innovation (WIN) Fund that would, among other things, support investments in research that would enable LTE-based technology to meet the particular requirements of public safety for mission critical data, voice, and video.

For the core commitments of President Obama's plan to be realized, Congress will need to address the relevant funding, technology, and governance issues that will enable a nationwide network for public safety to be developed and deployed.

Developing an effective nationwide public safety governance structure will be crucial to ensuring that public safety has access to a network with far greater levels of operability and interoperability than it has ever had before. A key part of this effort is moving away from the traditional path of individual jurisdictions making isolated purchasing decisions on equipment, devices, and services. Under that legacy model, the equipment and infrastructure were generally costlier, open standards that enabled public safety to support an innovation ecosystem (such as an "apps store" for public safety) did not exist, and even neighboring systems (or sometimes even communications systems within the same jurisdiction, such as fire and police) could not interoperate. Absent a governance system that will drive standard setting activity and ensure that local purchasing decisions support interoperability, there is a strong possibility that we will repeat the mistakes of LMR in the wireless broadband arena.

The management of wireless broadband network development and deployment requires an effective and empowered nationwide governance system. In particular, developing nationwide wireless broadband services tailored for public safety will require a national body that can specify the requirements for public safety communications, hold the license for public safety broadband spectrum, and oversee a competitive bidding process to enlist the best providers that can develop, deploy, and operate the appropriate wireless broadband system. Such a body should be composed of highly competent professionals, including leaders in the field of public safety, information technology, and cellular communications networking, operations, and deployment.

The continued development of effective regional, statewide, and local governance mechanisms is similarly critical to enabling the effective use of a wireless broadband network developed for public safety. In particular, such mechanisms ensure that the control over the network—including what agencies have priority in what circumstances—is exercised in a well coordinated fashion and is responsive to end user needs. Moreover, such mechanisms provide a basis for identifying key local issues with respect to coverage and opportunities for sharing infrastructure.

IV. The Opportunity for Cost Savings and Enhanced Effectiveness from a Nationwide Next Generation Public Safety Communications System

The development and deployment of a nationwide public safety next generation network promises significant opportunities for long term cost savings and improved functionality. While there are considerable initial Federal budgetary costs to establish a nationwide network, they will be offset in the medium and long run by three primary sources of savings: (1) reduced government spending focused on overseeing and managing today's fragmented and inefficient networks; (2) savings from reduced device and infrastructure costs; and (3) innovation enabled by competition and market entry as public safety adopts a modern wireless standard.

Even more important than the money saved, the Nation's first responders and public safety agencies will, on account of this initiative, be safer and more effective because they will have at their disposal a wealth of new devices, applications, and other cutting-edge technology. From accessing video images of a crime in progress, downloading building plans of a burning building to a handheld device, or connecting rapidly and securely with personnel from other towns and cities, a nationwide wireless broadband network for public safety will make a difference on a day-to-day basis—and not merely during the most severe emergencies when the availability of an interoperable and operable network will be at its most important.

A. The benefits from achieving a fully interoperable system

First and foremost, developing and deploying a nationwide wireless broadband system provides a unique opportunity to develop and deploy a network that is interoperable by design. The benefit of interoperability by design is difficult to capture as an economic matter because its value is in the more effective emergency response capability that results from those at the scene of an incident enjoining seamless and easily managed communications networks. It is also difficult to capture the costs of the assorted interoperability measures now being used, ranging from swapping radios to using Internet-based gateways to patch together non-interoperable systems.[11] In short, not only would interoperability be effectively achieved at the network level—providing our first responders with a greater level of effectiveness—but it would be achieved far more cost-effectively than today's solutions allow.

11. It merits note that such measures will continue to be used for the reasonably foreseeable future in that the transition to an LTE-based interoperable environment that replaces today's legacy LMR systems may well take a decade. Moreover, during this transition period, it will be important for LTE systems to have a level of backward compatibility to legacy LMR systems.

B. The benefits from a coordinated system for public safety communications

Today's public safety communication systems not only lack some of the capabilities of modern networks and commercial devices, but the systems are also fragmented across thousands of Federal, State, and local jurisdictions. This fragmentation puts the responders—and the public—at risk in emergencies like 9/11 or Hurricane Katrina, when different law enforcement agencies could not talk to one another. But beyond reducing the effectiveness of our public safety officials, this fragmentation also adds to the cost of communications systems, reducing resources for governments at every level. As one commenter explained:

> Particularly since 9/11, there has been great concern about the possibility of failures due to lack of interoperability, and failures due to a shortage of public safety spectrum. This paper shows how both of these and other serious problems are a logical consequence of America's fragmented approach to public safety, in which thousands of local agencies make independent decisions without a coherent strategy to unify or guide them. Because of this fragmented approach, public safety agencies build more infrastructure than they should, spend more taxpayer money than they should, and consume more scarce spectrum than they should, all for a system that is unnecessarily prone to interoperability failures.[12]

In general, the costs of maintaining this fragmented system are borne by Federal, State, and local governments. On the Federal front, DHS will award over $2 billion in grants for preparedness and homeland security as part of the FY2011 Budget, with many of the programs supporting communications procurement. Moreover, in a one-time infusion in 2007, the joint NTIA/FEMA Public Safety Interoperable Communications Grant program awarded $968 million to fund interoperable communications in 56 States and Territories.[13]

These costs to the Federal government—and the expenses incurred by State and local agencies—could be reduced substantially through the economies of scale gained by transitioning to a nationwide, interoperable network. An analysis of several different approaches concluded that the costs of this transition would be paid for in reduced spending towards the current, fragmented network within several years:

> Given the tremendous inefficiencies of the current fragmented system, as demonstrated above, it is perhaps no surprise that the cost of building an entire nationwide system is comparable to what is likely to be spent in just a few years to upgrade and maintain the existing infrastructure. For example, in the wake of 9/11, the U.S. federal government has dispersed billions of dollars in grants just to address communications issues at the state and local level, and billions more will be needed. In fact, the cost to upgrade the entire existing infrastructure has been estimated at $18 billion. In contrast, we found

12. Peha, Jon M. "How America's fragmented approach to public safety wastes money and spectrum," 33rd Telecommunications Policy Research Conference (September 2005), http://repository.cmu.edu/cgi/viewcontent.cgi?article=1029&context=epp&sei-redir=1#search="peha+waste+money+public+safety+communications.
13. Department of Commerce. National Telecommunications and Information Administration. "Public Safety Interoperable Communications (PSIC) Grant Program." Accessed May 2011. http://www.ntia.doc.gov/psic/index.html.

> that deploying a single 700MHz nationwide network that carries voice and data will cost about $10 billion.[14]

In addition to savings on Federal grants, one of the very significant benefits and opportunities from the President's plan is to provide federal first responders with the opportunity to use this network. It will require, however, just the sort of network—with the intelligent control capabilities of an advanced network—discussed herein to provide such users with the capabilities and assurances they need. To ensure that the public safety network is built to meet the requirements not only of public safety, but also Federal first responders, the Emergency Communications Preparedness Center is in the process—under the leadership of DHS—of developing an assessment of their broadband communications requirements.

C. Savings through economies of scale on devices and infrastructure

As it stands today, there are more than 2 million first responders in the Federal, State, and local governments.[15] This includes nearly 300,000 firefighters, more than 630,000 police patrol officers, and countless other public safety workers such as forest fire inspectors, correctional officers, and security guards. The Federal government, moreover, employs around 100,000 individuals in protective service occupations. Many of these public servants rely on advanced communication infrastructure and devices to go about their jobs every day. For our Federal, State and local governments, extra spending on communications devices comes directly out of the budget used to hire and retain police officers, fire fighters, and other first responders—not to mention education, healthcare, road maintenance, and other public services. Once it is fully implemented, the President's plan will allow governments at all levels to save on communications device and infrastructure costs, leaving more resources for State and local governments to improve public safety and other services.

The cost difference between traditional devices used by public safety and commercially available ones is quite stark. As a recent Congressional Research Service report found, "the latest radios developed for public safety…cost between $4,000 and $6,000. The current narrowband radios being used for 700 MHz networks typically start at $3,000."[16] By contrast, commercially-available 4G smartphones cost around $600.[17] To be sure, as explained above, this is not an apples-to-apples comparison. Although commercial smartphones have some functions that go beyond public safety communications devices—think of Internet-enabled applications available on such devices—they lack the ruggedness, reliability, rapid calling and conferencing, and direct device-to-device connectivity of traditional LMR systems and equipment. Consequently, a core part of the President's initiative focuses on developing the necessary technology based on the LTE standard to meet the requirements of public safety, enabling public safety to use commercially-developed handsets.

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14. Hallahan, Ryan and Jon M. Peha. "Quantifying the costs of a nationwide public safety wireless network." Working Paper. Carnegie Mellon University. Accessed May 2011. http://www.andrew.cmu.edu/user/rhallaha/papers/quantifying_costs_of_PS_network.pdf.

15. U.S. Department of Commerce. Bureau of the Census. Occupational Employment Statistics. National Occupational Employment and Wage Estimates by Ownership. Protective Service Occupations. May 2009 (most recent available). http://www.bls.gov/oes/current/999001.htm.

16. Moore, Linda K. "Public safety communications and spectrum resources: Policy issues for Congress." Congressional Research Service. September 2010. http://www.fas.org/sgp/crs/misc/R40859.pdf.

17. M. Maesto, "Apple Selling Unsubsidized Phones for $500-700: Report," *available at* http://www.eweek.com/c/a/Mobile-and-Wireless/Apple-Selling-Unsubsidized-iPhones-for-500-to-700-Report-682945/.

Once the relevant requirements are built into public safety systems based on 4G technology, end user devices for such systems are expected to be between five and ten times less expensive than today's LMR technology. As the Congressional Research Service concluded, "The participation of commercial carriers in developing and deploying, for example, a common radio interface, is expected to put the cost of public safety radios in the same price range as commercial high-end mobile devices ($500)."[18] Similarly, an analysis by Andrew Seybold concluded that "the overall cost savings will be substantial and we believe that the industry is willing to work with the public safety community to provide the types of devices it requires at reasonable costs."[19]

With respect to savings on infrastructure, public safety communications systems that leverage existing commercial (and governmental) infrastructure can be cost effective. Similarly, using greater leverage in procuring devices that are used across a national network also promises considerable cost savings. In examining this issue recently, the FCC found that leveraging available commercial systems could save considerably on capital expenditures compared with relying on the existing public safety communications infrastructure.[20]

D. Providing better performance and cost effectiveness through innovation

Public safety communications will benefit from a broader market for devices and technology, overcoming the fragmentation of today's often-proprietary systems and improving interoperability through non-proprietary, open standards of commercial wireless technology. Participation in a broader market based on open standards will also allow public safety to enjoy the benefits that come from many more firms competing to offer goods and services. Not only will devices and infrastructure be upgraded and improved based on advances in commercial technology, but public safety's adoption of an Internet-based framework will enable developers to provide open and standards-based applications for public safety use. To facilitate this opportunity, the President's plan calls for clear, nationwide standards that make public safety systems interoperable across jurisdictions and vendors.

Government Accountability Office findings support the fact that the lack of an open standards and a commercially vibrant ecosystem constitutes a critical weakness in public safety communications.[21] Further, a recent Federal Communications Commission letter to the Chairman of the House Committee on Energy and Commerce describes how clear, nationwide standards have the potential to rectify the poor performance currently experienced in public safety.[22] In particular, the FCC explained "the beneficial effect of competition through open standards" as follows:

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18. Federal Communications Commission. Letter to the Honorable Henry Waxman. July 20, 2010. http://democrats.energycommerce.house.gov/documents/20100726/Letter.FCC.07.26.2010.pdf.

19. Seybold, Andrew. "Comments on the FCC White Paper: Federal Communications Commission Omnibus Broadband Initiative." April 2010. http://andrewseybold.com/1572-white-paper-response-to-fcc-white-paper.

20. FCC. OBI Technical Working Paper No. 2. "A broadband network cost model: A basis for public funding essential to bringing nationwide interoperable communications to America's first responders." May 2010. http://download.broadband.gov/plan/fcc-omnibus-broadband-initiative-(obi)-technical-paper-broadband-network-cost-model-basis-for-public-funding-essential-to-bringing-nationwide-interoperable-communications-to-americas-first-responders.pdf.

21. GAO. "First Responders: Much work remains to improve communications interoperability." April 2007. http://www.gao.gov/new.items/d07301.pdf.

22. Federal Communications Commission. Letter to the Honorable Henry Waxman. July 20, 2010. http://democrats.energycommerce.house.gov/documents/20100726/Letter.FCC.07.26.2010.pdf.

> P25 systems still rely upon proprietary solutions and the beneficial effect of competition through open standards is not fully realized. A comparison to Tetra, a European standard similar to P25 but which was successfully completed in 1995, makes this stagnation clear. Though similar in function to P25, Tetra products are both more spectrally efficient than P25 and significantly cheaper…A broad framework for interoperability is essential to ensuring that this network is interoperable from day one and remains so as the technology evolves.

The former Los Angeles Chief of Police testified that modern broadband networks for public safety would allow law enforcement to deploy a range of innovative new technologies: "Today, many agencies have established Real Time Crime Centers that are leveraging new technologies to do an even more effective job of fighting crime…New technologies such as automated license plate readers, biometrics, medical telemetry, automated vehicle location, and streaming video only scratch the surface of the capabilities that will be carried by broadband networks."[23] Similarly, New York City Police Commissioner Raymond Kelly reiterated the importance of modernizing public safety communications in Congressional testimony in February:

> [An effective broadband network] could provide officers with an immediate, digital snapshot of anyone they detain. It would give them the suspect's address, prior arrest history, and other critical details. The officer would be able to take electronic fingerprints at the scene and compare them instantaneously with those in local, state, and federal databases. This kind of situational awareness is vital to the safety of the officers and members of the public.[24]

The testimony above clearly demonstrates public safety communications' need for nationwide, interoperable, open, standards-based voice and data broadband networks to replace the legacy public safety systems in use today. Of the many benefits a nationwide broadband network could enable, perhaps the most critical is to improve situational awareness and provide the opportunity for comprehensive identification.

In a public safety setting, accurate information about the subject, the surrounding area, and the environment is critical. Law enforcement and other public safety practitioners make better and more informed decisions when interacting with the public if they can access comprehensive identification and databases containing a range of information (e.g., driver's licenses or other photos; records of warrants, arrests, prison time, school attendance, or history of violent behavior; and customs and immigration status). Even current information with respect to weather or environmental concerns such as flood plains and wind direction can improve a practitioner's ability to do an effective and efficient job. But all of this information—pictures, records, video, etc.—requires bandwidth and the technology necessary to deliver such information to a handheld device. As explained above, that technology does not need to be invented, only tailored to meet the needs of public safety.

23. Bratton, William. Testimony Before the House Committee on Energy and Commerce Subcommittee on Communications, Technology, and the Internet. September 2009. http://democrats.energycommerce.house.gov/Press_111/20090924/bratton_testimony.pdf.

24. Kelly, Raymond. Testimony before the Senate Committee on Commerce, Science, and Transportation." February 2011. http://pdf.911dispatch.com.s3.amazonaws.com/senate_hearing_d-block_feb2011.pdf.

One example of comprehensive identification and improved situational awareness is the use of license plate readers. Public safety is quickly recognizing the value of license plate reader (LPR) technology in both the fight against crime and the battle against terrorism. LPRs are used in fixed, portable, and mobile environments to check against a defined alert lists for wanted status.[25] These lists may be combined or customized as needed and may include thousands of plate numbers at any given time. Checking vehicle status via LPR can be done hundreds, even thousands, of times in a single shift. Without LPRs, a patrol officer determines wanted status by either manually entering a plate via an in-car computer system or requesting the check by radio. Recognizing a wanted vehicle solely by observation relies on memory or reference to a printed list called a "hot sheet." Since LPR checks require little to no action on the part of the officer, full attention can be given to other tasks, such as driving or looking for crimes in progress, making the entire process much more effective while enhancing public and officer safety.

No matter how the data transport is achieved, the available bandwidth to provide the connectivity is critical to the performance of the system. Although some agencies still rely on manual flash drive updates at shift changes to update LPR systems, many are moving to wireless connectivity (3G, 4G, WiFi, and satellite) to improve the timeliness of data uploads. Fixed and portable LPRs may have the benefit of wired connectivity for updating data, but increasingly are dependent on wireless connectivity because LPRs tend to be installed in remote locations or areas lacking fixed infrastructure.

Another example of comprehensive identification and improved situational awareness is the dramatic increase in both use and value of streaming video to and from emergency vehicles in the field. A doctor at a hospital, with real-time broadband data communication with an enroute rural ambulance crew, might more swiftly recognize a patient's symptoms, and be able to give instructions to the ambulance crew resulting in potentially better life-saving treatment. (Also see Appendix A).

In-car video can also be useful in providing visual information to mobile command posts and emergency operations centers in the event of a major incident. As an example, a patrol officer responding to a structure fire can provide real-time visual assessment of the structure and provide specific information relevant to proper response that an individual patrol officer may not even be aware is relevant to fire personnel. This provides incident command staff and emergency operations much better situational awareness and understanding as input to command decisions, and as in the previous example, much more rapid and appropriate response to evolving situations.

Conclusion

The President's Wireless Initiative promises to both improve public safety's effectiveness and reap savings by providing public safety with a state-of-the-art nationwide wireless broadband system. Such a system will finally enable it to benefit from economies of scale of commercial infrastructure and devices as well as ongoing competitive innovation in that ecosystem. As such, the ultimate savings and benefits from this transition are very likely to eclipse and more than compensate for the upfront investment in a nationwide, modern broadband network. Most importantly, this effort will provide public safety officials

25. An LPR takes a photo of the license plate using a Smart Phone or Tablet PC camera and runs a check against a defined list. *See* Appendix A.

with access to a modern communications network that will enable them to better protect themselves, our families, and homeland security.

Appendix A

Examples of Innovative Applications for Public Safety Broadband

1. **License Plate Reader**
   By taking a photo using a smartphone or Tablet PC's camera, the investigator can automate the process to capture the license plate information to determine if the car is stolen and its registered owner. Not only can the photo be stored, but information such as location and date/time can be useful intelligence.

2. **Fingerprint Identification**
   Through M2M technologies tethered to the smartphone of Tablet PC, the fingerprint of a subject can be collected and searched against Law Enforcement databases to quickly identify a person and assess the level of threat incorporating the existing capabilities from Quick Capture Platform (QCP) and Repository for Individuals of Special Concern (RISC). QCP enables the mobile identification and enrollment using a mobile system. RISC enables rapid search to quickly assess the level of threat within seconds with two to ten fingerprint images in a mobile environment.

3. **Facial Recognition**
   By taking a picture with a smartphone or Tablet PC's, a subject's photograph can be matched against existing databases such as the DMV or booking databases to determine identity.

4. **Scars, Marks, and Tattoos**
   By taking a picture with a smartphone or Tablet PC's camera, a symbol can be matched against existing databases to determine identity, relationships, and intelligence such as symbol affiliation, last time seen, contributing department/agency, etc.

5. **Field Interview Cards**
   After conducting a field interview, an investigator can enter the information in a timely manner without the need to return to the office. The investigator can also query the database for relevant data on previous interviews.

6. **Crowd Sourcing and Interactive Maps**
   In multi-agency operations such as the Inauguration and Super Bowl, crowd sourcing applications along with interactive maps enhance situational awareness by providing real-time data and gathering intelligence through geo-location aware services.

7. **Local, State, Federal Data**
   Various apps with the ability to query Local, State, and/or Federal databases will provide investigators the ability to selectively search the appropriate repositories and return the right amount of information in a timely manner. This also applies in the EMS field.

8. **Child Abduction Leads Tracking**
   To expedite law enforcement response in Amber alert cases, integration of leads tracking functionality into Virtual Command Center will facilitate leads assignments and investigator updates in the field environment. Geographic information system (GIS)/visual-based icon-driven

situational awareness and common operating picture user interfaces connecting operational data bases.

9. **Multi-vital sign patient data transmission and access to patient history,** including real-time multi-vital sign data, current patient status (medic notes in real time), and high-definition video (patient and imaging video and stills, e.g., CT and ultrasound) regardless of location (e.g. emergency department, incoming helicopter, incoming back-up ambulance(s)).

Pro-D Block Op-Eds

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Let's give first responders tools needed to save lives (Houston Chronicle, 6/14/11)
By U.S. SEN. KAY BAILEY HUTCHISON and U.S. SEN. JAY ROCKEFELLER

On Sept. 11, 2001, our nation's first responders charged into the burning Twin Towers with little to guide them but instincts and courage. In the midst of the most violent and broad-scale attack on American soil since Pearl Harbor, emergency personnel and safety officials did not have access to the right tools — like an interoperable communications network - that could have helped save lives.

Nearly 10 years later, we live in a post-9/11 world marked by a national mindset of vigilance and substantially strengthened homeland security efforts. Unfortunately, our platform for modern public-safety communications remains stuck in the past. In fact, construction of a nationwide interoperable wireless network for first responders is one of the last outstanding recommendations of the 9/11 Commission.

After careful thought and deliberate negotiations, incorporating the valuable feedback of public safety officials and the wireless industry, we have come up with a framework to meet this national challenge, without costing taxpayers a dime. Our bill, S. 911, would lay the groundwork for building a nationwide public safety communications infrastructure - and it would do so in a forward-looking and financially responsible way, while also putting in place an effective and accountable governance structure.

In order to generate the revenue to fully offset the cost of construction of the public safety network, the bill allows broadcasters and other licensees of our airwaves to voluntarily remit back unwanted spectrum, which is used to transmit TV, radio and Internet signals. The freed-up spectrum would be reauctioned for commercial wireless broadband use in exchange for a portion of the proceeds through incentive auctions. These incentive auctions could clear as much as 120 megahertz of spectrum for new wireless broadband services, which could raise more than $28 billion in auction proceeds for the government. Further, our bill directs the Federal Communications Commission to auction at least 120 MHz of government spectrum suitable for commercial wireless broadband services and to allocate another 120 MHz for unlicensed uses, resulting in substantial innovation and hundreds of billions of dollars in economic growth.

Under our proposal, a critical band of high-quality spectrum, known as the "D block," will be allocated to public safety and paired with other public-safety spectrum to establish the nationwide public-safety broadband network. The Congressional Budget Office estimates that this will cost approximately $3 billion, which will be covered by funds raised by incentive auctions. Twelve billion dollars in proceeds will be used to deploy and maintain the public safety network. Additional funds will support high technology research and development. Excess funds - to the tune of $10 billion - will go toward deficit reduction. This legislation is efficient and cost-effective in that it utilizes our nation's valuable resources without requiring any additional taxpayer dollars.

The bill establishes a streamlined nonprofit corporation to build and oversee the wireless public safety network and to ensure it will seamlessly operate nationwide. This entity will leverage existing infrastructure to hold down costs. Its structure and management will be modeled after commercial wireless carriers in order to efficiently build the nationwide network. The corporation will utilize contracts with commercial vendors to build, operate and maintain the network. There is a robust structure in place to ensure significant input from state and local public-safety entities as well as oversight by the federal government. The corporation will be led by a board of directors that includes private sector, public safety and state and local expertise. Most importantly, this governance structure is designed to be self-sustaining, so it will not require funding through annual appropriations.

Our government has not always allocated precious spectrum wisely, nor has it always managed existing spectrum allocations efficiently. A shortsighted approach will create new challenges in the future. That is why we worked hard to make sure our proposal is comprehensive and forward-looking.

Finally, because our bill takes a broad approach that will free up considerable spectrum for commercial use in the next few years, it will be an economic driver. Over the long term, it will help the government allocate and manage spectrum more efficiently. Ultimately, this should produce as much as $400 billion in new economic activity through licensed and unlicensed uses of spectrum, a predictable supply of new spectrum, and important new research and development activities.

We believe we have come up with a balanced piece of technology legislation that will cost taxpayers nothing and, most importantly, will finally bring our nation's public safety system into the 21st century. Everything Congress does should emphasize fiscal responsibility and government efficiency, and we have made those imperatives a centerpiece of our proposal. We look forward to working with our colleagues and all stakeholders to pass this common-sense, bipartisan bill by the 10-year anniversary of 9/11.

Hutchison, a Republican from Texas, is ranking member of the Senate Commerce Committee; Rockefeller, a Democrat from West Virginia, is chairman of the committee.

Still Tongue-Tied, 10 Years Later: Let First Responders Talk To Each Other -- On Public Spectrum (Press Release, 6/1/11)
By Reps. Kirsten Gillibrand and Peter King

Just as Americans will never forget where they were on Sept. 11, 2001, we will also remember May 1, 2011, when President Obama announced Osama Bin Laden had been killed. This was a moment of justice for many New Yorkers, 9/11 families and first responders. It was a day the good guys won. But there are still those who want to do us harm, and we must remain vigilant in keeping our country safe.

New Yorkers know better than anyone the constant threat that our country faces. The city remains the No. 1 target for terrorists around the world who want to kill Americans.

So it is baffling that nearly 10 years after the attacks of 9/11, one of the key recommendations from the 9/11 commission report has yet to be implemented. The commission identified insufficient interoperability among communications systems used by first responders during the attacks and rescue efforts at Ground Zero as a major problem that needs to be fixed.

Firefighters, police officers, emergency medical technicians and other public safety professionals currently communicate on different frequencies and with different systems - creating barriers to providing a coordinated and efficient response during an emergency. It is alarming and unacceptable that any teenager with a smartphone can share more information than our emergency responders can. It is time to bring first responder technology into the 21st century.

The solution to this national security problem hasn't languished due to a lack of technological know-how. It has languished due to a lack of political will by Congress to create a public system tasked with maintaining a network devoted exclusively to public safety.

Opponents insist that we can rely on the private sector to build and maintain such a system; we strongly disagree.

As Police Commissioner Raymond Kelly pointed out in his testimony to Congress, "We know from past experience that we can't depend on systems run by the private sector. They are too susceptible to failure in a crisis. On Sept. 11 and after the 2009 crash of a commercial jet in the Hudson River, cell phone networks were deluged and police and fire communications over them became virtually impossible."

Sen. Jay Rockefeller (D-W.Va.) has introduced the Public Safety Spectrum and Wireless Innovation Act, and Chairman King has introduced the Broadband for First Responders Act of 2011. We are urging Congress to pass these bills before the 10th anniversary of the 9/11 attacks. The legislation would provide our first responders and public safety officials with the critical interoperable radio airwaves needed to effectively communicate in the event a major response is needed.

Here is how it works. The bill would create the framework for the deployment of a nationwide, interoperable, wireless broadband network for public safety by allocating 10 megahertz of spectrum, known as the "D Block," to the government for the purpose of public safety. This nationwide interoperable broadband network would finally enable first responders to communicate across jurisdictions and share critical data such as video feeds and up-to-date information in real time - making complex operations easier and safer.

The "D Block" would arm our men and women on the ground with the technology needed to share and disseminate information quickly and seamlessly, including receiving background checks, fingerprints, photos and videos instantly. Firefighters would be able to receive high-speed file downloads, including floor plans for a burning building. Police officers could use a hand-held device to look up outstanding warrants before arriving at a location. Emergency Medical Service workers could exchange diagnostic information about a victim with doctors while en route to the hospital.

Both bills are bipartisan and enjoy the enthusiastic support of law enforcement officials across the country.

To preempt some potential concerns: At a time when Congress is rightly focused on cutting spending, this legislation pays for itself, generating the revenue for the development and deployment of this network by auctioning off a variety of spectrum. Nor would it place burdensome requirements on police forces and firefighters to give up the spectrum they currently use.

The President has called for the development and deployment of just such a nationwide network. The job is long overdue. Just as we did with the 9/11 health bill for our heroes, we must and can come together, Democrats and Republicans, and pass this legislation. And we should do it now so our heroes have the best technology available when duty calls.

Gillibrand, a Democrat, is a U.S. senator from New York. King, a Republican, is a U.S. representative from Long Island who is chairman of the House Homeland Security Committee.

Chilling Echoes From Sept. 11 (New York Times, 5/22/11)
Editorial
http://www.nytimes.com/2011/05/23/opinion/23mon1.html

As the 10th anniversary of the terrorist attacks in New York, Washington and Pennsylvania draws near, one of the main recommendations of the 9/11 Commission remains unfulfilled: the creation of a common communications system that lets emergency responders talk to one another across jurisdictions.

The problem was laid bare in the tragic cacophony at the World Trade Center, where scores of firefighters perished as police and fire officials couldn't communicate on antiquated radio systems before the second tower fell.

Four years later during Hurricane Katrina, emergency workers from across the nation faced the same dangerous problem. They had to resort to running handwritten notes to warn of shifting conditions.

Congress should be haunted by the threat of new disasters finding rescue workers still incommunicado. Responsible lawmakers can mark the 10th anniversary by passing legislation to finally create a national public safety communications network.

The overall challenge is more complex than it sounds, touching on questions of financing, broadcast spectrum fights, technology innovation and turf battles among local public safety agencies.

Congress can begin cutting through a lot of that by approving the reallocation of radio spectrum to wireless broadband providers and public safety agencies. This would allow creation of a modern emergency system providing common access when needed by voice, video and text for responders now using separate voice systems typically jammed up in emergencies.

Senator John Rockefeller IV, chairman of the science and transportation committee, is championing the commission's dedicated spectrum approach, warning that the faulty emergency communication on 9/11 was "probably the greatest killer other than the planes themselves." He has the support of the ranking Republican, Kay Bailey Hutchison of Texas.

Crucial details remain to be settled.

Would a nonprofit corporation best manage the new network? What's the best way to get commercial broadcasters to yield needed spectrum — through incentive auctions proposed by the Obama administration?

Once Congress acts, this new generation of wireless broadband would require years of infrastructure construction. In the meantime, public safety and homeland security officials across the nation have been tapping into billions in federal aid designed to patch improvements into existing voice systems.

Critics warn there's been too much reliance on buying hardware and not enough on planning and coordinating among fiefdoms still reluctant to come to terms on single useful systems. In New York, where the scars of 9/11 remain raw, there is not yet a fully compatible system among police officers, firefighters and Port Authority forces, but officials insist they are making progress.

How many warnings does Congress need? How many more people will be endangered because of bureaucratic wrangling or political inertia? "Further delay is intolerable," the commission's leaders, Thomas Kean and Lee Hamilton, declared earlier this year. They are right.

Seybold: Reallocate the D Block to the public-safety network, rural America (FierceWireless, 5/16/11)
By Andrew M. Seybold

The $7.2 billion in federal grants that were to provide a push for broadband services into rural America was mostly wasted. Much of it went to fiber in some rural areas, but the bang for the buck in getting broadband into rural America is not to run fiber but to make use of wireless broadband. As of today, the push into rural America is still more of a crawl, and while many sections of rural America have systems of various types in the planning stages, growth is still slower than expected a few years ago.

WiMAX systems have made some gains; the promise of TV white space that can be used for longer-distance communications than Wi-Fi is coming online and might help in some rural areas, especially when combined with standard Wi-Fi to deliver signals into homes and offices. Some people have opted for satellite broadband. This, however, is expensive and, there is a lot of latency, which precludes some Internet activities such as banking and other secure applications that time-out over satellite systems. While some of the rural cellular networks have been deploying wireless broadband, much of rural America is still uncovered by broadband of any type, and there seems to be no concerted effort to change that.

There is one solution on the horizon that could bring broadband to most of rural America in record time. It will be wireless and use LTE on 700 MHz. How is this possible? Well, it depends on some things that are happening in Congress right now, but if the results turn out favorably, and I believe they will, this will be a solid opportunity for rural power companies, telcos, ISPs, and others that serve rural America today.

How will this work? Public safety is engaged in a debate with the FCC and Congress to add the 700 MHz D Block to its existing 10 MHz of spectrum to have a full 20 MHz of broadband spectrum. This spectrum is necessary for video and data services in most of the country, but, in rural America, it could be shared with any and all of those I mentioned above.

My thoughts on this are as follows: Rural power companies already have right-of-ways for their electric lines and high-tension towers that make ideal cell sites. They also serve rural America with fleets of trucks that are available for service calls. If the rural power companies entered into a private/public partnership with the public-safety agencies in their areas and assisted in the buildout of the spectrum (the full 20 MHz), then there would be enough for public safety, which needs it no matter where they are, enough for power companies to use the same network on a secondary basis for their own smart grid, and enough bandwidth to sell both fixed and mobile broadband services to the power customers.

Likewise, rural telcos could participate by partnering with and building out portions of the system. They could then resell service to their customers for fixed and mobile services. ISPs could also get into the game, perhaps using the 700 MHz LTE system in combination with TV white space and Wi-Fi to serve small towns with broadband services.

Public safety would get the network it needs in rural America, and those living and working in rural America would have access to wireless broadband services faster than with any other proposal I have seen. The network could be built more quickly, be cheaper, and provide services where there is no economic incentive to build out commercial wireless networks. Public safety brings spectrum to the table and the core users for the network. Private partners could contribute whatever they have to reduce public safety's cost for the network, and it would be built within a five-year period.

The glitch in all of this is that the reallocation of the D Block and the federal funding of the public-safety network are in the hands of Congress. There are several bills pending in both the House and the Senate to make this happen and the executive branch has expressed its desire to see it accomplished, so what public safety needs are the votes in Congress to get these bills passed, preferably between now and the 10th anniversary of 9/11 this September.

If this makes sense to you, then you should contact your Congressional representatives and tell them you are in favor of the reallocation of the D Block and funding of the public-safety network. This is one of the very few triple-wins (win, win, win) that has come to wireless in a long time. Public safety wins, rural providers win, and the citizens who live and work in rural America win.

We need to provide broadband services to rural America. It is imperative for them and for all of us. They are entitled to the same type of broadband access that those of us who live in the cities and suburbs enjoy today. This plan is a great way to accomplish this, and, for the first time, it becomes economically feasible for all parties concerned. If we wait for more stimulus money (which I don't believe will be forthcoming) it won't happen. Those within the federal and state governments who are working on solving this problem should take a long, hard look at this solution.

Andrew M. Seybold is an authority on technology and trends shaping the world of wireless mobility. A respected analyst, consultant, commentator, author and active participant in industry trade organizations, his views have influenced strategies and shaped initiatives for telecom, mobile computing and wireless industry leaders worldwide.

An opportunity to prepare our country's first responders (The Hill, 5/18/11)
By Peter Rysavy

Several weeks ago the distinguished Chairmen of the 9/11 Commission, Lee Hamilton and Thomas Kean, offered a stark warning to Congress, "The inability of first responders to communicate with each other was a critical failure on 9/11 … [that caused] needless loss of life."

The only realistic option for helping prevent a repeat of that horrific experience is for Congress to move quickly on legislation that will enable a national broadband network for emergency services by reallocating a portion of the nation's radio spectrum, specifically the 10 MHz D Block (758-763 MHz and 788-793 MHz) to public safety. Virtually every first responder organization has endorsed this option, including the Fraternal Order of Police and International Association of Fire Chiefs.

This public safety broadband network would enable first responders to seamlessly communicate with one another across the country. That is something that has been elusive in the past. There is a path forward before the nation now.

Discussions of radio spectrum are often dry, technical matters, which is why Hamilton and Kean deserve credit for the bluntness of their warning. Nearly ten years after those 2001 attacks, our first responders still do not have a nationwide, dedicated system to communicate with each other. In layperson's terms, that means rescue teams coordinating real-time emergency responses cannot access the instant data communication that ordinary cell phone users have used for years.

Think of the implications for police, fire, and rescue teams as they try to coordinate emergency responses to the volatile tornadoes that tore through southern states, or the forest fires that raged through Texas, or another devastating hurricane like Katrina. Regardless of whether the emergency communication is voice or data, it has to be reliable, instant and accessible by officials from across a state or even, as is often the case with forest fires, across entire regions. It also has to be accessible by officials from local, state and federal agencies, which currently do not use a single standard handset.

The reasons why allocating the D block to public safety makes sense are easy to understand. A dedicated public safety network using paired spectrum in the 700 MHz band establishes the capacity to support the bandwidth intensive uses public safety officials need; it reduces the costs to deploy an interoperable network; and it enables more dependable network operation than otherwise possible.

To put this in context, consider that the current bandwidth set aside for public safety could be quickly consumed by just a handful of emergency responders convening on the same location. Once bandwidth is consumed, the network can no longer operate reliably. Applications will run extremely slowly, possibly fail entirely or worse yet, require a full-system restart. The result will be seriously degraded communication – or worse, no ability to communicate – during situations when rescues are being coordinated and lives are at stake.

There is another technical issue driving this debate. While commercial wireless operators can design networks based on projected usage patterns, emergency networks must be ready to sustain sudden bursts of communications as first responders convene on a disaster. Public safety communications require more robust and resilient network architecture than is typically deployed by commercial service providers.

Fortunately, there is bipartisan momentum in Congress to reallocate the D block to enable the kind of dedicated, national wireless broadband network first responders need. Sens. Jay Rockefeller (D-W.Va.), Joe Lieberman (I-Conn.) and John McCain (R-Ariz.) have all introduced legislation, as have Reps. Peter King (R-N.Y.) and Bennie Thompson (D-Miss.). President Obama himself endorsed the concept this spring.

As 9/11 Commission Chairmen Hamilton and Kean emphasized to Congress, lives are at stake. We saw during 9-11 and Katrina how quickly wireless networks can become overloaded during emergencies, leaving both the public and our responders unable to communicate.

This is a vitally important decision, and an once-in-a-lifetime opportunity to arm our country's first responders with the mobile high-tech capabilities they need. We should not squander this incredible opportunity as a nation.

Peter Rysavy is a wireless technology consultant and president of Rysavy Research.

Attention Congress: We Need More Phone Spectrum, And Soon (Forbes, 5/4/11)
By Lawrence J. Spiwak, Phoenix Center
http://blogs.forbes.com/ericsavitz/2011/05/04/attention-congress-we-need-more-phone-spectrum-and-soon/

Americans love their mobile devices. With the rapid adoption of smartphones and tablets, the amount of data transmitted across mobile devices has exploded by 8,000% in four years on some networks, and experts expect demand to continue to increase exponentially over the coming years. However, as we demand more wireless broadband, the amount of spectrum available for these uses is rapidly becoming crowded, to the point where engineers are beginning to speak of "spectrum exhaustion." So as consumers switch from traditional mobile voice service to 4G broadband services, not only do providers need more spectrum, but this spectrum needs to be made available in large, contiguous blocks in order to maximize spectral efficiencies and to minimize network deployment costs.

With some carriers anticipating total spectrum exhaustion in their busiest markets by 2014 – just three years away – is there a solution to this looming problem?

In the short run, carriers have taken steps to manage spectrum more efficiently by splitting cell sites, offloading traffic onto local WiFi connections and upgrading back-haul networks. Similarly, carriers have introduced tiered pricing plans and data caps to curb demand usage. Neither of these options truly solves the problem, however.

The longer-range solution is for the federal government toc re-purpose unused and underused radio spectrum for mobile broadband purposes. Already, the Obama Administration in conjunction with the Federal Communications Commission has proposed to free up 500 MHz of spectrum for commercial use over the next 10 years, and the National Telecommunications and Information Administration, the government entity charged with overseeing federal spectrum usage, has identified 115 MHz to make available over the next five years. To make all of this happen, however, we need help from Congress. Senator Jay Rockefeller, chairman of the Senate Commerce Committee, has a proposal that might just be a win-win for everybody.

Under the Rockefeller plan, Congress would give the FCC the authority to hold "incentive" auctions to entice broadcasters to relinquish voluntarily some or all of their valuable spectrum in exchange for a portion of the auction revenue received. Broadcasters presently use 200 MHz of spectrum to provide over-the-air service to approximately 10 million American households. In contrast, wireless providers can access slightly more than 400 MHz of spectrum to serve a growing base of 292 million subscribers.

Rockefeller's proposal has some distinct advantages. First and foremost, because incentive auctions are 100% voluntary, Rockefeller's proposal takes the political fight of whether broadcasting is the best use of the nation's airways off the table. Second, unlike the recent DTV transition, the primary broadcast TV signals would not change, nor would consumers be required to purchase new equipment.

Finally, but perhaps most importantly, spectrum incentive auctions can deliver much needed revenue to the U.S. Treasury.

But there is more to the story. While commercial operators are facing spectrum exhaustion, it is a little-known fact that our first responders are facing the same problem. As we saw on September 11 and during Hurricane Katrina, the inability of public safety agencies to communicate quickly and effectively with each other needlessly cost lives. Leaders such as Tom Kean and Lee Hamilton, the co-chairs of the 9/11 Commission, have joined hundreds of public safety organizations around the country in calling for more spectrum to public safety.

Under Senator Rockefeller's plan, the FCC would also reallocate a 10 MHz block of spectrum (known inside the Beltway as the "D Block") for public safety use, thus providing first responders with a single 20 MHz block of contiguous, dedicated high-quality spectrum to operate their network. While some would argue that we should not be giving spectrum away to anyone, the fact is that Rockefeller's proposal will save taxpayers significant costs in the long-run by maximizing spectral efficiency today over having to pay for a more expensive network tomorrow that must accommodate a wide variety of non-contiguous radio bands.

Like it or not, the clock is ticking on spectrum exhaustion, both for consumers and our public safety professionals. Unless we want a market characterized by higher prices, failed data sessions, dropped calls and stifled innovation, policymakers need to implement a cohesive spectrum policy with a large degree of urgency.

Ten years later and still no solution (The Hill, 9/12/11)
By Sen. Kay Bailey Hutchison (R-Texas)
http://thehill.com/opinion/op-ed/181055-ten-years-later-and-still-no-solution

America saw the bravery and dedication of our country's first responders 10 years ago when terrorism struck. The same courage has been exhibited every day since 9/11 by police, firefighters and other emergency personnel who continue to face danger in order to protect us.

Robust and reliable communications is one of the most important tools these brave men and women use to keep us safe. Unfortunately, the inability of first responders to communicate with each other led to needless loss of life on Sept. 11. The 9/11 Commission made resolution of this problem a key recommendation in their report to Congress. They urged Congress to make additional radio spectrum available for public safety purposes to help improve radio interoperability.

Yet, 10 years later, that recommendation remains unfulfilled, and a lack of interoperability continues to hamper the efforts of first responders today.

We have all heard stories about responders resorting to hand-written notes passed across rubble piles during disasters because their devices are incapable of communicating with other responders. As emergency personnel rush to protect lives and property during hurricanes, earthquakes, wildfires, terrorist attacks and other emergency situations, it is unconscionable that they have to do so with decades-old technology and subpar connectivity.

Today, America leads the world in technological capabilities. Every corner coffee shop advertises free Wi-Fi and teenagers have smartphones, yet our police and firefighters are forced to use outdated communications in their duties. This is unacceptable, and the time has come for our public service networks to have parity with commercial offerings.

To rectify this situation, Sen. John Rockefeller (D-W.Va.) and I introduced the Public Safety Spectrum and Wireless Innovation Act, S. 911, which provides America's first responders with the dedicated spectrum and funding necessary to deploy an interoperable wireless broadband network for public safety use. It will help also to create new jobs and reduce the deficit. Our bill received overwhelming bipartisan support in the Senate Commerce Committee and has the broad bipartisan support of numerous governors, mayors, and public safety organizations across the country.

In particular, S. 911 would allocate the critical D Block of spectrum to public safety so they have sufficient bandwidth to meet current and future wireless broadband needs. Some people argue that this spectrum band should be auctioned for commercial use, but such an approach is pennywise and pound-foolish. This legislation would auction other spectrum blocks, contributing an estimated $6.5 billion to debt reduction. We are confident, however, that number will increase significantly with further modifications to S. 911.

Just as demand for spectrum in the commercial sector is increasing, public safety's wireless broadband needs are going to grow rapidly over the next decade, exhausting the capacity of their current spectrum supply. Studies show that without the D Block, police and firefighters will struggle to meet even day-to-day community public safety challenges like bus crashes, apartment building fires, bank robberies, coal mine collapses and multicar accidents. If everyday incidents will overload public safety broadband networks without the D Block, how can first responders be expected to communicate during catastrophic emergencies like another terrorist attack or large natural disaster?

S. 911 addresses the wireless industry's urgent need for more bandwidth by reallocating hundreds of megahertz of additional spectrum for mobile broadband purposes. The Congressional Budget Office has said that our bill would be completely paid for by spectrum auction proceeds and would actually bring in billions of dollars for deficit reduction.

Studies indicate also that pumping additional spectrum into the marketplace will spur massive private sector investment, generating hundreds of thousands of new jobs and hundreds of billions of dollars in new economic activity. With unemployment above 9 percent, this is exactly the kind of job-creating boost that our economy needs right now.

This critical legislation can create new jobs, grow the economy, reduce our massive fiscal deficit and provide first responders with the tools they need to make every American safer. Working in a bipartisan fashion to enact such legislation is the sort of leadership that Americans desperately want from Congress today. America's first responders face danger on our behalf without hesitation; they surely deserve Congress's best efforts in return.

Hutchison is the ranking member of the Senate Commerce, Science and Transportation Committee.

We don't need to auction the D block spectrum for public safety (*Red State*, 3/30/11)
We must avoid cargo cult markets
Posted by Neil Stevens
http://www.redstate.com/neil_stevens/2011/03/30/we-dont-need-to-auction-the-d-block-spectrum-for-public-safety/

Remember the Digital TV transition? That was when we took advantage of improved technology by making all the broadcast TV stations give up their old, huge blocks of wireless spectrum, in exchange for receiving new, narrower blocks. By making the switch, we made room for new wireless technologies to bloom.

That room was split into 5 "blocks." The C block, for example, was auctioned off to Verizon, who's using it for 4G LTE wireless Internet. The B block has been bought up heavily by AT&T for the same use. However the D block went unsold. When it went up for auction, nobody even met the reserve price, so today the D block remains available.

After 9/11, we learned that we need to make more spectrum available to first responders. The D block would work great for that purpose. So why don't we just hand out the D block to first responders across the country? You'd think that'd be obvious, but unfortunately some Republicans are hesitant.

Instead of just showing leadership and doing what we need to do for honest-to-goodness civil defense, we're playing with cargo cult markets.

Here's what the chairmen of the 9/11 Commission, Thomas Kean and Lee Hamilton, told the Senate on the matter:

> The inability of first responders to communicate with each other was a critical failure on 9/11. Incompatible and inadequate communications led to needless loss of life. To remedy this failure, the Commission recommended legislation to provide for the expedited and increased assignment of radio spectrum for public safety purposes.
>
> To date, this recommendation languishes. We find this unacceptable, because quite literally lives are at stake. The political fight has been over whether to allocate spectrum directly to public safety or auction it off to wireless bidders who would then be required to pay for a nationwide public safety communications network.
>
> Initially, some advances were made when 10 MHZ of radio spectrum were allocated to public safety. The overwhelming majority of our nation's police chiefs and first responders, however, support the allocation of an additional 10 MHz of radio spectrum—the "D block"—to the existing dedicated public safety spectrum. Public safety agencies would be able to use the D block spectrum to build a nationwide interoperable broadband spectrum, allowing diverse agencies to communicate with each other, and supporting mission critical voice, video, text, and other data transmissions.
>
> In his State of the Union address, President Obama called for allocating the D block spectrum to public safety. He also supports allocating $7 billion in federal funding to support a build-out of the network to ensure it reaches cash-strapped localities, especially rural communities.
>
> We support the immediate allocation of the D-block spectrum to public safety. We must not approach these urgent matters at a leisurely pace. We don't know when the next attack or disaster will strike. Further delay is intolerable. We urge the Congress to act.

This is something we can just do. Nothing is stopping us from giving the D block out to state and local governments to apply the lessons of 9/11. However some of us are hesitant. We hear talk of assigning spectrum and we oppose it, because one of the great policy successes of the FCC in recent years has been the auctioning of spectrum to the private sector.

However we're not talking about giving away the D block to the private sector. We're talking about giving it away for public safety. If we were to put it up to auction, we'd literally be having the government charge the government for a government service. We wouldn't make our troops in Afghanistan pay for bullets. Why make firefighters pay for their emergency wireless telecommunications spectrum?

It all comes down to the fact that we're conservatives. While we mistrust government, we're not categorically opposed to government. It's alright for a legitimate government action to happen without a fig leaf of a market in front of it. We shouldn't pretend to privatize civil defense by creating sham auctions to allocate needed spectrum. It's time we got behind allocating the D block to first responders without any needless delays or hoops.

Why D-Block allocation matters (*PoliceOne*, 2/10/11)
Editor's Corner with PoliceOne Senior Editor Doug Wyllie
http://www.policeone.com/columnists/Doug-Wyllie/articles/3326502-Why-D-Block-allocation-matters/

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs

Let's pause for a brief reminder about why D-Block allocation matters (or should) to cops.

1. Safety: Commercial networks now used by public safety agencies cannot fulfill mission-critical police, fire, and EMS operations needed during a large-scale emergency — they're simply not built to public safety standards of uptime, availability, and redundancy. These systems are not particularly fragile in normal circumstances, but we know that in a major catastrophe, everyone (and their cousin) will be trying to use the carrier network to contact friends and relatives to "see if they're okay." So, during a major emergency, when they would be most needed, the existing broadband communications systems would simply fail, putting first responders' lives at risk. Needless to say, this totally unacceptable.

2. Efficiency: The fact of the matter is that public safety needs a full 20MHz of 700MHz spectrum to build a robust nationwide broadband network capable of carrying data, video, and eventually one day, voice transmissions. The 10 MHz D-Block is immediately next door to the existing 10 MHz of 700 MHz already occupied by public safety, and simply extending the build to the D-Block would completely eliminate a host of technical issues (radio interference is just one problem you'd get from building on two distinctly separate 10 MHz bands as opposed to a single 20 MHz swath) and significantly reduce cost and complexity of building the network.

3. Timing: Now, finally, the concept has support from the President of the United States. During a speech at Northern Michigan University, in Marquette (Mich.), Obama officially threw his support behind an initiative that was originally called for by the 9/11 Commission more than seven years ago. Almost at the same time that Obama was stumping for the cause of D-Block allocation to public safety, Representative Peter King of New York — who serves as House Homeland Security Chairman — reintroduced a bill to devote that very same (and very valuable) swath of 700MHz wireless broadband spectrum to public safety agencies for the purpose of building a nationwide, interoperable mobile broadband network. Representative King was joined by Representative Bennie Thompson of Mississippi in the introduction of the Broadband for First Responder's Act of 2011 (H.R. 607).

Recall that in mid-2010, Senator Jay Rockefeller (D – W.V.) introduced the Public Safety Spectrum and Wireless Innovation Act of 2010 (S. 3756), which builds on several proposed pieces of legislation already gaining momentum in Congress including the First Responders Protection Act of 2010 (S. 3625) and Broadband for First Responders Act of 2010 (H.R. 5081). In early 2011, Rockefeller reintroduced the bill for consideration. Rockefeller's bill would, among other things, allocate the D-Block to public safety, establish a means by which technical standards would be developed, and perhaps most importantly, fund the construction and maintenance of the nationwide interoperable wireless broadband public safety network.

Assuming that the White House, Senate, and House plans coalesce as it presently appears they will, the 20MHz-wide, national, interoperable, wireless broadband network it produces would provide law enforcement and (other public safety agencies) with one of the key tools that has been missing in their mission of protecting lives in communities throughout the United States.

Admittedly, reasons two and three are a little esoteric, but that first reason alone should be enough for 99.99 percent of police officers to get behind this issue in one form or another. Just for good measure, here's a fourth reason for your consideration:

4. Cold, Rational Logic: The major telecommunications companies voted a resounding "no thanks" the last time this segment of spectrum came up for auction in Spring 2008. To do the same thing over and over and expect a different result is Einstein's definition of insanity. Let's not be insane and instead do what must be done — work very hard in the next few weeks and months to press Congress to pass legislation that will allocate the D-Block to public safety and provide funding needed to build and maintain a nationwide broadband network for public safety.

Allocation of the D-Block of 700 MHz wireless broadband spectrum seems to be imminently upon us. As was reported in this space late last month (and previously here, and here, and here), the march toward allocation of the D-Block to public safety has been about as slow as molasses going uphill in wintertime. But now, it seems to have finally hit a double-time stride.

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

About the author
Doug Wyllie is editor of PoliceOne, responsible for setting the editorial direction of the website and managing the planned editorial features by our roster of expert writers. In addition to his editorial and managerial responsibilities, Doug has authored more than 250 feature articles and tactical tips on a wide range of topics and trends that affect the law enforcement community. Doug is a member of the California Peace Officers' Association and is active in his support for the law enforcement community, contributing his time and talents toward police-related charitable events as well as participating in force-on-force training, search-and-rescue training, and other scenario-based training designed to prepare cops for the fight they face every day on the street.

First responders need updated communication technology (Kalamazoo Gazette, 7/3/11)
By Bradley A. Stoddard, director of the Michigan Public Safety Communications System

A year ago, a massive brush fire in Roscommon and Crawford counties forced residents of a nursing home to evacuate. Local firefighters and first responders rushed to the scene and moved residents to safety as they quickly worked to contain the fire. While the flames destroyed hundreds of acres of land, as well as countless structures and personal items, not one life was lost. Michigan was fortunate -- but luck won't always cut it.

When a large-scale disaster or complex emergency situation occurs in Michigan, police officers, firefighters and EMS workers must have the ability to communicate in real-time with voice, video and data -- essential for carrying out skilled rescue efforts and saving lives. Michigan's first responders have statewide access to leading voice communications technologies, but lack high-speed data communications, which so many of us use on a daily basis on our smartphones, netbooks and tablets. Thousands more public safety workers across the country lack both high-speed voice and data networks that provide critical communications capabilities. Instead, they are stuck with aging, low-speed equipment and disparate radio frequencies that often prevent them from talking with each other, sharing information and coordinating efforts.

Nearly 10 years after the 9/11 terrorist attacks thrust the issue of public safety communications into the national spotlight, interoperability is still a challenge across the nation.

When responding to disasters and emergencies, our first responders deserve to be equipped with state-of-the-art voice and data communications systems; police, fire and EMS need a dedicated, nationwide, interoperable wireless broadband network to help them help you in times of need. An advanced data network would, for example, allow first responders to stream real-time video of an emergency scene in order to locate injured victims. It would mean seamless support for delivering medical care to the injured and coordination of a more effective response across organizations and county lines.

This type of network should be dedicated to public safety's exclusive use, rather than shared by a wide range of users like in existing commercially operated systems. Enabling use of the most modern, sophisticated and robust wireless applications available via a data network that prioritizes the needs of public safety will save lives in Michigan. Concurrently, the general public would still be able to communicate with loved ones during a time of crisis with this approach.

The first step to making this network a reality rests with the federal government. It has a one-time opportunity to reallocate wireless spectrum to public safety operations. Now, in both the U.S. Senate and House of Representatives, bipartisan legislation has been introduced to reallocate an additional 10 megahertz of spectrum (referred to as the "D Block") for public safety's use. Lawmakers across party lines understand the proposed legislation backing D Block reallocation is a must for public safety and the American taxpayer.

How public safety supports citizens and protects the nation has greatly changed in the past decade; technology has become the fundamental component to aid in their respective efforts. And as more and more first responders have lost jobs due to funding challenges, the need for higher technology standards has never been greater. Availability and use of high-speed broadband Internet technology should no longer be a benefit limited to those in large cities; those in rural America deserve the same opportunities.

Reallocation of the D Block to public safety builds a foundation for the protection of our borders and support of our people. This spectrum is a critical data highway for all levels of first responders, from local volunteers to the federal government.

The decision to reallocate D Block spectrum to public safety requires congressional action. Michigan's lawmakers should support the brave men and women of our state that work to keep us safe every day by listening to their needs and urging the reallocation of D Block spectrum. This isn't a field of dreams; Congress can deliver now in preparation for tomorrow.

Bringing First Responder Communications Into the 21st Century (Huffington Post, 7/21/11)
By Sen. Kirsten Gillibrand (D-NY)
http://www.huffingtonpost.com/rep-kirsten-gillibrand/bringing-first-responder_b_905730.html?ir=Yahoo

New Yorkers know better than anyone the constant threat that our country faces. As we've seen time and again, New York continues to be the number one target for terrorists around the world who want to harm Americans.

That's why, as the Senator from New York, I am extremely concerned that we not forget the lessons of 9/11.

One important lesson we learned on that horrific day was how crucial it is that our first responders can communicate in real time between agencies in a time of emergency. We have the best firefighters, police officers, emergency medical technicians and public safety professionals in the world, yet currently they communicate on different frequencies and with different systems -- creating barriers to providing a coordinated and efficient response during a crisis.

The 9/11 commission identified insufficient interoperability among communications systems used by first responders during the attacks and rescue efforts as a major problem that needed to be fixed.

Yet here we are nearly ten years later and Congress has failed to implement this recommendation.

The fact is, a teenager with a smartphone can share more information more quickly than our emergency responders can. This is unacceptable. It's time to bring first responder communications into the 21st century.

Yesterday, I stood with Senator Jay Rockefeller (D-WV), who has been a dedicated leader in this effort, Senator Charles Schumer (D-NY), Rep. Peter King (R-NY) and some our brave first responders to renew our call on Congress to pass the Public Safety Spectrum and Wireless Innovation Act before the 10th Anniversary of 9/11.

This bipartisan legislation creates the framework for the deployment of a nationwide, interoperable, wireless broadband network for public safety by allocating 10 megahertz of spectrum, known as the "D-block," for emergency communications.

This nationwide interoperable broadband network would finally enable our brave first responders to communicate across jurisdictions, share critical data such as video feeds and up-to-date information in real-time -- making complex operations easier and safer.

The "D-block" would arm our men and women on the ground with the technology needed to share and disseminate information quickly and seamlessly, including receiving background checks, fingerprints, photos, and videos instantly.

This bill would also generate the necessary revenue to pay for the development and deployment of this network through FCC auctions of the spectrum. So, not only does this bill not cost taxpayers a dime, but the CBO estimates it will actually reduce the deficit by $6.5 billion between 2012-2021. Which is why this bill has attracted support from Republicans and Democrats alike.

Just as we did with the 9/11 health bill for our heroes, Congress must come together, put public safety ahead of politics, and pass this bi-partisan legislation. And we should do it by the 10th anniversary of 9/11.

Police Chiefs Applaud Representatives King And Thompson For Introduction Of Legislation Allocating D-Block Spectrum To Public Safety (Press Release, 2/14/11)
International Association of Chiefs of Police
http://www.corrections.com/news/article/27798-police-chiefs-applaud-representatives-king-and-thompson-for-introduction-of-legislation-allocating-d-block-spectrum-to-public-safety

Alexandria, VA -- The International Association of Chiefs of Police (IACP) applauds Representative Peter King (NY-3) and Representative Bennie Thompson (MS-2) for introducing the Broadband for First Responder's Act of 2011 (H.R. 607), which will allocate D-Block spectrum to public safety for the development of a national interoperable public safety broadband network.

Mark Marshall, IACP President and Chief of the Smithfield, VA, Police Department said, "The IACP fully supports this legislation by Representatives King and Thompson. We urge other members of Congress to sign on as co-sponsors of the legislation and support our efforts to have the 700 MHz D-Block spectrum allocated to the nationwide Public Safety Broadband License."

Law enforcement and public safety must have a minimum of 20 MHz of broadband spectrum to meet current and future needs and must have access to new technologies to perform increasingly complex duties. These technologies must have adequate and dedicated spectrum that is managed and controlled by public safety to ensure that they will be more secure and reliable than commercial systems. The D-Block allocation is essential if we are to meet the critical needs of our nation's law enforcement and public safety community.

The International Association of Chiefs of Police is the world's oldest and largest association of law enforcement executives. Founded in 1893, the IACP has more than 20,000 members in over 100 countries.

It's Way Past Time to Create a National Wireless Public Safety Network (IT Business Edge, 2/1/11)
Posted by Carl Weinschenk
http://www.itbusinessedge.com/cm/blogs/weinschenk/its-way-past-time-to-create-a-national-wireless-public-safety-network/?cs=45348

Some things seem to just take too long. NewsFactor carries an Associated Press report that says the White House is backing a plan to dedicate 10 MHz of spectrum – the "D" block, according to the story – for a nationwide wireless public safety network.

The story provides good detail about the political and regulatory machinations, including the fact that a 10 MHz block already exists for this purpose. Putting the two side by side will constitute a good foundation going forward, according to the piece. The story says that Sen. Jay Rockefeller (D-W.VA) has introduced legislation to make this happen.

The reaction is that setting aside bandwidth for first responders and other emergency personnel undoubtedly is terrific. The second reaction – which occurs about a nanosecond after the first – is to ask: Why it is taking so long? Shouldn't such a network have been created sooner, say about a week after 9/11?

On one level, it is possible to say that a swatch (or two) of bandwidth as big as what the government is talking about wasn't available until recently. Perhaps. But there is no doubt that a way to cobble together enough bandwidth to let firefighters, police, emergency personnel and others communicate fully could have been found. Remember, these folks help people every year, during hurricanes and other weather-related emergencies.

With the emergence of advanced wireless networks, schematics of buildings and video from security cameras can be sent to first responders in route and other helpful steps can be taken. There simply is no reason such technology isn't common in the world of tablets, smartphones and other advanced devices.

The administration's backing of the use of D-block for a national public safety network isn't the only recent news in this area. Last week, the FCC decided that Long Term Evolution (LTE) – the leading 4G networking platform – will be used for the network. That's no surprise, but still is important. Subsequently, at least one company – Alepo – has introduced equipment that optimizes LTE for emergency uses.

The bottom line here is pretty simple: Get it done. Slade Gorton, a former Republican congressman from Washington who calls himself a fiscal conservative, also mentioned 9/11 in a guest editorial in The Seattle Times. He is in favor of the FCC's approach:

While the 112th Congress may be sharply divided over many issues, both parties have an opportunity to address this vital national-security priority by supporting the FCC's broadband plan for public-safety communications. Quite simply, I believe it is the best way to guarantee that a national interoperable network is built for first responders in both urban and rural areas.

The good news is that a fairly thorough Google search turned up no stories of any systemic communications failure during the Tucson tragedy last month. As horrible as it was, the actual shooting was over quickly. It is entirely possible that a longer-term event would have resulted in the same issues. The message is clear: It is time to create a network to meet first responders' needs. Indeed, it was time a decade ago.

D Block Spectrum: Setting the Record Straight

The Public Safety Alliance (PSA) is setting the record straight on the top five D Block Spectrum Myths. We are working together with more than 27 of the nation's leading public safety and state and local government associations to support legislation that would allocate this spectrum to America's first responders to build a nationwide interoperable broadband network.

"We support the immediate allocation of the D-block spectrum to public safety. We must not approach these urgent matters at a leisurely pace. We don't know when the next attack or disaster will strike. Further delay is intolerable. We urge the Congress to act."

–Thomas Kean and Lee Hamilton, Chairmen of the 9/11 Commission

Congressional Supporters of Public Safety include:

Senator Jay Rockefeller (D-WV), Senator Kay Bailey Hutchison (R-TX), Senator John McCain (R-AZ), Senator Joseph Lieberman (I-CT), Senator Harry Reid (D-NV), Senator Charles E. Schumer (D-NY), Senator Kirsten Gillibrand (D-NY), Senator Amy Klobuchar (D_MN), and Senator Barbara Boxer (D-CA), Senator Michael Bennet (D-CO), Senator Benjamin Cardin (D-MD), Senator Al Franken (D-MN), Senator Thomas Harkin (D-IA), Senator John Kerry (D-MA), Senator Frank Lautenberg (D-NJ), Senator Bill Nelson (D-FL), Representative Peter King (R-NY3), Representative Bennie Thompson (D-MS2), Representative John Barrow (D-GA12), Representative Shelley Berkley (D-NV1), Representative Leonard Boswell (D-IA3), Representative Vern Buchanan (R-FL13), Representative Yvette Clarke (D-NY11), Representative Chip Cravaack (R-MN8), Representative Keith Ellison (D-MN5), Representative Jim Gerlach (R-PA6), Representative Michael Grimm (R-NY13), Representative Jesse Jackson (D-IL2), Representative Sheila Jackson-Lee (D-TX18), Representative Eddie Johnson (D-TX30), Representative James Langevin (D-RI2), Representative Thomas Latham (R-IA4), Representative David Loebsack (D-IA2), Representative Billy Long (R-MO7), Representative Nita Lowey (D-NY18), Representative Carolyn McCarthy (D-NY4), Representative John Mica (R-FL7), Representative Michael Michaud (D-ME2), Representative Candice Miller (R-MI10), Representative Erik Paulsen (R-MN3), Representative Dave Reichert (R-WA8), Representative Laura Richardson (D-CA37), Representative Michael Rogers (R-AL3), Representative Heath Shuler (D-NC11), Representative Edolphus Towns (D-NY10), Representative Rob Wittman (R-VA1), and Representative Donald Young (R-AK).

The main goals reflected in H.R. 607, S.28, S.1040 and S.911 – allocating D Block to public safety and providing funding for network build out derived from revenue generated by auction of other spectrum as the top priority -- have earned bi-partisan backing including President Obama, Sens. McCain and Lieberman, Chairmen of the 9/11 Commission Gov. Tom Kean and Rep. Lee Hamilton, Senate Commerce, Science, and Transportation Committee Chairman John Rockefeller, Ranking member Sen. Kay Bailey Hutchison, House Homeland Security Chairman Rep. Peter King and Ranking member Rep. Bennie Thompson, as well as approximately another 30 Members of Congress as co-sponsors, and from both sides of the aisle.

D Block Spectrum: Facts vs. Myths

1. MYTH: Building out a nationwide public safety network will cost $30 to $45 billion.
   FACT: In its Broadband Network Cost Model, the FCC provided a range of cost estimates from $7.8B to $47.5B to build and operate a public safety network for over a ten-year period. This myth stems from taking the *worst case scenario* from the FCC's model, which assumed building brand new cell sites requiring zoning, permits and construction of a towers and facilities. The fact is that public safety fully intends to leverage its existing facilities wherever possible and will augment with existing commercial facilities when needed. The fact is that building a 20 MHz network would cost approximately the same amount as building a 10 MHz network. We agree with

Congressional leaders that the $10 to $12 billion in federal funding for network construction and sustainment reflected in S.1040, S.28 and H.R. 607 is adequate.

2. MYTH: Managing a public safety network may require a new federal bureaucracy.
FACT: There are no proposals to create a federal agency for the public safety broadband network. The PSA has consistently advocated that the network should be managed by public safety with the private sector in a public-private partnership. Proposed legislation addresses this through a non-profit corporation that would transition over the current public safety broadband license (PSBL) and combine it with the D Block within the non-profit's authority.

3. MYTH: America's public safety community lacks a rollout plan for deploying a nationwide interoperable network.
FACT: Once the spectrum has been allocated and a specific funding model established, the PSA has a plan to establish a nationwide outreach and coordination effort that will document every eligible public safety entity contact and their readiness for broadband. The public safety community is eager and ready to deploy this 21st Century network in order to protect our citizens and save lives.

4. MYTH: A commercial D-Block auction process will help ease the federal deficit.
FACT: A commercial D-Block auction process will actually cost taxpayers significantly more than allocating the D Block to public safety. An analysis by The Phoenix Center[i] suggests that the loss of auction revenues today is more than offset by higher auction revenues and lower public safety network deployment costs tomorrow. Thus, the auction adds, rather than relieves stress to the public budget. The study, conducted by a noted economist and former high-level FCC official, also found that assigning the D Block to public safety provides at least $3.4B more in social benefits as opposed to an auction. Additionally, the FCC has stated that public safety will need more than 10 MHz for broadband in the future, and we know that it cost no more to build out 20 MHz than 10 MHz for LTE when the spectrum is contiguous and is built out together. Yet, if the D Block is not allocated to public safety and not joined with the current and contiguous 10 MHz that public safety has repurposed for broadband already within the 700 band, then it will cost more than twice as much to identify and build out an additional 10 MHz of noncontiguous spectrum in the future.

5. MYTH: Connect Public Safety Now is a credible and legitimate voice for the public safety community.
FACT: Connect Public Safety Now has *no* connection to public safety. CPSN is a front group for cellular industry heavy-hitters including Sprint Nextel and is still operating on funding provided by T-Mobile before they withdrew from the coalition. Its goal is to have the D Block auctioned for commercial use, to bid on the spectrum and ultimately use it to increase its own corporate profits and shareholder value through unrestricted commercial use. The coalition does not care to provide public-safety grade, mission-critical network capabilities that public safety requires such as higher security, redundancy, "ruthless preemption" level priority access, roaming, build out to geography vs. population (meaning equal priority for rural areas) and back-up requirements.

Public safety's approach, the public-private partnership which the National Broadband Plan proposed to abandon, creates competition and jobs, enhances public safety and reduces the deficit. CPSN's plan jeopardizes all else just to try to create competition, and at its best, may only get them part of the way there with only 10 MHz.

To learn more please visit: http://www.psafirst.org/

[i] To view the Phoenix Center study visit: http://www.phoenix-center.org/PolicyBulletin/PCPB26Final.pdf.

International Association of Chiefs of Police | International Association of Fire Chiefs
National Sheriffs' Association | Major Cities Chiefs Association
Major County Sheriffs' Association | Metropolitan Fire Chiefs Association
Association of Public-Safety Communications Officials International
National Emergency Management Association | National Association of State EMS Officials

COMMENTARY e-newsletter

Cell Phones and Nature

09.01.2011 by Andrew M. Seybold

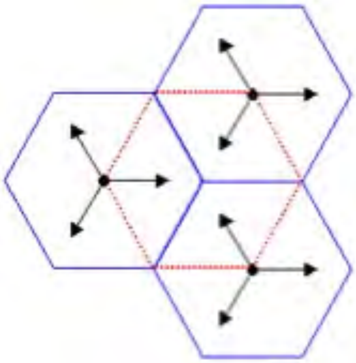
The East Coast has suffered a double whammy as we all know. First was the 5.8 earthquake followed by Hurricane Irene, which was not as bad as was feared but still bad enough that the damage will take a long time to repair. Both of these events caused problems for the commercial wireless networks but in very different ways, pointing out the major differences between network overload and cell site failures.

In both of these cases there were network issues. During the earthquake the problem was simple: The networks stayed up but they were overloaded and could not process all of the requests for service. This is the same scenario that has been experienced with landline phones for years. Remember how difficult it used to be to get a dial tone on Mother's Day? Perhaps you remember when after an earthquake in California or during the wildland fires you could not get a call through to your relatives using the wired network?

While the cause of wired and wireless phone system overloads are different, the results are the same. The network is up and running but the number of people trying to make calls simply overwhelms the network. In the case of wired phones, the reason is that after your dedicated line reaches the nearest central office your call is joined with all of the other calls on a cable or microwave link. This link transfers the requests and the calls overloaded the link since all of these systems are built on the premise that not all phone users will want to make a phone call at exactly the same time. Therefore, the wired phone systems were designed to handle a normal, expected traffic load with extra capacity for peak call periods, but they were not designed for times when demand is unusually high. The lines and switches were jammed and people could not get dial tone and had to wait until the demand subsided.

> What happened during the earthquake was that everyone reached for their phones at once. The networks worked perfectly during the aftermath of the quake but they were simply overloaded on both the voice and the data side. Calls could not be made or received, calls were dropped, video taken of damage could not be sent, and SMS messages did not get through.

The difference between wired and wireless network overloading is that in the wireless network the overloading happens when too many people are trying to use the network in a small area. Each cell site is typically made up of three sectors, each covering a 120-degree portion of the surrounding area (see diagram below).



This diagram depicts three cell sites with each site divided into three sectors. Each of the sectors has the same capacity as the others.

Each sector can handle a maximum loading within it. For the sake of simplicity, let's assume that within each sector the maximum number of voice calls that can be handled is 100. A sector's normal traffic load might be thirty calls at the same time, peaking at sixty calls in a single cell sector during busy periods. Good cellular design dictates that reserve capacity be built into each cell sector so that others entering that sector from another have capacity on the new sector and are not disconnected as they move from sector to sector.

The sector becomes overloaded when demand for service exceeds the maximum number of calls that can be processed in that sector, in this case 100, so if there are 120 people within the sector some will not have network access. The way you gain access to the network is that your device (or the network in the case of an incoming call) sends a request on what is typically called the signally channel. This channel is not only used to request a call but also for the network to track the location of the device so it can be found during an inbound call as well as to facilitate the hand-off to the next sector when the phone is moving. In some networks this signaling channel is also used for SMS traffic, which uses some of the capacity of the signaling channel.

If there are too many devices trying to access the network within a cell sector, the signaling channel becomes overloaded and some customers' requests will not even reach the network (this is one reason priority access for public safety is not a viable option). So there are two issues, the total number of calls a sector is capable of handling, and the amount of traffic on the signaling channel. Even if more spectrum is allocated to a cell sector, while the number of calls that can be handled by that sector increases, there is still a finite number the sector is capable of processing and completing.

On the data side, even fewer data sessions per sector are normally supported. In normal usage, data bursts to and from the device will permit more customers to make use of the broadband data side of the system. However, if a number of customers are streaming video up or down, the total number of broadband data users is diminished greatly. Even in normal times we have seen the results of cell site sector overloading. AT&T had this type of problem as the iPhone took off a few years ago and many of its customers started using a lot of data services. It is possible that one sector or multiple cell sites are completely overloaded due to demand but calls can still be made and received a few miles away where the demand is less.

What happened during the earthquake was that everyone reached for their phones at once. The networks worked perfectly during the aftermath of the quake but they were simply overloaded on both the voice and the data side. Calls could not be made or received, calls were dropped, video taken of damage could not be sent, and SMS messages did not get through. No matter how much spectrum we have or how robust the commercial operators build these networks, we will have network overloading during major events.

This is not a new problem. You might recall that during the Oklahoma bombing the radio and TV stations were telling people within the affected areas not to use their phones so the commercial systems could be used to augment the public safety channels. During the earthquake, I am not aware of a single cell site failure so the bottom line is that in this instance, the problems experienced were network overloading and this will never be solved no matter how much spectrum we throw at it and no matter how many more cell sites are built. It is not possible for anyone to build a commercial wired or wireless network that will not reach saturation at some point, due to some type of major incident. The same is true, by the way, with the Internet for all of you who plan to rely on it and store all of your data in the cloud.

One advantage to the commercial wireless networks is that the network operators can do some on-the-fly network management. Especially the newer 3G and 4G networks have tools built in that enable pro-active traffic management by changing antenna patterns to shrink the radius of a cell site, to overlap cell sectors in a given area, and to try to balance the load. However, even with all of this new technology there comes a point where a cell sector, and possibly many cell sectors, will be overloaded and this will happen over and over again. It is more severe during an event such as an earthquake because once the event is over, everyone reaches for their phones at once. During a longer incident, say a hurricane, the traffic does not usually peak as quickly and therefore the networks are generally able to handle the additional traffic.

Hurricane Irene

The other advantage to a natural disaster such as a hurricane is that there is advanced warning. In the case of Irene, you can review all of the press releases from the network operators and see that they were all preparing for the worst. They moved equipment around, made sure batteries and generators were operating and had their maximum capacity, and pre-dispatched people and spare parts to areas where the predictions were for the major damage from the storm.

From all of the reports I have seen, the commercial networks, for the most part, withstood what the hurricane threw at them. There were, according to the FCC's records, a number of outages but they were not network-wide and were limited to cell sites that were damaged or flooded, or where the connection between the site and the network was destroyed. The result was that most of the East Coast was able to use the commercial wireless networks. I have not heard of any network overloads simply because the storm was both predicted and lasted so long in most areas.

The sites that went down went down because of wind damage or flooding, or as mentioned, because the link between the cell site and the network was broken. Today, many cell sites, but not all, have battery back-up and many have both batteries and generators. The number of sites with generators depends in large part on the network. Some networks won't build a major site without a generator, others build out the network with key sites having both batteries and generators, but some sites only have battery back-up. Some sites are equipped with battery back-up and provisioned so that a portable generator can be driven to the site and connected. Some of the smaller picocell sites don't have any back-up power at all and if you have a femtocell in your house or office and you lose power, you will probably lose the picocell as well.

It would not matter if every cell site in the United States had massive generators on them. First of all, generators do not operate underwater (one of the big problems during Katrina). Secondly, even if the generator continues to keep the site up, if the link between the site and the network is down then the site, while on and operating, is not functioning and might as well be off. The network operators do the best they can and are very responsive to restoring sites that go down, but sometimes they have to wait for the wired phone company, the fiber company, or even the power company to restore the link to the site before they can bring it back online. As you know, there are still some people without power in various parts of the East Coast and the power companies are working overtime to restore power.

Conclusions

Two different acts of nature caused incidents resulting in two different types of commercial network issues. During the earthquake, the networks stayed up but were overcrowded, a situation that will be repeated regardless of what we do, and the hurricane saw more spot outages due to power and communications links problems. In both cases these types of problems cannot be fixed by an FCC inquiry or a change in the rules, they will continue to happen. There is no such thing as a network that can withstand overcrowding or wind and flooding.

We have all come to rely on our wireless devices, and these incidents underscore our reliance on them. We have to learn to live with the fact that such disruptions will continue to occur. Mother Nature is to blame, not the network operators. In the meantime, what we can learn from this is to not rely 100% on a single form of communications. For my part, I keep four family radio handhelds with good batteries in them for local conditions within my family, and I have been a licensed amateur radio operator since my teens and our local organization provides emergency communications during disasters. We train and we prepare. Our slogan is that "When all else fails there is Amateur radio." It worked during Katrina, in Haiti, and during the recent tornadoes; I will guarantee you that there were amateur radio operators on the air right after the earthquake and again during the hurricane.

Infrastructure-based communications systems will become overloaded or damaged, that is a fact of life. It is also one reason that the public safety community relies on what is known a simplex, or off-network communications (or peer-to-peer for IT types). If their infrastructure is down they are still able to communicate unit-to-unit no matter where they are, over distances of several miles in most cases. Their networks are designed to support this mode of operation and it is one of the reasons commercial cellular networks are not able to provide the type of communications needed by public safety. They simply cannot afford to be without the ability to communicate so they can continue to be effective during any type of emergency

We rely on our wireless devices but incidents such as these should make us more aware that we might not always be able to communicate with them. It is no one's fault, it is a fact of life we have to learn to live with—part of smart disaster planning should include at least one other form of communications for times such as these.

Andrew M. Seybold

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PUBLIC SAFETY ADVOCATE e-newsletter

LTE Support for Mission Critical Voice for Public Safety

06.19.2011 by Andrew M. Seybold

Introduction

LTE or fourth-generation (4G) wireless broadband was designed and implemented primarily as a data over broadband technology. Voice in the form of Voice over IP, which is being designed to implement voice calls in the traditional cellular fashion of dialing a number and completing the call using the LTE network as transport, is being developed. The issue is whether LTE can and will support other types of voice services, specifically Push-To-Talk (PTT) voice and most importantly, PTT off-network, when units are out of coverage of the network or when they need short-range communications in buildings and in other areas where the network does not provide coverage.

The standards for LTE are largely controlled by the 3GPP, an organization made up of hundreds of commercial members including chipset companies, infrastructure vendors, network operators, handset companies, software developers, and others. In order to add mission critical voice requirements to the LTE standard, the Public Safety community must petition the 3GPP for its inclusion AND there must be a number of other members of 3GPP that concur. Once (if) this happens, the amendment to the standard is assigned to a future release of LTE and when that release is being worked on, the amendment will be considered.

> IF LTE broadband can meet both the voice and the data requirements of the first responder community, a single device could be deployed that would provide not only data/video interoperability, but voice interoperability as well. This would be an ideal situation and one that is worth pursing. However, existing narrowband spectrum should not be reallocated for other uses until such time as LTE broadband can and does meet all of the requirements for Public Safety mission critical voice as well as data and video services.

In order for the amendment to the standard to be considered, all of the requirements must be defined and support must be garnered from members of the 3GPP. At present, there is no incentive for network operators that largely drive the direction of 3GPP, to embrace mission critical voice, especially the part of mission critical voice that is of paramount importance to Public Safety: The ability to communicate between devices without having to make use of a network. Commercial network operators are not inclined to agree to this type of voice communications because they won't have control of their customers and the minutes of use cannot be billed to the customer.

Therefore, Public Safety will have a difficult time convincing the 3GPP to address the issue of mission critical voice. If a non-standard workaround can be and is developed, it would mean that the devices used by Public Safety would not be nearly as standard as the devices being envisioned today for data and video, thus the cost of these devices would be considerably higher.

However, voice over LTE will happen. It might take longer than many people believe, and it will certainly be implemented in stages. The first voice over LTE smartphones will be available on commercial networks by the end of this year, and the first PTT LTE devices will be tested. Initially, neither of these voice services will meet all of the voice requirements of the Public Safety community. The first PTT service will probably be PTT over LTE for non-mission critical voice communications that will be bridged to existing narrowband P25 voice systems in order to provide for interoperability between narrowband voice and LTE PTT services.

For those trying to plan upgrades to or expansion of their existing narrowband voice networks, it is possible that voice over LTE, both on and off-network, will eventually be developed to provide all of the voice requirements for mission critical on and off-network services. If there is funding for research and development available from the federal government, the time frame will most likely be shortened. In either case, it will take time to first build out the nationwide broadband network, then it will take time for Public Safety to learn how to incorporate data and video into their everyday incidents and then how to integrate voice over LTE into their systems over time.

It is imperative, therefore, that those making decisions about the existing narrowband voice spectrum now available for Public Safety realize that this process could take many years. The commercial community is deploying its forth generation of wireless technology in thirty years while Public Safety is deploying its second generation of voice (P25) in fifty years. One advantage to Public Safety moving to a commercial standard for the first time is that it can piggyback on the standards developed for the commercial community and follow rather than lead the commercial networks with new and upgraded technologies, features, and functions. When it comes to voice over LTE, some of the requirements may not be relevant to the commercial network operators and vendors, thus the development of this functionality may take longer than functions driven by the commercial network operators.

LTE will be able to provide some of the voice capabilities needed by the Public Safety community. The questions remaining are how long will it take to implement the rest of these requirements, how much will it cost, and whether it is better in the near future to integrate voice and data services in the back-end network but not necessarily over the airlink. There is a lot of work to be done to transition from traditional narrowband voice to voice over LTE, and at this point no one knows how long it will take or even if all of Public Safety's requirements can be fully met on a broadband network.

What Is Mission Critical Voice?

At the moment, there is no "official" definition for mission critical voice; both SAFECOM and NPTSC are in the process of flushing out a number of definitions. But the two below, one developed by Motorola and one by me, are pretty close to what is necessary to provide true mission critical voice communications that are Public Safety grade.

From Motorola http://ezine.motorola.com/government?a=99

"Mission critical voice communication reflects the harsh realities on the emergency management scene: when every other commercial system is down, you expect mission critical voice to be there. The exacting standards for mission critical networks and devices disqualify many nascent technologies and devices in favor of proven, reliable standards. In a mission critical environment, all aspects of a device or technology must achieve interoperability, reliability, coverage, capacity, control and instant, real-time communications."

"In an emergency, mission critical voice remains the single most powerful tool public safety and government agencies have at their disposal to ensure the safety and well-being of first responders and the citizens they protect," says Thomas Quirke, director of Solutions Marketing at Motorola.

And the one I have developed is as follows:

1) Mission critical communications

1. Communications between two or more parties that must be conveyed no matter what the circumstances and it must be delivered in a timely (immediate) manner with clarity.
2. These communications must be 99.999% reliable regardless of the conditions.
3. This applies primarily to voice services but should also include data and video services during emergency situations
4. An emergency is any event or incident where life and/or property is in danger, and includes the safety of the responders.

Mission Critical Voice Today

Today, mission critical voice is provided to the Public Safety community using narrowband voice channels in one of eight different portions of the spectrum. These channels are dedicated to Public Safety and the larger an agency is, the more area it has to cover, or the denser the population in its area of responsibility, the more channels it will have licensed to a given agency, city, county, or region. For a more complete explanation of the way in which mission critical voice communications is used today, please refer to Appendix A.

There are those who are working toward the goal of having the Public Safety broadband nationwide network replace today's mission critical narrowband voice networks. There are many who believe that this will be possible to accomplish in only a few years, while others doubt it can be accomplished within the next decade, and some who believe that voice over broadband won't be able to replace the need for narrowband voice channels beyond a decade, if ever.

The first thing that is required in order to determine whether broadband networks will be able to replace narrowband voice systems for mission critical voice is a common set of system requirements based on the needs of the Public Safety community. Many of those who are proposing the use of broadband for all of the Public Safety community's needs for voice services do not fully understand the vast differences between Public Safety voice and voice over an existing cellular system and how different the requirements are for each. Working toward the goal of voice over broadband is fine but only with the understanding of exactly what is required by the Public Safety community and then developing hardware and software that may be able to meet all of these requirements at some point in time.

Mission Critical Voice Over LTE Impediments

The following is a partial list of the impediments that will present challenges to the development of mission critical voice over LTE including off-network, one-to-many communications:

1) LTE is the fourth-generation standard for wireless broadband and voice over IP (VoIP) will be added for typical cellular phone calls.

1. Neither the existing release nor future releases address the issue of mission critical voice over LTE or the issue of off-network, one-to-many direct voice communications.

2) LTE, while a worldwide standard for broadband services, will not be using a common portion of the spectrum.

1. Today, LTE is being deployed in more than fourteen different portions of the spectrum worldwide with many different off-sets between transmit and receive frequencies and as a time-division-duplex (TDD) technology using the same transmit and receive portions of the spectrum. This makes it even more difficult to develop a standard for off-network communications.

3) Today's LTE devices are controlled by the network and NOT only at the device level.

1. If off-network communications is required, then additional intelligence will have to be built into the devices in order for them to be able to select an LTE voice channel manually or in some other fashion

4) LTE commercial devices have an output power of 200mw as opposed to handheld LMR radios with power levels of 5 watts or more.

1. Therefore, the difference in in-building communications will be substantial unless LTE devices are designed with increased power levels for off-network communications.
2. However, the power levels will have to be different for on-network and off-network voice since higher-powered devices (with the current LTE specifications) will simply shut down a standard LTE network.

5) How many voice channels can be supported by LTE both on and off-network?

1. If LTE is to be used for voice dispatch, it will have to provide multiple, separate one-to-many on-network voice channels in order to replicate existing Public Safety narrowband voice systems.
    1. Many cities and counties make use of multiple dispatch channels as well as city or countywide channels (see appendix A). The number of channels required in major metro areas or large counties could run as high as fifteen to twenty separate dispatch channels. When using off-network voice communications, if it is possible to accomplish this, the number of off-network channels will have to be substantial.
2. In a major incident such as a wild land fire, upwards of seventy discrete one-to-many, off-network voice channels will need to be deployed during the incident.

6) How many voice channels will be available in a given metro area for one-to-many voice communications?

7) What impact will adding PTT and voice communications have on the network's ability to handle data and video at an incident?

1. Most daily incidents will take place in a confined area within a jurisdiction and will usually be covered by only a single cell sector. Therefore, the total bandwidth available for the incident will have to be shared between voice and data/video services. Using Voice over IP, voice must have priority on the system.
    1. Further, if thirty or forty PTT users are registered within a single cell sector, the amount of data/video capability at the incident will be limited because of the

requirement for voice within the same cell sector.

8) What additional infrastructure will need to be added to the Public Safety LTE network in order to implement one-to-many voice services?

1. eMBMS (Enhanced Multimedia Broadcast Services)?
2. Other?

9) Since LTE's transport layer is based on UDP (User Datagram Protocol) rather than TCP/IP, this means that packets that are not delivered or that are delivered with mistakes in them are not re-sent and are basically thrown away.

1. How will LTE's Quality of Service (QoS) and Priority features ensure that
    1. Voice packets have priority over data packets
    2. Voice packets arrive in the proper sequence and with no errors or
    3. The user devices are capable of error correction to ensure intelligible voice being received?

10) How will voice traffic, specifically PTT voice, be routed when a user is out of his/her prime area of operation?

The above list is only a partial list of the issues that must be dealt with and solved prior to LTE being able to support what is defined as one-to-many voice services for Public Safety.

Conclusions

IF LTE broadband can meet both the voice and the data requirements of the first responder community, a single device could be deployed that would provide not only data/video interoperability, but voice interoperability as well. This would be an ideal situation and one that is worth pursing. However, existing narrowband spectrum should not be reallocated for other uses until such time as LTE broadband can and does meet all of the requirements for Public Safety mission critical voice as well as data and video services.

Organizations such as NPSTC are working on defining the specific requirements for voice over LTE for Public Safety and there are those both within the federal government and within the vendor community that believe Public Safety will soon be able to use a single device for both mission critical voice and data on the common LTE broadband system. Others believe that some form of PTT over LTE, perhaps P25 digital PTT, will be able to be used over LTE but in conjunction with existing narrowband P25 voice systems.

Whatever the case proves to be, it is imperative that Public Safety not lose any of its meager spectrum holding for narrowband voice until voice over LTE is proven and readily available. As important as data and video are as new services to the Public Safety community, in the end, voice communications are the most critical form of Public Safety communications and it must remain mission critical, easy to use, and available on a moment's notice. If it is not, Public Safety agencies will not be able to perform their tasks efficiently and will, in fact, place themselves and the public in harm's way.

The most sensible approach for the short term is to work with vendors to develop dual-mode devices capable of LTE data/video services as well as narrowband P25 capabilities on both the 700 MHz and 800-MHz bands currently assigned to and licensed by Public Safety agencies. Such devices should become readily available within the next few years, and while they will still cost more than commercial wireless devices such as smartphones, these devices can and will provide both broadband data/video and voice over P25 using the narrowband channel capabilities. There will still be issues regarding voice interoperability with systems on other portions of the spectrum, but for the next few years there are workarounds that can be implemented to minimize, but not eliminate, the issue of voice interoperability.

LTE may be able to meet all of Public Safety's requirements for fully interoperable voice and data services but that has not been proven yet and I believe if it happens at all it is many years in the future. In the meantime, LTE for data and video should be deployed as quickly as possible, and workaround solutions for interoperable voice should continue to be implemented on a local, area, regional, and statewide basis. To stop the drive for voice interoperability on the existing narrowband voice channels while waiting to determine if LTE can, in fact, be effectively used for both voice and data mission critical applications would be dangerous not only to the first responders but to the people they serve.

Andrew M. Seybold

Appendix A:

Mission Critical Voice Use

Voice channel requirements for Public Safety include the following:

1) One or more one-to-many, on-network voice channels for dispatch.

   1. Dispatch channels must be capable of one-to-many communications since it is imperative that not only the units required for the dispatch are notified but that those in proximity to the incident be made aware of the incident and that the field commanders be aware of the dispatch and the incident as well.
   2. After the dispatch is made, either the units responding are directed to use a different one-to-many, on-network channel for unit coordination or they remain on the primary dispatch channel until the first unit(s) on the scene report the status of the incident.
   3. Usually fire and EMS personnel are dispatched on one set of dispatch channels while police agencies are dispatched on a different set of radio channels.
   4. In large populace and metropolitan areas, there need to be multiple dispatch channels. Normally they are assigned by geographic area within the agency's jurisdiction.
   5. In addition to the dispatch channels, each agency normally has one or more jurisdiction-wide command and control channel for incident coordination.

2) On-scene communications

   1. The first unit arriving on the scene of an incident will give both the dispatcher and the other units responding to an incident a report of the situation as visually observed upon arrival.
      1. This message needs to be heard by ALL of those responding, the dispatcher, and those within the area and/or line officers responsible for manpower and equipment allocations.
      2. In both police and fire incidents, if the incident involves additional responders, the incident is normally assigned to an off-network channel to free up the dispatch channel and to provide on-scene communications for those at the incident. Again, fire and EMS will normally operate on one or more off-network channels while police will operate on others.

3. As the incident grows, additional off-network channels are assigned so each group at the incident has its own working channel. For example, in a hostage situation, the SWAT team may be assigned one discrete channel, uniformed officers on the scene another, detectives yet another, and fire and EMS support yet additional channels.
4. The larger an incident becomes, the more off-network channels need to be assigned.

3) Off-network communications on different channels are a necessity for Public Safety. Oftentimes there are multiple incidents in progress at the same time, separated by some distance, and even more off-network channels are required in the day-to-day operation of Public Safety agencies.

Narrowband Voice Channels Currently Licensed to Public Safety Agencies:

Frequency Band	Type of Radio Channels	Band Shared with other Users?
30-50 MHz shared spectrum (6.3 MHz of spectrum)	Narrowband voice channels	Yes, business, utilities, government others
150-170 MHz shared spectrum (3.6 MHz of spectrum)	Narrowband voice channels	Yes, business, paging, utilities, other
220 MHz channels (only one area of U.S. near Canada)	Narrowband voice channels	No
450-470 MHz shared spectrum (3.7 MHz of spectrum)	Narrowband voice channels	Yes, business, alarm, utilities, paging, local government, others
470-512 MHz (shared TV channels certain areas only)	Narrowband voice channels	Shared with TV station and business radio/wireless mikes
700 MHz narrowband (12 MHz of spectrum)	Narrowband voice/data	No—contiguous spectrum
700 MHz broadband (10 MHz of spectrum)	Broadband data	No—contiguous spectrum
800 MHz narrowband (9.5 MHz of spectrum)	Narrowband voice/data	N0 AFTER rebanding is completed
4.9 GHz broadband (50 MHz of spectrum)	Low-power data	Suited only for local use and does not penetrate buildings

Note: Cleveland, Buffalo, and Detroit are using shared NTIA channels in the 421-430-MHz band
Note: There are a few 220-MHz systems in use in other areas such as Long Beach, CA.

As the chart above illustrates, today's Public Safety mission critical voice channels are spread across seven vastly different portions of the spectrum. It should be noted that except for the 700 and 800-MHz voice allocations, all of the other portions of spectrum allocated to Public Safety are shared with other services. It should also be noted that a radio system operating on the 30-MHz band, 150 MHz, 450 MHz, or 800 MHz will have different coverage capabilities on each;

the higher in the spectrum that you operate a system, the more infrastructure is required to cover the same given geography.

Different types of narrowband voice services and technologies available and in use in the various segments of the spectrum are as follows:

Possible Combinations of Systems that Need to Be Interoperable

Frequency Band	**Analog FM**	**P25 Digital**	**Base to Mobile**	**Repeater**	**Simulcast**	**Trunked**
30-50 MHz	X		X	X	X	
150-174 MHz	X	X	X	X	X	X
220 MHz	X	X		X		X
450-470 MHz	X	X	X	X	X	X
470-512 MHz	X	X	X	X	X	X
700 MHz NB	X	X	X	X	X	X
800 MHz NB	X	X	X	X	X	X

One-to-many voice communications, available on multiple on and off-network channels, is a prime requirement for Public Safety communications but is not a requirement for commercial wireless networks.

Public Safety Alliance

Dedicated to First Responders...First

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House of Cards

FCC's Capacity White Paper
Built on Assumptions and Conjecture

July 2, 2010

NEMA
NATIONAL EMERGENCY MANAGEMENT ASSOCIATION

International Association of Chiefs of Police | International Association of Fire Chiefs
National Sheriffs Association | Major Cities Chiefs Association
Major County Sheriffs Association | Metropolitan Fire Chiefs Association
Association of Public---Safety Communications Officials International
National Emergency Management Association

www.psafirst.org

Introduction

Three months after the Federal Communications Commission released the National Broadband Plan (NBP), the Public Safety and Homeland Security Bureau finalized *"The Public Safety Nationwide Interoperable Broadband Network: A New Model for Capacity, Performance and Cost"* white paper. The Commission's white paper, which should have been completed before the NBP was released, was requested by public safety and industry leaders five months ago. The paper was developed without meaningful input from the public safety community, and is built on a foundation of assumptions and conjecture.

The cornerstone of the Commission's white paper and the NBP's public safety recommendation is the utilization of 10 megahertz of dedicated 700-MHz band spectrum currently designated by Congress for public safety use. In addition, the Commission believes that public safety must be able to roam on commercial networks with priority access, which supposedly will increase spectrum resources in times of emergency. The Commission's white paper and the NBP recommend the need for 44,000 cell sites based upon three disaster studies that were conducted by the Commission over the last year. Construction of the public safety network would be funded by public funding and commercial auction of the 10MHz of the upper D-Block spectrum.

Unfortunately, the Commission's white paper is built on a weak foundation that is extremely problematic to the public safety community.

1. The Commission makes far too many assumptions and relies on conjecture to develop its misguided policy framework that will put public safety users at risk.

2. The Commission greatly underestimates the current and future capacity needs of public safety when it assumes that 10 MHz of broadband spectrum is adequate for mission-critical high-speed data, high-resolution two-way video conferencing, video monitoring and surveillance at an incident, multi-agency mission-critical IP-based voice communications with push-to-talk services, biometrics, telemedicine, and the thousands of other high-bandwidth applications that will be used by public safety in the near future. While the Commission has acknowledged that consumers will need an additional 500 MHz of spectrum for broadband, in addition to the more than 500 MHz they already have, the Commission assumes that public safety can do it in 10 MHz. In other words, the Commission wrongly assumes that public safety can build a skyscraper on a small piece of land that can only support a single family home.

3. The Commission believes that density of the cell sites makes up for the lack of spectrum capacity and ignores the environmental impact of cell

towers, local and state zoning restrictions, added cost of more backhaul, and the potential for network interference.

4. Public Safety continues to support public – private partnership for broadband deployment. However, the Commission recommends an “incentive based partnership” between public safety and the D Block winner. There is very little information on how this would work leaving public safety skeptical as to how it would be executed and on how it would insure public safety’s needs are meet.

Public Safety Alliance (PSA) takes serious exception with the findings of the Commission’s white paper and we ask the Commission to take immediate action to develop a more comprehensive, independent study of public safety’s capacity needs for mission-critical voice, high-resolution video, high-speed data applications. The study must include public safety practitioners, technicians, and industry experts; it must be able to project the capacity needs of public safety for the next 10 years; it must take into consideration the types of applications that can be used on the network by public safety; and it must provide a solid foundation upon which public safety can build a nationwide broadband network that will meet the needs of our nation’s first responders who put their lives on the line every day to protect and serve the public. Anything less is unacceptable.

The PSA fully supports the independent comments of Andrew Seybold, which provides an accurate and critical analysis of the FCC white paper.[1]

The Fallacy of Assumptions

PSA finds that there are many flawed assumptions and conclusions in the white paper, which could lead to the failure to build the public safety broadband network. Below are some of these flawed assumptions and conclusions:

1. “The 10 megahertz of dedicated spectrum allocated to public safety in the 700 MHz band for broadband communications provides more than the required capacity for day-to-day communications.”

   The Commission recognizes the importance of the 700 MHz D Block because it shares the same LTE band class as the public safety broadband spectrum, but fails to acknowledge the real advantages to public safety of combining these two blocks of spectrum. Unlike commercial providers, a public safety agency has to meet the

[1] Andrew M. Seybold, “Comments on: FCC White Paper The Public Safety Nationwide Interoperable Broadband Network: A New Model for Capacity, Performance and Cost”, FCC Proceeding No. 06-229, filed June 23, 2010.

operational requirements throughout their entire coverage area including at the cell edge where throughput decreases significantly.

Public safety has repeatedly argued that the additional 10 MHz of paired spectrum that would be gained through a D-Block allocation is necessary to ensure reliable operation of the public safety broadband network in the long term. It will be particularly crucial during times of high traffic when additional public safety users from the local area and from agencies coming in from elsewhere all converge at a major incident scene or disaster area.

Since the D-Block spectrum is adjacent to the public safety broadband allocation, it is uniquely positioned to provide the needed additional capacity **throughput for a public safety agency's entire coverage area including the cell edge where throughput decreases significantly**. Any alternative spectrum offered in other bands will be less efficient. Additional components would be required which would increase the cost and reduce performance of broadband devices. Non-adjacent spectrum blocks of the same size as the D Block will not provide as much throughput capacity, since greater efficiency is achieved through spectrum aggregation.

The most significant step that the Commission can take towards ensuring a consistently high level of network performance, reliability, capacity, and coverage across all public safety broadband networks is to recommend that Congress reallocate the Upper 700 MHz D Block to public safety.

2. "…priority access and roaming on the 700 MHz commercial networks is critical to providing adequate capacity in these extreme situations."

   The Commission assumes that commercial networks will be in operation during extreme situations and that there will be sufficient capacity to serve both public safety and consumer traffic. However, it is clear from the experience of public safety agencies around the country that commercial networks are often severely congested during even the most minor situations, including the situation where consumers are using SMS text messages to vote for their American Idol. Priority access to a network that is already congested will not result in meeting the dedicated capacity and transmission speeds needed by public safety users.

3. "The capacity and efficiency of a public safety broadband network will far exceed the expectations…because of the system architecture, density of cell sites, the density of cell sectors per site, network and spectrum management, and the use of new and emerging technologies."

The Commission's plan is built on the assumption that the amount of spectrum does not really matter if enough cell sites can be built producing enough tower density to make do with 10 MHz of existing spectrum. Public safety is concerned that utilizing this approach to solve capacity and interference is not at all a good value. This approach could require up to twice the number of cell sites that would otherwise be required in a regional approach.

The Commission assumes that public safety can make up for the lack of spectrum capacity on the network by adding more cell sites. Unfortunately this simplistic solution, ignores the local, state, and federal regulations such as zoning laws, environmental regulations, and other regulatory hurdles that often impede or stop the build-out of additional cell cites. Additional cell sites will also greatly increase the cost for backhaul, hardening, and ongoing operation and maintenance. Finally, multiple cell sites in a geographic area could lead to dangerous interference and network confusion.

4. The Commission assumes interference and out-of-band-emissions (OOBE) problems are easily solved.

   Public safety will experience interference if the Commission's plan is implemented and there are no attractive solutions. Reducing interference would require deploying up to twice as many cell sites as the public safety approach.

   Current OOBE limits adopted for the public safety broadband system are very inconsistent—they vary dramatically based on whether they were intended to protect the public safety broadband network from the D Block or the public safety narrowband channels from the adjacent commercial 700 MHz blocks.

   The best way to alleviate the OOBE concerns between commercial and public safety entities would be to reallocate the 700 MHz D Block to public safety. Reallocation would eliminate any concerns about interference between the D Block and public safety broadband spectrum.

Misrepresentation of the Facts

"Public safety has a total of 97Mhz of spectrum allocated for use across the RF spectrum with 60MHz of that total available for broadband use. Overall the allocation of spectrum per user for public safety is now 25 times that of commercial providers."

1. Public safety only has 10 MHz of spectrum in the 700 MHz band for mobile broadband. The additional 50 MHz in the 4.9 GHz band does

not penetrate buildings and is not suitable for wide area mobile public safety or commercial mobile broadband services.

2. The Commission allocated 50 MHz in the 4.9 GHz band based on public safety requests for the spectrum to serve “hot spot” types of deployments. This spectrum is suitable for fixed broadband services such as hot spots and point-to-point transmission, but not for jurisdiction-wide coverage.
3. Allocation of spectrum should never be based solely on a per-user calculation. Any credible analysis will also incorporate how the spectrum will be used and how much usage is likely for each user. The per-function use of the spectrum by a public safety user will be, at the very least, 10 times greater than that for the average commercial user. Further, the average application to manage the incident will require much more bandwidth and capacity than merely browsing a web page or texting a friend.

“Priority access and roaming onto commercial bands can provide public safety with far more capacity during periods of greatest need.”

1. Many disaster situations have shown that commercial systems get clogged with drastic increase in demand.
2. Priority access (without pre-emption) on a clogged commercial system will not guarantee public safety access to the capacity it will need.
3. There will be considerable delay in the transmission of data on congested commercial networks even if public safety has priority access.

Conclusion

The Commission studied three tragic moderately sized real disasters in its white paper. However, it failed to utilize data from more extensive real world situations like the attacks in New York on 9/11 or from Hurricane Katrina. The public safety community is left to wonder if anything has been learned from these disasters.

Given the concerns cited by the public safety community, the past failure of the D-Block auction, and the uncertain nature of an economically viable nationwide network fully funded by a commercial provider required to share spectrum, we believe the current public/private partnership model funded by an auction is not in the public’s best interest.

With only 10 MHz of paired spectrum in the 700 MHz Public Safety Broadband Spectrum, public safety network operators could deploy only one 5 MHz x 5 MHz LTE carrier. However, with a D-Block reallocation, public safety broadband networks will be able to operate over one 10 MHz x 10 MHz LTE carrier, which would provide higher peak data rates and increased overall network throughput. The 10 MHz x 10 MHz LTE system would provide superior network performance, as compared to a 5 MHz x 5 MHz system.

Furthermore, reallocating the D Block would provide a more viable option to retain control over the network in public safety hands. Without such control, there is no assurance that public safety will have the reliability and flexibility needed.

A single wireless public safety broadband network containing the D Block and adjacent public safety 700-MHz broadband spectrum is the only logical choice to satisfy the public safety community's wireless broadband spectrum requirements. Primary public safety access is critical, as demonstrated by the failure of the initial D-Block auction. Public safety cannot be relegated to roaming on commercial networks as just another customer.

Public safety strongly supports the bi-partisan bill introduced by Representative Peter King, H.R. 5081, and currently co-sponsored by thirty-five members of the House. We urge Congress to swiftly approve the bill and send it to the President for his signature.

Who Speaks For First Responders?

Who has the Support of State-Local Government & Public Technologists?

CONNECT PUBLIC SAFETY NOW

<u>Public Safety Members and Supporters</u>

(none)

Public Safety Alliance

Dedicated to First Responders...First

<u>Public Safety Members and Supporters</u>

International Association of Chiefs of Police

International Association of Fire Chiefs

National Sheriffs' Association

Major Cities Chiefs Association

Metropolitan Fire Chiefs Association

Major County Sheriffs' Association

Association of Public-Safety Communications Officials, International

National Emergency Management Association

National Association of State Emergency Medical Service Officials

International Association of Emergency Managers

Police Executive Research Forum

National Criminal Justice Association

National Association of Police Organizations

National Volunteer Fire Council

National Troopers' Coalition

National Organization of Black Law Enforcement Executives

Association of Air Medical Services

Advocates for Emergency Medical Services

Emergency Nurses Association

National Association of Emergency Medical Services Physicians

National Association of Emergency Medical Technicians

National Emergency Medical Services Management Association

American Probation and Parole Association

United States National Guard Association

Public Safety, State-Local Government Are United: Reallocate D Block to First Responders

What Are The Differences? You Decide.

CONNECT PUBLIC SAFETY NOW

(Formerly known as "The 4G Coalition")

COALITION SUPPORT INCLUDES:

Cellular Operators, Licensees and Associations:

Sprint Nextel; T-Mobile; Metro-PCS; Cellular South; Rural Cellular Association; Rural Telecommunications Group, Inc. Access Spectrum; Xanadoo Company

WHAT DO THE MEMBERS WANT?

- Re-auction the 10 MHz "D block" for commercial use without any public safety obligations
- Have public safety's mission critical voice communications network spectrum repurposed for broadband data use

WHY DO THEY WANT THIS?

- They want to expand their current spectrum holdings with 700 MHz
- They want to lower their research and development costs for 700 MHz devices through regulatory mandates
- They believe public safety has enough spectrum and can use their narrowband portion for broadband if they want to

THERE IS NO CONNECTION TO PUBLIC SAFETY

They have no real interest in supporting public safety other than suggesting, in concept only, that auction revenue could pay for a public safety network.

Their goal is to obtain spectrum at the expense of public safety. They want the D-block, originally slated for a combined public-private public safety network, to be auctioned for commercial use without any encumbrances or public safety obligations. Its all about business and shareholder value. While there is nothing wrong with businesses pursuing this, it is unacceptable for a coalition to pretend to be something they are not, and stand for something they do not.

Public Safety Alliance
Dedicated to First Responders…First

(Always known as "Public Safety Alliance")

ALLIANCE SUPPORT INCLUDES:

Police, Sheriff and Fire Chiefs Associations
Emergency Medical and Management Associations
Rank-n-File Public Safety Associations
State-Local Govt. and Public Technologists Groups

WHAT DO THE MEMBERS WANT?

- Have 10 MHz "D block" allocated to public safety to create a 20 MHz block of spectrum
- Use spectrum as the foundation for next-generation network with capacity to handle surge demands during any situation
- To finally secure first responders with low cost, next-generation technology and life saving applications

WHY DO WE WANT THIS?

- We recognize that wireless data usage is growing exponentially and will consume the 10 MHz capacity within a couple of years.
- Having contiguous 20 MHz provides surge capacity today and eliminates the need to purchase additional costly equipment and devices in the future
- Public safety needs to control priority over its communications networks

THE ALLIANCE IS PUBLIC SAFETY

The men and women that represent the Public Safety Alliance are made up of sworn officers and dedicated civilian employees of public safety organizations.

We are who we say we are, and we stand for what we believe in. We don't need to create a false front.

WE NEED YOUR SUPPORT,

Please stand with us.

Support Public Safety:
Reallocate D Block to First Responders

FCC Spectrum Plan Based on Faulty Logic

Andrew M. Seyboild, April 21, 2010

Editor's Note: Just as we were preparing this for publication, Representataive Peter King (R-NY) and others introduced the "Broadband for First Responders Act" (HR 5081) which has now been sent into committee. The bill, if passed, will require the FCC to turn over the D Block to public safety. However, simply because there is now a bill in congress does not mean we should let up the pressure. The bill makes no mention of funding to build out the network, but it is a very good start!

The FCC chairman has repeatedly stated that his Commission's actions will be based on data and facts. This may be true, but in the Broadband Plan it submitted to Congress on March 17, the FCC seems to have used its own brand of logic to mold the data to fit its own agenda for public safety.

The FCC and many others believe that broadband systems are the way forward when it comes to wireless spectrum usage. Therefore, it stated in its report to Congress that we need to find the commercial wireless community 500 MHz of additional spectrum over the next ten years—300 MHz of it within the next five years. The same document also stated that public safety's existing 10 MHz of spectrum is sufficient for their use, however, it has told the public safety community that if it is wrong about this it will "find" additional spectrum, but not in the 700-MHz band where public safety's existing 10 MHz of spectrum is located.

The FCC is planning to find additional spectrum (500 MHz) for commercial operators because demand for wireless data access is growing rapidly and is expected to continue to increase at even higher rates. According to Cisco and others, demand for broadband data services over wireless grew by 160 percent in 2009 to a total of 90 petabytes a month (enough data to fill 23 million DVDs). YouTube videos account for 10 percent of today's usage and according to Google, video demand today accounts for 40 percent of all Internet traffic. Video services are predicted to account for 66 percent of all data traffic by 2014.

These numbers clearly show that commercial network operators will have to have more spectrum, use their existing spectrum more efficiently, and manage their network loading to satisfy this immense new demand for data.

At the same time, the FCC is convinced that public safety does not need any more broadband spectrum than has already been allocated and points to empirical data it has collected from network operators, equipment vendors, and the public safety community itself. The data I have seen tells a very different story.

Today, commercial wireless operators have holdings in up to four different portions of the spectrum: 800 MHz, 1900 MHz, 2100 MHz (AWS), and now the 700-MHz band. Both AT&T and Verizon Wireless are licensed to use an average of 91 MHz of spectrum in all of these bands combined. Today they are using some of it for second-generation (2G) voice and slow-speed data services, and the rest for third-generation (3G) voice and broadband data services. The new spectrum they acquired at auction will be for fourth-generation (4G) data, followed by voice services.

Yes, they will need more spectrum in the next five years because of the growing demand for broadband services, but since all of the spectrum that is already licensed to the commercial operators is contiguous and in large chunks that will support 3G networks and that can be upgraded to 4G networks, any and all of the current spectrum can be converted, over time, to provide 4G services. To be more precise, the top two commercial network operators have spectrum holdings in every band that can, over time, be used for 4G services.

The public safety community, on the other hand, has spectrum holdings in the 30 MHz, 150 MHz, 450 MHz, and 800 MHz bands and the spectrum assignments are NOT contiguous or large enough to be combined for 4G broadband services. So while commercial operators will be able to convert their entire spectrum to 4G broadband, public safety will not. Only 21 percent of public safety's total spectrum allocations can be used for broadband.

The chart below shows that most of public safety's spectrum holdings are small slivers of spectrum as opposed to commercial operators' holdings of contiguous spectrum that can be used for both 3G and 4G networks.

Organization	**30 MHz**	**150 MHz**	**450 MHz**	**700 MHz**	**800 MHz**	**1.9 GHz**	**2.1 GHz**	**2.5 GHz**	**Total**	**Broadband**
AT&T	0	0	0	20	25	34	12	0	91	100%
Verizon	0	0	0	32	25	21	13	0	91	100%
T-Mobile	0	0	0	0	0	27	27	0	54	100%
Sprint/Nextel	0	0	0	0	17	36	0	0	53	100%
Clearwire	0	0	0	0	0	0	0	150	150	100%
Public Safety	6.3	3.6	3.7	24	9.5	0	0	0	47.1	21%

Spectrum by Band: Average per network operator in 100 top major markets

Time after time, public safety has proven its need for at least an additional 10 MHz of spectrum with hard facts based on New York's existing 2.5-GHz broadband network as well as the amount of data currently being used in other parts of the nation on the commercial networks. The FCC says it will make sure public safety can spill over or roam on the commercial network when it reaches capacity on its own network, and further, that this roaming or spillover will be provided by the commercial network operators using priority access. However, priority access is not the same as spectrum assigned specifically to public safety. In times of major emergencies, even on a local level, the demand for services comes from both the private and public safety sectors at the same time. While the FCC seems to be convinced that priority access on a 4G network will provide public safety with enough bandwidth, the technology to implement this is untested and theoretical at best.

Some of the best and well documented data concerning public safety broadband usage comes from Motorola, which is a major supplier for both public safety and commercial broadband systems and the acknowledged leader in the public safety sector. According to a presentation Motorola gave to the FCC as recently as April 12 of this year, the FCC's analysis of data traffic is flawed and not based on real-world usage. For example, the FCC's presentation to public safety states that 10 MHz of spectrum (already licensed to public safety) will provide an average uplink speed of 256 Kbps while the Motorola presentation clearly makes the case that the minimum required speed for a tactical decision-enabling video is 1.2 Mbps. Motorola further points out that several agencies already require 1.2 Mbps or higher for public safety quality video transmissions. It is obvious from the FCC's own average uplink speed that a cell sector will not support even one video feed from the field back to a command center. Motorola's document also included pictures representative of the video quality that could be delivered via wireless broadband. Even at 384 Kbps, the video would be Quarter VGA format (320x240 pixels) rather than VGA quality video that requires a minimum of 1.2 Mbps on the uplink or downlink.

And this is only the video part of the equation. It should be noted here that none of the commercial network operators will be deploying their 4G systems in less than 12 MHz (6X6) of spectrum, which means they will be able to occupy a full 5 MHz of spectrum for both the uplink and downlink, while the public safety spectrum would accommodate less than 5 MHz of bandwidth in each direction, especially if the D Block, which is adjacent to the public safety spectrum, was being used by a commercial network operator. Additional, "dead" spectrum is required for a buffer between different systems and must be built into the equation when discussing how much capacity and bandwidth will be available for public safety use.

So now you know why I consider the FCC's decision to be based on faulty logic. But wait! There's more! When public safety responds to the many larger incidents that occur every day, a lot of resources are thrown at them. A bank robbery might mean a response from multiple police personnel including a swat team, the fire department, and at least one EMS vehicle and personnel. The same is true for multiple-vehicle accidents, a gas tanker spill, and the many other incidents that are not considered to be “major” but are normal during a typical day in the life of the public safety community.

Once again, the input to the FCC detailed many of these incidents. A typical response for some might include anywhere from 15 to 50 vehicles and 50 to more than 100 first responders. Resources for these incidents will include full-motion video back to the command center from one or more unit at the scene, video or other large images such as building layouts or schematics down to those at the scene, plus GPS to track the location of personnel, photos of suspects, perhaps fingerprints and other evidence found at the scene, and many other images. While many of these broadband services have not yet been implemented, there is no doubt that they will be, and as the network is deployed, there will be more applications.

Several other points were also missed or neglected by the FCC in its recommendations. The first is that today, all of the broadband data usage is to and from the first responders’ vehicles. As we move toward the broadband network, data requirements will move from the vehicle to the person, just as we have seen them move from the home to the individual as commercial broadband services have become available. This means that there will be double or more the number of devices that need to send and receive data, and that will quickly generate more traffic on the network.

And since most incidents are confined to a single building or street, chances are that the coverage for broadband will be from a single cell sector or two at most. Since wireless broadband is a shared resource, the more people who are congregated within a cell sector, the less data speed and capacity each one will have. Having 20 MHz of spectrum available per cell sector would more than double both the capacity and data speeds that will be available at an incident. The FCC’s rationale is that by making use of commercial network cell sites, first responders will have access not only to their own 10 MHz of spectrum but, on a priority basis, to all of a commercial network operator’s cell sites and public spectrum as well.

Public safety personnel cannot and should not assume that commercial network bandwidth will be available for them. One of the major differences between commercial voice services and public safety voice services today is that commercial customers are subject to network overload and dropped calls. First responders know that when they need to use their radios, the call will go through and be heard by others. The FCC’s answer to this is that 4G technology (LTE) can provide a high priority level for the public safety community. During a large major incident, this additional bandwidth and capacity could perhaps be used for administrative and routine purposes, but all of the information to and from the incident needs to be handled on a public safety-grade system—not a system that is shared with commercial customers.

Cell systems for commercial network operation are designed and built for peak usage times while public safety networks are designed and built for the worst-case scenario. It is not acceptable for public safety responders to have to vie with the general public for available capacity and bandwidth during an incident. If this was a once-a-year occurrence, the general public and commercial network operators might be understanding and willing to cede their access to the first responders, but with only 10 MHz of public safety controlled spectrum, these service interruptions will happen on a daily basis, at least in the top 100 major urban areas.

Why does the Secret Service use two-way radios and why is its spectrum available to this department and no one else on a 24/7 basis everywhere in the United States? The answer is that when they need it, they really need it and they can never be in a position where they would have to share it with anyone else. This is true for the FBI, the DEA, and all of the federal law enforcement agencies. Why does the FCC think it is okay to treat local public safety any differently?

After reviewing other data as well as data provided to the FCC, it is clear to me that if public safety only has access to 10 MHz of broadband spectrum, it will exceed the capacity of its system every day handling normal level 1 responses, meaning it would need to use commercial spectrum for each and every one of these incidents.

The FCC does not seem to think that demand for wireless broadband services will grow in the public safety sector as well as in the private sector. It acknowledges the rapid growth in the private sector but states that the first responders have not demonstrated that they will experience the same type of growth. But there is no way to "demonstrate" this kind of growth until the first responder community has the types of devices and wealth of applications that are available to commercial customers today. Once its network is being built, public safety will begin expanding its use of broadband and the number of applications and services will skyrocket in the same way it has in the private sector. Even so, for now, the FCC seems determined to base its assumption that 10 MHz of spectrum is enough on today's limited broadband usage, which does not represent the highest and best use of broadband data for public safety.

Additional numbers from Motorola for uplink and downlink capacities and speeds are also provided in its presentation to the FCC and it is important to point out once again that figures for speeds and capacity per cell sector are the maximum possible for a single user within a specific cell sector. As more users enter the sector, the data speeds for each will diminish, and if a number of streaming videos are being sent back from the field or down to those in the field, the capacity is eaten up in a hurry and data speeds will suffer accordingly.

Motorola predicts that using 10 MHz of spectrum, the maximum data speed per sector from the field will be 3.5 Mbps, and down to field devices will be 8.4 Mbps. However, if public safety has access to 20 MHz of spectrum, speed and capacity per cell sector more than double. The uplink becomes 8.0 Mbps and the downlink 17.7 Mbps, providing public safety operated capacity that should be sufficient bandwidth for both level 1 and 2 incidents (but would need to be augmented for level 3 or higher incidents).

Conclusions

Ever since 9/11 and Katrina, attention has been drawn to the fact that first responders cannot always communicate with each other. Units from one department might have radios on one portion of the spectrum while adjacent units might be on a totally different portion. This came to be because over past 30 years, each time the FCC opened up more spectrum for wireless communications, public safety was given another sliver of spectrum in the new band and never enough to consolidate its communications into a single band segment.

Over the years, public safety has struggled with the issue of interoperability and has had to be creative in working around the problems. One way the problem was partially resolved on their voice services was to install two or more radios in each vehicle so they could communicate with neighboring departments. Using this approach, the investment in radio equipment can reach multi-thousands of dollars per vehicle. Compare these costs and lack of flexibility with today's smartphones that cost less than $200 each, many of which can make and receive calls across the United States and to almost anywhere in the world. These same smartphones provide access to thousands of applications and full access to the Internet. The observation that criminals have better communications capabilities than law enforcement has never been more true than today. Even today's teenagers have wireless devices with more capabilities than first responders have.

Since 9/11, the federal government in general and the FCC in particular have pledged time and again to fix the communications issues faced by the public safety community on a daily basis. Today, ten years later, what is being offered up is once again too little, and if the D Block is put out for auction and developed by a commercial network operator, it won't be too many years before the public safety community will once again have to return to the FCC and beg for additional broadband spectrum.

Public safety is about safeguarding life and property by responding to crime, fires, and medical emergencies, and first responders' communications systems MUST be able to provide both the voice and the data services they need to do their job more effectively. The FCC and congress have it within their power to make sure that this time around they provide the tools to solve many of the interoperability issues that have been facing public safety for more than 30 years.

Public safety communications require two different types of communications services: one for voice and one to exchange digital information, including video, in real time. The commercial networks cannot provide the types of voice services that are needed, and they can only provide the data side of the equation as part of their own commercial data services. Therefore, the public safety community needs its own broadband spectrum and it needs more than the 10 MHz now allotted.

The public safety community and the commercial sector have already begun working together to form a variety of public/private partnerships and as the public safety networks begin to be built, these partnerships will provide the best of both worlds—without the FCC's involvement. The two communities have come together to make it happen and they will, but congress and the FCC must reallocate the D Block to the public safety community today. Public safety has been short changed over and over again when it comes to spectrum allocations. It's time to do the right thing!

Andrew M. Seybold

About Andrew M. Seybold

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Andrew M. Seybold, CEO and Principal Analyst of Andrew Seybold, Inc., is one of the most respected and influential analysts in the wireless industry today. For more than twenty-five years, he has served the industry and shaped initiatives for world leaders of the wireless industry, including Verizon, Nokia, AT&T, Motorola, and Qualcomm. His firm has provided wireless consulting and education services for startups to Fortune 1000 companies such as Dow Chemical, Ford Motor Company, and Microsoft.

Andy is one of the few individuals in the industry who sees the lines beginning to blur between commercial networks and private mobile radio, between broadband and narrowband technologies and between the IT department and the radio shop. Whether you agree with him or not, having experience in all of these areas, Andy has a unique perspective that deserves listening to.

Andrew Seybold has consulted to some of the industry's most talented and successful entrepreneurs. He was a key consultant to a number of companies that introduced products and services that have had a significant impact on wireless including Research In Motion's popular BlackBerry, Hewlett-Packard's first handheld device, first two-way pager, Good Technologies' first products, and AT&T's push-to-talk offering. He also introduced RadioMail to Dell for the first-ever notebook wireless email offering. He has served on the Motorola Research Visionary Board, IBM's Mobile Computing Advisory Board, and a number of other prestigious advisory boards. Mr. Seybold is a Fellow in the Radio Club of America in recognition of his contributions to the wireless industry, he co-founded and served as a board member of the Personal Computing and Communications Association (PCCA), and he currently serves on the board of CommNexus San Diego.

Andrew Seybold's *Outlook for Mobile Computing* newsletter and his *Andrew Seybold/Forbes Wireless Outlook* newsletter were must-reads and today his *COMMENTARY* is arguably the most widely read e-newsletter among executives of leading wireless network operators. He co-founded Andrew Seybold Wireless University in 1995, which has been attended by thousands of industry professionals and continues to be the only in-depth educational program of its kind in the wireless industry. As a trusted authority on wireless technology and business issues, Mr. Seybold has been featured in the *Wall Street Journal*. He is the author of *Using Wireless Communications in Business* and several other books, and contributes regularly to *Mobile Enterprise Magazine*, *FierceWireless* and *FierceContent*, and *Wireless Week*.

Andrew Seybold is among the wireless industry's foremost speakers and is recognized worldwide for his keen perspective and track record for accurately predicting trends in mobile technology and convergence and is a featured speaker at major industry and customer events and conferences.

ANDREWSEYBOLD

June 2, 2011

Public Safety Voice Interoperability

Some in Congress and on the House Energy and Commerce Committee are pointing to a March 18, 2011 memo from the Congressional Research Service (CRS)[1] to assert that the Public Safety Community has wasted more than $13 billion in federal grants for radio communications systems since 2001. In reality, the grants have totaled less than $4 billion and they have, in fact, provided for a higher level of Public Safety interoperability than ever before. In order to fully understand the impact of these grants, it is important to understand the many and varied issues that must be addressed if the ultimate goal of nationwide interoperability is to be achieved for both voice and data services for Public Safety.

Interoperability between various Public Safety agencies had been an issue long before it was brought to public attention during 9/11, Katrina, and other disasters. Articles dating back several decades have pointed out both the need and the issues that must be overcome in order to provide the Public Safety community with interoperable voice and data.[2] Indeed, Public Safety and the Big 7 state and local government associations initially secured the 24 MHz derived from digital TV transition in the wake of the communications failures first responders experienced at the site of the domestic terrorist bombing of the Alfred Murrah building in Oklahoma City in 1994. At that site, firefighters and police officers conducting search and rescue could not speak to each other on their radios within different floors of the building and had to resort to talking to dueling command centers set up outside the site, and couriers running back and forth between the two command centers.

Three major factors have significantly hindered Public Safety's efforts to achieve mission-critical voice interoperability:

1) Public Safety's currently allocated spectrum is in small segments spread out over at least seven different portions of the radio spectrum.
2) Because this spectrum has been in use by Public Safety for many years, interoperability must start at the local level, then the regional, state, regional interstate level, and finally at the national level (and at international borders as well).
    a. Most of the money expended to date has resulted in better interoperability on a local, regional, and state level, interstate regional, and on international borders, but because of the lack of enough spectrum in any given FCC allocation, this process is slow, tedious, and expensive.
    b. The Public Safety broadband network will be built on greenfield, that is, unused spectrum. Therefore, it will be possible to design and implement this new network as a fully interoperable network from the beginning, something that has never before been possible for the Public Safety community.

3) Within each portion of the allocated spectrum, different Public Safety departments make use of different types of radios and radio configurations to meet their own individual coverage requirements.

[1] Congressional Research Service, Memorandum to Congressional Distribution, March 18, 2011 from Linda K. Moore

[2] Volume 1, No. 5, December 1980, Andrew Seybold's Report on Mobile Emergency Communications. A Limited Natural Resource

The main reason for a lack of Public Safety voice interoperability is the fact that while the FCC has continued to allocate more spectrum over the years for use by the Public Safety community, these new allocations have been in very different portions of the spectrum. Today, Public Safety voice communications are authorized in small segments of the spectrum from 30 MHz up to 800 MHz, and except for the spectrum in the 700 and 800-MHz bands, the Public Safety channels are comingled with channels used by business, taxi services, truckers, paging services, and others. In short, there has never been an allocation of enough spectrum in a common radio band to permit all of the various Public Safety agencies to migrate to a single portion of the spectrum and be able to interoperate between all agencies.

Frequency Band	Type of Radio Channels	Band Shared with other Users?
30-50 MHz shared spectrum (6.3 MHz of spectrum)	Narrowband voice channels	Yes, business, utilities, government others
150-170 MHz shared spectrum (3.6 MHz of spectrum)	Narrowband voice channels	Yes, business, paging, utilities, other
220 MHz channels (only one area of U.S. near Canada)	Narrowband voice channels	No
450-470 MHz shared spectrum (3.7 MHz of spectrum)	Narrowband voice channels	Yes, business, alarm, utilities, paging, local government, others
470-512 MHz (shared TV channels certain areas only)	Narrowband voice channels	Shared with TV station and business radio/wireless mikes
700 MHz narrowband (12 MHz of spectrum)	Narrowband voice/data	No—contiguous spectrum
700 MHz broadband (10 MHz of spectrum)	Broadband data	No—contiguous spectrum
800 MHz narrowband (9.5 MHz of spectrum)	Narrowband voice/data	N0 AFTER rebanding is completed
4.9 GHz broadband (50 MHz of spectrum)	Low-power data	Suited only for local use and does not penetrate buildings

Note: Cleveland, Buffalo, and Detroit are using shared NTIA channels in the 421-430 MHz band
Note: There are a few 220 MHz systems in use in other areas such as Long Beach, CA.

As the chart above illustrates, today's Public Safety mission-critical voice channels are spread across seven vastly different portions of the spectrum. It should be noted that except for the 700 and 800-MHz voice allocations, all of the other portions of spectrum allocated to Public Safety are shared with other services. It should also be noted that a radio system operating on the 30-MHz band, 150 MHz, 450 MHz, or 800 MHz will have different coverage capabilities on each; the higher in the spectrum that you operate a system, the more infrastructure is required to cover the same given geography.

When those outside the Public Safety community look at the spectrum allocations already made, they oftentimes do not take into account that the 4.9-GHz spectrum (50 MHz) is not suited for wide-area broadband service. In reality, it is designated for low-power, local communications just as today's unlicensed Wi-Fi bands are allocated for citizens' use. The average coverage of a single 4.9-GHz access point is 300 feet or less, and in most systems today, this spectrum is used for point-to-point communications for video transmissions from fixed-location cameras, or for on-scene local broadband services. This spectrum is not available or useful for Public Safety as part of the nationwide broadband network that is being planned to provide wide-area coverage across the nation.

Today, in many urban areas there are not enough radio channels in a given portion of the allocated spectrum to meet the requirements of Public Safety. Radio signals do not stop at city, county, or state (or international) boundaries, therefore the channels in use in a given area must be coordinated with adjacent users to prevent or minimize interference between systems. In many areas this means, for example, that the police departments will operate in the 450-MHz portion of the spectrum while fire and emergency medical services (EMS) units will operate in the 150-MHz portion of the spectrum. Providing interoperability between police, EMS, and fire in these areas requires either specialized equipment in the dispatch centers to patch channels together or the installation of two or more radios in each vehicle; which is an expensive and ineffective method of obtaining interoperability between systems.

If Public Safety had been allocated sufficient spectrum in any one of these bands to satisfy the number of radio channels required for true nationwide interoperability, the result would have been twofold:

1) We would, today, have a truly interoperable voice system nationwide.
2) The cost of Public Safety radio equipment would be at least 50% less than what it is today because it could have been built to operate on a single portion of the spectrum, providing[3] economies of scale and reducing per unit price for Public Safety radios. Today, equipment vendors must build radios for a specific portion of the spectrum, and therefore the quantities they produce for each portion of the spectrum are less.

Other Factors Hindering Mission-Critical Voice Interoperability

Because the narrowband voice spectrum is already heavily used, nationwide interoperability cannot be achieved until it is first made available on a local, regional, and then statewide basis. Much of the funding that has been granted to Public Safety since 2001 has in fact resulted in better regional and statewide interoperability. From 2001 until today, the number of new regional and statewide systems constructed and operational has grown rapidly as the various jurisdictions have sought out their own ways of providing mission-critical voice interoperability.

For example, in California, technology advances have provided fire service with the ability to purchase and install radios capable of more than 300 channels in the 150-MHz band. There is a standard plan in place so that most of the fire departments can and do have interoperability not only between city, county, and state fire units, but also with federal government fire units. However, in major cities such as San Diego, Los Angeles, and San Francisco, there are not enough of these channels to provide for day-to-day fire operations, so fire departments are operating on other portions of the spectrum. During major incidents, agencies responding from out of the area are not able to directly communicate with fire equipment from the large cities without either a second radio in each vehicle or some other form of non-automatic channel sharing equipment.

Many regions have built and installed regional radio systems that are used as interagency communications systems during mutual aid situations. Many of these serve as overlay systems since very few have the channel capacity to serve all of the various local entities. This also requires multiple radios in each vehicle. Several states such as Wyoming, Florida, Vermont, Montana and others have recently built or are in the process of building statewide interoperable mission-critical voice systems in

[3] Tetra radio prices in Europe are approximately 50% of P25 prices in the United States because they are on a common portion of the spectrum and one radio can be built and shipped to all European Countries

order to provide statewide interoperability, but in many cases, these systems augment rather than replace the local systems that are still needed on a daily basis to meet the capacity requirements of each local Public Safety agency.

In a recent memorandum from the Congressional Research Service (CRS)[4] dated March 18, 2011, the data used as a baseline was taken from a survey conducted by the National Emergency Management Association (NEMA).[5] This report was, in fact, based on Emergency Management Association directors' estimates of funds thought at the time to be necessary for states to achieve full statewide interoperability and did not, as portrayed in the CRS report, reflect actual amounts of funding received by the states and local agencies. Further, specific grant programs put requirements on accessing the funds that led to an emphasis on local, regional, and statewide interoperability (as opposed to nationwide), and there were conflicting requirements among and between grant programs causing a lack of greater interoperability.

When working toward the goal of both voice and data interoperability as is the desire of the Public Safety community, it should be stated again that trying to provide interoperable voice services when the agencies are already using spectrum spread out over seven different portions of the spectrum and on which, today, during peak hours, there is already severe network congestion that must be approached from a local, then regional, then statewide basis. However, the opportunity, with the 700-MHz broadband network is to design and implement it on spectrum that is unused, therefore, the network can be constructed from the ground up based on the requirement for nationwide interoperability.

Different Types of Systems

In addition to the shortage of radio channels in any given portion of the allocated Public Safety narrowband spectrum, there is yet another issue that makes mission-critical voice interoperability even more difficult. Namely, over the years, each local city, county, and region has built out different types of radio systems using differing technologies. Therefore, even two agencies in the same geographic area operating within the same portion of the spectrum are not always able to communicate with each other. Mission-critical voice communications systems, today, make use of two very different air interfaces. Many are still using the 30-year-old voice technology referred to as analog or FM voice communications. Newer systems have moved to the digital voice standard known as P25 or APCO project 25, which is a standard for digital voice systems. However, even within these two different types of voice systems, there are many variations of how they are deployed. Small rural areas might use a simple radio base station and radios in vehicles. Larger departments might elect to repeat all of the traffic on a given channel using repeater stations, while others have tied a number of repeaters together in what are called simulcast systems. Still others are grouping between five and twenty radio channels together into what is known as a trunked radio system. Not many of these radio systems are compatible with the other types, and, in many areas, the common way to provide interoperable voice communications is to use unit-to-unit, direct, or off-network voice channels so those on the scene of an incident can communicate with each other (provided they are all operating in the same portion of the spectrum).

The chart below reflects the complexities of working toward the goal of providing full interoperable mission-critical voice communications. As it shows, there are many variables that must be considered,

[4]Congressional Research Service, Memorandum to Congressional Distribution, March 18, 2011 from Linda K. Moore

[5] Letter from NEMA to CRS: http://www.psafirst.org/uploads/documents/CRS_Letter_FINAL_05_27_11.pdf

and the grants have been provided on a city, county, regional, or state basis with no substantial coordination between grants or agencies receiving the grants. The reality is that the grant funds already provided to Public Safety have advanced the state of interoperability with an emphasis on local-to-statewide interoperability, and so only achieved on a local, regional, and statewide basis.

Possible Combinations of Systems that need to be Interoperable:

Frequency Band	Analog FM	P25 Digital	Base to Mobile	Repeater	Simulcast	Trunked
30-50 MHz	X		X	X	X	
150-174 MHz	X	X	X	X	X	X
220 MHz	X	X		X		X
450-470 MHz	X	X	X	X	X	X
470-512 MHz	X	X	X	X	X	X
700 MHz NB	X	X	X	X	X	X
800 MHz NB	X	X	X	X	X	X

Conclusions

Given (1) the number of different portions of the spectrum in use today for Public Safety mission-critical voice communications, (2) the insufficient amounts of spectrum within each portion of spectrum provided to Public Safety, (3) the multiple types of systems in use within each portion of spectrum and throughout all of the different portions, and (4) the focus on interoperability for mission-critical voice on local, then regional, then statewide, and only recently on a nationwide level, the funds provided to Public Safety have been used wisely and have achieved much improved interoperability within and among voice systems in most localities in the United States.

One reason Public Safety must have enough contiguous spectrum on a nationwide basis for broadband services is to make sure that systems being built adhere to nationwide standards, use the same technology, adhere to the same system design and, therefore, provide for full interoperability from the very beginning. Public Safety can never again be placed in the position it has been in over the last thirty or more years where spectrum is not contiguous, there is not enough to handle the demands in major metropolitan areas, and there is a lack of financial resources to build the nationwide interoperable broadband network that will, for the first time, provide Public Safety with the resources it needs to accomplish the goal of true interoperability while realizing the cost savings of using a worldwide air interface standard (LTE) to provide Public Safety with economies of scale for the first time.

Public Safety needs the D Block spectrum and it needs federal funding in order to accomplish this goal. If enough spectrum is not made available this time, or if funding is lacking, the only option is to duplicate the mistakes that have resulted in the lack of nationwide interoperable voice and the problem and issues described above.

The Public Safety community has neither wasted the grants allocated since 2001, nor wasted any of the valuable and very limited spectrum provided. The Public Safety community has accomplished much with the little it has had to work with over the years. Today, more regions of the country have interoperable mission-critical voice communications than ever before, but full nationwide mission-critical voice interoperability is not achievable over the course of the next decade or two given the multitude of spectrum allocations, the differences in technologies being deployed, and the lack of a nationwide long-term plan.

We also believe that given enough broadband spectrum (20 MHz) and funding, Public Safety can and will build out a nationwide, mission-critical broadband network that will provide the level of interoperability needed on a daily basis for data and video services. Over time, this network will serve as a model to solve the nationwide voice interoperability issues that remain.

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SPECTRUM MANAGEMENT FOR THE 21ST CENTURY
THE PRESIDENT'S SPECTRUM POLICY INITIATIVE

FEDERAL STRATEGIC SPECTRUM PLAN

U.S. DEPARTMENT OF COMMERCE

CARLOS M. GUTIERREZ, SECRETARY

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I. OVERVIEW

A. The Presidential Mandate

Today, wireless technologies are essential in supporting Federal agency missions crucial to the nation and enabling commercial and non-Federal public safety operations that support economic growth and safeguard lives and property. As changing government missions increase demands for mobility and agility, and private sector uses continue to expand, spectrum's role as a critical asset intensifies. To ensure that United States' spectrum policy for the 21st Century continues to harness fully the power of the airwaves to meet Federal mission requirements and to enhance prosperity, President George W. Bush established the Spectrum Policy Initiative (Presidential Initiative) in 2003.[1] The goal is a U.S. spectrum policy for the 21st Century that will foster economic growth; ensure our national and homeland security; maintain U.S. global leadership in communications technology and services; and satisfy other vital U.S. needs in areas such as public safety, scientific research, Federal transportation infrastructure, and law enforcement.

B. The Federal Response

The Federal Strategic Spectrum Plan (Federal Plan) is an important component of the *Presidential Initiative*. In a 2004 Executive Memorandum (Appendix A), the President directed Federal agencies to formulate within one year agency-specific strategic spectrum plans ("agency plans") that include: (1) "spectrum requirements … for future technologies or services," (2) "the planned uses of new technologies or expanded services requiring spectrum," and (3) "suggested spectrum efficient approaches to meeting identified spectrum requirements." The 2004 Executive Memorandum also required that the Department of Homeland Security (DHS), through consultation with other Federal, state and local agencies, develop a Spectrum Needs Plan "to address issues related to communications spectrum used by the public safety community, as well as the continuity of Government operations."[2] The Federal Plan thus incorporates these two additional key elements.

C. The Federal Needs

Fifteen Federal agencies submitted agency strategic spectrum plans to the National Telecommunications and Information Administration (NTIA) in November 2005 for inclusion in the Federal Plan.[3] As directed by the President, NTIA integrated the agency plans and the DHS

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[1] Memorandum for the Heads of Executive Departments and Agencies, *Spectrum Policy for the 21st Century*, 69 Fed. Reg. 1569 (Jan. 9, 2004), 39 WEEKLY COMP. PRES. DOC. 726, 727 (May 29, 2003), *available at* http://www.whitehouse.gov/news/releases/2003/06/20030605-4.html.

[2] Presidential Determination: Memorandum for the Heads of Executive Departments and Agencies, *Improving Spectrum Management for the 21st Century*, 40 WEEKLY COMP. PRES. DOC. 2875 (Nov. 30, 2004), *available at* http://www.whitehouse.gov/news/releases/2004/11/20041130-8.html (hereinafter "2004 Executive Memorandum"), attached as Appendix A.

[3] In response to the 2004 Executive Memorandum, the following agencies submitted agency-specific plans in November 2005: the Departments of Agriculture, Commerce, Defense, Energy, Homeland Security, Interior, Justice, State, Transportation, Treasury, and Veterans Affairs; and the United States Postal Service; the Broadcasting Board of Governors; the National Aeronautics and Space Administration; and the National Science Foundation.

Spectrum Needs Plan into a Federal Strategic Spectrum Plan that provides the foundation for a national strategic vision to meet critical future spectrum needs. This foundation supports NTIA's goal of changing the current spectrum management system into a new model. This new and evolving spectrum management system will 1) enable more efficient and effective use of this vital resource; and, 2) where feasible and appropriate, increasingly allow dynamic access to spectrum.

Appendix B to this document is organized as follows: (1) B-1 provides a comprehensive description of current Federal spectrum use and future spectrum requirements of the 15 Federal agencies, by radio service, frequency band, and spectrum-supported systems; (2) B-2 addresses public safety spectrum requirements; (3) B-3 discusses new technologies; and (4) B-4 contains summaries of the agency-specific strategic spectrum plans.

D. <u>The National Response</u>

The President directed that NTIA consult with the Federal Communications Commission (FCC) on the creation of a National Strategic Spectrum Plan (National Plan) that will provide a basis for meeting future Federal and private sector radio-frequency needs.[4] This National Plan will address spectrum requirements for essential Federal missions, including national and homeland security, critical infrastructure, transportation, law enforcement; state, local and tribal public safety spectrum needs; and requirements of non-Federal entities for spectrum to support new services and systems.[5]

NTIA initiates in this Federal Plan a strategy to address the diverse mission-driven needs of the Federal agencies as well as the President's broadband goals and protection of lives and property. This strategy is needed to support Federal missions and the spectrum-dependent systems upon which they rely, while at the same time fostering the commercial systems that underpin the nation's economic growth and technological innovation. This unified strategy must ensure that Federal spectrum-based systems possess the necessary capabilities, including speed and mobility, that 21st Century defense, homeland security, law enforcement, and other priority undertakings demand.

This initial Federal Plan recognizes that Federal agency missions will continue to rely on the use of radio frequencies for the long-term. The agencies' plans indicate a future need for greater, dynamically available data throughput and mobility, often requiring additional spectrum or significant advances in technology. Recognizing that Federal and non-Federal spectrum requirements, much of which are below 5 GHz, will continue to grow, new methods must be

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DHS submitted a DHS agency-specific strategic spectrum plan, as well as a separate Coast Guard plan. In addition, DHS completed a Spectrum Needs Plan with a Continuity of Government operations plan (COG Annex) attached.

[4] Jurisdiction over spectrum management in the United States is divided between NTIA and the FCC. NTIA manages Federal spectrum uses for agency missions such as defense, homeland security, and science. The FCC manages all non-Federal spectrum uses, including commercial wireless communications and state and local public safety. There are also many bands which have shared Federal and non-Federal jurisdiction. *See generally*, National Telecommunications and Information Administration, U.S. Dep't of Commerce, *Spectrum Policy for the 21st Century – The President's Spectrum Policy Initiative: Report 1* (2004) (Report 1), *available at* http://www.ntia.doc.gov/reports/specpolini/presspecpolini_report1_06242004.htm.

[5] *See supra* note 2, at 1.

established to enable more use in the same amount of spectrum space. These requirements necessitate a new, evolutionary model for spectrum management, one that will encourage and facilitate spectrum efficient and effective operations and will meet the need to rapidly exploit the various aspects of spectrum operations, for example, dimensions of frequency, time and location. Ultimately, this model will provide the means to meet the increasing demand and, where appropriate, to assure dynamic spectrum access to bandwidth, wherever required, whenever required. This new spectrum management model will provide Federal agencies with the bandwidth and agility the Federal agencies identified as requirements in their agency plans, while at the same time ensuring access to spectrum for private sector growth and innovation.

This Federal Plan further recognizes that Federal agencies will need access to up-to-date, low cost, interoperable, and spectrally efficient technology, solutions that may only be found in commercial services. Meeting these needs will require greater coordination and cooperation among Federal agencies, the NTIA, the FCC, state and local public safety entities and private sector spectrum users and technology innovators.

II. TODAY'S SPECTRUM ENVIRONMENT

Sixty-nine Federal agencies and departments further their missions by using radio frequency spectrum for communications, navigation, broadcasting and other purposes. The radio-frequency spectrum is allocated to specific radio services, operating in specified frequency bands, and subject to technical and service rules. The Federal agencies use over 40 specific radio services and their frequency assignments are recorded in the Government Master File maintained by NTIA. These frequency assignments are coordinated via a collaborative Executive Branch review. The FCC licenses non-Federal spectrum use through a public process.

The current spectrum management system at times lacks the flexibility to rapidly accommodate new operational requirements and innovative technologies. The *Presidential Initiative* and ongoing NTIA efforts will enable the existing Federal agency spectrum management system to be more responsive to Federal agency needs. For example, NTIA is implementing extensive information technology (IT) improvements that will streamline the process of obtaining spectrum authorizations and improve access to information concerning Federal agency spectrum use. To the extent possible, obtaining frequency authorizations and coordination among Federal agency systems, and between Federal agency and non-Federal agency systems, will be automated. Several Federal agencies already share frequencies and networks.[6] Some Federal agencies also share facilities and frequencies with state and local entities. Many Federal agencies have revamped and centralized their spectrum management functions, integrating them with their agency's strategic and capital planning processes. In some Federal agencies, strategic spectrum planning is encompassed within the agency's IT activities. Further details on this spectrum management evolution are discussed in Section IV.

[6] For example, USDA runs the National Interagency Fire Center, where emergency supplies, including 8000 land mobile radios, can be used during emergencies wherever they are needed. Treasury operates the "Federal Common," an interoperable frequency assignment which can be shared among all Federal agencies for law enforcement, as well as in coordination with State and local police in emergencies.

III. FUTURE FEDERAL SPECTRUM REQUIREMENTS

A. More Data/ Higher Speeds

1. Overall. Federal agencies have identified a widespread demand for greater data throughput, which often translates into a need for more bandwidth. The agencies underscore a heightened need for wireless broadband applications. For example, DOD projects a substantial, but not yet quantified, requirement for broadband communications-on-the-move. DOD envisions an IP-based flexible, ad-hoc mobile network providing constant connectivity and situational awareness.[7] Faced with increased complexity in crime fighting, DOJ forecasts increased demand for new spectrum-dependent technologies and systems. These requirements may mean wider operating bandwidths and/or spectrum access in higher frequency bands, although most requirements for mobile communications focus on use of spectrum below 5 GHz. Some Federal agencies project increases in the use of wireless broadband access for desktop and mobile computers and for public safety broadband applications.

2. Public Safety. The DHS Spectrum Needs Plan outlines the utility of broadband in a number of public safety scenarios.[8] These range from fire services situational awareness to medical high-speed resolution video transmission, to mobile surveillance emergency response video and images. The Spectrum Needs Plan recommends that NTIA, the FCC and DHS study the use of additional spectrum below 1 GHz for public safety broadband applications.

3. Unmanned Systems. Agencies foresee more unmanned systems applied in military, law enforcement and public safety missions. Unmanned aerial and ground systems often require a number of frequencies for functions ranging from control of the vehicle to communications relay and mission functionality (*e.g.*, sensor data transfer, weapons functions and situational awareness). Compression techniques may assist in reducing the amount of bandwidth needed for some data links. Nevertheless, agencies project substantial demand for spectrum for unmanned vehicles, with large bandwidths necessary for data transfer.

B. Satellite and Space Services

1. Increased Demand for Satellite Capacity. Agencies, such as DOD, project an increased demand for satellite capacity for defense, backup for disaster relief and remote area communications. In the past decade, commercial satellite service providers have often met such requirements. Consolidation in the commercial satellite industry could affect the future availability of such services. If commercial satellite capacity is insufficient to meet agency missions, additional Federal satellite systems may be required, along with additional spectrum allocations. Also, current regulatory mechanisms do not automatically provide Federal use of

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[7] "Situational awareness" with respect to communications enables devices and personnel to have accurate and up-to-date information concerning their operational environment.

[8] The DHS Spectrum Needs Plan addresses state, local and tribal public safety needs. The COG Annex addresses continuity of government operations requirements. In addition, agencies have commented on emergency preparedness and continuity of Government operations issues in their agency-specific plans.

fixed-satellite earth stations in conjunction with commercial satellites with the same regulatory status as commercial users for purposes of protection from interference.[9]

2. Global Positioning System (GPS). DOD developed and operates GPS, a satellite constellation that provides radionavigation worldwide supporting its military aviation, maritime and terrestrial operations. The civilian community now uses GPS tracking and direction-finding extensively in civil aviation, automobiles, cell phones and other applications. Continued growth in use of GPS-enabled devices will be facilitated by the additional frequencies allocated to the radionavigation satellite service at the World Radiocommunication Conference in 2000 (WRC-2000). As the full civil potential of GPS services and its augmentations are realized, the demand for services provided by other Federal radionavigation systems is expected to decrease.

3. Remote Sensing Operations.

*a) Meteorological Satellite (MetSat) Service***.** The Department of Commerce, National Oceanographic and Atmospheric Administration (NOAA), uses satellites to collect information about weather and conditions on the Earth, supporting a variety of economic interests in addition to disaster relief operations. NOAA projects additional spectrum needs for MetSat data transmission, passive sensing, radar, telemetry links for control and programming of autonomous vehicles and for marine and wildlife tracking.

b) Climatic research applications. The Department of Interior, United States Geological Survey and NASA use active and passive sensing satellites for research into a variety of areas including earthquakes, volcanoes and climate modeling. This research directly contributes to disaster prediction/detection on a global basis.

Near-term, NASA will require additional spectrum to provide global observations of soil moisture under substantial vegetation canopies and at subsurface depth. This information can aid understanding of the global environment.

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[9] NTIA petitioned the FCC to address this matter. *See*, Amendment to the National Table of Frequency Allocations, RM-11341, *Petition for Rulemaking*, National Telecommunications and Information Administration, filed Aug. 4, 2006. NTIA also cited the National Space Policy as support for NTIA's petition in a letter to the FCC stating that the U.S. should "seek spectrum regulatory status under U.S. domestic regulations for United States Government owned and operated earth stations operating through commercial satellites, consistent with the regulatory status afforded commercial operations and with the allocation status of the satellite service." *See*, Letter of John M.R. Kneuer, Assistant Secretary of Commerce for Communication and Information to Kevin J. Martin, Chairman, Federal Communications Commission, dated Nov. 16, 2006. *See also*, U.S. National Space Policy, at 9 (August 31, 2006), *available at* http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf.http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf. The FCC has developed some mechanisms for providing such protection, on a case-by-case basis.

4. Space Policy and Research.

a) Overall. The President has authorized a new overarching national space policy.[10] The policy aims to strengthen the nation's space leadership and ensure that space capabilities are available when needed and free from harmful interference in order to further U.S. national security, homeland security and foreign policy objectives, to increase the benefits of discovery and environmental activities, and enable a dynamic, globally competitive domestic commercial space sector.

b) Research. President Bush has made space travel to the Moon and Mars a priority for NASA. NASA identifies specific additional spectrum requirements to meet the large bandwidth necessary to fulfill these missions. NASA has also developed a "Space Communications Architecture" for implementing the Presidential vision for space exploration.

C. <u>High Frequency (HF)</u>

Continued and growing demand for HF spectrum stands out in agency forecasts for defense, homeland security, public safety and continuity of Government operations, both fixed and mobile. Also known as "shortwave" radio, HF encompasses radio frequencies between 3 and 30 MHz. HF can achieve over-the-horizon communications at relatively low cost.[11] HF can serve as a main communications system, and as a backup for satellite communications. DOD notes that HF can be a "common denominator," achieving interoperable communications in multi-service and multi-national operations, especially with coalition partners that have limited communications capabilities.

Several Federal agencies use HF for emergency communications. The National Communications System has established the SHARES HF program for national security and emergency preparedness.[12] The BBG and the Coast Guard identify additional specific requirements for HF spectrum. The BBG uses HF for international non-military broadcasting. The Coast Guard uses HF for maritime mobile communications, and is also exploring use of HF radar systems. The Public Safety Spectrum Needs Plan underscores public safety's reliance on HF in disaster and emergency scenes when commercial and other terrestrial systems are disrupted.

NTIA recognizes the continued and potentially growing need for HF spectrum and will work with the Federal agencies and the FCC to further refine needs and identify possible solutions.

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[10] *See*, National Space Policy, *supra* note 9 at 5.

[11] HF waves can transmit to the other side of the earth because they are refracted by the Earth's atmosphere, a phenomenon known as ionospheric skip propagation.

[12] SHARES or SHAred RESources HF radio communications program provides a single, interagency emergency message-handling system. SHARES brings together existing HF radio resources of Federal, state and industry organizations when normal communications are unavailable. *See* http://www.ncs.gov/shares/.

D. Radar

Agencies use radar for air and maritime navigation. In addition, the Federal Government, particularly the DOD, uses radar for location, targeting, tracking and surveillance.

Defense and security use of radar systems will continue to grow and evolve. Agencies have projected future radar demand in the HF and VHF bands. Many spectrum bands for radar are not fungible. Rather, radar systems present particular engineering cases and require propagation qualities that are suited to specific missions and purposes vital to national security. However, these Federal uses face increased competition for spectrum from expanding commercial services, as well as services that can serve both Federal and non-Federal users. For example, RFID technologies are heavily used by certain agencies but the technology operates within UHF spectrum allocated for the radiolocation service. Commercial interest in the radar bands for non-Federal applications often begins overseas, but as international implementation becomes successful, interest in U.S. market implementation grows.

E. Air Traffic Control

The FAA projects steady increases in demand for aeronautical mobile capacity. Many of these demands will be met through equipment upgrades. However, flight safety and efficient aircraft movement require greater and timelier information, which could create a need for more spectrum.

F. Above 30 GHz

There are several emerging applications for radar in the upper regions of the spectrum. DOD's study of millimeter wave bands (30-300 GHz) includes radar ground-mapping applications such as precise resolution and target identification. In addition, there is developing interest in the above 300 GHz region for applications such as radio astronomy and remote sensing. Scientists anticipate using these upper frequency ranges to study galaxy and star formation with giant telescopes like the Atacama Large Millimeter Array in Chile. Researchers also are applying "T-rays," or radio waves in the terahertz range above 1000 GHz, to medical imaging and explosive detection.

IV. THE FEDERAL STRATEGY

While the Federal agencies have provided extensive information on their current and projected future spectrum use, this information is primarily qualitative in nature. Only a few have been able to supply quantified estimates of future spectrum uses. Furthermore, while agencies are motivated to utilize effective systems in order to meet their missions, further improvements to the Federal spectrum management framework are needed to improve spectrum efficiency. Agencies have taken some actions to utilize more spectrally efficient systems, for example, by implementing narrowband equipment and taking initial steps to consider the economic value of spectrum. However, more action is needed to meet growing spectrum demand. Further integration of spectrum management into agency capital planning and budget processes is needed to provide a mechanism for consideration of the value of spectrum when investing in new major spectrum-dependent systems. Mechanisms that enable agencies to factor in the value of spectrum or provide other means to use it more efficiently, along with assessment of system effectiveness in meeting mission requirements, could result in investment in more spectrum-efficient systems.

With respect to future non-Federal spectrum requirements, such needs generally are driven by market forces as well as state and local public safety requirements, which are difficult to project over the long run. Moreover, pending collaboration with the FCC on development of a National Strategic Spectrum Plan, information concerning future non-Federal agency spectrum requirements can only be inferred by the rapid growth of new wireless technologies and services over the past few years. In order to accommodate these trends, this Federal Strategic Spectrum Plan seeks to incrementally improve the Federal spectrum management processes through: automation and advanced analytical tools; standardized generation of spectrum requirements; and methods to forecast spectrum trends. These improvements will lead to a better understanding of existing and intended spectrum use and a comprehensive operational picture of the spectrum environment. This increased understanding will enable development of policies and standards which support the introduction and use of adaptive and dynamic means of utilizing spectrum. Improvements to Federal spectrum management must foster promising technologies that improve efficiency and effectiveness and ultimately result in the flexibility, agility and adaptability of spectrum-dependent systems required by Federal and non-Federal entities in the future.

A. Near–Term

For the next five years, NTIA expects the Federal agencies to continue many of the spectrum management improvements they have already instituted in response to the *Presidential Initiative,* including more strategic spectrum planning linked to overall agency strategic and capital planning processes as well as more rigorous analyses of alternative solutions to meeting mission requirements. The Federal Government and the nation will continue to reap the benefits of these and several other ongoing *Presidential Initiative* projects.

The Spectrum Needs Plan identifies the need for further study of public safety requirements.[13] In addition, the Spectrum Needs Plan encourages state and local public safety agencies to formulate long-term strategic spectrum plans that foster interoperability.[14]

NTIA will continue its program to streamline and integrate spectrum management processes through enterprise-wide information services which will reduce the time required to perform

[13] In 1995, the FCC and NTIA convened experts from local, state, and Federal user communities, as well as staff of their respective agencies, and private industry to form the Public Safety Wireless Advisory Committee (PSWAC). The goal of the PSWAC was to determine comprehensively the public safety spectrum requirements through 2010. The 1996 PSWAC Final Report stands as the first and only study of public safety spectrum requirements at all levels of government. *See*, Final Report of the Public Safety Wireless Advisory Committee to the Federal Communications Commission and the National Telecommunications and Information Administration, Sept. 11, 1996, http://www.ntia.doc.gov/osmhome/pubsafe/pswac_al.pdf.

[14] The Spectrum Needs Plan specifically recommends that non-Federal public safety agencies address how they intend to use all available spectrum efficiently, and to maximize the use of new technology, in public safety Tactical Interoperable Communication Plans (TICP), as required by the fiscal year 2005 Homeland Security Grant Program guidance.

operations, eliminate duplicative steps encountered with spectrum management processes, increase information sharing, and encourage consideration of adaptive technologies and efficiency measures. NTIA will continue to work with the Federal agencies in this effort so that the spectrum management community optimizes its human capital and investments as it improves operational effectiveness.

1. Use of Commercial Services Where Feasible. Federal regulations require Federal agencies to use commercial communications and spectrum-dependent services where possible.[15] The rapid deployment of improved commercial technologies, their decreasing costs, and tight Federal budgets can provide incentives to use such services.[16] The COG Annex acknowledges that, as a general rule, the Federal Government should make better use of commercial services.[17] The COG Annex, however, underscores that emergency services require higher standards of reliability and redundancy and that commercial networks may not be designed to this level.

Commercial communications services and networks nevertheless are an important adjunct to dedicated government systems. DOD, in particular, relies heavily on capacity on commercial communications satellites but cannot control the availability of such commercial capacity on an on-going basis. Thus, a rational plan is needed to balance commercial use, involving multiple commercial providers, with availability of government-dedicated systems, to ensure access to satellite capacity, whenever and wherever needed.

2. "Smart" Technologies. Many agencies plan to implement "smart" radio technologies such as software-defined radio (SDR) to improve adaptability and flexibility within an operational environment. Ultimately, these and other technologies will provide more rapid access to needed frequencies, wherever needed, whenever needed.

Through automatic reprogramming, an SDR device can transmit and receive on a wide range of frequencies, and operate pursuant to changing technologies and service rules and standards. "Cognitive" radios are programmed to "perceive" and "learn" their radio environment. By tracking and adapting to their electro-magnetic environment, cognitive radios can dynamically use whatever spectrum is available in any particular moment, and at the same time prevent interference to co-existing systems. NTIA is monitoring the development of such spectrally efficient approaches and encourages additional technology developments, particularly in the area of dynamic spectrum access. NTIA will look to both the government and private sector for assistance and support in devising the necessary plans and strategies that will allow evolution of the spectrum management system to support use of these technologies and minimize human-directed processes.

3. Flexible Approach to Incentives. Currently, regulatory hurdles prevent Federal and non-Federal spectrum users from efficiently sharing spectrum. New policies could allow Federal agencies to benefit from making available underutilized spectrum to non-Federal entities. More

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[15] *See e.g.,* NTIA Manual, supra note 39 § 8.2.48A ("Federal agencies implementing new land mobile communication systems and replacing aging ones should use available commercially offered land mobile services, or share land mobile services operated by other Federal, state or local government agencies whenever possible.")
[16] NTIA authorization is required for Federal entities operating on spectrum allocated to non-Federal users.
[17] COG Annex, at 2-7.

flexible spectrum sharing could allow both Federal and non-Federal users to more efficiently utilize the spectrum resource through economic and non-economic incentives. NTIA is studying various incentive approaches and methodologies to promote the use of spectrum-efficient technologies to satisfy Federal and non-Federal spectrum needs. These studies will identify policy changes required to implement these incentive mechanisms, possibly including secondary markets, property rights, sharing, and fees. NTIA expects to develop recommendations relating to these policy changes, as appropriate, develop legislative proposals as required, and implement such policies within the Federal Government.

4. Interoperability and Other Public Safety Issues.

a) Regulatory Flexibility. The lack of communications interoperability among public safety agencies is a complex and key concern. Several agencies have called for rule changes and policy reforms to improve interoperability and sharing in emergencies. NTIA, with the advice of the Interdepartment Radio Advisory Committee (IRAC), recently took steps to address the need for non-Federal entities to use public safety spectrum in appropriate situations.[18]

b) Federal/Non-Federal Public Safety Demonstration. Pursuant to the *Presidential Initiative*, NTIA tested the operational and cost effectiveness of sharing spectrum and communications infrastructure among Federal, state and local governments, and other non-Federal users.[19] This test utilized the Washington, DC Wireless Accelerated Responder Network (WARN), a pilot program operating on a dedicated public safety network in the 700 MHz band under an FCC experimental license. WARN provides real-time video for city-wide remote surveillance, chemical and biological detection and other emergency-related services. NTIA published a report on the results and observations of the demonstration project and associated recommendations in 2007.[20]

c) Microwave Backhaul. The Spectrum Needs Plan anticipates requirements for expanded microwave backbone networks to accommodate new public safety services, as contemplated in the 700 MHz band. The Spectrum Needs Plan recommends that the FCC, in coordination with NTIA and DHS, work with the public safety community to assess this need, as well as opportunities for sharing within the public safety community.

5. COG Considerations. The COG Annex to the Spectrum Needs Plan advises that, as new frequencies are assigned or re-allocated, spectrum managers consider how to support alternative communications in emergencies. NTIA will take these concerns into account, as appropriate.[21]

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[18] *See*, NTIA Manual, *supra* note 39 § 4.3.16.
[19] *See*, *Spectrum Policy for the 21st Century -- The President's Spectrum Policy Initiative: Report 2, Recommendations from State and Local Governments and Private Sector Responders*, U.S. Dep't of Commerce, National Telecommunications and Information Administration (June 2004) (Report 2), http://www.ntia.doc.gov/reports/specpolini/presspecpolini_report2_06242004.pdf.
[20] *See*, *A Public Safety Sharing Demonstration*, U.S. Dep't of Commerce, NTIA (May 2007), http://www.ntia.doc.gov/reports/NTIAWARNReport.pdf. This report fulfilled Recommendation 9(b) of Report 2. *See, supra* note 19, at 26.
[21] *See generally*, section III.C, *supra* at page 6.

6. IT Upgrades to the Federal Spectrum Management System. The *Presidential Initiative* underscores the criticality of information technology to reaching the ultimate goal of real-time processing of requests for new or additional frequency assignments. NTIA and the FCC have worked together in the past to automate frequency coordination. Future automation could build upon the success of 70-80-90 GHz coordination, where millimeter wave bands, once exclusively used by Federal agencies, can now be approved for non-Federal use in a matter of minutes. NTIA also is working to streamline the work of Federal spectrum managers through IT innovations such as single portal access to both classified and non-classified systems, electronic access to the IRAC documents and creation of a "Data Dictionary" that will standardize the terminology used in frequency applications.

7. Spectrum Valuation and Economic Efficiency. As directed by the President, the Office of Management and Budget has instructed the Federal agencies to consider the economic value of radio spectrum when developing justifications for new systems.[22] NTIA's *Presidential Initiative* program is considering methods of valuing Federal spectrum as well as incentives for more efficient spectrum use within the Federal Government.

The 2004 Executive Memorandum also directed the NTIA to develop a plan to identify and establish possible incentives for both the Federal and non-Federal sectors to use spectrum more efficiently and effectively. NTIA has created a project plan for this task, and begun its implementation. NTIA convened a public-private workshop on incentives in 2006 and inventoried international spectrum management "best practices". NTIA continues to focus on spectrum valuation, possible levying of user fees for Federal spectrum use, increased sharing and other, market and non-market-based approaches to stimulate the most efficient use of this important natural resource.

8. Technical Efficiency. NTIA's engineers are developing more precise methods to improve management of scarce spectrum. For example, NTIA is developing models for optimizing efficiency and effectiveness in land mobile systems. The Commerce Spectrum Management Advisory Committee (CSMAC) is studying technical and operational sharing efficiencies. DOD is developing a spectrum evaluation mechanism, the "spectrum scorecard", which provides a spectrum efficiency and effectiveness trade-off analysis for program managers. Further programs will develop automated spectrum management tools that also will promote dynamic frequency use, increasing the amount of time frequency assignments are in use.

9. Forecasting Trends. Development of new spectrum management tools will improve quantification of Federal spectrum use, and refine estimates of future requirements. NTIA will continue to collaborate with the Federal agencies, and other entities, as appropriate, on how to make projections of spectrum usage as accurate as possible. These efforts include exploring how to better predict both Federal and private sector spectrum use, including study of scenario-based simulation methods. These new approaches will improve forecasts of spectrum trends, and new tools will enable tracking spectrum usage in the dimensions of both time and space.

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[22] The Office of Management and Budget (OMB), Circular A-11, § 33.4 (2006), *available at* http://www.whitehouse.gov/omb/circulars/a11/current_year/s33.pdf (last visited, Feb. 7, 2008).

10. Improved Interagency and Federal/Private-Sector Coordination. The Policy and Plans Steering Group (PPSG), an advisory group of senior, political-level Federal officials advising NTIA's Administrator on spectrum policy and strategic plans, will continue to serve as a forum for issue resolution and harmonization on *Presidential Initiative* tasks.[23] The CSMAC will provide valuable input from the private sector. In addition, the working partnership between NTIA and the FCC on automation will reduce the need for staff to handle individual spectrum requests. Finally, NTIA's collaboration with the FCC on a National Strategic Spectrum Plan will promote full integration and execution of *Presidential Initiative* recommendations.

B. Mid-Term

1. Median Objectives. NTIA's five-to-ten-year goal is achieving a unified approach to improved spectrum situational awareness and adaptive spectrum use and control. Improved processes will increase the accuracy and fidelity of Federal spectrum requirements data. NTIA and FCC coordination will be automated, eliminating the "man in the loop" for most aspects of spectrum assignment and frequency coordination. DOD also is taking steps now to achieve automated coordination of its internal spectrum assets.

2. NTIA/FCC New Technology Testbed. The test bed proposal is a key recommendation of the President's Initiative.[24] It will enable Federal and non-Federal users of spectrum to explore new technologies and methods to share the finite radio spectrum. Both the NTIA and the FCC have solicited comment on the proposal. Each agency will identify 10 MHz of spectrum to be used in the test. NTIA expects that this project will drive future innovation and increased sharing to benefit government and commercial users, and serve as a proving ground and catalyst for advancing technologies important to dynamic spectrum access.

C. Long-Term

Because the agency-specific strategic spectrum plans contain limited information regarding future requirements and technology, NTIA's long-range assumptions are necessarily also limited. At this time, NTIA cannot predict the precise technologies, services and processes that will be utilized a decade from now. Current allocation and authorization methods and low-power unlicensed underlays will continue in use. For many bands and services, NTIA also envisions increased spectrum sharing through cognitive, self-adjusting spectrum use. This will provide a higher level of confidence of increased spectrum access for Federal, public safety and commercial users, providing an overall framework for meeting increasingly complex spectrum needs. Spectrum access on a dynamic basis will be realized only through effective planning by the spectrum management community to define and take the steps necessary to achieve this long-term vision. It is NTIA's goal within the next two-to-five years to identify the spectrum management framework required for the Federal Government to keep pace with the dramatic changes in technology and to achieve this vision of spectrum use. NTIA expects to execute this new framework within Federal spectrum management and related processes by 2012.

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[23] *See* Report 1, Recommendation 13, *supra* note 4, at 29.
[24] *See*, Recommendation 11, Report 1, *supra* note 4, at 28.

V. RECOMMENDATIONS

This Federal Plan sets in motion an evolutionary strategy for an overarching national spectrum policy for the 21st Century. The goal of this strategy is to provide access to spectrum for Federal and non-Federal users alike on an increasingly dynamic basis. In charting this course, both Federal and non-Federal sectors must work together to create a unified vision for this future state. The overarching, high-level vision, architecture, and steps to achieve the goals of the President's Spectrum Policy for the 21st Century will be articulated in this policy. A Federal or National Strategic Plan for Spectrum Management must embody this vision, architecture and steps and provide a blueprint for spectrum management for the Federal Government. Each Federal agency should then formulate a corresponding strategic plan for spectrum management to ensure that all agencies are consistent and unified in realizing this holistic vision. Finally, NTIA will continue to work with the Federal agencies to collectively and collaboratively establish the foundation, incremental steps, actions and milestones necessary to move the United States forward to achieving this goal. The National Telecommunications and Information Administration invites the Federal agencies, the Federal Communications Commission, and the spectrum-using American public, with input from technology and equipment developers and service providers, to work together to achieve this future of dynamic spectrum access.

Appendix A

PRESIDENTIAL MEMORANDUM

the White House
President George W. Bush

For Immediate Release
Office of the Press Secretary
November 30, 2004

Presidential Determination: Memorandum for the Heads of Executive Departments and Agencies

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

SUBJECT: Improving Spectrum Management for the 21st Century

In May 2003, I established the Spectrum Policy Initiative to promote the development and implementation of a U.S. spectrum management policy for the 21st century. This initiative will foster economic growth; promote our national and homeland security; maintain U.S. global leadership in communications technology; and satisfy other vital U.S. needs in areas such as public safety, scientific research, Federal transportation infrastructure, and law enforcement.

The existing legal and policy framework for spectrum management has not kept pace with the dramatic changes in technology and spectrum use. Under the existing framework, the Federal Government generally reviews every change in spectrum use. This process is often slow and inflexible and can encourage the introduction of new technologies. Some spectrum users, including Government agencies, have argued that the existing spectrum process is insufficiently responsive to the need to protect current critical uses.

As a result, I directed the Secretary of Commerce to prepare recommendations for improving spectrum management. The Secretary of Commerce then established a Federal Government Spectrum Task Force and initiated a series of public meetings to address improvements in policies affecting spectrum use by the Federal Government, State, and local governments, and the private sector. The recommendations resulting from these activities were included in a two-part series of reports released by the Secretary of Commerce in June 2004, under the title Spectrum Policy for the 21st Century - The Presidents Spectrum Policy Initiative (Reports).

Therefore, to the extent permitted by law and within existing appropriations, I hereby direct the heads of executive departments and agencies (agencies) to implement the recommendations in the Reports as follows:

Section 1. Office of Management and Budget.

Within 6 months of the date of this memorandum, the Office of Management and Budget (OMB) shall provide guidance to the agencies for improving capital planning and investment control procedures to better identify spectrum requirements and the costs of investments in spectrum-dependent programs and systems. Within 1 year of the date of this memorandum, agencies shall implement methods for improving capital planning and investment control procedures consistent with the OMB guidance, including making any modifications to agency capital planning procedures necessary to ensure greater consideration of more efficient and cost-effective spectrum use.

Section 2. Other Executive Departments and Agencies.

(a) Within 1 year of the date of this memorandum, the heads of agencies selected by the Secretary of Commerce shall provide agency-specific strategic spectrum plans (agency plans) to the Secretary of Commerce that include: (1) spectrum requirements, including bandwidth and frequency location for future technologies or services; (2) the planned uses of new technologies or expanded services requiring spectrum over a period of time agreed to by the selected agencies; and (3) suggested spectrum efficient approaches to meeting identified spectrum requirements. The heads of agencies shall update their agency plans biennially. In addition, the heads of agencies will implement a formal process to evaluate their proposed needs for spectrum. Such process shall include an analysis and assessment of the options available to obtain the associated communications services that are most spectrum-efficient and the effective alternatives available to meet the agency mission requirements. Heads of agencies shall provide their analysis and assessment to the National Telecommunications and Information Administration (NTIA) for review when seeking spectrum certification from the NTIA.

(b) Within 6 months of the date of this memorandum, the Secretary of Homeland Security, in coordination with the Secretary of Commerce and, as appropriate, the Chairman of the Federal Communications Commission, and considering the views of representatives from: (1) the public safety community, (2) State, local, tribal, and regional governments; and (3) the private sector, shall identify public safety spectrum needs.

(c) Within 1 year of the date of this memorandum, the Secretary of Homeland Security, in consultation with the Secretary of Commerce, the Director of the Office of Science and Technology Policy, the Director of the Office of Management and Budget, the Attorney General, the Secretaries of State, Defense, Transportation, Agriculture, and the Interior, the heads of other appropriate agencies, and, as appropriate, the Chairman of the Federal Communications Commission, shall develop a comprehensive plan, the Spectrum Needs Plan, to address issues related to communication spectrum used by the public safety community, as well as the continuity of Government operations. The Spectrum Needs Plan shall be submitted to the President through the Assistant to the President for Homeland Security, in coordination with the Assistant to the President for Economic Policy and other relevant components of the Executive Office of the President.

Section 3. Department of Commerce.

(a) Within 6 months after receiving the agency plans developed in section 2(a) of this memorandum, the Secretary of Commerce shall integrate the agency plans and Spectrum Needs Plan, based upon a Department of Commerce framework, into a Federal Strategic Spectrum Plan and shall assist in the formulation of a National Strategic Spectrum Plan. The Secretary of Commerce, in consultation with the Chairman of the Federal Communications Commission, as appropriate, shall update the National Strategic Spectrum Plan on a biennial basis thereafter.

(b) Within 1 year of the date of this memorandum, the Secretary of Commerce, in coordination with other relevant Federal agencies identified by the Secretary, shall develop a plan for identifying and implementing incentives that promote more efficient and effective use of the spectrum while protecting national and homeland security, critical infrastructure, and Government services.

(c) Within 6 months of the date of this memorandum, the Secretary of Commerce shall establish a plan for the implementation of all other recommendations included in the Reports. Not more than 1 year from the date of this memorandum, the Secretary of Commerce shall provide to the President a report describing the progress on implementing the recommendations in the Reports. The report shall include a section prepared by the Secretary of Homeland Security that describes the progress made with respect to public safety spectrum issues. This report shall be updated on an annual basis, until completion of the actions required by this memorandum. The heads of agencies shall provide the Secretary of Commerce and the Secretary of Homeland Security with any assistance or information required in the preparation of the annual report.

(d) The plans in sections 3(a)-(c) and the annual report developed in section 3(c) of this memorandum shall be submitted to the President through the Assistant to the President for Economic Policy, in coordination with the Assistant to the President for National Security Affairs and other relevant components of the Executive Office of the President.

(e) As appropriate, the Secretary of Commerce and heads of other agencies shall consult with the Chairman of the Federal Communications Commission regarding the implementation of the recommendations in the Reports.

Section 4. General.

(a) Nothing in this memorandum shall be construed to impair or otherwise affect the functions of the Director of the Office of Management and Budget relating to budget, administrative, or legislative proposals.

(b) This memorandum is intended only to improve the internal management of the Federal Government and is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity, by a party against the United States, its departments, agencies, entities, instrumentalities, its officers or employees, or any other person.

(c) This order shall be implemented in a manner consistent with existing statutes, treaties, Executive Agreements, and Executive Orders affecting the operation of any of the departments, agencies, or instrumentalities of the Federal Government.

GEORGE W. BUSH

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Appendix B

CURRENT FEDERAL SPECTRUM USE AND FUTURE REQUIREMENTS

INTRODUCTION

This Appendix describes the current and expected future uses of the spectrum for radiocommunication based on the submissions of the fifteen Federal agencies selected by the Secretary of Commerce in accordance with the direction of the President. This compendium is based on the National Telecommunications and Information Administration's (NTIA) review, compilation, and synthesis of these submissions so that the Federal Government's current and future spectrum needs could be described in the context of agency missions and functions. In preparing this Appendix, NTIA sought, as requested by the various Federal agencies, to ensure that the descriptions and subject matter presented would not jeopardize the sensitivity of government operations. This Appendix: (1) summarizes Federal agency spectrum use on a service-by-service basis; (2) addresses the specific needs of the public safety community; (3) discusses the impact of new technologies on Federal agency spectrum use; and (4) provides summaries of the Federal agency-specific strategic spectrum plans submitted to NTIA.

SPECTRUM ALLOCATIONS

Radio frequency spectrum allocations are a result of domestic and international spectrum planning processes in which parts of the spectrum ("frequency bands" or simply "bands") are set aside or allocated to the different radio services in a table of radio frequency spectrum allocations.[25] Most allocations result from the collective activities of the member nations of the International Telecommunication Union (ITU), a United Nations specialized agency. An international Table of Frequency Allocations is necessary because radio transmissions can transcend national borders. Furthermore, some services, such as aeronautical radionavigation, require the international commonality that such a table provides.

The ITU Table of Frequency Allocations is part of the ITU Radio Regulations, which has international treaty status. Each country, however, retains national sovereignty with respect to operation of wireless devices within its boundaries, and can adopt its own allocations. However, most ITU signatory countries, including the United States, use the ITU table as the basis for their national table. Many nations consider their table of frequency allocations as their national spectrum plan, since it provides guidance as to where in the radiofrequency spectrum to operate radio systems, including those under development. The ITU Table of Frequency Allocations not

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[25] Three key terms "allocation," "allotment," and "assignment" have precise legal definitions based on international telecommunications treaty law. These are incorporated into the U.S. regulations and are:

An allocation (of a frequency band) is "entry in the Table of Frequency Allocations of a given frequency band service under specified conditions. This term shall also be applied to the frequency band concerned."

An allotment (of a radio frequency or radio frequency channel) is "entry of a designated frequency channel in an agreed plan."

An assignment (of a radio frequency or radio frequency channel) is "authorization given by an administration for a radio station to use a radio frequency or radio frequency or a radio frequency channel under specific conditions."

See, ITU Radio Regulations, art. 1, sec. II, at 1.16-1.18 (Geneva 2004).

only pertains to current uses but provides allocations which can address many future needs. In some cases, individual country allocations may differ slightly from the ITU table, depending upon the spectrum needs of that nation. The United States further divides its allocation table into Federal and non-Federal allocations.[26]

The allocation table structure, both international and domestic, often allows multiple radio services in a frequency band. This provides flexibility within a country to use location, time or another aspect of a radio operation to allow sharing the same spectrum without harmful interference. In many cases, a country takes a band allocated to multiple services and separates those services into specific subbands to prevent interference or simplify assignment. The table of frequency allocations is changed as needed to accommodate new technologies and radio services, and to accommodate additional spectrum requirements created by growth in existing services. Similarly, spectrum allocations may no longer be required for some obsolete technologies or services that are no longer used, freeing that spectrum for other uses. The ITU changes the Table of Frequency Allocations via decisions made during World Radiocommunication Conferences (WRC). With the exception of changes in the bands allocated exclusively to Federal Government users, spectrum allocation changes in the United States are made in accordance with administrative law procedures.[27] For example, if a new service or system does not "fit" into an existing service category or allocation, a lengthy domestic, and often international process, is required to define the new service and provide allocations for such service. These processes, when they require changes to the international table of frequency allocations, can take many years.

[26] For the purposes of this Federal plan, Federal frequencies or allocations are those allocated for the Federal Government and NTIA authorization is required for federal entities operating in the radio frequency spectrum. Those allocated for use by state and local governments, commercial and private entities are non-Federal allocations and FCC authorization is required for non-federal entities operating in the spectum. It should be noted that there also are shared Federal and non-Federal allocations.
[27] *See*, Administrative Procedures Act, 5 U.S.C. § 553 (1946, as amended).

SECTION B-2

PUBLIC SAFETY SPECTRUM NEEDS

STATE AND LOCAL PUBLIC SAFETY SPECTRUM NEEDS

INTRODUCTION

When the President initiated the Spectrum Policy Reform Initiative in June 2003, he requested the Secretary of Commerce to prepare legislation and other recommendations to, among other things, develop means to address the critical spectrum needs of national security, homeland security, and public safety.

Subsequently, the President directed the Secretary of Homeland Security, in consultation with other Federal, state, and local agencies "to address issues related to communication spectrum used by the public safety community, as well as continuity of government operations" in a comprehensive plan, the "Spectrum Needs Plan."[229] DHS accordingly formulated a Public Safety Spectrum Needs Plan (Spectrum Needs Plan) after consulting with the NTIA, the FCC, and state, local, tribal and Federal public safety agencies. The President also directed the DOC to integrate the Spectrum Needs Plan and agency-specific strategic spectrum plans into a "Federal Strategic Spectrum Plan."[230]

DHS's plan addressed concerns of public safety spectrum users, identified the spectrum assets currently available and provided information concerning the public safety community's interest in spectrum in the 700 MHz band. Because the Spectrum Needs Plan was submitted prior to the FCC's actions in 2007 with respect to public safety use of spectrum in the 700 MHz band, it did not address the FCC's most recent decisions concerning public safety's access to narrowband and broadband allocations in that band. The FCC recently designated 10 MHz of spectrum in the 700 MHz band for a nationwide interoperable public safety broadband network to be provided by a public-private partnership.[231] This 10 MHz is part of the 24 MHz in the 700 MHz band already allocated to public safety (12 MHz for narrowband, 10 MHz for broadband,

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[229] Presidential Determination: Memorandum for the Heads of Executive Departments and Agencies, Improving Spectrum Management for the 21st Century, §§ 2(c), 3(a) (Nov. 30, 2004) (2004 Executive Memorandum) http://www.whitehouse.gov/news/releases/2004/11/20041130-8.html.

[230] State and local public safety radio services fall under the regulatory authority of the FCC. Therefore, rules, procedures, and spectrum needs are developed and codified by them. It is anticipated that the FCC will provide additional information on behalf of the State and local public safety communities during the development of the National Strategic Spectrum Plan.

[231] *See, Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010*, PS Docket No. 06-229, Second Report and Order, 22 F.C.C.R. 15289 (2007) (Second Report and Order). *See also*, Intelligence Reform and Terrorism Prevention Act of 2004, Pub.L.No. 108-458, § 7303, 118 Stat. 3638 (2004). *See also*, *FCC Revises 700 MHz Rules to Advance Interoperable Public Safety Communications and Promote Wireless Broadband Deployment*, FCC Press Release, http://fjallfoss.fcc.gov/edocs_public/attachmatch/DOC-275669A1.doc.

and 2 MHz for an internal guard band).[232] Thus, the following section contains information that in addition to that provided in the Spectrum Needs Plan, in order to accurately describe how spectrum will be made available for a nationwide interoperable broadband public safety system following the broadcast industry's return of analog spectrum in early 2009.

CURRENT NON-FEDERAL PUBLIC SAFETY SPECTRUM ASSETS

The FCC has allocated more than 97 MHz of spectrum for public safety service providers, including spectrum allocated prior to 2007. This includes 24 MHz of spectrum in the 763-775 and 793-805 MHz bands,[233] depicted in Table B-8, which will be available nationwide when terrestrial television broadcasters transition to digital television and release the spectrum currently used for analog transmissions. Congress mandated that non-Federal public safety entities will have nationwide access to all of the 24 MHz no later than February 17, 2009 when broadcasters must cease analog operations.[234]

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[232] *Id*.
[233] These two bands were adjusted by 1 MHz in the downward direction (to 763-775 MHz and 793-805 MHz) by the FCC in its recent order on the 700 MHz band. *Infra* note 254 at 131.
[234] Digital Television Transition and Public Safety Act of 2005, Pub.L. No. 109-171, 120 Stat. 4, Deficit Reduction Act of 2005, Title III, *codified at* 42 U.S.C. §§ 309, 337 (2006) (Digital Television Transition Act).

Table B-8 depicts the existing allocations to Non-Federal public safety interests.

Table B-8. Existing Non-Federal Public Safety Frequency Bands*

Non-Federal Public Safety Frequency Band (MHz)	Voice	Narrowband Data		Broadband Data	National Interoperability[235]	Outside Interference	Conventional or Trunked
2–25	✓	✓					Conventional
25–50	✓	✓					Conventional
72–76	✓	✓					Conventional
150–162[236]	✓	✓			✓		Both
220–222	✓	✓			✓		Conventional
450–470	✓	✓			✓		Both
470–512[237]	✓	✓					Both
763–775 793–805[238]	✓	✓		✓	✓		Both
806–821 851–866	✓	✓				✓	Both
821–824 866–869	✓	✓			✓	✓	Both
4940–4990[239]	✓			✓			N/A

*Source: DHS Public Safety Spectrum Needs Plan with addition of broadband notation for 700 MHz bands

[235] Current national interoperability channels are:

0.25 MHz of the 150–174 MHz band, which includes five narrowband channels in the 162–174 MHz federal band.
0.2 MHz of the 450–470 MHz band
2.6 MHz of the 763–775–776 and 793–805–806 MHz band
0.125 MHz of the 821–824 and 866–869 MHz band.

[236] Fire departments tend to select the 150-162 MHz band because of its long-range propagation characteristics.

[237] All frequencies in this band are only available in 11 metropolitan areas.

[238] *Infra* n. 256.

[239] Allocations in 4940–4990 MHz are best suited for incident site communications, i.e., high-speed, short-distance transmissions.

Unencumbered Spectrum

The DHS Spectrum Needs Plan emphasizes that certain public safety communications, especially those supporting emergency situations, command and control, situational analysis, and other mission-critical functions require spectrum unencumbered by other users to ensure reliability and eliminate or reduce potential interference.

Interoperability

The requirement for interoperability is a major concern for public safety identified by DHS. Federal agencies primarily use the 162-174 MHz and 406.1-420 MHz bands for their public safety requirements. Local and state public safety agency systems operate in many different bands, ranging from 25 MHz to 4.9 GHz. Existing public safety communications systems operating below 512 MHz lack common and sufficient channels to support all interoperability requirements. Fewer than a dozen standardized state and local interoperability frequencies, set aside by the FCC, exist below 512 MHz.

DHS cites the following challenges to achieving interoperability: (1) inadequate interagency cooperation; (2) insufficient standard operating procedures; (3) lack of available interoperable equipment; (4) inadequate training; and (5) lack of sufficient interoperable spectrum. Interoperability gateways, such as IP switches, have demonstrated the ability to "patch" systems together in certain circumstances.

However, the Spectrum Needs Plan indicates that such techniques are insufficient to provide broad-based, reliable and robust interoperability because of high costs, requirements for technically-trained staff, and limitations on the ability of such systems to support direct unit-to-unit communications.

The Spectrum Needs Plan suggested that additional allocations of spectrum designated specifically for interoperability could assist agencies in local, state and Federal homeland security coordination. Contiguous frequency allocations also could permit efficient equipment design and allow public safety agencies to benefit from economies of scale in equipment purchases.

Broadband Operational and Spectrum Requirements

Public safety requirements for and use of bandwidth-intensive wireless technologies are increasing. These broadband services include: in-car video cameras, medical video, mobile surveillance, software downloads, and transmission of large data files. The FCC reallocated the 4940-4990 MHz band in 2003 from a Federal Government-only allocation for fixed and mobile non-Federal public safety services.[240] In its reallocation order, the FCC adopted rules "intended

[240] *See, The 4.9 GHz Band Transferred from Federal Government Use,* Third Report and Order, 18 F.C.C.R. 9152 (2003) (*Third Report and Order*). *See also, The 4.9 GHz Band Transferred from Federal Government Use,* WT

to accommodate a variety of new broadband applications such as high-speed digital technologies and wireless local area networks for incident scene Management, dispatch operations and vehicular operations." However, according to the Spectrum Needs Plan, the non-Federal public safety community has not extensively used the 4940-4990 MHz band because of propagation characteristics, limited geographic range, lack of available and affordable equipment, and susceptibility to adverse weather conditions. Within the context of the reallocation of the analog television spectrum in the 700 MHz band, numerous public safety organizations supported an allocation of 700 MHz band spectrum for broadband use, as part of the 24 MHz already identified for public safety use beginning in 2009.[241] The recent FCC action to create a nationwide interoperable public-safety broadband system in the 700 MHz band is intended to address these requirements.[242]

FCC Actions to Provide For a Nationwide Interoperable Broadband Public Safety Network

The FCC, in August, 2007, determined that 10 MHz of the spectrum from the D Block (758-763 MHz and 788-793 MHz) to be auctioned in early 2008, combined with 10 MHz of public safety's 24 MHz (763-768 MHz and 788-793 MHz), will be made available to form a nationwide shared public safety/private broadband network. The Commission concluded that a single nationwide Public Safety Broadband License would be issued for the 10 MHz designated for public safety. The "Public Safety Broadband Licensee will be responsible for implementing the 700 MHz public safety nationwide interoperable broadband network".[243] The broadband network (using both public safety's 10 MHz and the commercial 10 MHz) will be funded and built by the commercial D Block licensee.

The FCC decided that the "upper 700 MHz D Block Licensee will gain access to the 700 MHz public safety broadband spectrum on a secondary preemptible basis through a spectrum leasing arrangement with the Public Safety Broadband Licensee."[244] The basis for such access will be negotiated between the commercial D Block licensee and the Public Safety Broadband licensee.

The public safety licensee, as prescribed by the FCC, is comprised of a broad range of organizations representative of non-Federal public safety interests. Under FCC rules, no

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Docket No. 00-32,Second Report and Order and Further Notice of Proposed Rule Making, 17 F.C.C.R. 3955, 3955 (2002).

[241] *See, Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010*, PS Docket No. 06-229, Second Report and Order, 22 F.C.C.R. 15289 (2007) (*Second Report and Order*). *See also*, Intelligence Reform and Terrorism Prevention Act of 2004, Pub.L. No. 108-458, § 7303, 118 Stat. 3638 (2004). *See also*, *FCC Revises 700 MHz Rules to Advance Interoperable Public Safety Communications and Promote Wireless Broadband Deployment*, FCC Press Release, http://fjallfoss.fcc.gov/edocs_public/attachmatch/DOC-275669A1.doc.

[242] *Second Report and Order*, at 1.

[243] *Id*. at 142.

[244] *Id*.

commercial interest may be held in or participate in the management of the Public Safety Broadband Licensee.[245]

Because there are some existing public safety narrowband systems in portions of the 700 MHz band, the FCC determined that narrowband operations now operating in channels 63 and 68 (and the upper 1 megahertz of channels 64 and 69) must be relocated no later than the DTV transition date of February 17, 2009.[246]

These existing narrowband systems will have to be relocated to accommodate the new band plan and ensure that the 700 MHz nationwide interoperable broadband system can be implemented as soon as possible by the D block licensee. The FCC determined that the Upper 700 MHz D Block commercial licensee will be required to pay the costs associated with relocating public safety narrowband operations to the consolidated channels, "in recognition of the significant benefits that will accrue to the D Block licensee".[247]

NON-FEDERAL SPECTRUM USE AND FUTURE SPECTRUM REQUIREMENTS

Spectrum Requirements Below 512 MHz for Communications in Rural Areas

Outside the major urban areas, most public safety agencies operate below 512 MHz because the long-range propagation characteristics of VHF make it much more cost-effective to cover larger areas with fewer antenna towers. Furthermore, in rural areas, there is often insufficient capacity on existing public safety VHF channels, and DHS has recommended the identification of additional frequencies for rural-area communications.

Improving Spectrum Efficiency by Narrowbanding

Narrowbanding increases spectral efficiency by using technological measures to transport the same wireless information in a percentage of the spectral bandwidth (typically fifty percent). DHS recommends narrowbanding below 512 MHz for voice and low-speed data applications.

Spectrum Requirements for Point-To-Point Microwave Radio Relay Backhaul Links

The availability to non-Federal public safety entities of 700 MHz band spectrum will encourage deployment of wide-area, multi-agency radio systems that may require expanded infrastructure. Such infrastructure is likely to include point-to-point fixed microwave communications links. The non-Federal public safety community does not currently have dedicated allocations in the 6 GHz, 10-11 GHz, 12 GHz, 18 GHz, or 21-23 GHz microwave bands. Microwave radio relay link backhaul communications provide inexpensive and effective long-distance communication, especially when land-line (wire) systems are disrupted in an emergency.

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245 *Id*. at 144-146*. See also, Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band*, PS Docket No. 06-229, Order on Reconsideration, 22 F.C.C.R. 17935 (2007); and *Order*, 22 F.C.C.R. 20453 (2007).
246 *Id.* at 132.
247 *Id.* at 133.

Therefore, DHS suggests that it would be useful for the FCC, in coordination with NTIA and DHS, to work with the public safety community to perform an assessment of current public safety point-to-point microwave use to evaluate anticipated growth and a potential need for additional public safety exclusive microwave spectrum, as well as opportunities for sharing microwave spectrum within the public safety community and between public safety and other users of point-to-point systems.

USING COMMERCIAL SERVICES FOR PUBLIC SAFETY

Public safety agencies require readily available spectrum in emergency situations. Commercial services have a tolerated a level of non-coverage in some areas and at some times. DHS therefore does not view commercial services as an effective solution for mission-critical public safety spectrum use. However, guidelines and resources to aid public safety agencies in identifying appropriate commercial applications could be useful. This may free up dedicated public safety spectrum for mission-critical functions.

LONG-RANGE STRATEGIC SPECTRUM PLANNING

Public safety telecommunications needs continue to grow as homeland security responsibilities increase. Therefore, the DHS, in coordination with the FCC and NTIA, will have a key role in providing guidance for non-Federal public safety agencies to prepare long-range strategic spectrum plans.

DHS also recommends conducting a comprehensive examination of public safety communications, comparable to the 1996 Final Report of the Public Safety Wireless Advisory Committee (PSWAC).[248] Further, in coordination with DOC and the FCC, DHS suggests that the PSWAC findings be reviewed in light of the changes that have occurred in the public safety environment over the past decade.

CONCLUSION

While additional spectrum in the 700 MHz band will be made available to state, local and tribal public safety entities pursuant the FCC's recent action, the benefits from the public-private partnership will take a number of years to be realized. In addition, a number of technical, operational, financial and political issues will need to be addressed as this system is implemented. However, the public safety community and the public at large could reap significant benefits from the responsiveness of the Congress and the FCC to the requirements for spectrum for broadband interoperable public safety communications.

However, more spectrum in and of itself will not solve all of the challenges facing non-Federal public safety communications. To respond to these challenges, the non-Federal public safety community is working to develop common standards for certain radio systems, implement new technologies, interconnect with other networks, including IP networks, and develop back-up systems. Increasingly, the non-Federal public safety community is coordinating these efforts

[248] PSWAC Report, *supra* note 13.

across jurisdictional boundaries. With the additional 700 MHz spectrum available for a nationwide interoperable broadband public safety system, state, local and tribal public safety entities should be able to develop interoperable systems (both narrowband and broadband) which significantly improve the communications capabilities needed to safeguard life and property.

FEDERAL PUBLIC SAFETY SPECTRUM NEEDS

CURRENT SPECTRUM USE AND FUTURE SPECTRUM REQUIREMENTS

The 162-174 MHz and 406.1-420 MHz bands, the two most heavily used Federal bands, are the primary public safety bands for Federal agencies.[249] The general use of these bands is discussed in more detail in the mobile and land mobile sections of Section B-1.

Most Federal agencies note that their departments rely on spectrum for public safety and interoperability purposes. Many agencies see an even greater future need for spectrum for these uses, but have not yet quantified these needs.

DOE expects that incident prevention and control will require UWB technology, in addition to land mobile radio systems, in the 162 MHz and 406.1 MHz bands to communicate with public safety.

DOJ sees the need for rapid response, and thus, unfettered spectrum access as situations dictate. DOJ needs the ability to set up mobile land mobile repeaters where a mission may require, without the need for embedded infrastructure. DOJ's use of nationwide land mobile frequencies may be justified in such cases.

As the USDA's operational support requirements increase, National Interagency Fire Center (NIFC) operations would be vastly improved with the permanent assignment of additional national frequencies. The NIFC is the nation's support center for wildland firefighting. Through the NIFC, seven Federal agencies, along with state foresters, work cooperatively to fight fires and provide other natural disaster relief across the country. The NIFC maintains a cache of handheld land mobile radios for use in large scale disaster relief.

The USDA keeps accurate records on the annual use of permanently assigned spectrum and frequencies temporarily assigned from other agencies. Every year the USDA engages in sophisticated planning for the upcoming fire season, using historical information and data from the drought index, weather, water, and snow-pack programs to anticipate resources, including radio frequencies. Traditionally, other Federal agencies provide USDA with temporary assignments to make up for shortfalls in permanent USDA frequency assignments. This impacts firefighting operations because off-the-shelf equipment configured to operate on USDA's permanently assigned frequencies often has to be reconfigured to operate on temporary frequencies before it can be deployed.

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[249] *Alternative Frequencies for Use by Public Safety Systems: Response to Title XVII, Section 1705 of the National Defense Authorization Act for FY2001*, U.S. Dep't of Commerce, NTIA Special Pub. 01-48 at 3-1 (Dec. 2001).

The Federal Government is increasingly looking to the NIFC to perform emergency support functions in addition to wildland firefighting, such as relief from weather-related natural disasters. Additional incident-command frequencies for large-scale incidents would improve overall operations. NIFC shares their existing frequencies with other Federal agencies for non-emergency operational needs when not in use.

INTEROPERABILITY

For DHS, interoperability means day-to-day, task force and incident (emergency response) communications both horizontally (Federal-to-Federal) and vertically (Federal-state-local-tribal). It sees an increased need for interoperation with other Federal agencies and non-Federal first responders.

DOJ expects an expanded presence in FCC-regulated spectrum at 150-162 MHz, 450-470 MHz, and 800 MHz region to support interoperability. There is a critical requirement for interoperability with non-Federal public safety users in these bands and DOJ expects interoperability needs to grow exponentially. These interoperability requirements are localized, and consequently, not amenable to a nationwide solution.

The VA also expects to join with other Federal, state, and local agencies to develop interoperable first responder capabilities. Treasury operates an interoperability frequency named the "Federal Common" which can be shared among all Federal agencies for law enforcement, as well as in coordination with State and local police in emergencies.

Many DOE field offices have established cooperative relationships with local and state public safety agencies.

DOI/Bureau of Land Management is reengineering and consolidating its land mobile systems with its partners to reduce spectrum demand and improve interoperability.

Several agencies acknowledge the importance of standardized equipment. DOC is developing a standard in LMR Project 25 for narrowband land mobile radios for public safety. The Coast Guard's uses for VHF high band (136-174 MHz) Project 25 include interoperability with Federal agencies. The Coast Guard's Rescue 21 system, an advanced search and rescue system that is replacing the Coast Guard's current system, the National Distress Response System, requires interoperability with public safety. Rescue 21 enhances line of sight coverage, increases position localization, increases the number of available voice and data changes and improves interoperability with Federal, state and local partners.

The new IWN acts as the core for some agencies' interoperability plans. The IWN is a collaborative effort of Treasury, DOJ, and DHS to create a consolidated Federal wireless network that can support interoperability with state and local public safety officials. IWN may be the future key to interoperability with other Federal agencies as well as state, local, and tribal partners. Interoperability could be improved through Treasury's participation in and connectivity to the IWN.

Public safety interoperability is a complex issue and a key concern of government entities at all levels. Policy and regulatory changes, some of which were recently made, are needed to facilitate interoperability and sharing in emergency situations. Standardized equipment, such as that being developed for narrowband land mobile radios under Project 25, can facilitate interoperability. Other technological approaches also are under development which may have significant impact on public safety interoperability.

Recent experimental programs, such as the WARN system in the District of Columbia, have demonstrated how partnerships among Federal, state and local governments which share spectrum and infrastructure facilitate interoperable communications.[250]

HF Spectrum Requirements

DHS expects a growing need for HF bandwidth for both fixed and mobile uses. The existing and future plans of several Federal agencies, as well as local and state first responders, echo this. Both Treasury and VA have initiated deployment of HF networks.

Broadband Spectrum Requirements

As did state and local public safety agencies, some Federal agencies underscore the growing need for broadband wireless networks for emergency uses. Broadband data networks might be needed for DHS's internal functions as well as interoperability. Broadband data networks may be a topic for additional deliberation with NTIA. Recent developments in using broadband in public safety incidents suggest that Federal agencies with similar missions should use this technology. No Federal spectrum is identified or structured specifically for this use.

Communications Satellite Spectrum Requirements

Commercial satellite services can provide very useful emergency communications, especially when terrestrial infrastructure is impaired or destroyed. Transportable earth stations can create an instant infrastructure in emergency situations. Yet, satellite infrastructure takes a great deal of time and money to implement. There are also some inherent delays in voice or data transmissions, which can cause communications difficulties.[251]

Several agencies use satellite telephones as a primary communications method for areas with a non-existent terrestrial communications infrastructure. For example, the USDA, and especially the USDA's Forest Service, utilizes commercial satellite services to provide coverage in remote areas where a land mobile radio system available 100 percent of the time may not be feasible or cost-effective for their fire-fighting and other public safety missions. Use of commercial satellite systems, however, also may be costly, on a per minute basis, but may support mission-critical

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[250]*Supra* note 19. *See*, *Spectrum Policy for the 21st Century – The President's Spectrum Policy Initiative: A Public Safety Sharing Demonstration*, U.S. Dep't. of Commerce, NTIA, (June 2007), http://www.ntia.doc.gov/reports/2007/NTIAWARNReport.htm.

[251] Federal Communications Commission, *Report to Congress On The Study To Assess Short-Term and Long-Term Needs for Allocations of Additional Portions of the Electromagnetic Spectrum for Federal, State and Local Emergency Response Providers Appendix C* (December 19, 2005) (FCC Appendix C), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-262865A1.pdf..

functions. In addition, the NSF uses satellite communications to provide medical and logistical public safety support to the U.S. Antarctica scientific bases.

Agencies also use satellite communications as backup communications in the event of degraded or destroyed terrestrial communications infrastructure. In particular, the VA procured 154 satellite telephones for emergency communications use after the terrorist attacks of September 11, 2001. The Coast Guard also uses satellite communications for search and rescue operations when other communications methods are unsuited for the task.

Commercial services help to fulfill a great deal of the agency satellite needs. For example, the Treasury sometimes uses commercial satellite telephones during enforcement and investigative activities, especially during joint operations for interoperability purposes. In addition, the Forest Service is deploying commercial satellite broadband technologies to assist with battling large fires.

In the aftermath of the September 11, 2001 attacks and Hurricane Katrina, satellite telephones played a vital role in public safety communications. Often they were the only available communications link. Satellites also provide programming distribution for telemedicine and associated emergency medical services, situational analysis imaging of disaster and emergency areas, meteorological and scientific analysis for emerging weather threats that may affect fire-fighting or homeland security interests, maritime communication (including search and rescue missions and other maritime law enforcement tasks), and asset tracking and navigation for emergency responders.

OTHER ISSUES RELATING TO PUBLIC SAFETY SPECTRUM USE

DHS may advocate for additional spectrum and adequate policy, rules, standards, and coordination to enhance interoperability at and between all government levels. DHS seeks more flexible rules permitting timely use of spectrum and common FCC/NTIA interoperability standards. Flexible channel plans would allow all public safety agencies to use Federal and non-Federal emergency frequencies without the need to undergo a lengthy approval process. DHS's goal is a seamless, nationwide public safety and incident response channeling plan spanning all public safety bands.

DOI would like to eliminate legacy regulations that impede innovations, including enhanced receiver standards that allow transmitters and receivers in separate networks to operate closer to each other, and allowing public safety local agency procurement of radio equipment through current contracts, enhancing the effectiveness of public safety joint interoperability operations.

Reform of the existing regulatory framework, including fostering an environment to allow improved spectrum sharing and interoperability between Federal and non-Federal activities, creating more flexible access rights as real-time requirements dictate, and ensuring the budget process allows for adequate funding for modernization directives could benefit DOJ.

NTIA and the IRAC have recently taken significant measures to address the need for non-Federal entities to use Federal public safety spectrum in appropriate situations. NTIA revised

Section 4.3.16 of the NTIA Manual to allow greater flexibility to non-Federal agencies to use the 162-174 MHz and 406.1-420 MHz bands for interagency law enforcement and incident response operations in coordination with Federal partners.

Appendix G - Testimony

Testimony of Congressman Lee Hamilton
Co-Chair of the National Security Preparedness Group
at the Bipartisan Policy Center

Hearing before the U.S. House Committee on Homeland Security
"The Attacks of September 11th: Where We Are Today"
September 8, 2011

Mr. Chairman, Ranking Member Thompson, and members of the Committee: Thank you for the opportunity to appear before you today. This Committee has been at the center of defending the country from the terrorist threat we face. You have provided sustained support for the implementation of the 9/11 Commission's recommendations. By doing so, you have done a great deal to ensure we are taking the difficult steps necessary to confront this determined enemy and protect Americans, our allies, and people throughout the world.

Today, I am appearing in my capacity as a Co-Chair of the Bipartisan Policy Center's National Security Preparedness Group (NSPG), a successor to the 9/11 Commission. Drawing on a strong roster of national security professionals, the NSPG works as an independent, bipartisan group to monitor the implementation of the 9/11 Commission's recommendations and address emerging national security issues. The NSPG has the following members:

Governor Tom Kean, Former Governor of New Jersey, Chairman of the 9/11 Commission, and Co-Chair of the National Security Preparedness Group;

The Honorable E. Spencer Abraham, Former U.S. Secretary of Energy and U.S. Senator from Michigan, The Abraham Group;

Peter Bergen, Director, National Securities Program at the New America Foundation;

Dr. Stephen Flynn, President, Center for National Policy;

Dr. John Gannon, BAE Systems, former CIA Deputy Director for Intelligence, Chairman of the National Intelligence Council, and U.S. House Homeland Security Staff Director;

The Honorable Dan Glickman, former Secretary of Agriculture and U.S. Congressman;

Dr. Bruce Hoffman, Georgetown University terrorism specialist;

The Honorable Dave McCurdy, Former Congressman from Oklahoma and Chairman of the U.S. House Intelligence Committee, President of the American Gas Association;

The Honorable Edwin Meese III, Former U.S. Attorney General, Ronald Reagan Distinguished Fellow in Public Policy and Chairman of the Center for Legal and Judicial Studies at the Heritage Foundation;

The Honorable Tom Ridge, Former Governor of Pennsylvania and U.S. Secretary of Homeland Security, Senior Advisor at Deloitte Global LLP, Ridge Global;

The Honorable Richard L. Thornburgh, former U.S. Attorney General, Of Counsel at K&L Gates;

The Honorable Frances Townsend, Former Homeland Security Advisor and Deputy National Security Advisor for Combating Terrorism; and

The Honorable Jim Turner, Former Congressman from Texas and Ranking Member of the U.S. House Homeland Security Committee, Arnold and Porter, LLP.

Last week, we released a report assessing the 9/11 Commission's recommendations, which I will discuss today.

I. Response to 9/11 and the Evolving Terrorist Threat

On September 11, 2001, violent Islamist extremists hijacked four commercial airplanes and turned them into weapons, killing nearly 3,000 people, and altering our society forever. These attacks exacted a devastating toll on so many families. Our government, the private sector, and daily lives have been profoundly transformed in the decade since the attacks.

Indeed, it is difficult to comprehend all the ways that our nation has changed. The most visible reminders of these changes are the airport screening protocols and being asked to report suspicious activity in public places. Drone strikes that kill terrorist operatives are front page news.

The less notorious changes that have occurred within the federal government are even more dramatic. We have seen the largest reorganization of the intelligence community since 1947. The intelligence budget itself has doubled since 2001. The creation of the Department of Homeland Security (DHS) was also a massive reconfiguration of government, combining 22 agencies into a new department, with a workforce of 230,000 people and an annual budget of more than $50 billion. In total, some 263 organizations have been established or redesigned.

The terrorist threat has changed as well. Today, unlike 2001, we must be concerned about Americans, such as Anwar al-Awlaki, playing prominent roles in al Qaeda's global network. For example, in Minneapolis, Minnesota, Muslim-American youth are being recruited in Somali communities to fight for an al Qaeda affiliate in Somalia.

We also have seen Americans recruited by Islamist extremists through Internet forums. Major Nidal Hasan, who killed 13 fellow soldiers at Fort Hood in Texas, was radicalized online. This self-radicalization is very difficult, if not impossible, for law enforcement to detect.

Our terrorist adversaries and the tactics and techniques they employ are evolving rapidly. We will see new attempts, and likely successful attacks. One of our major deficiencies before the 9/11 attacks was a failure by national security agencies to change at the accelerated rate required by a new and different kind of enemy. We must not make that mistake again.

The terrorist threat will be with us far into the future, demanding that we be ever vigilant. Changing circumstances require that we regularly reassess our priorities and expenditures to determine what is needed to defend our country and people.

II. Unfinished 9/11 Commission Recommendations

After a 20 month investigation, in July 2004, the 9/11 Commission made 41 recommendations for improving the nation's security. The vast majority of these were endorsed by both presidential candidates at the time and almost every member of Congress. On the tenth anniversary of the attacks, it is appropriate to reflect and take stock of where we are in national security reform – and what we have yet to achieve.

The good news is that substantial progress has been made in fulfilling many of the Commission's recommendations. Among these is the transformation of the intelligence community and breaking down barriers in information sharing.

Legal, policy, and cultural barriers between agencies created serious impediments to information sharing that prevented disruption of the 9/11 attacks. Therefore, the 9/11 Commission made a number of specific recommendations to improve information sharing across our government. Information sharing within the federal government, and among federal, state, and local authorities, and with allies, while not perfect, has considerably improved since 9/11. Those changes facilitated the successful capture of Osama bin Laden.

In our report last week, we highlighted nine unfinished 9/11 Commission recommendations. They demonstrate that we are not as secure as we could or should be. We urge immediate action to complete their implementation.

<u>Unity of Effort:</u> Unity of effort for the many actors at a disaster scene is critical because a well-coordinated response can save many lives. Our nation was not fully prepared for the size and complexity of the 9/11 attacks or for Hurricane Katrina.

While training under a uniform command structure has taken place, many metropolitan areas where multiple agencies respond to a disaster still have not solved the problem of who is in charge. Our concern is that the failure to resolve the basic building blocks of establishing roles and responsibilities, conducting catastrophic disaster planning, and exercising those plans would likely result in confusion at the scene of a major disaster.

<u>Radio Interoperability:</u> A prerequisite to establishing unity of effort is providing first responders the ability to communicate with each other directly, on demand, during an emergency. Incompatible and inadequate communications led to needless loss of life on 9/11.

To remedy this failure, the Commission recommended additional assignment of radio spectrum to improve radio interoperability for first responders. Despite the lives at stake, this recommendation has stalled in part because of a political fight over allocating 10 MHz of radio spectrum – the D-block – directly to public safety for a nationwide interoperable network. I want to recognize the leadership that Chairman King and Ranking Member Thompson and many members of this Committee have shown in supporting a bill that would allocate the D-block to public safety.

Efforts to achieve unity of effort and interoperable emergency communications must be dramatically accelerated. Congress needs to allocate the radio spectrum by passing legislation, and DHS and state and local governments must work together to address gaps in unity of effort and interoperability planning.

<u>Congressional Reform:</u> Congressional oversight of the government's homeland security and intelligence functions remains as dysfunctional as it was when we released our 2004 report. At that time, we said that strengthening congressional oversight may be among the most difficult and important recommendations. It still is.

Congress should immediately consolidate jurisdiction over the Department of Homeland Security within the House and Senate homeland security committees. This would avoid the duplication of having DHS respond to more than 100 congressional committees and subcommittees that have overlapping jurisdiction over the Department. In 2009 and 2010, DHS provided more than 3,900 briefings and DHS witnesses testified more than 285 times. This amounted to many thousands of hours of work, often duplicating efforts, and cost taxpayers tens of millions of dollars.

To improve intelligence oversight, the 9/11 Commission recommended a joint, bicameral Intelligence Committee or Intelligence Committees in each body with combined authorizing and appropriating authority. The basic issue is that agencies listen to the people who control their purse.

Currently, the House and Senate appropriations committees fund the intelligence agencies through their defense subcommittees and the DoD budget. At a minimum, separate intelligence subcommittees should be established to fund the intelligence community.

The House Permanent Select Committee on Intelligence announced a decision this year to include three members of the House Appropriations Committee to participate in Intelligence Committee hearings and briefings. This is a positive step, but there is more to do here.

<u>Civil Liberties and Executive Power:</u> We recommended in 2004 that a Privacy and Civil Liberties Oversight Board should be established to address and monitor privacy and liberty concerns across government. All five democrats and five republicans on the Commission felt strongly about this recommendation.

Since 9/11, the executive branch has received expanded authorities to collect information and to conduct surveillance. Even if these powers are being employed in a careful way respectful of civil liberties, the history of the abuse of such powers should give us pause and make us commit to ensuring that mechanisms are in place to protect our liberty. A robust and visible Board can help reassure Americans that security programs are designed and executed with the preservation of our core values in mind.

Although legislation was enacted to establish this Board, it has, in fact, been dormant for more than three years. To date, only two of the Board's five members have been nominated by the President and neither has been confirmed by Congress. The remaining three should be appointed immediately.

Director of National Intelligence: The establishment of the Director of National Intelligence and the National Counterterrorism Center to coordinate the activities of the intelligence community represented major progress in intelligence reform. In the last six years, the DNI has increased information-sharing, improved coordination among agencies, sharpened collection priorities, brought additional expertise into the analysis of intelligence, and further integrated the FBI into the overall intelligence effort.

But it still is not clear that the DNI is the driving force for intelligence community integration that we had envisioned. There have been four DNIs in six years. There also is ambiguity about the DNI's authorities over budget and personnel. Further clarity about the DNI's role is needed. This could be done through legislation or with repeated declarations from the president that the DNI is the unequivocal leader of the intelligence community.

Biometric Entry-Exit System: In 2004, the 9/11 Commission recommended that the federal government establish a comprehensive biometric system to track foreign nationals that enter and leave the country. DHS has deployed a system that checks all individuals who arrive at U.S. borders, ensures they are who they say they are, and helps prevent known terrorists from entering the country.

But the exit portion of the system has not been completed, so we do not know with any certainty who has left the country or remains here on an expired visa. Such a capability would have assisted law enforcement and intelligence officials in August and September 2001 in conducting a search for two of the 9/11 hijackers that were in the U.S. on expired visas.

Standardized Secure IDs: Eighteen of the nineteen 9/11 hijackers obtained 30 state-issued IDs amongst them that enabled them to more easily board planes on the morning of 9/11. Due to the ease with which fraud was used to obtain legitimate IDs that helped the hijackers embed and assimilate in the United States for the purpose of carrying out a terrorist act, the 9/11 Commission recommended that "the federal government set standards for the issuance of birth certificates and sources of identification, such as driver's licenses."

In 2008, detailed regulations were issued, setting standards and benchmarks for driver's license issuance. However, the states' compliance with DHS regulations for more secure driver's licenses has been delayed to 2013 by DHS. This delay in compliance creates vulnerabilities and makes us less safe. No further delay should be authorized, and instead the deadline should be accelerated.

Transportation Security: With significant federal funding, TSA has deployed large numbers of enhanced screening equipment used in passenger checkpoint explosives detection and checked bag screening. Unfortunately, explosives detection technology lacks reliability and lags in its capability to automatically identify concealed weapons and explosives. The next generation whole body scanning machines also are not effective at detecting explosives hidden within the body and raise privacy and health concerns that DHS has not fully addressed.

Our conclusion is that despite ten years of working on the problem, the detection system still falls short in critical ways with respect to detection. DHS must improve the way it sets screening technology requirements, works with the private sector to develop this equipment, and tests it in the field.

<u>Standards for Terrorist Detention:</u> Within days of his inauguration, President Obama signed a series of executive orders on the treatment of detainees and barring the CIA from using any interrogation methods not already authorized in the U.S. Army Field Manual. By bringing the U.S. into compliance with the Geneva Conventions and with international and customary law on the treatment of prisoners, the executive orders have substantially fulfilled our recommendation.

However, for too long, our nation's political leadership have delayed resolving the difficult problem of reconciling the rule of law with indefinitely detaining alleged terrorists, some of whom would no doubt attempt to do the nation grievous harm. So Congress and the president must decide on a comprehensive approach of how to handle these detainees that is grounded in the principles of fairness, respect for due process, and protecting the American people.

III. Conclusion

While we have done much since the attacks ten years ago and are safer than we were that day, there is much more to do. Political leadership from both parties and at all levels of government should renew their focus on completing implementation of the 9/11 Commission recommendations.

Our national security departments require strong leadership and attentive management at every level to ensure that all parts are working well together. Their dedicated workforces enacted much change and should be commended for their achievements in protecting the American people. But there is a tendency toward inertia in all bureaucracies. Vigorous congressional oversight is imperative to ensure sustained vigilance and continued reforms.

Statement for the Record
of
Greg Schaffer
Acting Deputy Under Secretary
National Protection and Programs Directorate
Department of Homeland Security

Before the
United States Senate
Homeland Security and Governmental Affairs Committee
Washington, DC

July 27, 2011

Introduction

Thank you Chairman Lieberman, Ranking Member Collins, and distinguished members of the Committee. It is a pleasure to discuss the Department of Homeland Security's (DHS) efforts to improve communications for emergency response providers and government officials. As we approach the tenth anniversary of the attacks of September 11, 2001, there is no shortage of reminders of the need for an effective and efficient emergency response framework to manage incidents and restore essential services in the aftermath of a disaster. As just one recent example of many, we are all aware of the tragic series of tornadoes that ripped through the nation's heartland this year, causing billions of dollars in damages, killing hundreds, and leaving thousands homeless.

A top priority for DHS is improving the communications capabilities of those who are often the first to arrive at the scene of a disaster site—the Nation's emergency responders. Public safety personnel must have access to reliable and instantaneous communications at all times to effectively coordinate response and recovery operations. The Department recognizes that establishing emergency communications is not solely a technology problem that can be solved with just the "right" equipment or the "right" communications system. All of the critical factors for a successful interoperability solution—governance, standard operating procedures, training and exercises, and integration of systems into daily operations *as well as* technology—must and are being addressed through the collective work of our programs.

Further, DHS believes that effective emergency communications requires continued partnering with the millions of emergency responders that are the first to arrive on the scene of an incident, as well as non-governmental organizations, the general public, and citizens of affected communities. We look forward to discussing our respective efforts and key accomplishments to make the nation more prepared in an all-hazards environment.

Emergency Communications Responsibilities

Within the National Protection and Programs Directorate's (NPPD) Office of Cybersecurity and Communications (CS&C) are two organizations that focus on different but converging areas of telecommunications in support of emergency operations: the Office of Emergency

Communications (OEC) and the National Communications System (NCS). OEC and NCS are critical to shaping national policy and both work with other DHS components, federal departments and agencies, multiple levels of government, and the private sector to improve communications capabilities and achieve their mission requirements.

OEC was established as part of the congressional response to the communications challenges faced during the September 11, 2001, terrorist attacks and Hurricane Katrina in 2005. OEC coordinates policy and assists in the development and implementation of operable and interoperable emergency communications capabilities for emergency responders at all levels of government, including federal, state, local, tribal, and territorial. OEC also led the development of the first National Emergency Communications Plan (NECP).

The NCS, transferred from the Department of Defense to DHS in 2003, was created by executive order under President Kennedy to support the telecommunications functions of the Executive Office of the President and all federal departments and agencies for Continuity of Government, Enduring Constitutional Government, and Continuity of Operations. Presidents Reagan and George W. Bush each issued executive orders that evolved the responsibilities and structure of the NCS. Today, the NCS is an interagency system comprised of the telecommunications assets of 24 federal departments and agencies, each with significant operational, policy, regulatory, and enforcement responsibilities. The NCS coordinates telecommunications preparedness, response, and restoration activities across its 24 member agencies through the NCS Committee of Principals, which consists of senior government officials from each of the 24 member agencies, ensuring a diverse representation across the NCS that includes the full range of federal telecommunications assets.

Office of Emergency Communications

The creation of OEC was an important step toward improving the communication capabilities of those who are often the first to arrive at the scene of an incident—the nation's emergency responders. Inadequate emergency communications have been a critical gap in our nation's preparedness, and previous efforts to address this issue were hampered by the lack of a strong partnership between the Federal government and the public safety community. In addition, the nation lacked an overarching strategy to guide emergency communications planning and build capabilities at all levels of government.

In the last four years, OEC has worked to fill many of these and other gaps, and we are seeing progress in several key areas that enable emergency responders to interoperate in an all-hazards environment. As part of its mission, OEC led a comprehensive nationwide planning effort with more than 150 stakeholders from the emergency response community to develop the NECP. This included significant feedback and coordination with the SAFECOM Executive Committee, the SAFECOM Emergency Response Council, and the National Public Safety Telecommunications Council. These stakeholder groups represent the interests of millions of emergency responders, as well as the state and local governments that public safety communications serves. Involving these groups from the beginning ensured that the plan took stakeholders' input into account and would be widely accepted in the public safety community.

In the almost three years since it was released, the NECP has been instrumental in defining communication priorities for public safety personnel at all levels of government. OEC has been driving implementation of the NECP in coordination with its federal, state, and local partners, and we are seeing measurable improvements with building capabilities and closing gaps identified in the plan for governance, training, operating procedures, and others, including:

- **Enhanced Statewide Coordination:** The creation of Statewide Communication Interoperability Plans (SCIPs), Statewide Interoperability Coordinators (SWICs) and Statewide Interoperability Governing Bodies (SIGBs) has improved coordination of emergency communications activities and investments throughout all 56 states and territories. Through the SCIP development and updating process, the SWICs, in collaboration with their SIGBs, have been effective in helping states define their communications needs and future investments and ensuring that federal funding is directed where it is needed most. In addition, OEC has conducted nearly 150 workshops over the past three years to assist states as they implement and update their SCIPs.

- **Common Plans, Protocols, and Procedures:** The use of standardized plans and procedures is driving improved command, control, and communications among emergency responder agencies in the field. To facilitate this, OEC and FEMA have worked with more than 140 jurisdictions, including Urban Area Security Initiative (UASI) regions, to develop Tactical Interoperable Communications Plans that document formalized interoperability governance groups, standardized policies and procedures, and emergency communications equipment inventories. States continue to develop these communications plans to cover additional regions.

- **Targeted Technical Assistance:** OEC has implemented a technical assistance strategy to ensure that all states and territories can request and receive its targeted, on-site emergency communications assistance, while also focusing support on the states and urban areas most in need. These offerings are tailored to support the priorities in each state's or territory's SCIP and the objectives of the NECP. Since 2008, the 56 states and territories have combined to request more than 750 individual technical assistance services from OEC for support with the development of governance structures, tactical and strategic planning, and a variety of engineering services.

- **Increased Training Opportunities:** OEC has developed Communications Unit Leader (COML) and Communications Technician (COMT) courses to improve emergency responders' proficiency with communications equipment and to assist them with coordinating roles and responsibilities during an incident or event. The COML program has been embraced by emergency responders nationwide, and OEC has trained more than 3,500 responders, technicians, and planners to lead communications at incidents across the nation, including local floods, blizzards, and wildfires. Trained COMLs have also contributed to recovery efforts throughout the United States, including the recent outbreak of tornados and massive flooding in the Midwest and Southeast.

- **Enhanced Border Communications and Coordination:** OEC has been actively working with our international partners at the Northern and Southern borders to improve cross-border interoperable communications planning, policy development, and operations communications. DHS recently awarded $25 million in grant funding to states and local communities under the Border Interoperability Demonstration Project—a one-time competitive grant program focused on developing innovative solutions to strengthen interoperable emergency communications along the U.S. borders with our partners in Canada and Mexico.

- **Improved Governance and Coordination:** OEC is working with federal, regional, state, and local agencies to increase coordination, information sharing, and oversight of interoperability through formal governance structures and partnerships. For example:

  - SIGBs have been created in every state and territory and include representatives from all levels of government to coordinate and support statewide interoperability. The State of Indiana, for example, has implemented an effective governance process for emergency communications through the Statewide Interoperability Executive Committee, which also serves as an advisory group to the State's Integrated Public Safety Commission. Many states have also implemented Regional Interoperability Committees to provide insight into the statewide strategy from an operational perspective.

  - OEC continues to receive insightful feedback and input from responders, associations, and emergency communications professionals through the SAFECOM Executive Committee, SAFECOM Emergency Response Council, and the newly chartered National Council of Statewide Interoperability Coordinators.

  - OEC recently instituted a Regional Coordination Program to strengthen collaboration and knowledge sharing with our stakeholders. OEC has established a Regional Coordinator in each of the 10 FEMA Regions, and they regularly participate in the SIGBS, the UASI interoperability meetings and their respective FEMA Regional Emergency Communications Coordination Working Groups.

  - The Emergency Communications Preparedness Center (ECPC) provides an inter-departmental mechanism to coordinate common solutions, streamline development of policy and plans, and jointly engage state, local, and tribal partners. The ECPC has achieved early successes through defining a strategic agenda that reflects shared member priorities and establishes issue-specific focus groups to drive immediate action. Key accomplishments include: (1) coordinated inputs on national policy, such as federal agency comments on the Federal Communications Commission's (FCC) National Broadband Plan; (2) developed and published recommendations for common federal grant guidance to synchronize emergency communications spending across more than 40 grant programs; (3) initiated efforts to drive capability and resource sharing through mapping and analyzing existing federal communications resources; and (4) implemented a clearinghouse capability and data repository to yield improved information sharing and coordination.

- To complement inter-governmental activities, OEC facilitates the Department's One DHS Emergency Communications Committee. This committee, comprising senior executives from the Office of the Secretary and the Components, provides a vital mechanism for maximizing the efficiency and effectiveness of the Department's emergency communications investments and activities. The One DHS Committee reached its most significant milestone recently with the creation of the first-ever unified One DHS Emergency Communications Strategy. The Strategy establishes a common vision "to ensure access to and exchange of mission-critical information across the Homeland Security Enterprise anywhere, anytime, through unified capabilities." The Strategy also sets goals for coordinating and improving emergency communications architecture, investment, governance, and operations.

Further, OEC and FEMA have partnered on the Interoperable Emergency Communications Grant Program (IECGP), which has been a primary vehicle for implementing the Department's interoperability goals. It has been instrumental in advancing the state of interoperable emergency communications throughout the nation, especially through its emphasis on:

- Establishing governance bodies that conduct strategic planning and prioritize investments;
- Supporting SWICs who ensure federally funded projects align to strategic plans; and
- Funding the implementation of NECP Goals, allowing DHS to measure progress in emergency communications capabilities nationwide.

OEC has also partnered with the DHS Science and Technology (S&T) Directorate to promote the effective use of Federal grant funding through the development of the SAFECOM Grant Guidance.

By focusing on these core capabilities—planning, governance, training, interagency coordination, and technology support—emergency response agencies are becoming more equipped to establish and maintain interoperable communications during response and recovery activities. One such example of how this is translating into "real world" success can be seen in Louisiana, where recovery operations have benefitted from years of governance planning, relationship building, and communications training. Using lessons learned and improvement efforts associated with Hurricane Katrina, Louisiana statewide officials are invested in improving interoperable and operable communications throughout the State, including the deployment of a robust statewide communication system for public safety use.

The State's standards-based system—called the Louisiana Wireless Information Network—has effectively supported interoperable communications performance during evacuation efforts for Hurricane Gustav and, more recently, the response to the BP oil spill. Interagency coordination was tested from the moment that the explosion occurred last April, and local responders were able to successfully communicate with each other and with the United States Coast Guard.

Louisiana also coordinated with surrounding states to create talk groups designated for the spill and effectively used trained COMLs to initiate the process of action planning and lead major communications efforts throughout operations, including connecting multiple systems from surrounding states. Of course our hope is that another large incident in the Gulf will never happen, but if it does, Federal, state, and local agencies have demonstrated that they are more prepared and coordinated than ever before.

NECP Goal Assessments

Implementation of the NECP has been a key driver behind much of our progress in improving interoperability. More than 85 percent of the NECP milestones have been achieved to date, and progress is evident in all of the NECP priority areas, such as governance, training, and coordination. Nevertheless, considerable work still remains to achieve the long-term vision of the NECP, in which emergency responders can communicate as needed, on demand, as authorized, at all levels of government and across all disciplines.

To move the nation even closer to that vision, OEC is engaged in a comprehensive, nationwide assessment of emergency communications capabilities as it implements the NECP Goals. When complete, this assessment will provide a detailed view of capabilities at the county or county-equivalent level in all 56 states and territories. This detailed look at emergency communications—the first of its kind—will generate valuable data for both DHS and the states to use to more effectively and efficiently focus future resources and improvement activities.

OEC recently completed the measurement of Goal 1 of the NECP, which focused on emergency communications capabilities in the nation's largest cities. To measure NECP Goal 1, OEC worked with the UASI regions to assess their ability to demonstrate response-level emergency communications during a real-world event in each region. This approach enabled OEC to evaluate their use of emergency communications in real-world settings and in an economically efficient manner.

The results have been encouraging. Based on the capabilities documented at each Goal 1 event, all 60 urban areas were able to demonstrate the ability to establish response-level emergency communications in accordance with NECP Goal 1. This illustrated how the significant organizational and technical investments made by the UASIs have improved their emergency communications capabilities in recent years. In fact, OEC saw measurable improvements over key gaps identified in the previous DHS assessment of these urban areas in 2007, the *Tactical Interoperable Communications Scorecards* report. Some of these areas of progress were the result of DHS programs and funding, including the following:

- **Grants:** The NECP Goal 1 results showed an increase in the number of UASI regions using Project 25 (P25) digital radio standards-based systems, which are designed to allow interoperability regardless of equipment vendor. The implementation of P25 systems has been a provision in DHS grant guidance for several years, including the SAFECOM grant guidance and the Public Safety Interoperable Communications Grant Program.

- **Training and Technical Assistance:** As previously discussed, OEC offers a COML training program that has trained more than 3,500 responders, technicians, and planners to lead communications at incidents across the nation. This program began in part as a response to gaps identified in the 2007 DHS Tactical Interoperable Communications Plans Tactical Interoperable Communications Plan (TICP) Scorecard assessment, specifically the lack of trained COMLs. During the NECP Goal 1 events, OEC found that a large majority of the UASI regions had assigned DHS-trained COMLs to handle planning and implementing multi-system communications for the event.

- **Exercises:** Almost all UASI regions reported that agencies within their regions are now holding communication-specific exercises, and approximately half of them reported that the agencies are holding these exercises on a regular basis. This represents significant progress over similar findings from the DHS TICP report in 2007, which concluded that "almost no [UASI] region had completed a communications-focused exercise before the TICP validation exercise."

OEC is currently in the process of implementing Goal 2 measurement, which calls for an assessment of emergency communications performance and capabilities at the county level (or county-equivalent level, such as parishes in Louisiana). This is a large undertaking, as there are more than 3,000 counties in the United States. OEC is working closely with the states and territories to complete this assessment by the end of this year and will be following up with them on how to use the results to update their SCIPs and more effectively utilize resources. From a DHS perspective, we believe the NECP Goals assessment will generate much needed capability data to more strategically direct federal and state emergency communications resources—including grant funds and technical assistance support—to where they are needed most.

Public Safety Broadband Network

Over the last decade, our Nation has made critical strides in strengthening overall security and national preparedness. The public safety community also has made significant progress improving emergency communications capabilities through enhanced coordination, planning, training, and equipment.

However, we have been limited by wireless technologies that were introduced decades ago. To fully achieve the vision of the 9/11 Commission, emergency responders must have an advanced, nationwide, inherently interoperable, public safety communications network. Recent developments in high-speed, wireless communications technology represent a new opportunity for emergency responders to have significantly greater operability, interoperability, and capability.

These broadband advancements can provide emergency responders with access to information that will improve their ability to safely and efficiently manage their daily activities and respond to all levels of emergency situations. For example, as President Obama stated in his State of the Union Address, these advancements can enable a firefighter to use a handheld device to download the design of a building before arriving at the scene of an emergency. These types of capabilities have the potential to save countless lives. That is why the Administration has been coordinating with the public safety community, the private sector, and Congress to promote initiatives for the deployment and development of a Nationwide Public Safety Broadband Network.

Earlier this year, President Obama outlined his commitment to the development and deployment of such a network for public safety, a key recommendation from the *9/11 Commission Report*. The Administration's program in support of such a network is a component of its Wireless Innovation and Infrastructure Initiative, which was outlined in its Fiscal Year 2012 Budget. The public safety elements of the Initiative include an accounting for the foregone auction revenues resulting from reallocation of the D Block for use in the public safety broadband network; $7 billion in direct financial support for network deployment; $500 million for development and testing of broadband public safety requirements, standards and software applications (to be administered through the National Institute of Standards and Technology); and $5 billion for support to rural broadband services, including public safety services.

The Administration is fully committed to working with Congress to ensure the passage of legislation that meets the critical national need of establishing a public safety broadband network. We appreciate the bipartisan Congressional leadership on this issue that crosses committees of jurisdiction, including Chairman Lieberman, Chairman Rockefeller, and Senator McCain. We are confident that through continued cooperation with Congress, we can deliver a network that meets the needs of America's first responders whom all Americans rely upon.

OEC has been extremely active in support of the President's Wireless Innovation and Infrastructure Initiative and helping prepare the nation's responders for the deployment of broadband. OEC has worked closely with its federal partners at the Departments of Commerce and Justice to help set the broad policy framework for the planned network, and has coordinated with its state and local partners to ensure the public safety community's requirements are fully represented in network broadband planning and implementation efforts. More specific examples include the following OEC broadband-focused programs and activities:

- **Policy and Planning**: OEC is preparing an addendum to the NECP for release later this year that will identify key broadband challenges and recommend near-term actions to foster the integration of broadband technologies and data capabilities. This addendum also will propose further measures to support current interoperability efforts and to maintain existing Land Mobile Radio communications capabilities until broadband technologies can support mission-critical communications for first responders.

- **Outreach and Coordination:** OEC is working with all of its stakeholder groups—including the SAFECOM Executive Committee and Emergency Response Council, National Council of Statewide Interoperability Coordinators, ECPC, and the One DHS Committee on Emergency Communications—to ensure the views and requirements of the public safety community are fully represented in broadband planning and implementation efforts.

    - OEC supports outreach efforts related to the development and deployment of a nationwide public safety broadband network to include operational requirements, funding, standards, spectrum requirements, and governance. This includes support for an Innovation Roundtable with representatives from government, associations, public safety, and industry. OEC is also supporting a committee of jurisdictions that received FCC waivers for early deployment of 700 MHz broadband systems as they begin their efforts to build networks. Through these efforts, OEC is continuing to emphasize the need for planning and good governance, since these elements of emergency communications have yielded progress to date.

  - OEC continues to coordinate with the emergency response community, preparing wireless broadband guidance documents for SWICs, urban area and regional interoperability coordinators, public officials and executives, and emergency responders to support current NECP initiatives on interoperability planning. OEC also continues to provide emergency response stakeholders up-to-date and comprehensive information about wireless broadband in the emergency response environment. In addition, OEC is working with states and jurisdictions to incorporate broadband initiatives into the SCIPs.

  - To increase coordination of federal efforts for broadband implementation, the ECPC is working to identify federal broadband requirements, preparing a consolidated view of emergency communications assets, addressing associated legal and regulatory barriers, developing departmental positions on pending broadband regulatory matters and rulemakings, and establishing standardized grant guidance and processes. The ECPC has identified the development of broadband standards and research and development as one of its strategic priorities for the coming year.

  - Concurrently, the One DHS for Emergency Communications Committee is providing consolidated departmental input into federal interagency efforts, as well as developing strategies for broadband technology migration (i.e., transition from current land mobile radio technology).

- **Grants:** OEC's current SAFECOM grant guidance, which includes input from state, local, territorial, and tribal responders, contains a number of key provisions pertaining to broadband deployment. Further, the *ECPC Recommendations for Federal Agencies: Financial Assistance for Emergency Communications*, a document for federal emergency communications grant programs, will include updated guidance concerning the deployment of the Nationwide Public Safety Broadband Network.

- **Technical Assistance:** OEC has developed a wireless broadband technical assistance offering for 2011 to assist state, local, territorial, tribal and regional users develop and improve their use of broadband technology in line with the vision of a nationally interoperable network. The offering, which can be tailored for each jurisdiction, will provide informational briefings, governance models and standard operating procedures, project planning, and engineering support.

In addition, NCS provides technical advice to OEC regarding communications standards to ensure the proposed public safety network is interoperable with the commercial communications networks. NCS also ensures that the priority functions for national security emergency preparedness function seamlessly as they operate between the networks.

National Communications System

Since its inception, NCS has developed programs and services to address the unique communications challenges associated with communications divestiture, deregulation, natural disasters, and terrorist attacks on our nation.

As the co-lead for Emergency Support Function #2 (ESF-2) – Communications, under the National Response Framework, NCS coordinates government and industry during planning for and response to disasters and major outages. The operational arm for communications activities is the 24/7 National Coordinating Center for Telecommunications (NCC), which coordinates emergency response operations supporting the National Response Framework. The NCC is, and has been, a consistent coordinating mechanism for managing efficient communications restoration and recovery activity for more than 25 years. The NCC also coordinates the communications assets of the NCS members to provide communications assistance during disasters (manmade or natural). During a response, the NCC also provides requirements priorities to industry partners.

NCS also manages government industry partnerships to assist decision-makers in understanding the risks to the Communications Sector. Under Homeland Security Presidential Directive 7, NCS is the sector-specific agency for the Communications Sector and coordinates government and industry partners under the Critical Infrastructure Protection Advisory Committee Act to reduce communications sector risk. NCS also manages the President's National Security Telecommunications Advisory Committee (NSTAC), which comprises 27 Chief Executive Officer-level members from communications, information technology, and defense corporations. Most recently, the NSTAC examined four scenarios designed to stress future 2015-level networks, and provided the President with recommendations for technology enhancements and government investments that would provide the best network resilience and recovery.

NCS capabilities include the following:

- **Operational Activities:** NCS develops and maintains NS/EP communications priority services programs, such as the Government Emergency Telecommunication System (GETS) and Wireless Priority Services (WPS), which provide users with priority on commercial networks. The GETS program is a White House-directed emergency telecommunications service managed by NCS. GETS supports over 274,000 federal, state, local, and tribal government, industry, and non-governmental organization personnel in performing their NS/EP communications missions by providing a robust mechanism to complete calls during network congestion from anywhere in the United States. Specifically, GETS provides 90 percent or more call completion rates when network call volume is up to eight times greater than normal capacity. For example, approximately 10,000 GETS calls were made with a 95 percent success rate during the 9/11 attacks, and 1,231 GETS calls were made with a 90 percent or more success rate during the 2003 Blackout.

WPS is a nationwide program that provides priority NS/EP telecommunications via selected commercial wireless carriers. This program enhances the ability of 108,000 NS/EP subscribers to complete calls through a degraded public switched telephone network during a crisis or emergency situation. WPS calls receive the next available radio channel during times of wireless congestion and helps to ensure that key NS/EP personnel can complete critical calls by providing priority access for key leaders and supporting first responders. WPS service provides authorized cellular users with the ability to have priority within the public switched telephone network as well as access to priority channels.

The Telecommunications Service Priority (TSP) Program authorizes and provides priority treatment of NS/EP telecommunications services. The TSP Program provides service providers with an FCC mandate for prioritizing service requests by identifying those services critical to NS/EP. For example, a telecommunications service with a TSP assignment will receive priority by the service vendor before a non-TSP service. The TSP Program has two components: restoration and provisioning. A restoration priority applies to telecommunications services to ensure restoration before any other services. A provisioning priority is obtained to facilitate priority installation of new telecommunications services in response to an emergency. In addition to daily operations, TSP Program Office personnel are notified of presidentially declared disasters; activation of the National Response Framework, ESF-2; and Continuity of Operations and Continuity of Government (COOP/COG) plans. TSP Program Office personnel are on call 24/7. TSP can save days to weeks on the time required to return wireline voice/data services, and there are more than 200,000 active TSP circuit assignments in support of NS/EP communications.

NCS continues to migrate GETS and WPS services to work across evolving networks. NCS works with industry to enhance and assure these priority programs are compatible with Next Generation Network (NGN) technology.

The Modeling, Analysis, and Technology Assessments team provides expertise in modeling and analyzing current and future protocols, algorithms, network designs, and capabilities that will impact priority service communications in legacy and NGNs. The modeling team also maintains a suite of specialized infrastructure analysis tools to provide critical infrastructure risk assessments for the communications sector in the event of a man-made or natural disaster. The assessments consist of the following:

- Providing technical analysis of current and next generation communications systems, new technologies, physical and logical architectures, and products related to communications network infrastructures.

- Determining new and emerging communications technologies under various congestion and failure conditions to identify vulnerabilities and predict performance of existing and next generation networks.

- Developing products to be used for COOP/COG functions during disaster response related to federal, state, local and tribal governments.

- **Standards Activities:** The NCS Standards Team is an active leader and contributor to various national and international standards developing organizations, ensuring industry-wide adoption of non-proprietary solutions for NS/EP preparedness telecommunications requirements.

  The Team provides leadership and representation in standards bodies to recommend standards that, when implemented in Internet Protocol-based networks, will provide capabilities to ensure national, state, and local leaderships' ability to communicate during times of crisis.

  The Third Generation Partnership Project, known as 3GPP, is focused on the technical aspects associated with provisioning priority services in Long Term Evolution networks and is being pursued under the enhanced Multimedia Priority Service project. In cooperation with the Alliance for Telecommunications Industry Solutions (ATIS), NCS is developing an End-to-End Next Generation Network GETS Service Call Flow Standard that specifies end-to-end call flows. ATIS is also developing the baseline text for an Emergency Telecommunications Service wireline access requirements standard. This standard details the network element requirements for wireline access in support of Digital Subscriber Line, Cable, Fiber, and Metro Ethernet.

- **National Response Planning:** NCS is working with federal, regional, state, and local agencies to increase communications coordination, information sharing, and oversight of emergency preparedness activities to improve response to man-made and natural disasters. NCS works with these entities to ensure a coordinated response through formal governance structures and partnerships.

International Interoperability

DHS is working with its international partners to enhance interoperable communications to bolster information sharing and coordination among law enforcement personnel around the world.

For example, the United States and Mexico are establishing a new cross-border communications network, which will improve incident response and coordination among participating federal, state, local, and tribal law enforcement and public safety personnel along the border. Installation is scheduled to begin this summer. DHS and Public Safety Canada also work together to enhance cross-border interoperable communications planning, policy development and operations through the annual Canada-U.S. Cross-Border Interoperable Communications Workshops.

Conclusion

The Department appreciates the Committee's support for our interoperable emergency communications activities. Thank you again for this opportunity to testify. I would be pleased to answer your questions.

MAJOR CITIES CHIEFS POLICE ASSOCIATION

POLICE EXECUTIVE RESEARCH FORUM

Public Safety Alliance
Dedicated to First Responders...First

Hearing before the Senate Committee on Homeland Security and Governmental Affairs

Ten Years After 9/11: Improving Emergency Communications

July 27, 2011
Dirksen Senate Office Building

Testimony of Charles H. Ramsey
Police Commissioner, Philadelphia Police Department
President, Major Cities Chiefs Association
President, Police Executive Research Forum

Good Morning Chairman Lieberman, Ranking Member Collins and all invited speakers and guests. Thank you for this opportunity to discuss a critical issue affecting all public safety and law enforcement organizations across our country, and our ability to serve the public. Having had 42 years in law enforcement, I have witnessed many important changes in emergency communications across police departments in three cities: first in Chicago for 30 years, then as Chief of the Metropolitan Police Department here in Washington, DC, for nine years, and now as Police Commissioner in Philadelphia for the past three and half years. I also have the privilege of serving as the President of the Major Cities Chiefs Association (MCCA) and the Police Executive Research Forum (PERF), both of which are members of the Public Safety Alliance (PSA).

The PSA is a coalition of the leading national public safety associations that represent every law enforcement, fire, EMS, emergency management agency and first responder organization in the country. I am here on behalf of first responders across this country to thank you, Mr. Chairman and Senator McCain for sponsoring bill S. 1040: The Broadband for First Responders Act of 2011.

We hope that you will also continue to work closely with Senator Rockefeller, Chairman, of the Senate Committee on Commerce, Science and Transportation, and sponsor of bill S.911: SPECTRUM Act, which was recently voted out of Committee for consideration by the Senate.

These bills fulfill an absolutely critical need. They allocate the D Block to public safety; provide the necessary funding to build out and expand the nationwide broadband network; and establish a governance structure in cooperation with state and local authorities.

Since September 11th, 2001, like many other jurisdictions around the nation, the Philadelphia region worked diligently to ensure adequate Local, State and Federal coordination for emergency communications. We established an "Interoperable Communications Committee" within our Southeast Pennsylvania Regional Task Force. Representatives from the five counties in the Philadelphia UASI, as well as seven additional regional counties from New Jersey, Delaware and Maryland comprise this task force. I'd like to thank Committee Member, Senator Tom Carper, for his assistance in strengthening homeland security in our region.

Let us be very clear in our mission: A terrorist attack or a major catastrophic event knows no municipal, state or federal boundary. Emergency preparedness spans across lines, and demands that law enforcement and public safety organizations across the country plan and coordinate their responses.

Mr. Chairman and Members of the committee, we have an extremely valuable opportunity in front of us to meet our needs in emergency communications. Seamless interoperability can only be achieved through a dedicated public safety nationwide broadband network. The allocation of the D block for public safety organizations, with adequate capacity, control and funding, is the only proposal that will meet the challenges and demands that we confront. As President of MCCA and PERF, I am here to support this solution, which serves law enforcement and public safety organizations, and most importantly, helps to protect the American people in the best way possible.

Commercial networks are not designed to serve our public safety needs. Past experience with major national disasters have demonstrated that these networks are not interchangeable with dedicated public safety networks. There are fundamental differences in the architecture that go to the heart of public safety communications. The Public Safety Alliance will strongly oppose any legislation or resolution that supports auctioning the D block. Public safety becomes both less public and less safe if we auction any part of the D Block to the highest commercial bidder.

We need the upfront funding to jump-start the investment and build out of the network, and to attract and encourage commercial interest and competition. We will partner with the private sector to leverage and make maximum use of the existing infrastructure, while managing operations locally through a national governance structure.

This Committee, the House Homeland Security Committee, the House Energy and Commerce Committee, and the Senate Commerce, Science and Transportation Committee have all held numerous hearings over the past two years on the proposed public safety spectrum and the nationwide broadband network. Congress has asked many good questions, and hopefully you now have the information you need to make an informed recommendation.

Our first responders, who put their lives on the line every day, must have the resources that they need to do their jobs more efficiently and effectively, armed with real-time data, video and other critical information. We can only accomplish this goal if we have the latest in mobile broadband technology that is fully interoperable on a Local, State, and Federal level. The ability to share mission critical information nationwide to coordinate and plan our response to emergencies depends on having this capability.

I would like to thank all of the Members of the Committee for your continued time and commitment to finding a solution that will meet the communications needs of our first responders, and will best serve the American people. What Congress decides now will dictate the future of our emergency response capabilities. Ten years after 9/11, we urge you to make the decision that will finally establish a dedicated nationwide public safety broadband network.

I am happy to answer any questions that you may have now. Thank you for your time and consideration.

Public Safety Alliance
Dedicated to First Responders...First

Written Testimony of Christopher Moore
Chief of Police, San Jose, CA

before the

House Energy and Commerce Committee
Subcommittee on Communications and Technology

Legislative Hearing to Address Spectrum and Public Safety Issues

July 15, 2011

International Association of Chiefs of Police I International Association of Fire Chiefs
National Sheriffs' Association I Major Cities Chiefs Association
Major County Sheriffs' Association I Metropolitan Fire Chiefs Association
Association of Public-Safety Communications Officials International
National Emergency Management Association I National Association of State EMS Officials

www.psafirst.org

Thank you, Chairman Walden and Ranking Member Eshoo. My Name is Chris Moore, and I am the Chief of Police for the San Jose, California Police Department. I am also one of the representatives of the Major Cities Chiefs Association (MCCA) to the Public Safety Alliance (PSA), which is a coalition of the leading national public safety associations that represent every law enforcement, fire, EMS, emergency management agency and first responder organization in the country.

My comments today will be brief and to the point. I am here on behalf of the PSA and the millions of first responders across this country to ask for your support of companion legislation to ***S.911: The Public Safety Spectrum and Wireless Innovation Act of 2011***, which was recently and overwhelmingly passed by a 21-4 bipartisan vote by your counterparts in the Senate Commerce, Science and Transportation Committee. This act does what public safety and state and local governments have requested Congress to sponsor and support as a top priority for more than two years. The legislation allocates the D Block to public safety, provides the necessary funding to build out the nationwide broadband network, especially in rural areas, and establishes the governance to oversee and manage the build out, maintenance, operation, and upgrade of the network for decades to come. We urge the committee to act now, as if a 9/11 or Hurricane Katrina event had happened just yesterday, and fulfill the last recommendation of the 9/11 Commission by allocating the D block, as recently endorsed in testimony this year by the co-chairs of that Commission.

The PSA is greatly encouraged by the Democratic Staff Discussion Draft that has been circulated by Congresswoman Eshoo and Congressman Waxman just this week, and urges swift introduction and Committee consideration to move this matter to the House floor. The PSA strongly believes that this language, as developed within the committee of jurisdiction, builds and improves upon H.R. 607, which has garnered bipartisan support of forty-three (43) co-sponsors so far this year. Indeed, legislation to allocate D block to public safety introduced in the House in the 111th Congress last year garnered 80 bipartisan co-sponsors.

Mr. Chairman and Members of the committee, PSA representatives testified before this committee as recently as April and May to press for a nationwide public safety broadband network. We emphasized that this is a unique, one-time opportunity to change our operations of the past, a past trying to make do by linking and patching together communications systems on thin slices of spectrum spread out over at least six different bands to acquire interoperability and spectral efficiency. We also stressed the need for adequate capacity of the network with public safety control and mission-critical capabilities from the outset. The PSA strongly believes that allocation of the D block with funding is the only proposal that establishes those baseline principles and needs. We need the upfront funding to jumpstart investment and build out of the network, and to attract and encourage commercial interest and competition. We will partner with the private sector to leverage and make maximum use of existing infrastructure, and we do support a strong governance structure as proposed in the Senate's bipartisan bill, S. 911.

Mr. Chairman, the Majority Staff Discussion Draft, as currently written, does not meet those conditions as we have outlined previously both in the House and the Senate. In fact, if passed into law as currently written, it would leave public safety worse off than it is today. Mr. Chairman, we cannot support this draft legislation. While the PSA is opposed to the Majority Staff Discussion Draft on key points including (1) the auction of the D block, (2) the multiple state licensing, (3) the governance structure, and (4) the lack of specified funding as the top priority of any auction proceeds, we do appreciate the ongoing dialogue and consideration of our views, experience and perspective. We are committed to continuing to work with the committee to bring a bill to the floor of the House and to achieve final enactment of legislation on this critical matter this year. Indeed, the PSA continues to seek enactment before the 10th Anniversary of the tragic events of 9/11.

Over the past two years, numerous hearings have been held on public safety spectrum and a nationwide public safety broadband network by this Committee, the House Homeland Security Committee, the Senate Homeland Security and Government Affairs Committee, and the Senate Commerce, Science and Transportation Committee. Congress has asked many good questions, and we in public safety and state and local government have worked hard to provide answers to your questions.

We are not here asking for the spectrum and funding to make a profit. We are not here asking for the spectrum and funding for some personal gain or reward. We are here asking for the spectrum and funding in order for us to better serve and protect the American people. We are here to make sure that our first responders, who put their lives on the line every day, have the resources they need to do their jobs more efficiently and effectively, armed with real-time data, video and other information that can only be accessed with the latest in mobile broadband technology.

I am here also to let you know that the Public Safety Alliance will strongly oppose any legislative action that will require auctioning the D Block. This is not an acceptable solution and it ignores everything we have been advocating long before 9/11. Auctioning the D Block will put the public's safety at risk and will considerably limit our first responders' ability to do their jobs.

We will continue to oppose legislative action that would abandon a single nationwide public safety broadband network, as well as action that would prematurely mandate conversion of our current 700 MHz narrowband voice spectrum to broadband. There are no current broadband LTE technology solutions that will replace our mission-critical voice networks or provide us with unit-to-unit talk capability absent access to a network.

In conclusion, I would like to thank you for your continued time and commitment to finding a solution that will meet the communications needs of our first responders for decades to come. The time has come for Congress to act and we urge you to pass legislation before the 10th Anniversary of 9/11. I will be happy to answer any questions you may have.

Chief Christopher Moore has been a police officer with the San Jose, California Police Department since 1982. He has worked in numerous assignments including Patrol, Patrol Administration, Street Crimes, Internal Affairs, Burglary, Community Services, Systems Development, Field Training and a tour as department spokesperson.

In 1999, Chief Moore was selected as a White House Fellow and served one year as Counsel to U.S. Attorney General Janet Reno. In 2004, Moore was awarded a Fulbright Police Research Fellowship to study police accountability at the London School of Economics and New Scotland Yard. He is a member of the Police Executive Research Forum (PERF) and the International Association of Chiefs of Police (IACP).

Chief Moore holds a B.A. from the University of California at Berkeley, a M.P.A. from San Jose State University, and a J.D. from Lincoln Law School of San Jose. He is a member of the State Bar of California and is a graduate of the California P.O.S.T. Law Enforcement Command College. Chief Moore is also a recipient of the SJPD Hazardous Duty Award.

STATEMENT OF
DEPUTY CHIEF CHARLES F. DOWD
COMMANDING OFFICER, COMMUNICATIONS DIVISION
NEW YORK CITY POLICE DEPARTMENT

BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON COMMUNICATIONS, TECHNOLOGY AND THE INTERNET

JUNE 17, 2010

STATEMENT OF
DEPUTY CHIEF CHARLES F. DOWD
COMMANDING OFFICER, COMMUNICATIONS DIVISION
NEW YORK CITY POLICE DEPARTMENT

BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON COMMUNICATIONS, TECHNOLOGY AND THE INTERNET

JUNE 17, 2010

Good morning Chairman Boucher, Ranking Member Stearns, and members of the Subcommittee. I am Deputy Chief Charles Dowd, Commanding Officer of the New York City Police Department's Communications Division. On behalf of Police Commissioner Raymond Kelly, I want to thank you for the opportunity to discuss with you today the critical need for Congress to act to ensure that public safety agencies will be able to communicate effectively, now and in the future.

I speak today not only for the NYPD and the City of New York, but also on behalf of virtually all of my colleagues in public safety, represented by the International Association of Chiefs of Police, the International Association of Fire Chiefs, the National Sheriffs' Association, the Metropolitan Fire Chiefs, the Major Cities Police Chiefs, the Major County Sheriffs' Association, the Association of Public Safety Communications Officials, and the National Emergency Management Association. We are joined in this effort by the National Governors Association, the National Conference of State Legislatures, the Council of State Governments, the National Association of Counties, the National League of Cities, the U.S. Conference of Mayors, and the International City/County Management Association, and to many others to list here today.

We jointly and urgently request that Congress take immediate action to reallocate and assign the 700 MHz D Block of broadband spectrum directly to public safety, rather than conducting a public auction of this vital resource. We strongly support a bi-partisan bill introduced by Representative Peter King. This legislation, H.R. 5081, currently co-sponsored by twenty-four members of the House, including Representative Anthony Weiner, Vice-Chair of this Subcommittee, would accomplish this purpose, and ask that Congress swiftly approve the bill and send it to the President for his signature.

In previous testimony before this committee we have said that broadband technology will create a paradigm shift in public safety communications. The events in

Mumbai India and more recently in Times Square confirm the need for information sharing capabilities that will allow first responders to be effective in preventing such attacks. The ability to share information in real time on a local, state, and federal level is critical to that goal.

The staff discussion draft referred to by this committee as the "Public Safety Act of 2010" is fatally flawed legislation in that it calls for the auctioning of the D Block. It does address some of public safety's needs by designating other spectrum for auction with the proceeds being dedicated to public safety broadband. It also talks about the establishment of an advisory board under the FCC. Such an entity could be successful if comprised of public safety practitioners as decision makers. The section on flexibility and sharing of broadband spectrum is an idea also generally supported by public safety as a way to fund and maintain the network. However, we cannot agree with the bill's intent to auction a resource as critical to public safety as the D Block.

Since the D Block spectrum is adjacent to the public safety broadband allocation it is uniquely desirable, as it can provide needed additional capacity simply and elegantly, without complicating network or handset design. Any alternative spectrum offered will be less desirable since additional components would be required which would dramatically increase the cost while reducing performance. Non adjacent spectrum blocks will not provide as much throughput capacity as the D Block, since greater efficiency is achieved through spectrum aggregation; this is the essence of broadband. If adding sites were the solution to a network capacity shortage, there would be no contention for, or market for the D Block. Rather than seeking additional spectrum, network operators would simply add more sites. This is clearly not the case.

Allocating the D Block to public safety will also provide first responders with the bandwidth required for the eventual migration of mission critical voice to 700 LTE as envisioned in the National Broadband Plan. The NYPD shares this vision and looks forward to a day when public safety users can share a nationwide network that supports voice, video, and data on an integrated wireless network and abandon the web of disparate legacy networks that impedes interoperability today. The D Block is the cornerstone of the mission critical voice foundation; without it, a mission critical voice and data network would not be possible. The City of New York filed a whitepaper with the FCC describing the spectrum needs for an integrated voice and data network several months ago. As public safety experts, we contend that filing provided proof that 10MHz. of dedicated spectrum is insufficient for public safety's needs during emergencies. We have submitted a copy for the record of this hearing.

Our experience with commercial network failures tells us we need network control to ensure guaranteed access and security. Commercial networks are simply not built to the same standards of reliability and survivability as our public safety networks. In a timely 60 Minutes broadcast last Sunday, federal officials criticized the utility industry for failing to safeguard their networks and systems from intrusion and malicious software. It was clear that the biggest impediment to protecting the power grid was the utilities' unwillingness to spend profits to secure their systems. What assurances do we have that commercial carriers will provide the adequate network security and robust buildout that public safety requires and demands? The nationwide network will be interconnected to confidential databases and secure servers that need to be protected. We need to have the option to build our own secure networks and manage the security of these networks ourselves.

The public safety organizations mentioned at the beginning of my testimony are unified in the goal of establishing for the first time a nationwide interoperable mission critical voice and data public safety broadband network. They are not motivated by profit or politics. Their only motivation is the ability to serve the public they are sworn to protect. On behalf of these organizations, I thank you for your attention to this important issue, and I will be happy to answer any questions from this Subcommittee.

Testimony before the United States House Homeland Security Committee

Hearing on "Public Safety Communications: Are the needs of our First Responders being met?"

Paul Fitzgerald
Sheriff, Story County, IA
First Vice President, National Sheriffs' Association

March 30, 2011

Good Morning Chairman King, Ranking Member Thompson, and Members of the Committee. My name is Paul Fitzgerald and I currently serve as the Sheriff of Story County, Iowa and as the First Vice President of the National Sheriffs' Association (NSA). The National Sheriffs' Association represents the 3,083 elected sheriffs across the country and more than 20,000 law enforcement professionals, making us one of the largest law enforcement associations in the nation. I am pleased to have this opportunity to appear before you today to discuss the critical issue of public safety communications and whether our current communication needs are being met.

Public safety communications has been a heavily debated and discussed issue over the last decade, particularly regarding the issue of interoperability among the nation's first responders. Since the tragic events of September 11, 2001, there has been a significant need among our nation's first responders to build and implement a robust nationwide public safety interoperable mobile broadband network that will improve our nation's homeland security and provide first responders with new interoperable communications technologies that are urgently needed. It is a need that was recognized and recommended by the 9/11 Commission - and it is the only recommendation from the Commission that has yet to be implemented.

The purpose of this hearing is to examine whether the needs of first responder communications are being met. Mr. Chairman, simply stated, public safety currently lacks the basic ability to interoperably communicate amongst each other. In my county of Story, the local law enforcement, fire, and EMS does have interoperability amongst each other within the county lines. We are the exception in Story County – not the rule. The vast majority of public safety agencies nationwide do not have these capabilities. Furthermore, although local Story County first responders have interoperability, we are still unable to communicate with state law enforcement on the same bandwidth nor are we able to communicate with local first responders in neighboring counties.

There must be a solution to this critical problem – and the NSA strongly believes that the solution lies in the implementation of a nationwide public safety interoperable broadband network.

For us to be successful, we need allocation of the 10MHz of spectrum known as the “D Block” to public safety and sufficient and sustainable funding to implement the network.

Both government and non-government studies have recently shown that public safety will not be able to obtain the necessary bandwidth and speed for our current and future needs based on 10MHz of broadband spectrum alone. The additional 10MHz of spectrum will be combined with the current 10MHz of broadband spectrum that is allocated to public safety to create a 20MHz block of spectrum to build a nationwide public safety interoperable broadband network. It should also be said that the D Block is located directly next to the current 10MHz of broadband spectrum that is currently licensed to public safety.

When built, the new nationwide public safety broadband network will be able to support a wide range of public safety; government; critical infrastructure and consumer applications such as voice, video, and internet services, including:

- transmitting high resolution pictures and building blueprints
- on-the-scene telemedicine services
- emergency vehicle telematics, such as GPS tracking
- incident command and control operations
- two-way video conferencing; video monitoring and broadcast services
- first responder health monitoring equipment
- emergency management programs
- large scale evacuation management
- public alerting and alarm services
- enabling next generation 9-1-1

These capabilities mean: that deputies will be able to receive real-time video on their patrol car laptops from videos within a school in the event of a school shooting, enabling deputies to identify where to quickly and most appropriately respond; that firefighters will be able to download building schematics of a burning building to determine safe points of entry; and the EMTs will be able to transmit patients' vital signs en route to hospitals – saving time and lives.

While current law mandates that the Federal Communications Commission (FCC) auction off the D Block spectrum – an auction that originally failed in 2008 - the NSA, along with numerous public safety; state and local intergovernmental; and industry partners, have urged Congress to swiftly pass legislation allocating the D Block directly to public safety.

Allocating the D Block to public safety enables public safety to know that the network and communication will be there when needed. Commercial networks do not and will not provide the reliability needed for mission critical public safety communications – we cannot agree to an unproven, untested theoretical plan that puts our first responders and citizens in real jeopardy.

Currently, there are two measures in Congress which not only allocate the D Block to public safety, but also provide for the funding necessary to create and implement a nationwide public safety interoperable mobile broadband network: **H.R. 607 - the Broadband for First Responders Act of 2011**, introduced by Chairman King and Ranking Member Thompson in the House; and **S. 28 – the Public Safety Spectrum and Wireless Innovation Act of 2011**, introduced by Senator Rockefeller in the Senate. These two bills take the critical steps necessary to assist the nation's first responders in our homeland security and emergency preparedness efforts.

It is rare, in fact almost unheard of, that law enforcement; fire; EMS; dispatchers; mayors; governors; county commissioners; state legislators all agree on an issue. However, the allocation of the D Block to public safety is that one issue. Moreover, the White House; the Department of Homeland Security; and the Department of Justice have all come out in strong and unified support of D Block allocation to public safety; thus, also recognizing the significant need to create this broadband network.

The time to act is now. The 10-year anniversary of 9/11 is quickly approaching; however, public safety continues to lack the ability to communicate effectively and efficiently amongst each other. Interoperability needs to be coast to coast; border to border; urban, suburban, and rural. The allocation of the D Block to public safety, as well as the allocation of funding needed to build the network, are the significant and necessary steps forward to achieving this goal; obtaining interoperability; and creating a nationwide public safety interoperable mobile broadband network.

I want to thank you for the opportunity to come before you today and discuss the critical issue of whether the current communication needs of public safety are being met. I would also like to thank Chairman King and Ranking Member Thompson for their strong leadership on the issue of D Block allocation and their unwavering support for the nation's first responders. I am happy to answer any questions the Committee may have.

CREATING AN INTEROPERABLE PUBLIC SAFETY NETWORK

Testimony of

Chief Jeffrey D. Johnson, EFO, CFO, MIFireE

Presented to the

SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY

of the

COMMITTEE ON ENERGY AND COMMERCE

U. S. House of Representatives

May 25, 2011

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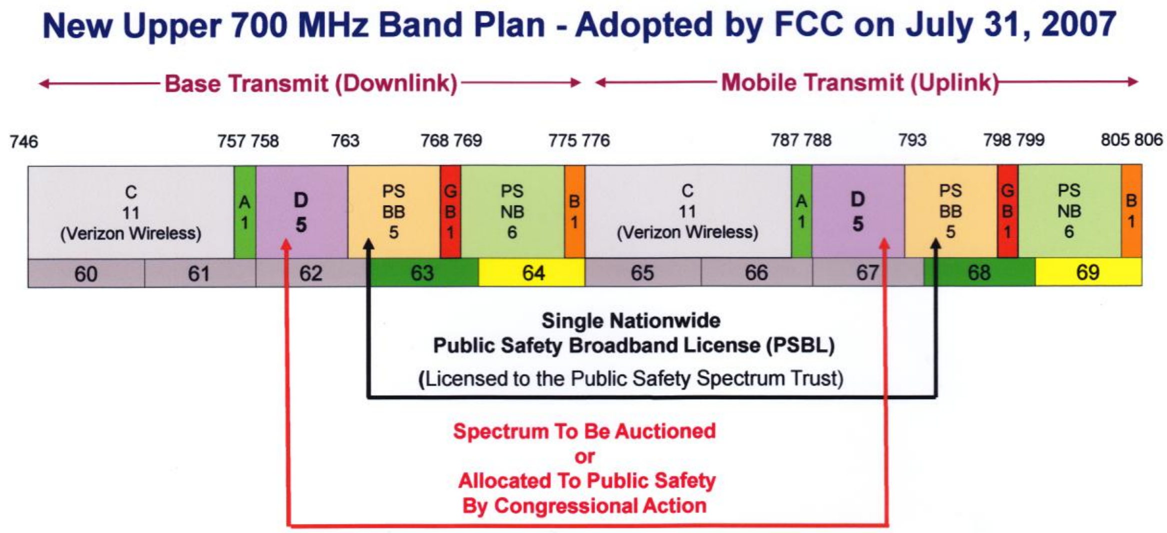
Good Morning Chairman Walden, Ranking Member Eshoo, and members of the subcommittee. I am Chief Jeffrey Johnson, immediate past president of the International Association of Fire Chiefs (IAFC) and currently chief executive officer of the Western Fire Chiefs Association. I testify today on behalf of the Public Safety Alliance comprised of nine national associations representing the leadership of public safety: International Association of Chiefs of Police, International Association of Fire Chiefs, National Sheriffs' Association, Major Cities Chiefs Association, Metropolitan Fire Chiefs Association, Major Counties Sheriffs' Association, Association of Public-Safety Communications Officials-International, National Emergency Management Association, and National Association of State Emergency Medical Service Officials. We are also joined with the formal support of approximately three dozen other national associations and business entities including organizations representing over 2 million rank and file first, second and situational responders.

Over the past fifty years, America's domestic defenders have been allocated thin slices of spectrum in each new band as it became available. That is why, today, we have over 55,000 public safety agencies each operating its own mission critical radio system over six or more different radio bands. Connecting disparate frequency slices among and between agencies and jurisdictions to achieve interoperability requires the purchase, programming and deployment of electronic patching equipment operating under a governing protocol. This makes our goal of interoperability limited, difficult and expensive. After numerous major events and other significant disasters demonstrating communications failures, it is clear that a new model is necessary. What is required is a national architecture for public safety wireless communications.

To create and construct a nationwide public safety broadband network three key ingredients are requisite: the D Block of spectrum, federal funding, and a governance model.

To achieve our plan of connectivity coast to coast and border to border, the 10 MHz of "D Block" spectrum, currently slated for Federal Communications Commission (FCC) auction, must be added to the current 10 MHz of spectrum licensed to Public Safety in order to build out a 20 MHz network with sufficient capacity. The currently licensed public safety spectrum abuts the D Block and is perfect for public safety. (See band plan below):



Only with this particular spectrum configuration, and none other, can public safety be assured that it will have the ability to build the network it needs now and into the future.

Local control of the network by public safety agencies is a critical component to realizing a nationwide interoperable public safety broadband network. Utilizing the Long Term Evolution (LTE) technology standard with sufficient spectrum will ensure nationwide interoperability and allow us to effectively manage day-to-day operations, as well as major incidents. We cannot have commercial providers defining when an emergency is taking place and deciding which communications should have the highest priority. Public safety transmissions have to go through without delay. A "no service" signal is not acceptable. The lives of firefighters, the lives of medics, the lives of law enforcement officers depend on this. It is our responsibility.

Public safety expects to work with others and enter into public-private partnerships. We will work with state, county and local governmental agencies, federal partners, utilities, and other agencies including water and highways who respond to emergency incidents. *But, public safety must have control over the operation of the network in real time.* It cannot rely on commercial operators to provide its critical governance needs. Network control will give our responders the assurance that we will have full, pre-emptive priority over our spectrum on a "when-needed" basis.

The network must be "mission critical" at the outset. In the beginning, this system will handle only data and video. At some future time – years away – we believe there will be a transition to mission critical voice. We all need to take a long term view – to start out with sufficient spectrum so that we will have the ability to migrate to mission critical voice. This migration will happen only after the technology is developed and operationally tested, public safety has confidence in it, and it is affordable. Here are the key elements of "mission-critical:"

- The network must be hardened to public safety requirements. This means towers must be able to withstand the elements that might disable them. Towers in hurricane-prone areas and tornado alleys must be designed accordingly. Back up electrical power must be available 24/7. Redundancy is necessary.

- The public safety mission critical voice network must have the ability to broadcast and receive "one-to-one" and "one-to-many" and the ability to broadcast and receive without the network infrastructure being operative. This is called "talk around" mode. This is a command and control imperative. You know well that we operate under extremely hazardous conditions. If the network, for any reason, cannot provide connectivity, then we need the capability to communicate without the network. This is the essence of public safety communications.

- The network must have back-up capabilities in the event of network loss and these capabilities must be built to public safety requirements. We envision satellite capability for the network to be available when a tower is disabled or other crippling malfunction. Satellites also can cover remote areas that do not have towers. Our mission is geography-oriented, whereas commercial carriers are concerned with population.

Funding is important for the build-out of the public safety broadband network. The Public Safety Alliance supports the auction of spectrum by the FCC – from incentive auctions, auctions of the unsold portion of the Advanced Wireless Spectrum, or of designated federal spectrum - with the top priority that the derived proceeds are marked for funding the construction, operation and maintenance funds to construct the nationwide public safety network.

A governance structure must be created to manage and operate this new nationwide public safety broadband network. The PSA recommends the following guiding principles in establishing the governing body:

- Public Safety First Responder delegates constitute a majority of the governing body that sets the rules and enforcement for network operation and facilitates nationwide build-out. The governing body should include private sector representation from commercial and other stakeholder groups.

- The governing body would be established as an independent quasi-governmental entity with rule-making ability.

- The governing body has authority to enter into contractual agreements either public or private and the responsibility to delegate the authority to regional, state, tribal or local operators.

- Accommodations for regional or large entity sub-governance (local presence but under the single license for purposes of technology, etc.) to facilitate regional access and presence.

- The Public Safety 10 MHz and the D-Block would be combined under a single license issued to the governing body.

- The governing body would be authorized to receive and distribute federal, grant, and other funds designated for its operation and for creating and facilitating operation of the nationwide broadband network.

- The governing body shall assume the responsibilities of the current licensee.

A nationwide public safety broadband network will offer capabilities not now available to law enforcement, fire or emergency medical services (EMS). In the fire and EMS field, we envision firefighter/medics with a device which would deliver building diagrams, hydrant locations, maps, and highway information as well as video to provide instantaneous situational awareness of major fire and hazmat incidents in real-time to incident command. A future capability for emergency medical operations is the ability for digital imaging, portable EKGs and ultrasounds, field blood work, and video of an accident scene – all transmitted to an emergency department and a physician many miles away. Law enforcement plans to use the wireless broadband network for numerous applications from field fingerprint identification to the rapid access of criminal records. Sophisticated broadband applications are available to the general public today through commercial carriers, but are not available to public safety. It is time to bring mission critical public safety communications into the 21st Century.

The urgent need for this network has been vigorously voiced by public safety over the past several years. Congress has responded with the introduction of bi-partisan legislation in both the House and Senate supported by public safety. Hearings have been held. And, the administration has clearly voiced its support for the construction of this proposed network through its budget submission to Congress.

Public safety is supported in its quest for the D Block by the seven national associations representing state and local governments known as the "Big 7." We also are supported by the two top U.S. telecommunications carriers as well as the primary manufacturers of telecommunications equipment. Additionally, there are more than 150 state and local associations that join in this effort.

The National Commission on Terrorist Attacks Upon the United States (also known as "the 9/11 Commission") recommended in its report that an interoperable communications system be established for public safety. At a Senate hearing on March 30th , former commission chairman Governor Thomas H. Kean, said: "We support the immediate allocation of the D-block spectrum to public safety. We must not approach these urgent matters at a leisurely pace. We don't know when the next attack or disaster will strike. Further delay is intolerable. We urge the Congress to act."

Mr. Chairman, I thank you and this subcommittee for today's hearing on this vital issue. I will be pleased to answer any questions.

UNITED STATES SENATE

COMMITTEE ON

COMMERCE, SCIENCE, AND TRANSPORTATION

TESTIMONY OF

CHIEF ROBERT L. DAVIS

SAN JOSE POLICE DEPARTMENT

PRESIDENT

MAJOR CITIES CHIEFS ASSOCIATION

SEPTEMBER 23, 2010

Good Morning Chairman Rockefeller and members of the Committee.

My name is Robert Davis and I currently serve as Chief of the San Jose Police Department. I would like to thank you for this opportunity to appear before you today to discuss one of the most critical issues facing public safety that I have witnessed in my 30-year career—the creation of a nationwide, interoperable, wireless broadband communications network for public safety.

I am here today speaking as President of the Major Cities Chiefs Association (MCC). The fifty-six U.S. cities represented in MCC are America's centers of industry, transportation, education, and commerce. Our police departments provide public safety services to roughly forty percent of America's population.

I speak today not only for the Major Cities Chiefs, but also on behalf of virtually all of my colleagues in public safety across America. For the first time in my memory, law enforcement, fire, EMS, and other emergency service organizations have come together to speak with one voice on an issue that profoundly affects the security of our homeland. The organizations leading this effort include the Major Cities Chiefs; the International Association of Chiefs of Police; the International Association of Fire Chiefs, represented by my colleague on this panel, Chief Jeff Johnson; the National Sheriffs Association; the Metropolitan Fire Chiefs; the Major County Sheriffs Association; the Association of Public Safety Communications Officials; and the National Emergency Management Association. We are also joined in this effort by the National Governors Association, the National Conference of State Legislatures, the Council of State Governments, the

National Association of Counties, the National League of Cities, the U.S. Conference of Mayors, and the International City/County Management Association, and too many others to list here today. For those familiar with government, it is indeed a rare event that you will see all of these organizations come together and unite around a single issue.

We have come here with a straight-forward, yet urgent request. Almost a decade has past since the tragic events of 9/11, and our nation needs a mission-critical grade, interoperable, public safety, wireless broadband network controlled by public safety. After much discussion during the past two years, the leadership of public safety in this country has studied this issue thoroughly and concluded that the two most important things necessary to achieve this outcome are: 1) reallocation of the 700 MHz D Block to public safety and 2) adequate funding to build and maintain a national infrastructure. Mr. Chairman, your bill, S. 3756 provides us exactly what we need to make this network a reality. We thank you for your leadership, and we urge all of your colleagues in Congress to support your bill.

Why is the D Block so important? The answer is that this slice of spectrum is both uniquely suitable and desirable for public safety use. First, 700 MHz is the ideal spectrum for nationwide emergency operations. Signals in this band can penetrate walls and windows much better than the higher-band frequencies that some have suggested should be an alternative for public safety. Second, the D Block is immediately adjacent to the existing public safety broadband allocation, thus it can provide needed additional capacity simply and elegantly without complicating network or radio handset design.

Any alternative spectrum would be less desirable, since additional components would be required which would dramatically increase costs while reducing performance. Non-adjacent spectrum blocks will not provide as much throughput capacity as the D Block, since greater efficiency is achieved through spectrum aggregation. Indeed, this is the essence of broadband.

Moreover, the D Block is critical for the accessibility of information by our nation's first responders. New technologies such as automated license plate readers, in-field biometrics, medical telemetry, automated vehicle location, and streaming video only scratch the surface of the applications that will be carried by the national public safety broadband network.

I would like to take a moment to address the notion that has been advanced by some wireless carriers that they should control the network and allow public safety to lease it. This simply *will not* work for public safety. A dropped call on a cell phone is an annoyance; in an emergency it literally can mean the difference between life and death. Public safety personnel must have coverage whenever and wherever we respond in an emergency.

In closing, the public safety organizations mentioned at the beginning of my testimony are unified in the goal of establishing for the first time a nationwide, interoperable, mission-critical, public safety broadband network. We are not motivated by profit or politics. Our only motivation is the ability to serve the public we are sworn to protect.

On behalf of these organizations, I thank you for your attention to this important issue, and I will be pleased to answer any questions from the Committee.

Hearing on "Public Safety Communications: Are the Needs of Our First Responders Being Met?"

Responses to the Questions for the Record from the Honorable Laura Richardson

1. Under President Obama's recently announced Wireless Innovation and Infrastructure Initiative, the Administration proposed a one-time investment of $5 billion and reform of the "Universal Service Fund" to provide at least 98% of Americans with access to 4G high-speed wireless, including most rural communities. The administration believes that by extending a high-speed broadband network to rural communities, it will also be able increase interoperability among rural public safety agencies. What are some of the challenges that public safety agencies in rural communities face today without access to a wireless broadband network?

Answer: In an era where police, fire and EMS officials in areas all across the country are dealing with serious budget shortfalls, and subsequent layoffs, the inability to wirelessly transmit data in the form of an incident report back to central command is hampering how the remaining public safety officials efficiently manage their tasks.

Take for example, two police officers in two similar rural jurisdictions. Officer "A" does not have the ability to wirelessly transmit biometric information (i.e., facial recognition) relating to a traffic stop back to his central command post. With no knowledge of the suspect he just pulled over, the officer approaches the vehicle operator and engages the driver in a dialogue. The officer issues a ticket for excessive speeding, his fourth ticket of the day. The driver provides the officer with false information including a picture ID and insurance card. When the officer radios into dispatch the false information no warrants are found. He sends the speeder along his way, and then turns around to drive the 40 miles back to his central command to fill out the paperwork for the 4 tickets he issued that afternoon. Instead of being able to fill out his report on the road and send it wirelessly back to his dispatch, Officer A is forced to drive back to his station, leaving one less officer on the road. Meanwhile, the officer later finds out, through a more comprehensive and exhaustive hands-on query once back at dispatch that the driver who was issued the officer's last ticket had two outstanding warrants, including one for felony gun possession. Had the officer known this fact, he would have apprehended the suspect, and would have found a semi-automatic weapon lodged under the front seat of the vehicle. Later that day, the driver commits a serious crime using the illegally owned weapon.

Now we turn to Officer "B" who, under the same fact pattern provided above has access to a secure wireless broadband network. During a routine traffic stop, the officer is able to take a picture of the driver and transmit the picture along with the driver's license number and license plate of a violator she's pulled over back to the station on a public safety network. Seconds after the information is submitted, she receives a real-time message on her broadband radio informing her that the individual identified by the license number does not match the picture of that was transmitted and the driver has two outstanding warrants, one relating to a felony weapon possession. Not only does the officer now know that she must bring the driver in, but that she must use extreme caution when handling the situation. She is alone with the driver in a rural part of the state without any back up and the nearest officer is miles away. She flips the switch to the video camera in her car that instantly transmits to dispatch the video of the pending arrest. Dispatch is able see the situation as it unfolds and sends the necessary support to assist the officer in the apprehension of the criminal. The arriving units, which could be from a neighboring jurisdiction, are able to see the video because they are on the same interoperable broadband network, and know instantly how to control the situation and assist the officer as they arrive on the scene. This information not only may save her life, but she was able to bring in a dangerous individual off the street – all without having to run back to the main station to fill out a report.

In just this one example of how broadband in rural communities can benefit public safety agencies. It keeps public safety officers on the street rather than commuting to and from the station, it catches offenders who would otherwise go free, and, most importantly, it keeps our nation's first responders safe from possible harm.

2. At the time of the attempted auction of the D Block, the cost of building the mobile broadband network under the public/private partnership proposed by the FCC was estimated at from $18 billion to as much as $40 billion. If the D Block is reallocated to public safety, what do you estimate the total costs to be, including user equipment such as radios and other hand-held devices?

Answer: We agree with the FCC's more recent statement found in the March 2010 National Broadband Plan that states the build-out of a 10 MHz (or 5x5) broadband network will cost approximately $6 to $10 billion over the next five years. If the D Block is allocated to public safety, thereby creating a contiguous 20 MHz swath of spectrum, the additional effort and materials required to build out a 10 x 10 network would cost little-to-no more than the 5 x 5 network. It would only take a software upgrade to public safety's towers to transform a 5 x 5 network to a 10 x 10 network; no additional hardware would be needed.

With that information in mind, we believe that the numbers discussed in H.R. 607, S. 28, S. 1040 and the bipartisan discussion draft recently circulated by Senators Rockefeller and Hutchison that will eventually become S. 911 would *all* adequately help to cover the cost of the build-out and sustainment of the network. As for user equipment, including hand-held devices, we believe that the broadband market will allow for greater competition, a larger user base, open standards development and significant new applications that will drive down hardware costs and software application costs while realizing cost savings through more remote productivity, efficiency and effectiveness of field workers in public safety, as well as those secondary users of the network. Grants, state and local budgets, public- and private partnerships and secondary user fees will help to fund ongoing operational costs, and at some point, migration from LMR to broadband will free up additional dollars toward broadband.

It should be noted that with a 10 MHz network, the ability to leverage excess capacity with second and situational responders, including utilities and critical infrastructure companies becomes minimal-to-nonexistent. This is a critical part of the network equation. We not only want to be good stewards of the spectrum we use, but we want to be self-sustaining, and not come back to Congress seeking additional funding through the transition in future years. With 20 MHz of spectrum, there are a number of partnerships that become more viable, and that we believe we can leverage not only with the initial build-out, but during the life-span of the LTE data network. These partnerships will help create a constant and substantive funding stream to help continue the build out as well as maintenance of the network. With a 10 MHz system, public safety will be the only users on the network, and may likely have to look for additional funding to help maintain and operate the network in the future.

It should be noted that the cost of the radios and hand-held equipment is expected to be far less than the cost of current land mobile radio equipment. With open source standards that leverage commercial LTE technologies, we believe the cost of radios and hand-held equipment would be between $600 to $1,000 dollars, where as today, public safety agencies are paying on the average of $3,000 to $5,000 for their mobile radios and considerably more for their transmitters and receivers. Once fully implemented, the public safety broadband network would provide for considerable savings resulting from lower cost radios and new competition. The question should not be how much user equipment such as radios and other hand-held devices will cost but instead how much will local and state public safety agencies save as they transition to broadband.

Respectfully submitted by:

William D. Carrow

William D. Carrow, President
APCO International

Written Statement of the

Steve McClure
Director, Jackson County Emergency Medical Services

Before the

UNITED STATES SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION

Hearing on

Keeping Us Safe: The Need for a Nationwide Public Safety Network

Good morning Chairman Rockefeller, Ranking member Hutchison and Distinguished members of this committee. I thank you for the opportunity to speak about an extremely important subject-communications for public safety.

My name is Steve McClure and I am the Director of Emergency Medical Services for Jackson County, West Virginia. I have over 40 years of experience in the public safety sector. Jackson County Emergency Service (JCEMS) provides emergency ambulance service for Jackson County and JCEMS also provides non-emergency transports.

As you may know, Jackson County is located in the Mid-Ohio Valley and has a very diverse topography with an area of approximately 472 square miles and a population of nearly 30,000. The county lies just north of Kanawha County, and the Capitol City, Charleston, and includes a level I trauma center. Employment in the area ranges from manufacturing to farming and a major river borders the western part of the County. A major highway transects the county from north to south. All of these factors present Public Safety providers with a myriad of situations to deal with.

I am here today to specifically address an item that is at the very core of public safety communications in rural America. Effective communication between the requester of service and the dispatch center, between the dispatch center and public safety response agencies, and among the responders themselves is paramount to delivery of services. However, inherent problems in the way we communicate today must be addressed for the future of public safety communications and over the next several decades.

My paramedics can be within twenty minutes of the trauma center and can not communicate with anyone- radios won't work, cell phones have no signal and land lines in the area can be scarce.

Communications problems are not unique to my county or to West Virginia. From Hawaii to Florida, from Texas to Maine and all parts in between, we have the same problems. While many of these problems occur in rural and remote areas, a broken bone still hurts the same and a heart attack can still do the same damage in rural America as well as any urban setting.

How do we solve these problems and permit public safety officials to do a more effective job? Funding to build-out infrastructure and securing enough spectrum are two major steps forward that will provide all Americans with the quality of emergency services they expect.

The long-term vision for public safety should be to migrate land mobile radio (LMR) systems to a robust nationwide broadband network that can meet the mission critical and day to day operational needs of our nation's first responders. This will not happen overnight, and indeed, may be measured by decade, but the sooner we start building and testing, the faster we will realize the goal. The converged data and voice network must be at least as reliable as existing land mobile mission critical voice networks before public safety agencies would even consider migrating their voice communications to the broadband network. The broadband networks must be hardened to survive most natural and man made disasters and flexible enough to support a variety of government and commercial applications that will strengthen America's leadership in broadband services to all parts of this great nation.

With advances in technology, public safety has identified an increasing need to access data and video networks during all emergency incidents.

- Law enforcement needs access to streaming video, surveillance networks, criminal records, automated license plate recognition, and biometric technologies including mobile fingerprint and iris identification to prevent and respond to criminal activities.
- Fire services need access to building blue prints, health-monitoring sensors for firefighters, and GPS tracking systems to respond to fires in order to save lives.
- Emergency medical services needs access to telemedicine, high resolution video, and patient records to reduce the time it takes to deliver medical services at the scene of a incident such as a car crash on a highway.
- Critical infrastructure service providers need to be able to coordinate their responses to restore power and telecommunications services during large-scale incidents.
- Federal government patrol, investigative and other public safety operations, including the U.S. Marshal Service, Federal Bureau of Investigations, U.S. Customs Service, Federal Emergency Management Agency, Department of Homeland Security and U.S. Secret Service Uniformed Division, Department of Interior and U.S. Park Police, and various other federal agencies need to access data networks during everyday to large-scale incidents to coordinate Federal assistance with State and local response and recovery operations.[1]

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[1] Department of Commerce, Federal Strategic Spectrum Plan (Mar. 2008), at 4, B137-139, B-143, available at http://www.ntia.doc.gov/reports/2008/FederalStrategicSpectrumPlan2008.pdf (increasing Federal broadband requirements) and Department of Commerce, A Public Safety Sharing

Above are just a few of the applications and services that will need to ride on a public safety broadband network. Unfortunately, the hard-reality of what applications and services will ride on the network depends greatly on the amount of spectrum that is available for the public safety broadband services. Many of the applications listed above require considerable bandwidth and speed and 10 megahertz (MHz) spectrum that is already allocated to public safety is not going to be enough.

In 2007, the FCC adopted a Report & Order[2] approving the issuance of a single nationwide license for 10 MHz of 700 MHz public safety spectrum re-designated for broadband use to deploy a nationwide public safety-grade broadband network. This allocation only meets the basic data needs for public safety. Most, if not all, of this spectrum will be consumed by local law enforcement and fire services. The 10 MHz of spectrum is insufficient to allow for high quality voice and video applications or the ability to provide access to other government and critical infrastructure services.[3]

One of the most important goals for public safety is to begin using voice applications on the broadband network within, but this requires a firm commitment from the commercial wireless industry to research, develop, and establish standards for the next generation of public safety communications equipment. Indeed, as Congresswoman Harman and others suggest in support of public safety, we do need the federal government to help create incentives and support for device R&D as a next priority once the D block is secured for public safety and adequate funding is established for build out and sustainment of the nationwide public safety broadband network.

I am proud to say that my Senator and your Chairman has answered public safety's call, and the public's expectation, to provide the funding and spectrum necessary with S.3756: The Public Safety Spectrum and Wireless Innovation Act of 2010.

The Obama Administration, Congress, the Federal Communications Commission, the Department of Homeland Security, the Department of Commerce, the Department of Justice, Department of Defense, and others need to work together with public safety to develop the appropriate spectrum and funding policy that will enable local, State, Tribal governments to build out their next generation of interoperable public safety wireless

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Demonstration, (June 2007), at xiv, available at http://www.ntia.doc.gov/reports/2007/NTIAWARNReport.htm .

2 See Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, WT Docket No. 06-150, PS Docket No. 06-229, 23 FCC Rcd 8047 (2008) (700 MHz Second Further Notice); see also, generally, Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, WT Docket No. 06-150, PS Docket No. 06-229, 23 FCC Rcd 14301 (2008) (700 MHz Third Further Notice).

3 New York City 700 MHz Broadband Public Safety Applications And Spectrum Requirements (http://d-block.net/assets/pdf/NYC_Spectrum_Requirements.pdf) and Spectrum Coalition, How Much Do We Need For Data (http://d-block.net/assets/pdf/How_Much_Do_We_Need_For_Data.pdf)

broadband networks. I understand that a series of meetings have taken place over the past month, culminating with a two-day session out n Northern Virginia earlier this week. I am glad to know that the conversation includes an equal focus on rural America, and again know that Senator Rockefeller and others will continue to emphasize that public safety networks are built out based on geography, as well as population, to cover the entire jurisdiction, and so must the nationwide public safety network. Indeed, federal users will rely on those networks whether at a plane crash site, fighting a wildfire or dealing with a myriad of other everyday to large scale incidents in remote areas.

The Congress should consider the following six principals in developing the national policy for improving our nation's public safety communications systems.

1. Adequate amount of spectrum needs to be allocated to public safety to provide the highest speed and quality for transmitting mission critical voice, video and data services throughout their jurisdiction. The propagation characteristics of the spectrum that is allocated should allow for in building coverage and be able transmit a signal over large geographic areas.[4]

2. Local public safety agencies need to control the amount of spectrum resources they need to ensure broadband networks are able to provide voice, video, and data services to law enforcement, fire and emergency services.[5]

3. State and local public safety agencies need to have full control over who can access the network and what applications are authorized to operate on the network.

4. Auction proceeds from the sale of reclaimed radio spectrum for commercial wireless services should be allocated to help expedite the build out and continued maintenance and operation of a nationwide wireless broadband network.[6]

5. State and local government should be able to use current federal grant program such as the State Homeland Security Program (SHSP), the Urban Area Security Initiative Grant Program (UASI), the Metropolitan Medical Response System (MMRS), Emergency Management Performance Grants (EMPG), Interoperable Emergency Communications Grant Program (IECGP), Regional Catastrophic Preparedness Grant Program (RCPGP), and Preparedness Grants, the Community Oriented Policing Services (COPS) Technology, Department of Justice's State,

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[4] 700 MHz Band Channel Propagation Model by the National Institute of Standards and Technology (NIST) http://www.nist.gov/itl/antd/emntg/700mhz.cfm.

[5] If public safety owns and operates its own network, or at a minimum holds the spectrum license in a public private joint venture network, they can exert greater control over future technical decisions that effect network performance. Additionally, ownership of the network allows public safety to exert influence over the network design and deployment to satisfy the immediate and future needs of public safety users. (New York City's 700 MHz Broadband Public Safety Applications And Spectrum Requirements White Paper)

[6] At least 25 megahertz of contiguous spectrum at frequencies located between 1675 megahertz and 1710 megahertz, inclusive, can be made available for immediate reallocation and auction.

Local, and Tribal Terrorism Prevention Training and Technical Assistance National Initiative Program, and the Justice Assistance Grant (JAG) Program to assist them in building out their public safety broadband networks.

6. Public-private partnership should be encouraged when possible however, public safety agencies must have the ability to deploy dedicated wireless broadband networks in their jurisdiction if commercial providers are unable to or unwilling to support their mission critical needs.

In order for public safety to be successful in deploying the next generation of broadband networks, Congress must act quickly to pass S. 3756: the Public Safety Spectrum and Wireless Innovations Act of 2010. This legislation will allocate sufficient dedicated spectrum and funding resources to public safety to build out the network. Without sufficient spectrum and funding, public safety will be relegated to using commercial networks that do not meet the mission critical needs of our first responders. Inability of by Congress to enact legislation to allocate additional spectrum to public safety will place the public's safety and safety our first responders at risk.

The goal for improving our nation's public safety communications systems should be to create a ubiquitous public safety broadband network in the 700 MHz band that meets all of public safety's needs in all geographic locations and across all jurisdictions and services.

A unique opportunity exists to change the paradigm of public safety communications where multiple frequency bands and incompatible technologies create obstacles to interoperability and perpetuate inefficiency. The ultimate goal and vision of the public safety broadband network is to learn from the mistakes of the past and plan for a future in which wireless broadband networks deployed on a common frequency band using a common technology platform provide public safety with the tools they need for the twenty first century.

I can vividly recall that day in July, 1969 as a young child I watched the first moon landing and heard Neil Armstrong issue those famous words, "that's one small step for man, one giant leap for mankind." If someone could communicate those words from almost 290,000 miles away, why can't we communicate with services that are 20 miles way? Radio towers and cell towers (infrastructure) in the Southern part of my county are nearly non-existent. This same problem manifests across the country and we need to fix it. Quickly passing S. 3756 is the key to fixing this problem.

Thank you again Chairman Rockefeller, Senator Hutchison and members of this committee and I look forward to any questions you might have. I leave you with some basic questions and answers to re-emphasize the main points from perspective.

Why does public safety need 20 megahertz of spectrum?

The allocation of 20 megahertz of spectrum will double the transmission speed and reduce the degradation of data especially in voice and video applications. The additional spectrum will also reduce the cost of build out of the network because less base stations will be needed to accommodate all the users and applications on the network.

The 20 MHz of spectrum will be sufficient to build equipment that will provide voice, video and data applications to first responders. Without sufficient spectrum, equipment manufacturers may not invest the money that is needed to develop new mission critical broadband communications equipment and applications. The amount of spectrum public safety can use will determine what equipment and applications will be available.

The 20 MHz of spectrum will also provide enough excess capacity on the network to allow for government and critical infrastructure[7] applications and also allow for commercial services to consumers, businesses, and schools and other key institutions in the most rural and underserved areas of the country.

To truly understand the broadband need of public safety we need to emphasize the key word *mobile*. So, what do we mean by *mobile*?

Mobile means that while traveling at 55 mph on the highway you are able to continuously access a broadband network to upload and download data. It means that if you are pursuing a suspect at 80 mph and have an in-car video camera you can upload the live video to the emergency communications center. It means that while you are responding to a fire you can download the blueprints to the burning building before you get to the scene. It means transmitting medical data to emergency medical personnel that are transporting a trauma patient and receiving a patient's vital statistics at the hospital before the ambulance ever arrives.

How do you solve the technological divide between public safety and commercial systems?

Public safety has endorsed Long Term Evolution (LTE) as the standard technology for the 700 MHz broadband networks. By adopting the LTE standard prior to any deployments, public safety is working to ensure systems are interoperable. Also by adopting the LTE standard, which has been adopted by the largest commercial carriers, public safety believes that there will be considerable cost savings in purchasing equipment that will operate on the network.

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[7] Example of government operations include water, electric and gas meters read remotely taking advantage of the broadband wireless network and/or its backhaul infrastructure to improve accuracy and reduce labor costs. (New York City's 700 MHz Broadband Public Safety Applications And Spectrum Requirements White Paper)

The LTE technology will also allow public safety agencies to partner with commercial carriers in their regions to build out their networks. This is critical for geographic areas of the country that are serviced by the rural cellular carriers. By partnering with public safety, the rural carriers will be able to extend their coverage area and provide greater services to the customers.

It is important that one of the goals for improving our nation's public safety communications systems is to provide funding to encourage investment in research and development (R&D) of new communications equipment and applications that can be integrated in to the public safety broadband network.

One of the most immediate R&D efforts should be to develop LTE equipment and applications that can meet the mission critical voice communications needs of public safety. To ensure competition and reduce the cost of the equipment, the Federal government should provide funding for the R&D program.

LTE technologies must be capable of providing two-way, peer-to-peer, and one-to-many transmission of mission critical voice communications services for first responders. Delay in developing the standards for these types of applications will prolong the migration of LMR systems to next generation of public safety communications technologies.

Commercial carriers are moving rapidly to develop a single standard for voice over LTE technology (VoLTE).[8] This standard however is being primarily developed for voice communications that are similar to existing cellular services. As these standards are developed, public safety needs to work closely with commercial partners to ensure VoLTE is going to be compatible with the voice communications applications that will be used by public safety. By building commercial equipment that can support public safety's voice communications needs the cost of purchasing equipment could be greatly reduced.

Before public safety agencies are able to migrate their LMR systems to broadband networks, they must be assured the network will be capable of providing the same level of services as their existing LMR networks. A key component of this is the availability of sufficient spectrum to provide the highest quality of voice communications to first responders.

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[8] GSM Association adopts carriers' framework for LTE voice: VoLTE made its debut late last year, when AT&T, Verizon and several other telecom companies and device manufacturers joined forces to help develop voice and SMS standards for LTE. The coalition of telecom and tech companies originally banded together to create joint voice and SMS standards that would avoid potential fragmentation of LTE services and thus ensure that voice-capable LTE devices could operate on different networks. (http://www.networkworld.com/news/2010/021510-gsma-one-voice.html)

TESTIMONY OF:

DR. DENNIS MARTINEZ, CHIEF TECHNOLOGY OFFICER

RF COMMUNICATIONS DIVISION

HARRIS CORPORATION

BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES

COMMITTEE ON ENERGY AND COMMERCE

HEARING ON:

CREATING AN INTEROPERABLE PUBLIC SAFETY BROADBAND NETWORK

MAY 25, 2011

GOOD MORNING, MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE. FIRST, LET ME THANK THE COMMITTEE FOR INVITING ME TO TESTIFY ABOUT KEY STEPS THAT MUST BE ACHIEVED RAPIDLY TO DEVELOP AND DEPLOY A TRULY INTEROPERABLE PUBLIC SAFETY WIRELESS BROADBAND NETWORK (PSWBN).

LET ME BEGIN BY INTRODUCING YOU TO THE HARRIS CORPORATION. HARRIS IS AN INTERNATIONAL COMMUNICATIONS AND INFORMATION TECHNOLOGY COMPANY SERVING GOVERNMENT AND COMMERCIAL MARKETS IN MORE THAN 150 COUNTRIES. HEADQUARTERED IN MELBOURNE, FLORIDA, THE COMPANY HAS APPROXIMATELY $6 BILLION OF ANNUAL REVENUE AND MORE THAN 16,000 EMPLOYEES — INCLUDING NEARLY 7,000 ENGINEERS AND SCIENTISTS. HARRIS IS A LEADING GLOBAL SUPPLIER OF SECURE RADIO COMMUNICATIONS PRODUCTS AND SYSTEMS, AND EMBEDDED HIGH-GRADE ENCRYPTION SOFTWARE, FOR THE MILITARY, GOVERNMENT, AND PUBLIC SAFETY. HARRIS IS A PIONEER IN THE DEVELOPMENT OF INTERNET PROTOCOL (IP) BASED NETWORKS FOR PRIVATE RADIO AND BROADBAND APPLICATIONS, AND SUPPLIES INDUSTRY-LEADING NARROWBAND, MULTIBAND, AND BROADBAND NETWORKS, SERVICES, AND DEVICES.

I SERVE AS THE CTO OF HARRIS CORPORATION’S RF COMMUNICATIONS DIVISION, AND I ALSO CHAIR THE FCC’S EMERGENCY RESPONSE INTEROPERABILITY CENTER (ERIC) PUBLIC SAFETY ADVISORY COMMITTEE

(PSAC) SECURITY AND AUTHENTICATION WORK GROUP. I HAVE SPENT MOST OF MY CAREER BRINGING ADVANCED TECHNOLOGIES TO PUBLIC SAFETY, HOMELAND SECURITY, NATIONAL DEFENSE, AND OTHER MISSION CRITICAL MARKETS. IN THESE ROLES, I HAVE LEARNED HOW LEVERAGING CONTINUAL TECHNOLOGY INNOVATION CAN HAVE A PROFOUND IMPACT ON OUR NATION'S ABILITY TO PROCURE AND DEPLOY STATE-OF-THE ART PRODUCTS AND SERVICES FOR THESE MISSION-CRITICAL MARKETS. I HAVE ALSO SEEN THAT A ROBUST SUPPLY CHAIN FOSTERED BY APPROPRIATE BUSINESS MODELS AND MULTI-SOURCE PROCUREMENT PRACTICES MUST BE IMPLEMENTED TO ENSURE THAT ALL LEVELS OF GOVERNMENT WILL PROCURE THESE CAPABILITIES IN A COST-EFFECTIVE MANNER.

TODAY, SMART PHONES, SUPPORTED BY A VAST ECO-SYSTEM OF APPLICATION PROVIDERS, HAVE UNLEASHED THE CAPABILITIES OF MODERN 3G AND 4G WIRELESS BROADBAND NETWORKS. THESE CAPABILITIES LITERALLY ARE REVOLUTIONIZING THE SOCIO-ECONOMIC STRUCTURE OF THE WORLD. HOWEVER, OUR NATION'S FIRST RESPONDERS, CHARGED WITH PROTECTING LIVES AND PROPERTY, ARE NOT YET ABLE TO TAKE FULL ADVANTAGE OF THIS CAPABILITY. PUBLIC SAFETY FINALLY MUST BE ENABLED TO LEVERAGE BROADBAND TECHNOLOGY IN WAYS THAT WILL SIGNIFICANTLY ENHANCE THEIR ABILITY TO PERFORM THEIR MISSIONS. IT IS TIME FOR OUR NATION TO BUILD THIS HARDENED NATIONWIDE INTEROPERABLE WIRELESS BROADBAND NETWORK ON DEDICATED SPECTRUM IN THE 700 MHZ BAND. WE SUPPORT THE

REALLOCATION OF D BLOCK SPECTRUM TO PUBLIC SAFETY AND WE COMMEND CONGRESS' CLOSE EXAMINATION OF THIS CRITICAL ISSUE.

TWO KEY INGREDIENTS - POLICIES OPENING THE 700 MHZ BROADBAND SPECTRUM TO PUBLIC SAFETY AND THE AVAILABILITY OF BROADBAND TECHNOLOGY - ENABLE CONSTRUCTION OF A NATIONWIDE INTEROPERABLE PUBLIC SAFETY BROADBAND NETWORK. IT IS NOW TIME TO FINALIZE TWO IMPORTANT ELEMENTS: GOVERNANCE AND PROCUREMENT.

THE PSWBN, PROPERLY DEPLOYED, WILL SERVE FIRST RESPONDERS AND GOVERNMENT AGENCIES CHARGED WITH THE PUBLIC SAFETY MISSION, WHICH INVOLVES STATE, LOCAL, FEDERAL, AND TRIBAL ORGANIZATIONS. ESTABLISHING A GOVERNANCE STRUCTURE TO ENSURE NATIONWIDE INTEROPERABILITY AMONG THESE ORGANIZATIONS IS ESSENTIAL.   WHILE WE AS A NATION MUST PROVIDE <u>NATIONWIDE INTEROPERABILITY</u>, CARE MUST BE TAKEN TO ENSURE THAT THE <u>OPERABILITY</u> REQUIREMENTS UNIQUE TO INDIVIDUAL STATE, LOCAL, FEDERAL, AND TRIBAL ORGANIZATIONS ARE ALSO SATISFIED.   FOR EXAMPLE, THE CITY OF LOS ANGELES, BY VIRTUE OF ITS SIZE, POPULATION, AND GEOGRAPHIC LOCATION HAS NEEDS THAT DIFFER FROM A SMALLER IN-LAND LOCATION SUCH AS BEND, OREGON. A KEY GOAL IN CREATING A RELEVANT GOVERNANCE STRUCTURE FOR ALL IS TO ENSURE THAT THESE STAKEHOLDERS HAVE SIGNIFICANT PARTICIPATION IN THE ESTABLISHMENT PROCESS AND OPERATION OF THE GOVERNANCE STRUCTURE.

THE ACTIVITIES OF THE FCC IN PAST AND ON-GOING RULE MAKINGS ARE TO BE APPLAUDED AND CAN SERVE AS A MODEL FOR GOVERNANCE IN MATTERS OUTSIDE THE JURISDICTIONAL AUTHORITY OF THE FCC. A GOVERNANCE ENTITY MUST OVERSEE ALL PHASES OF THE NETWORK LIFECYCLE; DESIGN, IMPLEMENTATION, OPERATIONS, AND MAINTENANCE. THE GOVERNANCE ENTITY MUST ENSURE IMPLEMENTATION OF A PROCUREMENT MODEL THAT ENSURES THE ACHIEVEMENT OF NATIONWIDE INTEROPERABILITY.

IN THIS REGARD, WE MUST FINALIZE A REGULATORY FRAMEWORK AND DETERMINE WHAT INTEROPERABILITY MEANS AS A THRESHOLD MATTER. CONSIDERABLE TIME AND EFFORT HAS BEEN SPENT DEFINING INTEROPERABILITY FROM TECHNICAL AND OPERATIONAL PERSPECTIVES. <u>HERE WE WANT TO DISCUSS WHAT INTEROPERABILITY MEANS FROM THE PERSPECTIVE OF GOVERNANCE AND PROCUREMENT.</u> INDEED, TECHNICAL AND OPERATIONAL CONSIDERATIONS ALONE WILL NOT YIELD THE DESIRED OUTCOME.

WE CAN DRAW FROM MANY EXAMPLES OF SUCCESS IN THE COMMERCIAL WORLD. AS CONSUMERS AND USERS OF COMMERCIAL TELECOMMUNICATION PRODUCTS AND SERVICES, WE UNDERSTAND THIS ISSUE. IT MEANS WE CAN PURCHASE THESE ITEMS IN AN OPEN AND COMPETITIVE ENVIRONMENT – OUR EXPECTATIONS DRIVE THE NEED NOT ONLY FOR INTEROPERABILITY, BUT EVEN MORE, FOR INTERCHANGEABILITY. WE CHOOSE THE DEVICE THAT SUITS OUR

NEEDS, ON THE NETWORK THAT PROVIDES THE SERVICE WE REQUIRE, IN A HIGHLY COMPETITIVE AND INNOVATIVE OPEN MARKET. MARKET DEMANDS DRIVE COMMERCIAL SERVICE PROVIDERS TO DELIVER INTEROPERABILITY. IN TURN, COMMERCIAL SERVICE PROVIDERS DRIVE INTERCHANGEABILITY THROUGHOUT THEIR SUPPLY CHAIN TO ENSURE UNINTERRUPTED AVAILABILITY OF COMPETITIVE AND INNOVATIVE PRODUCTS. THEIR BUSINESS SUCCESS REQUIRES HAVING MULTIPLE SOURCES WITHIN THEIR SUPPLY CHAIN. THIS IS THE MODEL THAT SHOULD GUIDE THE GOVERNANCE STRUCTURE AND PROCUREMENT PROCESS FOR THE PSWBN. IN THIS WAY, INTEROPERABILITY BECOMES THE OUTCOME, NOT JUST A MANDATE.

INTEROPERABILITY THEREFORE SHOULD BE THE CAPABILITY FOR PUBLIC SAFETY ORGANIZATIONS TO PROCURE THE BUILDING BLOCKS OF THE NETWORK AND DEVICES THAT ARE INTERCHANGEABLE AND CAN BE USED TOGETHER REGARDLESS OF BRAND OR NETWORK LOCATION. THIS DEFINITION WILL ALLOW EVERY FIRST RESPONDER TO COMMUNICATE ACROSS THE NATION AND WILL DRIVE SUPPLIERS TO THIS INDUSTRY TO PRODUCE HIGHLY INNOVATIVE AND COST-EFFECTIVE PRODUCTS THAT PUBLIC SAFETY AGENCIES CAN PROCURE AND DEPLOY WITH CONFIDENCE – THAT WILL “PLUG AND PLAY”. CREATING THIS MARKET DYNAMIC WILL REQUIRE FUNDING MECHANISMS THAT DRIVE THE PROCUREMENT PROCESS TO ENFORCE THIS PROCUREMENT MODEL.

FINALLY, IT IS VITAL TO ENSURE ECONOMIC VIABILITY FOR THE PSWBN. THE NEED FOR FEDERAL FUNDS TO LAUNCH THIS INITIATIVE IS WELL UNDERSTOOD. ALSO UNDERSTOOD ARE THE CHALLENGES IN DOING SO UNDER CURRENT ECONOMIC CONDITIONS. HERE WE WANT TO BRIEFLY DISCUSS HOW THOSE CHALLENGES CAN BE ALLEVIATED.

(1) THE BENEFIT OF LEVERAGING TECHNOLOGY SUPPLIED BY A VAST ECO-SYSTEM OF MANUFACTURERS WILL GENERATE LONG-TERM SAVINGS ON AN ON-GOING BASIS. THIS DIFFERS MARKEDLY FROM THE RATHER LIMITED SUPPLY BASE AVAILABLE TO PUBLIC SAFETY TODAY FOR CONSTRUCTING ITS MISSION CRITICAL NETWORKS.

(2) FULLY REALIZING THOSE SAVINGS WILL REQUIRE MANDATING COMPETITIVE BUSINESS PRACTICES AS DISCUSSED EARLIER. PROCUREMENT OF NETWORK ELEMENTS, WHERE ECONOMIES OF SCALE CAN BE REALIZED, WILL ENABLE IMPLEMENTATION OF BEST COMMERCIAL PRACTICES THROUGH MULTI-SOURCING.

(3) BUILDING THIS NEXT GENERATION PUBLIC SAFETY NETWORK ON 4G TECHNOLOGIES WILL ENABLE CONVERGENCE – A SINGLE NETWORK WITH DEVICES THAT CAN SERVE THE NEEDS FOR VOICE COMMUNICATION AND A MYRIAD OF MISSION-CRITICAL APPLICATIONS. THE COST SAVINGS FROM CONVERGENCE WILL BE LARGE AND WILL FURTHER ENSURE LONG-TERM ECONOMIC VIABILITY OF THE PSWBN.

IN CONCLUSION, THE PUBLIC SAFETY BROADBAND NETWORK WILL BRING UNPRECEDENTED CAPABILITIES TO OUR NATION'S FIRST RESPONDERS AND GOVERNMENT AGENCIES THAT SUPPORT THE PUBLIC SAFETY MISSION. BUILT UPON A COMPETITIVE MARKET AND THE LATEST BROADBAND STANDARDS, AND SUPPORTED BY A LARGE EMERGING ECO-SYSTEM, THE PSWBN WILL ENABLE NATIONWIDE INTEROPERABILITY TO BECOME A REALITY.

ONCE AGAIN, MR. CHAIRMAN, I APPLAUD THE COMMITTEE'S LEADERSHIP ON THESE ISSUES AND GREATLY APPRECIATE THE OPPORTUNITY TO TESTIFY TODAY. I LOOK FORWARD TO FURTHER WORKING WITH YOU TO MAKE THE INTEROPERABLE PSWBN A REALITY.

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Motorola Solutions, Inc.
Hearing on "Interoperable Public Safety Communications"
Before the Subcommittee on Communications and Technology
Committee on Energy and Commerce
U.S. House of Representatives
May 25, 2011

SUMMARY OF TESTIMONY

- Motorola Solutions, Inc. has served the public safety community for over 82 years and remains steadfast in its commitment to providing reliable, state-of-the-art equipment and innovative solution. We are committed to open standards-based technologies and have committed significant resources to assist industry efforts to embrace open standards. We concur with the Committee's desire to ensure a robust competitive marketplace.

- Reallocation of the 700 MHz D block spectrum from commercial to public safety use is necessary to ensure that our first responders have the capacity available to effectively respond to day to day wide scale incidents.

- Public safety currently has 24 MHz of spectrum in the 700 MHz band. Of this total, 12 MHz is reserved for narrowband uses and is not able to provide the types of video and data communications described above. That leaves public safety with only 10 MHz of spectrum to accommodate mobile broadband applications – a total that the FCC has confirmed is inadequate for wide scale emergency response.

- Allocating D block to public safety means a contiguous 20MHz of spectrum that could result in significant savings-doubling public safety's network capacity with a small increase in deployment costs.

- Costs would be less with an allocation of the D Block to Public Safety than an auction of the D-Block due to unanticipated LTE service charges, lack of unlimited data plans, priority service expenses, and RF interference mitigation – in addition to decreased communications independence for public safety.

- The Phoenix Center, a nonprofit organization that studies broad public policy issues with a specialty in telecommunications reported that while the issue is complex, the economics weigh in favor of allocating the D Block to public safety.

- Adequate spectrum is necessary before broadband networks can accommodate mission critical voice traffic in addition to the video and data traffic.

- While more needs to be done, public safety has made great strides in achieving interoperability since 9/11. This is due in large part to the focus state and local government has placed on the need to improve public safety first response to major incidents, as well as the adoption and implementation of the Project 25 (P25) standard supporting public safety interoperability.

Statement of Paul Steinberg

Chief Technology Officer

Motorola Solutions, Inc.

Hearing on "Interoperable Public Safety Communications"

Before the Subcommittee on Communications and Technology

Committee on Energy and Commerce

U.S. House of Representatives

May 25, 2011

Thank you, Chairman Walden, Ranking Member Eshoo, and other members of the Subcommittee for this opportunity to testify on the topic of Interoperable Public Safety Communications.

My name is Paul Steinberg and I am the Chief Technology Officer at the newly independent Motorola Solutions, Inc., which, following its split from Motorola Mobility this past January continues to focus on the needs of the public safety community.

For almost 20 years, I have been fortunate to work at Motorola with an extremely knowledgeable and talented team of people who help deliver innovative and best-in-class technologies to our customers. Prior to being appointed CTO in January 2011, I was Chief Architect for Integrated Command and Control and Private Broadband Solutions for Public Safety Systems.

Motorola Solutions, Inc. (formerly Motorola, Inc.) has been committed to innovation in communications and electronics for over 82 years. The Company is headquartered in Schaumburg, Illinois, employs over 25,000 people in over 65 countries globally. Motorola pioneered mobile communications in the 1930s with car radios and public safety networks. We made the equipment that carried the first words from the moon in 1969. We commercialized the first handheld portable scanner in 1980. Today, as a global industry leader, excellence in innovation continues to shape the future of the Motorola.

COMMITMENT TO INTEROPERABILITY

Motorola has served public safety continuously over these eight decades, and the company is proud of this history. Motorola has remained committed to the marketplace and has listened closely to public safety's needs, providing public safety with reliable, state-of-the-art equipment and innovative solutions.

Motorola agrees that a robust competitive marketplace can help provide interoperable services – including broadband services – to public safety in a cost-effective manner. Motorola is actively competing in the marketplace today to help public safety realize its vision to have a truly interoperable nationwide broadband network. We are committed to open standards-based technologies and have committed significant resources to assist industry efforts to embrace open standards.

REALLOCATION OF THE D BLOCK

Reallocation of the 700 MHz D block spectrum from commercial to public safety use is necessary to ensure that our first responders have the capacity available to effectively respond to wide scale incidents. But it is important to remember that it is not only the catastrophic events that can benefit from this increased spectrum. Day to day situations ranging from an overturned gasoline tanker on the beltway; a tornado in Joplin, Missouri or a hostage situation at a school can all benefit from the enhanced situational awareness and command and control that is enabled through this additional spectrum.

As FCC Chairman Genachowski has stated as recently as last Thursday at the TIA conference, broadband spectrum needs are predicted to grow 35 times in the next few years. Consumer use and demand for broadband applications is experiencing explosive growth as are the public safety's broadband requirements.

We recently confirmed this by working with public safety officials on a network capacity analysis to understand how broadband networks can enhance emergency response and better protect the safety of all involved. This involved performing a step-by-step assessment of the communications requirements through an emergency situation's "life cycle" – from start to SWAT team deployment to resolution.

During these "stress test" scenarios, we found that a network infrastructure based solely on the existing 10 MHz public safety allocation will struggle to provide the necessary capacity. Adding the additional 10 MHz D-Block spectrum would effectively double the network capacity for public safety and improve incident response.

Commanders directing response teams need real-time situational awareness at the onset. A tightly coordinated response means all those involved need access to the right information at the right time. With multiple agencies working together to resolve the incident, interoperability is crucial to creating one shared operational view for maximum coordination. Content, including streaming video, can be sent to a command and control center from various cameras on the scene. This video can be collected, monitored and redistributed to first responders in the field with command and control serving as the "director" of the content, dynamically choosing the views and information to propagate from multiple sources.

In many incident scenarios, video information is critical. Live video feeds from well-placed specialty units, overhead aircraft, and remotely operated robots provide different angles and views that can be streamed in real time over a Public Safety broadband network. Using a wide area broadband network is much safer, and quicker to activate, than deploying a temporary local network. More importantly, it allows officers to immediately survey the area in its crucial first stages without the risk and complexities associated with establishing local communications equipment.

Applications such as real time hot-spot video to reduce crime in certain areas; in-car video that is live and networked back to command and control centers; detailed building diagrams relayed to firefighters; video of trauma patients being fed directly to emergency rooms; and wild fire thermal and weather imaging, are just a few of the broadband applications that can make a difference to public safety and the communities they serve. More spectrum is required to make this a reality, not just in certain communities, but for public safety throughout the country.

Public safety currently has 24 MHz of spectrum in the 700 MHz band. Of this total, 12 MHz is reserved for narrowband uses and is not able to provide the types of video and data communications described above. That leaves public safety with only 10 MHz of spectrum to accommodate mobile broadband applications – a total that the FCC has confirmed is inadequate for wide scale emergency response. In contrast, commercial service providers have requested an additional 500 MHz of spectrum for advanced wireless services.

Allocating the D block to public safety means a contiguous 20 MHz of spectrum that could result in significant saving – doubling public safety's network capacity with only a small increase in deployment costs. The build-out of one network that leverages existing infrastructure will cost far less at the $6.5 billion estimated by the FCC than the build-out of a second network on a non-adjacent spectrum. There is also potential for additional cost savings if other agencies are permitted to use the public safety network.

Motorola believes that costs would be less with an allocation of the D Block to Public Safety than an auction of the D-Block due to unanticipated LTE service charges, lack of unlimited data plans, priority service expenses, and RF interference mitigation – in addition to decreased communications independence for public safety. Further, should commercial carriers operate in the D block spectrum, we believe it will be necessary to use guard bands to protect current public safety operations in the adjacent spectrum and the economic impact of such guard bands could potentially be billions of dollars.

In terms of the economic value of the spectrum from a public safety standpoint, a report was issued earlier this year by the Phoenix Center, a nonprofit organization that studies broad public policy issues with a specialty in telecommunications. The Phoenix Center report concludes that while the issue is complex, the economics weigh in favor of allocating the D Block to public safety.

Highlighting that the allocation of D Block to public safety creates a unique opportunity to create a contiguous 20 MHz of spectrum for public safety broadband, the report notes that the spectrum can create significant value to public safety – which the Phoenix Center values at $2 to $6 billion.

Alternatively, assigning 10 MHz in the future in some other spectrum band would cost about $4 billion in additional deployment costs and offer inferior performance. In contrast, the Phoenix Center notes that at best, the D Block would bring auction revenues in the $1 to $3 billion range, and probably much less. Service obligations or conditions that may be placed at auction could reduce that revenue by as much as $1 billion.[1]

KEY TECHNICAL CONSIDERATIONS

Motorola concurs with the vision that LTE is the right technology for the interoperable Public Safety 700 MHz broadband network. With adequate spectrum available, a properly designed public safety network based on standardized LTE technology can support our nation's first responders in the field with the information-rich applications like high speed data and video which is currently unavailable. LTE also provides the opportunity to leverage the larger economies of scale of commercial technologies.

[1] "Public Safety or Commercial Use? A Cost/Benefit Framework for the D Block, "Phoenix Center Policy Bulletin No. 26, March 2011, George S. Ford, PhD., Lawrence J. Spiwak, J.D.,

Eventually, the integration of voice and data services over the LTE platform could provide public safety even greater operational benefits. To achieve this goal, additional efforts must be directed at addressing two critical areas.

First, public safety officials and the vendor community must collaborate to define and develop key features associated with mission critical voice on narrowband networks in order to enable their support on broadband networks.

Public safety users demand a lot from their voice communications service. For example, they expect to be able to complete a one-to-many group call set up immediately at the push of a button. They also demand to be able to communicate directly "unit-to-unit" when they are beyond network coverage.

Public safety voice systems must provide high availability to users with multiple levels of back-up. Finally, the devices must be rugged and suitable for public safety environments. These features are currently supported as fundamental operational features in existing standards-based, mission critical voice networks. Public safety users identify these as key features that must be replicated before voice services can be transitioned to broadband networks.

However, the current LTE standards do not cover these mission critical voice services, only consumer telephony services, as the 3GPP standards committee is primarily driven by the requirements of the cellular carriers and have not addressed these services. Various federal and public safety customer associations are in the process of specifying the requirements and examining the alternatives for standardization in the various standards setting bodies. There is no firm commitment on how and when these critical standards will be completed.

Second, adequate spectrum is necessary before broadband networks can accommodate mission critical voice traffic in addition to the video and data traffic. If the majority of public safety voice operations are transitioned to the 700 MHz broadband network, then the network must support the necessary voice capacity in a completely consistent and dependable fashion as is the case with narrowband networks today. Technical evaluations are underway to better understand the impact that moving narrowband communications from multiple frequency bands would have on the 700 MHz broadband public safety network.

The timelines to address these two considerations are subject to debate with some arguing that standards could be completed in as little as three years, while others argue that achieving the full feature and performance requirements within a coordinated set of standards could take at least five to seven years, with a completion timeframe of eight to 10 years for development of production grade equipment and deployment.

The length of time the process can take is driven by the selection of a willing standards body, creation of the necessary standards for mission critical, public safety voice services, and then followed by the product development, certification and field testing to ensure the operational requirements of public safety are being met.

SYSTEM ARCHITECTURE AND GOVERNANCE CONSIDERATIONS

From an architecture standpoint, we believe the best approach is one that deploys regionally distributed infrastructure as this will ensure more robust physical site redundancy and disaster tolerance. This would mirror the architecture currently used in commercial carrier networks where regional LTE core components are deployed into major markets to reduce overall costs.

LTE cores are actually a small fraction of overall deployment costs and will be reduced even further as low cost small scale cores emerge. The initial costs of locating cores closer to the local traffic are recouped by reduced backhaul costs. This helps avoid routing traffic from regional cell sites to a far distant core and back to the local agencies over a national backbone.

Regionally based cores also allow a first responder to access both local and national applications from anywhere within the nationwide network as needed and as authorized. Interoperability with the 911 PSAP (Public Safety Answering Point), current land mobile systems and Next

Generation 911 would also be enhanced as the network and functions are locally/regionally based.

At the same time, while we support a regional architecture approach, we believe these regional cores should share a common nationwide network identification number which will essentially result in creating a single nationwide network by enabling all devices to operate in all areas of coverage of the public safety common architecture. The only roaming required would be from the public safety network onto commercial networks.

In addition to the network ID numbers, there are other architectural and governance components that also are best managed at the national level. These include, for example, the national IP backbone, the roaming clearinghouse to commercial carriers, the deployment of national interoperability applications, and the establishment of a nationwide network numbering plan and regional partitioning.

Overall, this regionally-focused architecture model may involve varying levels of national control that will impact overall system governance. We anticipate the model to be formed through collaboration between Congress, the Administration, state/local government and public safety users. As someone who designs public safety systems, I would just note there are good operational reasons to consider some level of regional control as this will best reflect how public safety operates today through local/regional Computer Aided Dispatch and incident command structures.

PROGRESS ON NATIONWIDE INTEROPERABILITY

While more needs to be done, public safety has made great strides in achieving interoperability since 9/11. This is due in large part to the focus state and local government has placed on the need to improve public safety first response to major incidents, as well as the adoption and implementation of the Project 25 (P25) standard supporting public safety interoperability.

Today, 27 states have deployed, or are in the process of deploying, statewide P25 public safety communications systems, with another four states planning upgrades of their existing statewide networks to the standard. There are a total of 187 P25 state and local systems in place today, a majority of which have been built with the help of federal funding. The vendor community has invested heavily in the standard -- the Project 25 Technology Interest Group identifies in excess of 12 vendors that produce compliant mobile and portable subscriber equipment. Some examples of "best practices" in public safety interoperability include the following:

State of Michigan

The Michigan Public Safety Communications System (MPSCS) is P25 standards-based 800 MHz radio system that enables first responders to communicate with each other regardless of jurisdiction or geographic location. There are over 1200 local, state and federal agencies representing over 60,000 first responders utilizing the MPSCS system today.

State of Ohio

MARCS (Multi-Agency Radio Communication System) is an 800 MHz radio and data network that provides statewide interoperability to its subscribers throughout Ohio. There are currently over 33,000 voice units and over 1,800 mobile data units on the MARCS system with over 700 public safety and public service agencies utilizing the system today.

State of Colorado

The Colorado Statewide Digital Trunked Radio System (DTRS) is a P25 standard-based system using 700 and 800 MHz frequencies. Today the DTRS supports 53,000 radios from over 990 user agencies representing all levels of local, county, tribal, state and federal government. This includes the recent integration of the Pikes Peak Regional Communications Network (PPRCN), providing interoperability with the Colorado Springs metropolitan and El Paso County areas, serving an additional 5,400 public safety responders.

State of Minnesota

Minnesota has invested in the Allied Radio Matrix for Emergency Response (ARMER) system; an 800 MHz P25 standards-based communications system for public safety agencies in the state. The system was recognized by FEMA in 2007 report (U.S. Fire Administration/Technical Report Series - I-35W Bridge Collapse and Response, Minneapolis, Minnesota, USFA-TR-166/August 2007) were it identified the system as a best practice in the public safety response to the incident, stating "the new 800 MHz radio system streamlined communications and enabled successful connections among a variety of organizations and agencies."
(http://www.usfa.dhs.gov/downloads/pdf/publications/tr_166.pdf)

San Diego County, California

The San Diego County Regional Communications System (RCS) provides seamless wireless voice and data communications for public safety and public service agencies in San Diego and Imperial Counties. The San Diego RCS incorporates the P25 standard and supports 217 government agencies and 15 dispatch centers, with over 20,000 radios operating on the system today.

CONCLUSION

Mr. Chairman, Motorola welcomes the opportunity to compete in a standards-based environment to help public safety realize its vision to have a truly interoperable nationwide broadband network. We look forward to working with the Subcommittee to further realize our shared vision of a competitive market providing innovative solutions for public safety communications.

Thank you.

Appendix H – Public Safety Statistics

Public Safety Personnel (Source Bureau of Labor Statistics, Department of Labor)			
STATE	OCC_CODE	OCC_TITLE	Total
Alabama	11-9161	Emergency Management Directors	240
	29-2041	Emergency Medical Technicians and Paramedics	3650
	33-1011	First-Line Supervisors of Correctional Officers	450
	33-1012	First-Line Supervisors of Police and Detectives	920
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	850
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	470
	33-2011	Firefighters	5350
	33-2021	Fire Inspectors and Investigators	190
	33-2022	Forest Fire Inspectors and Prevention Specialists	60
	33-3012	Correctional Officers and Jailers	5760
	33-3021	Detectives and Criminal Investigators	1120
	33-3031	Fish and Game Wardens	220
	33-3041	Parking Enforcement Workers	70
	33-3051	Police and Sheriff's Patrol Officers	11330
	33-9011	Animal Control Workers	240
	33-9031	Gaming Surveillance Officers and Gaming Investigators	50
	33-9032	Security Guards	14340
	33-9093	Transportation Security Screeners* (federal only)	330
	33-9099	Protective Service Workers, All Other *	770
Alabama Total			46410
Alaska	29-2041	Emergency Medical Technicians and Paramedics	450
	33-1011	First-Line Supervisors of Correctional Officers	60
	33-1012	First-Line Supervisors of Police and Detectives	300
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	180
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	180
	33-2011	Firefighters	860
	33-3012	Correctional Officers and Jailers	1090
	33-3021	Detectives and Criminal Investigators	110
	33-3051	Police and Sheriff's Patrol Officers	1210
	33-9011	Animal Control Workers	40
	33-9032	Security Guards	2180
	33-9093	Transportation Security Screeners* (federal only)	420
	33-9099	Protective Service Workers, All Other *	560
Alaska Total			7640
Arizona	11-9161	Emergency Management Directors	150
	29-2041	Emergency Medical Technicians and Paramedics	3560
	33-1011	First-Line Supervisors of Correctional Officers	1660
	33-1012	First-Line Supervisors of Police and Detectives	2900
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	2020
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1100
	33-2011	Firefighters	7690
	33-2021	Fire Inspectors and Investigators	210

	33-3012	Correctional Officers and Jailers	13400
	33-3021	Detectives and Criminal Investigators	5230
	33-3031	Fish and Game Wardens	220
	33-3041	Parking Enforcement Workers	70
	33-3051	Police and Sheriff's Patrol Officers	12270
	33-9011	Animal Control Workers	210
	33-9031	Gaming Surveillance Officers and Gaming Investigators	260
	33-9032	Security Guards	21040
	33-9093	Transportation Security Screeners* (federal only)	1130
	33-9099	Protective Service Workers, All Other *	1510
Arizona Total			74630
Arkansas	11-9161	Emergency Management Directors	170
	29-2041	Emergency Medical Technicians and Paramedics	2120
	33-1011	First-Line Supervisors of Correctional Officers	200
	33-1012	First-Line Supervisors of Police and Detectives	740
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	510
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	300
	33-2011	Firefighters	2550
	33-2021	Fire Inspectors and Investigators	50
	33-2022	Forest Fire Inspectors and Prevention Specialists	180
	33-3012	Correctional Officers and Jailers	5030
	33-3021	Detectives and Criminal Investigators	590
	33-3051	Police and Sheriff's Patrol Officers	5640
	33-9011	Animal Control Workers	200
	33-9032	Security Guards	6490
	33-9093	Transportation Security Screeners* (federal only)	200
	33-9099	Protective Service Workers, All Other *	730
Arkansas Total			25700
California	11-9161	Emergency Management Directors	940
	29-2041	Emergency Medical Technicians and Paramedics	15220
	33-1011	First-Line Supervisors of Correctional Officers	2370
	33-1012	First-Line Supervisors of Police and Detectives	5660
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	4430
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	0
	33-2011	Firefighters	33100
	33-2021	Fire Inspectors and Investigators	1920
	33-2022	Forest Fire Inspectors and Prevention Specialists	100
	33-3012	Correctional Officers and Jailers	44120
	33-3021	Detectives and Criminal Investigators	12720
	33-3041	Parking Enforcement Workers	2200
	33-3051	Police and Sheriff's Patrol Officers	75730
	33-3052	Transit and Railroad Police	290
	33-9011	Animal Control Workers	2110
	33-9031	Gaming Surveillance Officers and Gaming Investigators	480
	33-9032	Security Guards	131780
	33-9093	Transportation Security Screeners* (federal only)	5070

	33-9099	Protective Service Workers, All Other *	16270
California Total			354510
Colorado	11-9161	Emergency Management Directors	180
	29-2041	Emergency Medical Technicians and Paramedics	2880
	33-1011	First-Line Supervisors of Correctional Officers	640
	33-1012	First-Line Supervisors of Police and Detectives	1270
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	840
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1020
	33-2011	Firefighters	4720
	33-2021	Fire Inspectors and Investigators	100
	33-3012	Correctional Officers and Jailers	7630
	33-3021	Detectives and Criminal Investigators	1710
	33-3041	Parking Enforcement Workers	50
	33-3051	Police and Sheriff's Patrol Officers	9590
	33-9011	Animal Control Workers	240
	33-9031	Gaming Surveillance Officers and Gaming Investigators	150
	33-9032	Security Guards	15050
	33-9093	Transportation Security Screeners* (federal only)	940
	33-9099	Protective Service Workers, All Other *	2940
Colorado Total			49950
Connecticut	11-9161	Emergency Management Directors	180
	29-2041	Emergency Medical Technicians and Paramedics	3110
	33-1012	First-Line Supervisors of Police and Detectives	1370
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	860
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	560
	33-2011	Firefighters	3510
	33-2021	Fire Inspectors and Investigators	360
	33-3012	Correctional Officers and Jailers	0
	33-3021	Detectives and Criminal Investigators	1050
	33-3041	Parking Enforcement Workers	100
	33-3051	Police and Sheriff's Patrol Officers	7160
	33-9011	Animal Control Workers	240
	33-9031	Gaming Surveillance Officers and Gaming Investigators	0
	33-9032	Security Guards	10930
	33-9093	Transportation Security Screeners* (federal only)	320
	33-9099	Protective Service Workers, All Other *	620
Connecticut Total			30370
Delaware	29-2041	Emergency Medical Technicians and Paramedics	920
	33-1012	First-Line Supervisors of Police and Detectives	250
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	300
	33-2011	Firefighters	370
	33-2021	Fire Inspectors and Investigators	80
	33-3021	Detectives and Criminal Investigators	0
	33-3041	Parking Enforcement Workers	30
	33-3051	Police and Sheriff's Patrol Officers	1530
	33-9011	Animal Control Workers	100

	33-9031	Gaming Surveillance Officers and Gaming Investigators	50
	33-9032	Security Guards	3280
	33-9099	Protective Service Workers, All Other *	160
Delaware Total			7070
District of Columbia	11-9161	Emergency Management Directors	80
	29-2041	Emergency Medical Technicians and Paramedics	1310
	33-1011	First-Line Supervisors of Correctional Officers	80
	33-1012	First-Line Supervisors of Police and Detectives	0
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	490
	33-3012	Correctional Officers and Jailers	1660
	33-3021	Detectives and Criminal Investigators	0
	33-3041	Parking Enforcement Workers	0
	33-3051	Police and Sheriff's Patrol Officers	0
	33-9032	Security Guards	12370
	33-9099	Protective Service Workers, All Other *	110
District of Columbia Total			16100
Florida	11-9161	Emergency Management Directors	320
	29-2041	Emergency Medical Technicians and Paramedics	8910
	33-1011	First-Line Supervisors of Correctional Officers	1950
	33-1012	First-Line Supervisors of Police and Detectives	5000
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	3210
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	3700
	33-2011	Firefighters	23460
	33-2021	Fire Inspectors and Investigators	1020
	33-3012	Correctional Officers and Jailers	33960
	33-3021	Detectives and Criminal Investigators	6960
	33-3031	Fish and Game Wardens	550
	33-3041	Parking Enforcement Workers	530
	33-3051	Police and Sheriff's Patrol Officers	36540
	33-3052	Transit and Railroad Police	130
	33-9011	Animal Control Workers	640
	33-9031	Gaming Surveillance Officers and Gaming Investigators	130
	33-9032	Security Guards	76670
	33-9093	Transportation Security Screeners* (federal only)	4720
	33-9099	Protective Service Workers, All Other *	6950
Florida Total			215350
Georgia	11-9161	Emergency Management Directors	230
	29-2041	Emergency Medical Technicians and Paramedics	8050
	33-1011	First-Line Supervisors of Correctional Officers	1290
	33-1012	First-Line Supervisors of Police and Detectives	4180
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	2190
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1530
	33-2011	Firefighters	9390
	33-2021	Fire Inspectors and Investigators	280
	33-2022	Forest Fire Inspectors and Prevention Specialists	0
	33-3012	Correctional Officers and Jailers	17680

	33-3021	Detectives and Criminal Investigators	4750
	33-3031	Fish and Game Wardens	560
	33-3041	Parking Enforcement Workers	120
	33-3051	Police and Sheriff's Patrol Officers	18750
	33-9011	Animal Control Workers	470
	33-9032	Security Guards	27220
	33-9093	Transportation Security Screeners* (federal only)	1050
	33-9099	Protective Service Workers, All Other *	1440
Georgia Total			99180
Guam	33-1099	First-Line Supervisors of Protective Service Workers, All Other	40
	33-9032	Security Guards	1070
	33-9093	Transportation Security Screeners* (federal only)	120
Guam Total			1230
Hawaii	11-9161	Emergency Management Directors	80
	29-2041	Emergency Medical Technicians and Paramedics	500
	33-1011	First-Line Supervisors of Correctional Officers	130
	33-1012	First-Line Supervisors of Police and Detectives	670
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	450
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	660
	33-2011	Firefighters	1880
	33-3012	Correctional Officers and Jailers	2250
	33-3021	Detectives and Criminal Investigators	470
	33-3041	Parking Enforcement Workers	40
	33-3051	Police and Sheriff's Patrol Officers	2950
	33-9032	Security Guards	9890
	33-9093	Transportation Security Screeners* (federal only)	1110
	33-9099	Protective Service Workers, All Other *	230
Hawaii Total			21310
Idaho	11-9161	Emergency Management Directors	0
	29-2041	Emergency Medical Technicians and Paramedics	870
	33-1011	First-Line Supervisors of Correctional Officers	290
	33-1012	First-Line Supervisors of Police and Detectives	670
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	270
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	140
	33-2011	Firefighters	1670
	33-2021	Fire Inspectors and Investigators	30
	33-3012	Correctional Officers and Jailers	1610
	33-3021	Detectives and Criminal Investigators	410
	33-3031	Fish and Game Wardens	120
	33-3041	Parking Enforcement Workers	0
	33-3051	Police and Sheriff's Patrol Officers	2750
	33-9011	Animal Control Workers	130
	33-9032	Security Guards	1930
	33-9093	Transportation Security Screeners* (federal only)	140
	33-9099	Protective Service Workers, All Other *	400
Idaho Total			11430

Illinois	11-9161	Emergency Management Directors	400
	29-2041	Emergency Medical Technicians and Paramedics	10450
	33-1011	First-Line Supervisors of Correctional Officers	1600
	33-1012	First-Line Supervisors of Police and Detectives	5080
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	3080
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	2080
	33-2011	Firefighters	17240
	33-2021	Fire Inspectors and Investigators	380
	33-3012	Correctional Officers and Jailers	11990
	33-3021	Detectives and Criminal Investigators	2970
	33-3041	Parking Enforcement Workers	480
	33-3051	Police and Sheriff's Patrol Officers	30110
	33-3052	Transit and Railroad Police	280
	33-9011	Animal Control Workers	540
	33-9031	Gaming Surveillance Officers and Gaming Investigators	290
	33-9032	Security Guards	46570
	33-9093	Transportation Security Screeners* (federal only)	1970
	33-9099	Protective Service Workers, All Other *	2570
Illinois Total			138080
Indiana	11-9161	Emergency Management Directors	260
	29-2041	Emergency Medical Technicians and Paramedics	5680
	33-1011	First-Line Supervisors of Correctional Officers	1220
	33-1012	First-Line Supervisors of Police and Detectives	1550
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	860
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1060
	33-2011	Firefighters	7730
	33-2021	Fire Inspectors and Investigators	230
	33-3012	Correctional Officers and Jailers	8290
	33-3021	Detectives and Criminal Investigators	1070
	33-3041	Parking Enforcement Workers	60
	33-3051	Police and Sheriff's Patrol Officers	10800
	33-3052	Transit and Railroad Police	40
	33-9011	Animal Control Workers	290
	33-9031	Gaming Surveillance Officers and Gaming Investigators	390
	33-9032	Security Guards	17210
	33-9093	Transportation Security Screeners* (federal only)	400
	33-9099	Protective Service Workers, All Other *	1190
Indiana Total			58330
Iowa	11-9161	Emergency Management Directors	150
	29-2041	Emergency Medical Technicians and Paramedics	2360
	33-1011	First-Line Supervisors of Correctional Officers	280
	33-1012	First-Line Supervisors of Police and Detectives	850
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	420
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	330
	33-2011	Firefighters	1830
	33-2021	Fire Inspectors and Investigators	70

	33-3012	Correctional Officers and Jailers	3240
	33-3021	Detectives and Criminal Investigators	460
	33-3031	Fish and Game Wardens	130
	33-3041	Parking Enforcement Workers	90
	33-3051	Police and Sheriff's Patrol Officers	4800
	33-9011	Animal Control Workers	130
	33-9031	Gaming Surveillance Officers and Gaming Investigators	230
	33-9032	Security Guards	6510
	33-9093	Transportation Security Screeners* (federal only)	190
	33-9099	Protective Service Workers, All Other *	410
Iowa Total			22480
Kansas	11-9161	Emergency Management Directors	180
	29-2041	Emergency Medical Technicians and Paramedics	2610
	33-1011	First-Line Supervisors of Correctional Officers	350
	33-1012	First-Line Supervisors of Police and Detectives	1300
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	770
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	310
	33-2011	Firefighters	3600
	33-2021	Fire Inspectors and Investigators	100
	33-3012	Correctional Officers and Jailers	4050
	33-3021	Detectives and Criminal Investigators	880
	33-3041	Parking Enforcement Workers	40
	33-3051	Police and Sheriff's Patrol Officers	6000
	33-9011	Animal Control Workers	200
	33-9032	Security Guards	5930
	33-9093	Transportation Security Screeners* (federal only)	120
	33-9099	Protective Service Workers, All Other *	730
Kansas Total			27170
Kentucky	11-9161	Emergency Management Directors	120
	29-2041	Emergency Medical Technicians and Paramedics	4550
	33-1011	First-Line Supervisors of Correctional Officers	920
	33-1012	First-Line Supervisors of Police and Detectives	1160
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	690
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	950
	33-2011	Firefighters	3250
	33-2021	Fire Inspectors and Investigators	130
	33-3012	Correctional Officers and Jailers	7120
	33-3021	Detectives and Criminal Investigators	610
	33-3041	Parking Enforcement Workers	100
	33-3051	Police and Sheriff's Patrol Officers	6670
	33-9011	Animal Control Workers	290
	33-9032	Security Guards	10880
	33-9093	Transportation Security Screeners* (federal only)	460
	33-9099	Protective Service Workers, All Other *	1110
Kentucky Total			39010
Louisiana	11-9161	Emergency Management Directors	220

	29-2041	Emergency Medical Technicians and Paramedics	3470
	33-1011	First-Line Supervisors of Correctional Officers	1720
	33-1012	First-Line Supervisors of Police and Detectives	2040
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1450
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	710
	33-2011	Firefighters	4700
	33-2021	Fire Inspectors and Investigators	260
	33-3012	Correctional Officers and Jailers	10560
	33-3021	Detectives and Criminal Investigators	2300
	33-3031	Fish and Game Wardens	240
	33-3041	Parking Enforcement Workers	140
	33-3051	Police and Sheriff's Patrol Officers	11520
	33-3052	Transit and Railroad Police	40
	33-9011	Animal Control Workers	270
	33-9031	Gaming Surveillance Officers and Gaming Investigators	240
	33-9032	Security Guards	15330
	33-9093	Transportation Security Screeners* (federal only)	410
	33-9099	Protective Service Workers, All Other *	1310
Louisiana Total			56930
Maine	11-9161	Emergency Management Directors	80
	29-2041	Emergency Medical Technicians and Paramedics	1730
	33-1011	First-Line Supervisors of Correctional Officers	190
	33-1012	First-Line Supervisors of Police and Detectives	360
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	210
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	190
	33-2011	Firefighters	2140
	33-2021	Fire Inspectors and Investigators	70
	33-3012	Correctional Officers and Jailers	1430
	33-3021	Detectives and Criminal Investigators	560
	33-3031	Fish and Game Wardens	140
	33-3041	Parking Enforcement Workers	40
	33-3051	Police and Sheriff's Patrol Officers	1990
	33-9011	Animal Control Workers	180
	33-9032	Security Guards	1840
	33-9093	Transportation Security Screeners* (federal only)	190
	33-9099	Protective Service Workers, All Other *	420
Maine Total			11760
Maryland	11-9161	Emergency Management Directors	170
	29-2041	Emergency Medical Technicians and Paramedics	4400
	33-1011	First-Line Supervisors of Correctional Officers	410
	33-1012	First-Line Supervisors of Police and Detectives	2840
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1090
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1000
	33-2011	Firefighters	2790
	33-2021	Fire Inspectors and Investigators	90
	33-3012	Correctional Officers and Jailers	10420

	33-3021	Detectives and Criminal Investigators	1460
	33-3031	Fish and Game Wardens	140
	33-3041	Parking Enforcement Workers	170
	33-3051	Police and Sheriff's Patrol Officers	16660
	33-3052	Transit and Railroad Police	70
	33-9011	Animal Control Workers	180
	33-9032	Security Guards	25010
	33-9093	Transportation Security Screeners* (federal only)	660
	33-9099	Protective Service Workers, All Other *	1340
Maryland Total			68900
Massachusetts	11-9161	Emergency Management Directors	260
	29-2041	Emergency Medical Technicians and Paramedics	6190
	33-1011	First-Line Supervisors of Correctional Officers	260
	33-1012	First-Line Supervisors of Police and Detectives	3550
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	2540
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1330
	33-2011	Firefighters	11440
	33-2021	Fire Inspectors and Investigators	350
	33-3012	Correctional Officers and Jailers	7410
	33-3021	Detectives and Criminal Investigators	1790
	33-3031	Fish and Game Wardens	70
	33-3041	Parking Enforcement Workers	410
	33-3051	Police and Sheriff's Patrol Officers	16330
	33-3052	Transit and Railroad Police	50
	33-9011	Animal Control Workers	460
	33-9032	Security Guards	20700
	33-9093	Transportation Security Screeners* (federal only)	1090
	33-9099	Protective Service Workers, All Other *	1380
Massachusetts Total			75610
Michigan	11-9161	Emergency Management Directors	240
	29-2041	Emergency Medical Technicians and Paramedics	7320
	33-1011	First-Line Supervisors of Correctional Officers	1110
	33-1012	First-Line Supervisors of Police and Detectives	3080
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1330
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1320
	33-2011	Firefighters	5810
	33-2021	Fire Inspectors and Investigators	350
	33-3012	Correctional Officers and Jailers	9340
	33-3021	Detectives and Criminal Investigators	1840
	33-3041	Parking Enforcement Workers	230
	33-3051	Police and Sheriff's Patrol Officers	15780
	33-9011	Animal Control Workers	300
	33-9031	Gaming Surveillance Officers and Gaming Investigators	110
	33-9032	Security Guards	21680
	33-9093	Transportation Security Screeners* (federal only)	1060
	33-9099	Protective Service Workers, All Other *	2610

Michigan Total			73510
Minnesota	11-9161	Emergency Management Directors	130
	29-2041	Emergency Medical Technicians and Paramedics	4240
	33-1011	First-Line Supervisors of Correctional Officers	580
	33-1012	First-Line Supervisors of Police and Detectives	1920
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	630
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1510
	33-2011	Firefighters	3880
	33-2021	Fire Inspectors and Investigators	120
	33-3012	Correctional Officers and Jailers	4960
	33-3021	Detectives and Criminal Investigators	1280
	33-3051	Police and Sheriff's Patrol Officers	8120
	33-9011	Animal Control Workers	80
	33-9031	Gaming Surveillance Officers and Gaming Investigators	140
	33-9032	Security Guards	10660
	33-9093	Transportation Security Screeners* (federal only)	740
	33-9099	Protective Service Workers, All Other *	3990
Minnesota Total			42980
Mississippi	11-9161	Emergency Management Directors	280
	29-2041	Emergency Medical Technicians and Paramedics	1750
	33-1011	First-Line Supervisors of Correctional Officers	450
	33-1012	First-Line Supervisors of Police and Detectives	760
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	590
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	490
	33-2011	Firefighters	2940
	33-2021	Fire Inspectors and Investigators	90
	33-2022	Forest Fire Inspectors and Prevention Specialists	130
	33-3012	Correctional Officers and Jailers	5620
	33-3021	Detectives and Criminal Investigators	1060
	33-3041	Parking Enforcement Workers	60
	33-3051	Police and Sheriff's Patrol Officers	6860
	33-9011	Animal Control Workers	140
	33-9031	Gaming Surveillance Officers and Gaming Investigators	420
	33-9032	Security Guards	9760
	33-9093	Transportation Security Screeners* (federal only)	190
Mississippi Total			31590
Missouri	11-9161	Emergency Management Directors	350
	29-2041	Emergency Medical Technicians and Paramedics	7620
	33-1011	First-Line Supervisors of Correctional Officers	500
	33-1012	First-Line Supervisors of Police and Detectives	2060
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	860
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	690
	33-2011	Firefighters	5380
	33-2021	Fire Inspectors and Investigators	210
	33-3012	Correctional Officers and Jailers	9060
	33-3021	Detectives and Criminal Investigators	1550

	33-3041	Parking Enforcement Workers	80
	33-3051	Police and Sheriff's Patrol Officers	12670
	33-3052	Transit and Railroad Police	150
	33-9011	Animal Control Workers	280
	33-9031	Gaming Surveillance Officers and Gaming Investigators	280
	33-9032	Security Guards	17630
	33-9093	Transportation Security Screeners* (federal only)	460
	33-9099	Protective Service Workers, All Other *	1020
Missouri Total			60850
Montana	11-9161	Emergency Management Directors	50
	29-2041	Emergency Medical Technicians and Paramedics	820
	33-1011	First-Line Supervisors of Correctional Officers	90
	33-1012	First-Line Supervisors of Police and Detectives	310
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	270
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	130
	33-2011	Firefighters	760
	33-3012	Correctional Officers and Jailers	1270
	33-3021	Detectives and Criminal Investigators	520
	33-3031	Fish and Game Wardens	100
	33-3041	Parking Enforcement Workers	40
	33-3051	Police and Sheriff's Patrol Officers	1780
	33-9011	Animal Control Workers	60
	33-9032	Security Guards	1780
	33-9093	Transportation Security Screeners* (federal only)	240
	33-9099	Protective Service Workers, All Other *	450
Montana Total			8670
Nebraska	11-9161	Emergency Management Directors	190
	29-2041	Emergency Medical Technicians and Paramedics	420
	33-1011	First-Line Supervisors of Correctional Officers	290
	33-1012	First-Line Supervisors of Police and Detectives	610
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	410
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	270
	33-2011	Firefighters	1160
	33-2021	Fire Inspectors and Investigators	90
	33-3012	Correctional Officers and Jailers	1880
	33-3021	Detectives and Criminal Investigators	310
	33-3051	Police and Sheriff's Patrol Officers	3080
	33-9011	Animal Control Workers	50
	33-9032	Security Guards	3890
	33-9093	Transportation Security Screeners* (federal only)	220
	33-9099	Protective Service Workers, All Other *	830
Nebraska Total			13700
Nevada	11-9161	Emergency Management Directors	80
	29-2041	Emergency Medical Technicians and Paramedics	1270
	33-1011	First-Line Supervisors of Correctional Officers	280
	33-1012	First-Line Supervisors of Police and Detectives	860

	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	500
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1340
	33-2011	Firefighters	1840
	33-2021	Fire Inspectors and Investigators	140
	33-3012	Correctional Officers and Jailers	2760
	33-3021	Detectives and Criminal Investigators	630
	33-3031	Fish and Game Wardens	60
	33-3041	Parking Enforcement Workers	50
	33-3051	Police and Sheriff's Patrol Officers	4790
	33-9011	Animal Control Workers	110
	33-9031	Gaming Surveillance Officers and Gaming Investigators	750
	33-9032	Security Guards	18810
	33-9093	Transportation Security Screeners* (federal only)	1090
	33-9099	Protective Service Workers, All Other *	1090
Nevada Total			36450
New Hampshire	11-9161	Emergency Management Directors	50
	29-2041	Emergency Medical Technicians and Paramedics	1330
	33-1011	First-Line Supervisors of Correctional Officers	70
	33-1012	First-Line Supervisors of Police and Detectives	470
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	390
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	150
	33-2011	Firefighters	1160
	33-2021	Fire Inspectors and Investigators	80
	33-3012	Correctional Officers and Jailers	1050
	33-3021	Detectives and Criminal Investigators	370
	33-3041	Parking Enforcement Workers	80
	33-3051	Police and Sheriff's Patrol Officers	2840
	33-9011	Animal Control Workers	90
	33-9032	Security Guards	2380
	33-9093	Transportation Security Screeners* (federal only)	170
	33-9099	Protective Service Workers, All Other *	340
New Hampshire Total			11020
New Jersey	11-9161	Emergency Management Directors	440
	29-2041	Emergency Medical Technicians and Paramedics	7260
	33-1011	First-Line Supervisors of Correctional Officers	740
	33-1012	First-Line Supervisors of Police and Detectives	3310
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1740
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	2590
	33-2011	Firefighters	5500
	33-2021	Fire Inspectors and Investigators	1170
	33-2022	Forest Fire Inspectors and Prevention Specialists	70
	33-3012	Correctional Officers and Jailers	11340
	33-3021	Detectives and Criminal Investigators	3180
	33-3041	Parking Enforcement Workers	520
	33-3051	Police and Sheriff's Patrol Officers	22830
	33-3052	Transit and Railroad Police	200

	33-9011	Animal Control Workers	370
	33-9031	Gaming Surveillance Officers and Gaming Investigators	270
	33-9032	Security Guards	37310
	33-9093	Transportation Security Screeners* (federal only)	1110
	33-9099	Protective Service Workers, All Other *	1260
New Jersey Total			101210
New Mexico	11-9161	Emergency Management Directors	50
	29-2041	Emergency Medical Technicians and Paramedics	1340
	33-1011	First-Line Supervisors of Correctional Officers	680
	33-1012	First-Line Supervisors of Police and Detectives	760
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	300
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	580
	33-2011	Firefighters	1900
	33-2021	Fire Inspectors and Investigators	80
	33-3012	Correctional Officers and Jailers	5800
	33-3021	Detectives and Criminal Investigators	1790
	33-3051	Police and Sheriff's Patrol Officers	3590
	33-9011	Animal Control Workers	200
	33-9031	Gaming Surveillance Officers and Gaming Investigators	190
	33-9032	Security Guards	7020
	33-9093	Transportation Security Screeners* (federal only)	210
	33-9099	Protective Service Workers, All Other *	850
New Mexico Total			25340
New York	11-9161	Emergency Management Directors	480
	29-2041	Emergency Medical Technicians and Paramedics	13370
	33-1011	First-Line Supervisors of Correctional Officers	3910
	33-1012	First-Line Supervisors of Police and Detectives	12880
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	4110
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	5690
	33-2011	Firefighters	14020
	33-2021	Fire Inspectors and Investigators	790
	33-2022	Forest Fire Inspectors and Prevention Specialists	140
	33-3012	Correctional Officers and Jailers	34310
	33-3021	Detectives and Criminal Investigators	9150
	33-3041	Parking Enforcement Workers	570
	33-3051	Police and Sheriff's Patrol Officers	55480
	33-3052	Transit and Railroad Police	120
	33-9011	Animal Control Workers	1060
	33-9031	Gaming Surveillance Officers and Gaming Investigators	230
	33-9032	Security Guards	95860
	33-9093	Transportation Security Screeners* (federal only)	3210
	33-9099	Protective Service Workers, All Other *	2010
New York Total			257390
North Carolina	11-9161	Emergency Management Directors	290
	29-2041	Emergency Medical Technicians and Paramedics	8940
	33-1011	First-Line Supervisors of Correctional Officers	1470

	33-1012	First-Line Supervisors of Police and Detectives	4160
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	2620
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1710
	33-2011	Firefighters	11330
	33-2021	Fire Inspectors and Investigators	500
	33-3012	Correctional Officers and Jailers	15770
	33-3021	Detectives and Criminal Investigators	3660
	33-3041	Parking Enforcement Workers	110
	33-3051	Police and Sheriff's Patrol Officers	19040
	33-9011	Animal Control Workers	570
	33-9032	Security Guards	25040
	33-9093	Transportation Security Screeners* (federal only)	1060
	33-9099	Protective Service Workers, All Other *	1870
North Carolina Total			98140
North Dakota	11-9161	Emergency Management Directors	100
	29-2041	Emergency Medical Technicians and Paramedics	620
	33-1011	First-Line Supervisors of Correctional Officers	120
	33-1012	First-Line Supervisors of Police and Detectives	200
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	60
	33-2011	Firefighters	560
	33-2021	Fire Inspectors and Investigators	30
	33-3012	Correctional Officers and Jailers	650
	33-3021	Detectives and Criminal Investigators	310
	33-3031	Fish and Game Wardens	50
	33-3051	Police and Sheriff's Patrol Officers	0
	33-9031	Gaming Surveillance Officers and Gaming Investigators	70
	33-9032	Security Guards	1520
	33-9093	Transportation Security Screeners* (federal only)	120
	33-9099	Protective Service Workers, All Other *	200
North Dakota Total			4610
Ohio	11-9161	Emergency Management Directors	470
	29-2041	Emergency Medical Technicians and Paramedics	8490
	33-1011	First-Line Supervisors of Correctional Officers	660
	33-1012	First-Line Supervisors of Police and Detectives	2600
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	2030
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1730
	33-2011	Firefighters	19900
	33-2021	Fire Inspectors and Investigators	430
	33-3012	Correctional Officers and Jailers	13570
	33-3021	Detectives and Criminal Investigators	2720
	33-3041	Parking Enforcement Workers	340
	33-3051	Police and Sheriff's Patrol Officers	24110
	33-9011	Animal Control Workers	370
	33-9032	Security Guards	29460
	33-9093	Transportation Security Screeners* (federal only)	790
	33-9099	Protective Service Workers, All Other *	2400

Ohio Total			110070
Oklahoma	11-9161	Emergency Management Directors	240
	29-2041	Emergency Medical Technicians and Paramedics	2870
	33-1011	First-Line Supervisors of Correctional Officers	620
	33-1012	First-Line Supervisors of Police and Detectives	1490
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1700
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	450
	33-2011	Firefighters	3360
	33-2021	Fire Inspectors and Investigators	180
	33-2022	Forest Fire Inspectors and Prevention Specialists	120
	33-3012	Correctional Officers and Jailers	6590
	33-3021	Detectives and Criminal Investigators	1670
	33-3031	Fish and Game Wardens	210
	33-3041	Parking Enforcement Workers	50
	33-3051	Police and Sheriff's Patrol Officers	7800
	33-3052	Transit and Railroad Police	90
	33-9011	Animal Control Workers	370
	33-9031	Gaming Surveillance Officers and Gaming Investigators	340
	33-9032	Security Guards	9860
	33-9093	Transportation Security Screeners* (federal only)	320
Oklahoma Total			38330
Oregon	11-9161	Emergency Management Directors	130
	29-2041	Emergency Medical Technicians and Paramedics	2530
	33-1011	First-Line Supervisors of Correctional Officers	440
	33-1012	First-Line Supervisors of Police and Detectives	1210
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1050
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	560
	33-2011	Firefighters	3180
	33-2021	Fire Inspectors and Investigators	160
	33-2022	Forest Fire Inspectors and Prevention Specialists	50
	33-3012	Correctional Officers and Jailers	4280
	33-3021	Detectives and Criminal Investigators	660
	33-3041	Parking Enforcement Workers	130
	33-3051	Police and Sheriff's Patrol Officers	5140
	33-3052	Transit and Railroad Police	40
	33-9011	Animal Control Workers	100
	33-9031	Gaming Surveillance Officers and Gaming Investigators	170
	33-9032	Security Guards	7600
	33-9093	Transportation Security Screeners* (federal only)	550
	33-9099	Protective Service Workers, All Other *	1090
Oregon Total			29070
Pennsylvania	11-9161	Emergency Management Directors	800
	29-2041	Emergency Medical Technicians and Paramedics	12760
	33-1011	First-Line Supervisors of Correctional Officers	580
	33-1012	First-Line Supervisors of Police and Detectives	4120
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1190

	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1300
	33-2011	Firefighters	5380
	33-2021	Fire Inspectors and Investigators	360
	33-3012	Correctional Officers and Jailers	17940
	33-3021	Detectives and Criminal Investigators	3260
	33-3041	Parking Enforcement Workers	370
	33-3051	Police and Sheriff's Patrol Officers	27830
	33-3052	Transit and Railroad Police	230
	33-9011	Animal Control Workers	300
	33-9031	Gaming Surveillance Officers and Gaming Investigators	320
	33-9032	Security Guards	38840
	33-9093	Transportation Security Screeners* (federal only)	1470
	33-9099	Protective Service Workers, All Other *	1710
Pennsylvania Total			118760
Puerto Rico	11-9161	Emergency Management Directors	300
	29-2041	Emergency Medical Technicians and Paramedics	2730
	33-1012	First-Line Supervisors of Police and Detectives	2430
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	910
	33-2011	Firefighters	1550
	33-3012	Correctional Officers and Jailers	5800
	33-3021	Detectives and Criminal Investigators	650
	33-3041	Parking Enforcement Workers	60
	33-3051	Police and Sheriff's Patrol Officers	19250
	33-9031	Gaming Surveillance Officers and Gaming Investigators	150
	33-9032	Security Guards	28030
	33-9093	Transportation Security Screeners* (federal only)	460
	33-9099	Protective Service Workers, All Other *	1210
Puerto Rico Total			63530
Rhode Island	29-2041	Emergency Medical Technicians and Paramedics	780
	33-1012	First-Line Supervisors of Police and Detectives	610
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	600
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	170
	33-2011	Firefighters	1710
	33-2021	Fire Inspectors and Investigators	60
	33-3021	Detectives and Criminal Investigators	360
	33-3051	Police and Sheriff's Patrol Officers	1790
	33-9011	Animal Control Workers	70
	33-9032	Security Guards	2870
	33-9093	Transportation Security Screeners* (federal only)	190
	33-9099	Protective Service Workers, All Other *	420
Rhode Island Total			9630
South Carolina	11-9161	Emergency Management Directors	190
	29-2041	Emergency Medical Technicians and Paramedics	4530
	33-1011	First-Line Supervisors of Correctional Officers	370
	33-1012	First-Line Supervisors of Police and Detectives	1360
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	950

	33-1099	First-Line Supervisors of Protective Service Workers, All Other	680
	33-2011	Firefighters	4860
	33-2021	Fire Inspectors and Investigators	330
	33-3012	Correctional Officers and Jailers	7600
	33-3021	Detectives and Criminal Investigators	1030
	33-3041	Parking Enforcement Workers	110
	33-3051	Police and Sheriff's Patrol Officers	9510
	33-9011	Animal Control Workers	230
	33-9032	Security Guards	13970
	33-9093	Transportation Security Screeners* (federal only)	410
	33-9099	Protective Service Workers, All Other *	790
South Carolina Total			46920
South Dakota	11-9161	Emergency Management Directors	90
	29-2041	Emergency Medical Technicians and Paramedics	770
	33-1011	First-Line Supervisors of Correctional Officers	50
	33-1012	First-Line Supervisors of Police and Detectives	160
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	100
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	90
	33-2011	Firefighters	410
	33-3012	Correctional Officers and Jailers	1290
	33-3021	Detectives and Criminal Investigators	220
	33-3031	Fish and Game Wardens	100
	33-3051	Police and Sheriff's Patrol Officers	1550
	33-9011	Animal Control Workers	40
	33-9031	Gaming Surveillance Officers and Gaming Investigators	120
	33-9032	Security Guards	1130
	33-9093	Transportation Security Screeners* (federal only)	60
	33-9099	Protective Service Workers, All Other *	0
South Dakota Total			6180
Tennessee	11-9161	Emergency Management Directors	220
	29-2041	Emergency Medical Technicians and Paramedics	7000
	33-1011	First-Line Supervisors of Correctional Officers	600
	33-1012	First-Line Supervisors of Police and Detectives	1470
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1080
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	700
	33-2011	Firefighters	5850
	33-2021	Fire Inspectors and Investigators	250
	33-3012	Correctional Officers and Jailers	9710
	33-3021	Detectives and Criminal Investigators	1570
	33-3031	Fish and Game Wardens	360
	33-3041	Parking Enforcement Workers	80
	33-3051	Police and Sheriff's Patrol Officers	13440
	33-3052	Transit and Railroad Police	50
	33-9011	Animal Control Workers	300
	33-9031	Gaming Surveillance Officers and Gaming Investigators	0
	33-9032	Security Guards	21280

	33-9093	Transportation Security Screeners* (federal only)	700
	33-9099	Protective Service Workers, All Other *	1100
Tennessee Total			65760
Texas	11-9161	Emergency Management Directors	840
	29-2041	Emergency Medical Technicians and Paramedics	15010
	33-1011	First-Line Supervisors of Correctional Officers	4820
	33-1012	First-Line Supervisors of Police and Detectives	6570
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	4400
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	3280
	33-2011	Firefighters	23280
	33-2021	Fire Inspectors and Investigators	820
	33-3012	Correctional Officers and Jailers	49250
	33-3021	Detectives and Criminal Investigators	15940
	33-3031	Fish and Game Wardens	420
	33-3041	Parking Enforcement Workers	290
	33-3051	Police and Sheriff's Patrol Officers	53490
	33-3052	Transit and Railroad Police	660
	33-9011	Animal Control Workers	1410
	33-9032	Security Guards	75390
	33-9093	Transportation Security Screeners* (federal only)	3230
	33-9099	Protective Service Workers, All Other *	3320
Texas Total			262420
Utah	11-9161	Emergency Management Directors	150
	29-2041	Emergency Medical Technicians and Paramedics	2000
	33-1011	First-Line Supervisors of Correctional Officers	320
	33-1012	First-Line Supervisors of Police and Detectives	880
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	250
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	370
	33-2011	Firefighters	2220
	33-2021	Fire Inspectors and Investigators	70
	33-3012	Correctional Officers and Jailers	2580
	33-3021	Detectives and Criminal Investigators	420
	33-3031	Fish and Game Wardens	110
	33-3041	Parking Enforcement Workers	0
	33-3051	Police and Sheriff's Patrol Officers	4300
	33-9011	Animal Control Workers	240
	33-9032	Security Guards	5820
	33-9093	Transportation Security Screeners* (federal only)	530
	33-9099	Protective Service Workers, All Other *	1060
Utah Total			21320
Vermont	11-9161	Emergency Management Directors	40
	29-2041	Emergency Medical Technicians and Paramedics	610
	33-1012	First-Line Supervisors of Police and Detectives	170
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	110
	33-2011	Firefighters	310
	33-2021	Fire Inspectors and Investigators	30

	33-3021	Detectives and Criminal Investigators	240
	33-3051	Police and Sheriff's Patrol Officers	1240
	33-9011	Animal Control Workers	30
	33-9032	Security Guards	970
	33-9093	Transportation Security Screeners* (federal only)	100
	33-9099	Protective Service Workers, All Other *	110
Vermont Total			3960
Virgin Islands	33-1099	First-Line Supervisors of Protective Service Workers, All Other	70
	33-9032	Security Guards	1190
	33-9093	Transportation Security Screeners* (federal only)	130
Virgin Islands Total			1390
Virginia	11-9161	Emergency Management Directors	550
	29-2041	Emergency Medical Technicians and Paramedics	4420
	33-1011	First-Line Supervisors of Correctional Officers	2230
	33-1012	First-Line Supervisors of Police and Detectives	2380
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1720
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1820
	33-2011	Firefighters	7950
	33-2021	Fire Inspectors and Investigators	140
	33-3012	Correctional Officers and Jailers	15890
	33-3021	Detectives and Criminal Investigators	3150
	33-3031	Fish and Game Wardens	220
	33-3041	Parking Enforcement Workers	180
	33-3051	Police and Sheriff's Patrol Officers	16480
	33-3052	Transit and Railroad Police	0
	33-9011	Animal Control Workers	500
	33-9032	Security Guards	31500
	33-9093	Transportation Security Screeners* (federal only)	1690
	33-9099	Protective Service Workers, All Other *	2310
Virginia Total			93130
Washington	11-9161	Emergency Management Directors	330
	29-2041	Emergency Medical Technicians and Paramedics	2850
	33-1011	First-Line Supervisors of Correctional Officers	950
	33-1012	First-Line Supervisors of Police and Detectives	1900
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	1820
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	1140
	33-2011	Firefighters	8380
	33-2021	Fire Inspectors and Investigators	180
	33-3012	Correctional Officers and Jailers	6800
	33-3021	Detectives and Criminal Investigators	1810
	33-3031	Fish and Game Wardens	110
	33-3041	Parking Enforcement Workers	160
	33-3051	Police and Sheriff's Patrol Officers	8600
	33-9011	Animal Control Workers	270
	33-9031	Gaming Surveillance Officers and Gaming Investigators	480
	33-9032	Security Guards	14580

	33-9093	Transportation Security Screeners* (federal only)	880
	33-9099	Protective Service Workers, All Other *	2280
Washington Total			53520
West Virginia	11-9161	Emergency Management Directors	140
	29-2041	Emergency Medical Technicians and Paramedics	1950
	33-1012	First-Line Supervisors of Police and Detectives	0
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	100
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	240
	33-2011	Firefighters	910
	33-2021	Fire Inspectors and Investigators	40
	33-3021	Detectives and Criminal Investigators	390
	33-3031	Fish and Game Wardens	120
	33-3041	Parking Enforcement Workers	60
	33-3051	Police and Sheriff's Patrol Officers	3170
	33-9011	Animal Control Workers	110
	33-9031	Gaming Surveillance Officers and Gaming Investigators	50
	33-9032	Security Guards	5070
	33-9093	Transportation Security Screeners* (federal only)	130
West Virginia Total			12480
Wisconsin	11-9161	Emergency Management Directors	170
	29-2041	Emergency Medical Technicians and Paramedics	5290
	33-1011	First-Line Supervisors of Correctional Officers	760
	33-1012	First-Line Supervisors of Police and Detectives	1290
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	720
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	760
	33-2011	Firefighters	8110
	33-2021	Fire Inspectors and Investigators	250
	33-3012	Correctional Officers and Jailers	7630
	33-3021	Detectives and Criminal Investigators	1330
	33-3031	Fish and Game Wardens	140
	33-3041	Parking Enforcement Workers	220
	33-3051	Police and Sheriff's Patrol Officers	11240
	33-9011	Animal Control Workers	100
	33-9031	Gaming Surveillance Officers and Gaming Investigators	140
	33-9032	Security Guards	11280
	33-9093	Transportation Security Screeners* (federal only)	520
	33-9099	Protective Service Workers, All Other *	1230
Wisconsin Total			51180
Wyoming	11-9161	Emergency Management Directors	70
	29-2041	Emergency Medical Technicians and Paramedics	580
	33-1011	First-Line Supervisors of Correctional Officers	130
	33-1012	First-Line Supervisors of Police and Detectives	300
	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	140
	33-1099	First-Line Supervisors of Protective Service Workers, All Other	150
	33-2011	Firefighters	380
	33-3012	Correctional Officers and Jailers	960

	33-3021	Detectives and Criminal Investigators	180
	33-3031	Fish and Game Wardens	80
	33-3041	Parking Enforcement Workers	40
	33-3051	Police and Sheriff's Patrol Officers	1300
	33-9011	Animal Control Workers	70
	33-9032	Security Guards	820
	33-9093	Transportation Security Screeners* (federal only)	60
	33-9099	Protective Service Workers, All Other *	390
Wyoming Total			5650
Grand Total			3217910

Table 8

Offenses Known to Law Enforcement

by State by City, 2010

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
ALABAMA	Abbeville	2,950	21	1	0	0	20	67	19	45
	Adamsville	4,796	10	0	3	2	5	294	21	250
	Addison	714	0	0	0	0	0	33	3	26
	Alabaster	30,781	33	0	0	7	26	515	22	458
	Albertville	20,588	81	0	6	13	62	1,112	346	710
	Alexander City	15,229	59	1	8	9	41	646	113	522
	Aliceville	2,423	12	0	1	0	11	51	10	35
	Andalusia[2]	8,946	24	0	3	0	21			
	Anderson	358	1	0	0	0	1	8	4	4
	Anniston[2]	23,703		3	23	76		2,038	831	1,107
	Ardmore	1,328	2	0	0	1	1	49	12	30
	Argo	2,005	3	0	1	0	2	21	10	8
	Ariton	750	2	0	0	0	2	11	2	9
	Arley	320	0	0	0	0	0	17	1	14
	Ashford	2,146	3	0	1	0	2	88	39	41
	Ashland	1,900	3	0	0	0	3	43	4	37
	Ashville	2,708	8	0	0	2	6	32	13	19
	Athens	24,989	34	0	4	12	18	717	129	564
	Atmore	10,182	49	0	2	5	42	335	62	252
	Attalla	6,621	60	0	4	4	52	297	65	226
	Auburn	59,651	83	3	4	13	63	1,818	206	1,559
	Bayou La Batre	3,253	23	0	1	0	22	172	62	90
	Bear Creek	993	7	0	0	0	7	11	0	10
	Bessemer	28,881	289	5	18	83	183	2,189	273	1,753
	Blountsville	2,042	4	0	0	0	4	96	18	74
	Boaz	8,656	10	0	2	1	7	496	69	403
	Brantley	912	0	0	0	0	0	0	0	0
	Brent	4,361	19	0	1	2	16	106	9	93
	Brewton	5,262	95	0	0	1	94	239	24	210
	Bridgeport	2,616	1	0	0	0	1	76	7	61
	Brilliant	943	3	0	1	1	1	30	1	26
	Brookside	1,343	0	0	0	0	0	1	0	0
	Brundidge	2,271	9	0	0	1	8	59	23	34
	Butler	1,681	14	0	0	2	12	49	25	21
	Calera	12,424	24	0	4	4	16	322	23	293
	Camden	2,153	2	0	0	0	2	8	1	4
	Camp Hill	1,219	15	0	0	0	15	24	1	23
	Carbon Hill	2,040	5	0	0	1	4	35	6	25
	Carrollton	911	2	0	0	0	2	22	1	19
	Cedar Bluff	1,666	11	0	0	1	10	135	21	93
	Centre	3,515	3	0	2	0	1	114	18	86
	Centreville	2,646	7	0	2	1	4	20	1	15
	Chatom	1,153	5	0	0	1	4	19	2	15
	Chickasaw	5,948	36	0	4	10	22	345	104	219

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Citronelle	3,791	24	0	0	4	20	122	33	81
	Clanton[2]	9,109	47	0	3	8	36			388
	Clayhatchee	496	0	0	0	0	0	7	0	5
	Clayton	1,396	4	0	0	0	4	6	1	5
	Cleveland	1,460	0	0	0	0	0	13	2	11
	Clio	2,391	0	0	0	0	0	1	0	0
	Coffeeville	340	1	0	0	0	1	4	2	2
	Collinsville	2,026	4	0	0	1	3	83	23	54
	Columbia	866	1	0	0	0	1	8	0	7
	Columbiana	4,210	3	0	0	0	3	108	7	99
	Coosada	1,731	1	0	0	0	1	20	1	17
	Cottonwood	1,231	3	0	0	0	3	27	7	19
	Courtland	767	3	0	0	0	3	9	1	7
	Creola	2,100	4	0	1	0	3	79	18	55
	Crossville	1,535	0	0	0	0	0	7	0	3
	Cullman	15,540	23	0	3	3	17	675	78	571
	Dadeville	3,265	37	0	1	0	36	192	8	171
	Daleville[2]	4,561	17	0	3	2	12			174
	Daphne	20,018	31	0	0	5	26	453	77	368
	Dauphin Island	1,640	3	0	0	0	3	57	27	28
	Decatur	57,153	212	4	17	74	117	2,751	682	1,920
	Demopolis	7,312	58	0	7	7	44	392	67	313
	Dora	2,431	5	0	0	0	5	57	7	47
	Dothan	69,134	411	1	29	118	263	3,136	1,011	2,034
	Douglas	643	9	0	1	0	8	54	2	49
	Eclectic	1,183	6	0	0	1	5	39	11	28
	Elba	4,254	21	1	3	2	15	125	30	84
	Elberta	1,527	9	0	0	0	9	80	8	64
	Enterprise[3]	26,649	124	4	8	23	89			
	Eufaula[2]	14,709	19	1	5	6	7			411
	Eutaw	2,833	34	0	1	2	31	75	26	45
	Evergreen	3,468	36	0	0	6	30	188	60	124
	Excel	609	4	0	0	0	4	8	1	7
	Fairfield	11,344	105	4	5	36	60	1,352	396	869
	Falkville	1,229	3	0	1	0	2	45	13	27
	Fayette	4,676	14	0	0	2	12	105	10	87
	Flomaton	1,547	2	0	0	0	2	31	4	26
	Florala	1,878	9	0	0	0	9	65	2	56
	Florence[2]	38,643		1	12		58			1,475
	Foley	15,044	45	0	4	4	37	501	63	408
	Fort Deposit	1,154	14	0	0	0	14	52	2	45
	Fultondale	7,095	3	0	1	1	1	231	18	202
	Gadsden	36,835	318	5	30	110	173	2,620	681	1,797
	Gantt	239	1	0	0	0	1	2	0	2
	Gardendale	14,048	30	2	1	14	13	516	91	405
	Georgiana	1,548	7	0	0	1	6	39	6	32
	Geraldine	857	2	0	0	0	2	20	2	13
	Glencoe	5,393	18	0	4	0	14	139	39	97
	Gordo	1,520	4	0	0	0	4	16	3	13

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Grant	732	3	0	0	0	3	24	5	16
	Graysville	2,394	0	0	0	0	0	3	0	3
	Greenville	6,961	31	0	0	7	24	362	74	270
	Grove Hill	1,320	10	0	0	2	8	24	12	10
	Guin	2,146	7	0	0	0	7	28	0	23
	Gulf Shores	10,999	24	1	9	4	10	469	28	428
	Guntersville[2]	8,775	34	0	7	8	19			556
	Gurley	885	1	0	0	0	1	3	2	0
	Hackleburg	1,432	4	0	0	0	4	35	3	27
	Haleyville	4,080	10	0	2	0	8	196	8	178
	Hamilton	6,324	6	0	0	0	6	171	10	152
	Hammondville	556	0	0	0	0	0	5	0	5
	Hanceville	3,531	12	0	2	2	8	94	8	78
	Harpersville	1,869	3	0	0	0	3	7	1	5
	Hartford	2,447	12	0	2	0	10	112	9	98
	Hartselle	14,258	8	0	2	0	6	560	80	457
	Heflin	3,592	12	0	1	0	11	67	13	50
	Helena	15,845	8	0	1	0	7	102	12	85
	Henagar	2,654	5	0	0	0	5	63	19	44
	Highland Lake	522	0	0	0	0	0	2	0	2
	Hillsboro	593	3	0	1	0	2	1	0	0
	Hokes Bluff	4,531	3	0	0	1	2	44	2	40
	Hollywood	923	2	0	0	0	2	9	0	9
	Homewood	24,101	114	0	3	69	42	1,540	298	1,156
	Hoover	74,687	75	1	3	47	24	2,172	397	1,670
	Hueytown	15,942	24	0	1	8	15	674	35	615
	Huntsville	183,357	1,182	12	76	463	631	9,768	2,677	6,230
	Ider	733	4	0	0	0	4	20	6	14
	Irondale	9,865	51	1	1	11	38	627	179	378
	Jacksons Gap	773	4	0	0	0	4	28	0	27
	Jasper[2]	14,138	72	0	7	13	52			920
	Jemison	3,077	7	0	0	0	7	114	7	96
	Killen	1,154	6	0	0	0	6	48	3	43
	Kimberly	3,027	0	0	0	0	0	19	4	15
	Kinston	630	4	0	0	1	3	15	10	4
	Lafayette	2,875	27	0	1	0	26	120	11	103
	Lake View	2,630	1	0	0	0	1	42	5	33
	Lanett	7,026	38	0	6	3	29	715	50	639
	Leeds	11,679	63	2	2	33	26	514	105	379
	Leesburg	827	4	0	0	1	3	39	6	30
	Leighton	832	0	0	0	0	0	7	4	3
	Level Plains	1,537	12	0	0	0	12	32	9	22
	Lexington	852	0	0	0	0	0	9	3	6
	Lincoln	6,279	27	1	5	1	20	317	80	208
	Linden	2,225	8	0	0	0	8	49	15	30
	Lineville	2,333	21	0	0	0	21	28	2	26
	Lipscomb	2,036	9	1	0	4	4	94	32	50
	Littleville	1,056	6	0	0	0	6	32	5	27
	Livingston	2,869	15	1	1	1	12	111	25	81

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lockhart	542	1	0	0	0	1	1	0	0
	Louisville	573	1	0	0	0	1	6	3	3
	Loxley	2,063	25	0	3	14	8	156	17	135
	Lynn	718	0	0	0	0	0	4	1	2
	Madison	41,426	82	1	12	26	43	925	166	712
	Margaret	1,313	4	0	1	0	3	42	1	35
	McIntosh	231	11	0	2	1	8	16	5	9
	Mentone	492	0	0	0	0	0	2	0	2
	Midfield	5,215	34	2	4	17	11	348	10	311
	Midland City	1,927	9	0	0	1	8	70	14	47
	Millbrook	17,750	33	0	3	15	15	445	106	336
	Millry	588	1	0	0	0	1	3	0	3
	Mobile[4,5]	255,178	1,702	25	59	653	965	14,179	3,873	9,279
	Monroeville	6,285	80	0	5	2	73	425	75	328
	Montevallo[2]	6,657	15	0	1	3	11			187
	Montgomery	203,966	797	25	55	401	316	11,260	3,279	7,200
	Moody[2]	14,726	2	0	0	0	2			
	Morris	1,927	4	0	0	0	4	44	1	38
	Mosses	1,006	7	0	0	0	7	8	3	4
	Moulton	3,259	10	0	0	4	6	80	5	70
	Moundville	2,660	16	0	2	0	14	72	16	48
	Mount Vernon	819	10	0	0	0	10	79	31	43
	Muscle Shoals	13,277	50	0	5	7	38	614	134	460
	Napier Field	398	3	0	0	0	3	12	5	6
	New Brockton	1,258	12	0	0	2	10	28	14	12
	New Site	843	0	0	0	0	0	0	0	0
	Newville	547	0	0	0	0	0	5	5	0
	Northport	24,019	171	2	8	41	120	970	273	649
	Notasulga	825	3	0	0	0	3	59	3	53
	Oakman	921	0	0	0	0	0	8	0	8
	Odenville	2,968	11	0	2	0	9	80	13	55
	Ohatchee	1,285	1	0	0	0	1	10	2	6
	Oneonta	7,317	12	0	2	0	10	161	8	145
	Opelika	28,815	156	2	17	31	106	1,492	430	1,044
	Opp	6,552	14	1	1	0	12	193	17	168
	Orange Beach[2]	6,575	6	0	0	0	6			224
	Owens Crossroads	1,814	1	0	0	0	1	26	1	21
	Oxford[2]	21,171		4	1		56	1,242	186	998
	Ozark	14,669	72	1	5	7	59	452	5	426
	Parrish	1,252	5	0	0	0	5	28	2	25
	Pelham	22,777	32	1	2	7	22	457	65	374
	Pell City	13,637	41	0	5	4	32	477	63	392
	Phenix City	31,662	157	4	12	55	86	1,628	561	944
	Phil Campbell	1,061	1	0	0	1	0	21	0	20
	Piedmont	4,994	19	0	3	2	14	193	53	128
	Pine Hill	878	7	0	1	0	6	36	6	27
	Pisgah	693	0	0	0	0	0	8	0	8
	Pleasant Grove	10,407	11	0	1	2	8	164	26	130
	Powell	1,002	0	0	0	0	0	13	9	4

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Prattville	33,738	90	0	10	25	55	1,296	203	1,045
	Priceville	3,072	0	0	0	0	0	53	1	47
	Ragland	2,232	7	0	0	0	7	53	7	42
	Rainbow City	9,569	11	0	2	1	8	253	52	195
	Rainsville	5,141	2	0	0	0	2	108	7	91
	Ranburne	488	3	0	0	0	3	13	7	5
	Red Bay	3,338	7	0	1	0	6	57	1	52
	Red Level	549	0	0	0	0	0	1	0	1
	Reform[2]	1,751	13	0	2	1	10			35
	River Falls	611	0	0	0	0	0	1	0	1
	Riverside[3]	2,146	4	0	0	0	4		7	
	Roanoke	6,716	19	1	0	5	13	105	8	92
	Robertsdale	5,320	17	1	3	2	11	220	28	185
	Rockford	386	0	0	0	0	0	3	0	3
	Rogersville	1,219	4	0	0	0	4	34	3	27
	Samson	2,039	7	0	0	0	7	42	6	35
	Saraland	13,238	53	0	4	8	41	547	86	439
	Sardis City	2,227	1	0	0	0	1	64	5	53
	Section	757	0	0	0	0	0	6	0	6
	Sheffield	9,053	17	0	5	6	6	256	99	147
	Silas	472	0	0	0	0	0	2	1	1
	Silverhill	719	1	0	0	0	1	30	4	26
	Skyline	883	0	0	0	0	0	14	2	12
	Slocomb	2,065	9	0	0	1	8	23	1	20
	Snead	879	8	0	1	0	7	33	10	17
	Somerville	662	0	0	0	0	0	9	1	7
	Southside	8,731	7	1	0	0	6	143	10	128
	Spanish Fort	7,873	13	0	0	2	11	367	28	338
	Springville	3,906	8	0	0	1	7	114	22	91
	Steele	1,273	0	0	0	0	0	7	0	7
	St. Florian	538	4	0	0	0	4	18	3	12
	Sulligent	1,949	4	0	1	0	3	44	5	34
	Sumiton	2,566	7	0	1	1	5	207	13	182
	Summerdale	787	6	0	1	0	5	73	9	63
	Sylacauga	13,159	46	1	8	10	27	669	154	494
	Sylvania	1,425	1	0	0	0	1	29	3	26
	Talladega	16,826	91	0	3	9	79	1,138	361	707
	Tarrant	6,529	61	3	4	17	37	621	227	355
	Taylor	2,059	1	0	0	0	1	9	2	7
	Thomasville	4,433	43	1	3	1	38	189	58	119
	Thorsby	2,148	3	0	0	0	3	13	0	12
	Town Creek	1,213	6	0	0	0	6	29	3	24
	Trafford	500	0	0	0	0	0	0	0	0
	Trinity	2,079	4	0	0	0	4	55	2	49
	Troy[3]	15,395		0	10	15			337	625
	Tuscaloosa	95,570	449	7	31	190	221	4,828	1,462	3,188
	Tuscumbia[3]	8,490		0	3	6			54	276
	Valley	9,966	42	0	1	4	37	505	25	459
	Valley Head	667	2	0	0	0	2	5	2	3

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Vance	1,307	8	0	0	0	8	43	18	22
	Vernon	1,863	2	0	1	0	1	21	1	19
	Vestavia Hills	31,420	18	1	2	5	10	531	48	444
	Warrior	3,171	0	0	0	0	0	31	5	24
	Weaver	2,972	7	0	1	0	6	72	23	48
	Webb	1,417	0	0	0	0	0	5	0	5
	Wedowee	823	10	0	0	0	10	19	0	18
	West Blocton	1,422	0	0	0	0	0	3	1	1
	Winfield[2]	4,573	13	1	3	0	9			119
	Woodstock	1,099	14	0	0	1	13	123	10	102
	York	2,466	14	0	0	0	14	79	22	53
ALASKA	Anchorage	290,334	2,432	13	264	454	1,701	10,214	1,223	8,178
	Bethel	6,667	63	2	14	6	41	149	44	73
	Bristol Bay Borough	856	1	0	0	0	1	52	9	23
	Cordova	2,231	5	0	0	0	5	6	0	5
	Craig	1,184	11	0	0	0	11	14	3	10
	Dillingham	2,496	55	0	31	0	24	69	5	56
	Fairbanks[5]	35,989	284	0	70	33	181	1,367	149	1,117
	Haines	2,412	7	0	0	0	7	21	3	17
	Homer	6,158	40	0	1	5	34	265	40	219
	Houston[5]	2,412	18	0	2	0	16	53	18	27
	Juneau[5]	30,966	133	1	20	23	89	1,523	181	1,279
	Kenai	8,094	30	0	7	3	20	279	37	226
	Ketchikan	7,479	29	0	8	3	18	405	31	350
	Kodiak[5]	6,387	80	0	8	5	67	209	22	168
	Kotzebue	3,173	27	0	10	4	13	103	22	52
	Nome	3,688	17	0	8	0	9	79	14	55
	North Pole	2,318	10	0	2	1	7	97	12	78
	North Slope Borough	6,728	69	0	10	0	59	109	36	51
	Palmer	8,964	34	0	3	3	28	207	25	170
	Petersburg	2,797	12	0	0	0	12	74	11	62
	Seward	3,224	3	0	0	0	3	102	10	91
	Sitka	8,783	33	0	3	2	28	222	19	182
	Skagway	930	2	0	0	0	2	27	5	21
	Soldotna	4,621	20	0	0	2	18	249	26	217
	St. Paul	431	6	0	0	0	6	1	0	1
	Unalaska	3,539	9	0	2	0	7	87	16	57
	Valdez	3,786	20	0	2	0	18	119	14	99
	Wasilla[6]	11,471		0	0	8		326	32	263
	Wrangell	2,130	0	0	0	0	0	43	7	36
ARIZONA	Apache Junction	33,225	108	3	15	14	76	1,043	266	697
	Avondale	82,580	199	0	18	78	103	3,732	802	2,559
	Buckeye	50,008	43	1	0	13	29	1,245	344	815
	Bullhead City	39,488	59	3	0	17	39	1,540	336	1,107
	Camp Verde	10,535	18	0	0	1	17	240	60	166
	Casa Grande	42,522	250	1	6	52	191	2,847	599	2,075
	Chandler	241,826	691	6	61	195	429	7,516	1,373	5,766

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Chino Valley	10,837	48	0	4	0	44	220	44	165
	Clarkdale	4,121	11	0	0	0	11	82	52	27
	Clifton	2,490	12	0	0	0	12	27	12	13
	Colorado City	4,524	4	0	0	0	4	25	4	19
	Coolidge	10,737	80	0	8	10	62	564	133	401
	Cottonwood	11,010	58	0	2	3	53	376	51	318
	Eagar	4,376	11	0	0	2	9	125	39	83
	El Mirage	24,047	83	1	9	25	48	846	225	540
	Eloy	12,897	88	4	3	8	73	675	270	341
	Flagstaff	58,739	267	5	37	49	176	2,955	226	2,666
	Florence	21,096	39	0	1	1	37	247	106	126
	Fredonia	1,110	2	0	0	0	2	11	6	4
	Gilbert	215,215	205	5	26	61	113	4,080	791	3,135
	Glendale	245,387	963	12	46	385	520	13,529	2,264	9,936
	Globe	6,936	38	0	2	2	34	285	77	203
	Goodyear	61,721	134	0	11	26	97	1,991	883	907
	Holbrook	4,926	62	0	0	1	61	333	68	250
	Huachuca City	1,896	6	0	0	0	6	21	7	10
	Jerome	366	2	0	0	0	2	27	3	23
	Kingman	26,671	83	1	15	22	45	1,574	358	1,142
	Mammoth	2,618	2	0	0	1	1	40	19	19
	Marana	34,039	28	0	3	12	13	1,095	125	900
	Mesa	452,725	1,790	15	124	511	1,140	14,876	2,711	11,158
	Miami	1,710	24	0	0	3	21	66	36	28
	Nogales	19,399	51	0	0	5	46	766	114	556
	Oro Valley	42,644	30	0	4	10	16	774	94	654
	Page	6,854	118	0	1	3	114	428	43	368
	Paradise Valley	14,715	11	0	0	4	7	279	172	99
	Parker	3,024	5	0	0	0	5	124	28	89
	Payson	15,067	122	0	3	3	116	405	89	302
	Peoria	158,184	282	6	38	66	172	4,630	867	3,380
	Phoenix	1,544,427	8,002	117	522	3,250	4,113	61,362	15,626	38,012
	Pinetop-Lakeside	4,382	56	1	0	7	48	231	65	164
	Prescott	41,428	135	0	11	13	111	1,251	221	979
	Prescott Valley	37,275	109	1	8	4	96	670	105	552
	Quartzsite	3,359	8	0	0	0	8	89	7	69
	Sahuarita	24,067	14	0	3	0	11	369	55	292
	Scottsdale	230,496	353	4	33	100	216	6,563	1,281	5,014
	Sedona	11,240	17	0	6	0	11	210	50	155
	Sierra Vista	41,892	121	1	21	13	86	1,395	212	1,129
	Snowflake-Taylor	9,563	47	2	0	0	45	192	66	110
	Somerton	12,360	5	0	0	3	2	225	41	160
	South Tucson	5,855	149	0	4	51	94	854	83	725
	Springerville	1,943	11	0	3	0	8	61	13	47
	Surprise	92,294	106	0	13	35	58	1,977	440	1,438
	Tempe	173,004	779	11	43	268	457	8,472	1,416	6,412
	Thatcher	4,913	3	0	0	0	3	126	38	88
	Tolleson	7,103	49	0	2	16	31	723	204	471
	Tombstone	1,514	12	0	1	1	10	70	6	61

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Tucson[6]	527,107	3,331	51	158	1,088	2,034		5,002	
	Wellton	1,891	3	0	2	0	1	13	9	4
	Willcox	3,704	9	0	2	2	5	216	57	151
	Williams	3,233	11	0	2	1	8	137	21	116
	Youngtown	4,759	18	0	1	3	14	84	33	39
	Yuma	88,291	550	3	24	56	467	3,060	815	2,058
ARKANSAS	Alma	5,318	9	0	1	3	5	273	85	183
	Arkadelphia	11,213	50	1	10	5	34	387	168	206
	Atkins	2,992	0	0	0	0	0	51	18	28
	Bald Knob	3,456	9	0	2	1	6	131	43	82
	Barling	4,587	20	0	0	0	20	51	7	37
	Beebe	7,173	56	0	6	2	48	302	114	177
	Bella Vista	26,745	18	0	2	0	16	155	74	77
	Benton	30,692	145	1	8	32	104	1,359	260	1,036
	Bentonville	39,161	63	0	15	4	44	705	142	537
	Berryville	5,391	12	0	0	2	10	222	61	157
	Blytheville	15,787	175	10	14	35	116	1,192	454	664
	Booneville	4,024	21	0	2	0	19	136	51	82
	Bradford	973	0	0	0	0	0	22	9	11
	Bryant	16,740	9	0	4	5	0	742	191	520
	Bull Shoals	2,138	1	0	1	0	0	31	10	21
	Cabot	24,900	72	0	12	8	52	1,048	493	535
	Camden	11,163	83	2	4	23	54	580	170	393
	Carlisle	2,470	4	0	0	0	4	37	15	21
	Cave City	2,028	2	0	0	0	2	29	4	25
	Cave Springs	1,892	0	0	0	0	0	20	9	11
	Centerton	9,788	18	0	4	0	14	100	53	46
	Charleston	2,999	1	0	0	0	1	11	3	7
	Cherokee Village	4,710	4	0	1	0	3	121	29	89
	Clarksville	8,843	28	0	5	1	22	404	66	328
	Clinton	2,609	2	0	0	0	2	57	7	45
	Conway	61,425	257	4	21	49	183	2,603	444	2,068
	Crossett	5,349	26	1	0	4	21	265	98	161
	Danville	2,529	5	0	2	0	3	7	4	3
	Dardanelle	4,548	26	0	2	0	24	225	108	108
	Decatur	2,143	4	0	1	0	3	34	23	11
	De Queen	6,251	29	0	6	4	19	179	63	105
	De Witt	3,175	13	0	1	4	8	146	57	84
	Dumas	4,496	18	0	2	0	16	115	25	84
	Earle	2,732	14	0	1	6	7	137	59	78
	El Dorado	19,441	157	1	3	39	114	1,123	526	559
	Eureka Springs	2,402	7	3	1	0	3	128	41	85
	Fairfield Bay	2,460	2	0	0	0	2	31	17	13
	Farmington	4,795	12	0	2	1	9	126	35	89
	Fayetteville	79,237	328	1	55	37	235	2,746	465	2,168
	Flippin	1,357	2	0	0	0	2	33	13	20
	Fordyce	4,087	25	0	1	2	22	111	40	63
	Forrest City	13,052	101	2	5	31	63	1,188	236	921

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Fort Smith	86,096	667	6	74	124	463	4,815	1,073	3,530
	Gassville	2,210	2	0	0	0	2	29	8	21
	Gentry	3,200	6	0	3	1	2	19	6	13
	Glenwood	1,986	10	0	2	1	7	36	21	15
	Gosnell	3,541	21	0	1	1	19	91	45	44
	Gravette	2,756	5	0	1	0	4	29	17	12
	Greenbrier	4,746	0	0	0	0	0	1	0	1
	Green Forest	3,106	8	0	2	0	6	90	61	26
	Greenland	1,278	3	0	0	0	3	17	7	10
	Greenwood	8,937	20	0	2	1	17	115	48	64
	Gurdon	2,251	14	0	1	2	11	60	24	34
	Hamburg	2,644	28	0	0	3	25	40	15	25
	Hampton	1,392	3	0	1	1	1	20	8	11
	Hardy	799	1	0	0	0	1	65	15	46
	Harrison	13,285	86	0	12	3	71	576	180	378
	Hazen	1,441	3	0	0	1	2	24	9	15
	Heber Springs	7,392	15	0	4	0	11	334	104	224
	Helena-West Helena	11,502	93	0	6	20	67	739	422	294
	Highland	1,099	0	0	0	0	0	9	2	7
	Hope	10,368	106	0	4	8	94	649	194	427
	Horseshoe Bend	2,226	3	0	3	0	0	18	7	11
	Hot Springs	40,081	402	7	22	72	301	3,124	793	2,161
	Jacksonville	31,833	190	1	27	30	132	1,333	364	903
	Jonesboro	67,382	295	2	22	56	215	2,901	1,213	1,619
	Judsonia	2,207	3	0	0	0	3	38	18	18
	Kensett	1,874	3	0	0	0	3	25	7	13
	Lakeview	849	0	0	0	0	0	9	2	7
	Lake Village	2,301	62	0	1	1	60	74	31	42
	Lepanto	2,001	1	0	0	0	1	30	13	17
	Little Flock	3,328	4	0	4	0	0	6	0	5
	Little Rock	192,922	2,938	25	149	859	1,905	14,796	4,241	9,440
	Lonoke	4,721	35	0	2	2	31	188	42	145
	Lowell	7,660	10	0	3	0	7	135	49	77
	Luxora	1,210	4	0	0	1	3	9	5	4
	Magnolia	10,882	37	0	5	7	25	427	229	182
	Marianna	4,079	32	0	0	3	29	174	70	104
	Marion	12,769	60	0	3	13	44	409	155	235
	Marked Tree	2,601	1	0	0	1	0	68	4	64
	Marmaduke	1,177	1	0	0	0	1	35	4	31
	Maumelle	17,331	19	0	1	1	17	307	190	106
	McCrory	1,509	0	0	0	0	0	18	14	4
	McGehee	3,821	95	1	4	1	89	175	70	94
	Mena	5,605	13	0	2	1	10	288	105	178
	Mineral Springs	1,287	11	0	1	1	9	22	15	7
	Monette	1,255	0	0	0	0	0	16	7	9
	Monticello	9,207	54	0	7	8	39	360	125	220
	Morrilton	6,571	24	0	4	2	18	444	62	369
	Mountain Home	12,642	3	0	0	0	3	406	31	368
	Mountain View	3,121	11	0	1	0	10	57	15	41

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Murfreesboro	1,625	2	0	1	0	1	15	4	11
	Nashville	4,855	12	0	5	0	7	250	66	182
	Newport	7,303	72	1	9	5	57	458	124	320
	North Little Rock	60,129	562	6	14	184	358	5,088	1,136	3,618
	Ola	1,272	2	0	0	0	2	7	6	1
	Osceola	7,807	144	0	11	10	123	383	110	255
	Ozark	3,532	20	0	3	0	17	119	25	90
	Paragould	25,350	86	0	15	8	63	1,754	526	1,164
	Paris	3,553	17	0	1	2	14	115	51	60
	Pea Ridge	5,098	8	0	2	0	6	35	17	17
	Piggott	3,372	11	0	0	3	8	93	65	27
	Pine Bluff	49,971	687	7	40	165	475	3,748	1,371	2,074
	Plainview	799	1	0	0	0	1	15	6	9
	Plummerville	867	5	0	2	1	2	7	0	6
	Pocahontas	6,631	2	0	0	0	2	80	7	68
	Pottsville	2,941	12	0	1	0	11	39	22	16
	Prairie Grove	3,986	11	0	0	1	10	112	42	69
	Prescott	4,406	18	0	1	3	14	139	38	96
	Quitman	742	1	0	0	0	1	13	2	11
	Redfield	1,191	1	0	0	0	1	19	9	10
	Rogers[3]	61,417	219	2	50	11	156			1,629
	Rose Bud	460	1	0	0	0	1	10	1	7
	Russellville	27,992	97	0	13	15	69	1,242	273	887
	Salem	1,591	1	0	0	0	1	28	6	22
	Searcy	23,791	74	0	4	16	54	1,216	413	771
	Sheridan	4,670	19	1	4	0	14	125	30	92
	Sherwood	29,370	130	1	6	6	117	965	205	708
	Siloam Springs	15,337	31	0	5	0	26	323	100	205
	Springdale	71,047	325	0	68	18	239	2,129	373	1,631
	Stamps	1,835	6	0	0	1	5	48	24	24
	Stuttgart	8,750	47	3	2	8	34	480	166	298
	Texarkana	30,488	298	0	19	51	228	1,935	425	1,389
	Trumann	6,766	31	0	3	3	25	452	121	325
	Van Buren	23,072	74	0	9	8	57	654	167	479
	Vilonia	3,753	10	0	2	1	7	63	18	43
	Waldron	3,523	9	0	1	0	8	172	84	83
	Ward	4,311	20	0	4	0	16	128	38	88
	Warren	6,015	26	0	5	2	19	135	90	36
	West Fork	2,365	7	0	1	0	6	40	21	17
	West Memphis	27,196	685	6	26	124	529	2,271	1,049	1,075
	White Hall	5,216	6	0	1	1	4	89	4	80
	Wynne	8,317	29	0	5	9	15	297	125	167
CALIFORNIA	Adelanto	29,697	242	4	9	39	190	726	359	273
	Agoura Hills	22,318	18	0	2	1	15	240	59	173
	Alameda	71,016	173	1	15	74	83	1,964	389	1,360
	Albany	16,096	37	0	5	24	8	582	95	392
	Alhambra	84,987	185	3	8	82	92	2,075	345	1,460
	Aliso Viejo	41,989	37	0	4	8	25	439	87	324

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Alturas	2,733	5	0	2	0	3	63	28	30
	American Canyon	17,507	38	0	2	20	16	515	100	375
	Anaheim	338,492	1,161	7	88	492	574	8,473	1,594	5,869
	Anderson	10,851	77	0	5	10	62	510	90	394
	Antioch	102,125	864	13	32	313	506	3,096	1,087	1,049
	Apple Valley	71,834	188	2	22	58	106	1,889	592	1,107
	Arcadia	56,465	88	1	5	36	46	1,737	364	1,267
	Arcata	17,172	40	0	6	14	20	648	172	444
	Arroyo Grande	17,358	25	0	3	5	17	317	76	224
	Artesia	16,146	64	0	3	33	28	265	81	140
	Arvin	15,410	187	0	1	19	167	500	186	232
	Atascadero	28,468	79	0	10	8	61	620	152	435
	Atherton	7,527	21	0	3	4	14	136	28	107
	Atwater	26,495	114	4	6	23	81	1,128	322	700
	Auburn	13,432	59	0	7	14	38	291	60	189
	Avalon	3,087	24	0	0	0	24	75	21	38
	Avenal	16,523	57	2	2	8	45	143	63	66
	Azusa	46,824	226	2	11	63	150	1,136	276	731
	Bakersfield	333,458	2,104	33	34	641	1,396	15,197	4,235	8,507
	Baldwin Park	77,127	253	2	8	102	141	1,752	306	940
	Banning	29,563	155	3	7	32	113	546	278	205
	Barstow	24,704	190	6	8	45	131	777	263	371
	Bear Valley	4,655	1	0	1	0	0	72	9	60
	Beaumont	37,399	87	0	6	16	65	781	173	543
	Bell	36,506	241	1	12	90	138	601	176	285
	Bellflower	72,790	415	1	24	176	214	1,776	413	906
	Bell Gardens	44,591	210	5	5	112	88	940	150	391
	Belmont	24,881	26	0	0	8	18	367	69	268
	Belvedere	2,050	0	0	0	0	0	25	1	21
	Benicia	26,082	50	1	7	15	27	471	136	268
	Berkeley	102,700	533	5	23	365	140	5,943	1,088	4,240
	Beverly Hills	34,329	75	3	4	35	33	985	263	677
	Big Bear Lake	6,209	28	0	1	5	22	253	58	190
	Biggs	1,815	3	0	0	1	2	28	11	15
	Bishop	3,412	22	0	2	3	17	84	19	62
	Blythe	21,365	77	0	3	13	61	605	256	332
	Bradbury	1,092	0	0	0	0	0	11	6	5
	Brawley	23,464	53	0	5	10	38	1,102	354	622
	Brea	38,725	71	1	3	28	39	1,471	197	1,200
	Brentwood	53,312	112	0	6	41	65	1,117	214	796
	Brisbane	3,712	5	0	0	1	4	68	13	47
	Broadmoor	4,428	14	0	1	2	11	79	25	45
	Buellton	4,348	11	1	0	1	9	78	13	62
	Buena Park	79,929	241	0	13	82	146	2,007	355	1,270
	Burbank	103,304	221	0	13	98	110	2,687	478	1,933
	Burlingame	27,838	59	0	5	20	34	702	108	520
	Calabasas	22,223	13	0	1	3	9	321	83	220
	Calexico	40,186	77	0	5	34	38	1,429	518	584
	California City	15,573	56	3	4	2	47	475	184	257

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Calimesa	7,594	18	0	2	6	10	166	65	81
	Calipatria	7,715	15	0	0	0	15	19	12	7
	Calistoga	5,252	8	0	2	2	4	126	25	97
	Camarillo	64,577	54	0	3	12	39	972	167	763
	Campbell	38,854	83	0	10	32	41	1,451	319	1,017
	Canyon Lake	11,335	10	0	0	3	7	223	45	146
	Capitola	9,747	113	0	3	11	99	708	78	608
	Carlsbad	100,461	195	0	20	41	134	1,820	399	1,313
	Carmel	3,882	13	0	3	3	7	106	31	74
	Carpinteria	13,708	39	0	3	3	33	184	26	149
	Carson	92,409	499	6	12	130	351	2,326	441	1,421
	Cathedral City	53,449	249	3	17	49	180	1,505	556	660
	Ceres	43,505	168	3	7	57	101	1,946	360	1,134
	Cerritos	51,025	93	0	3	49	41	1,696	301	1,167
	Chico	85,630	245	1	47	88	109	2,347	710	1,416
	Chino	84,170	264	0	13	76	175	2,009	479	1,314
	Chino Hills	74,520	80	1	5	16	58	978	239	657
	Chowchilla	19,795	64	0	5	5	54	344	153	168
	Chula Vista	229,060	663	2	54	254	353	5,124	760	3,255
	Citrus Heights	84,476	385	4	25	155	201	3,931	756	2,675
	City of Angels	3,774	11	0	1	2	8	67	24	38
	Claremont	35,527	49	0	5	26	18	877	231	595
	Clayton	11,487	15	0	0	9	6	142	38	96
	Clearlake	15,352	73	0	9	20	44	584	188	310
	Cloverdale	8,357	19	0	5	2	12	174	39	123
	Clovis	95,901	165	2	31	55	77	3,569	755	2,428
	Coachella	42,480	193	2	3	74	114	1,623	551	667
	Coalinga	18,833	124	0	6	12	106	539	173	343
	Colma	1,456	8	0	0	5	3	259	6	236
	Colton	50,706	170	6	14	79	71	1,579	406	890
	Colusa	5,952	11	0	2	1	8	124	37	77
	Commerce	13,466	142	2	4	54	82	1,000	157	511
	Compton	93,916	1,327	25	25	477	800	2,784	847	1,223
	Concord	122,119	551	4	28	167	352	3,799	922	2,128
	Corcoran	25,112	42	0	1	4	37	289	119	135
	Corning	7,323	46	0	5	6	35	314	63	228
	Corona	153,311	199	2	15	90	92	3,536	650	2,453
	Coronado	22,033	25	0	0	3	22	442	69	336
	Costa Mesa	110,424	240	1	34	93	112	3,194	458	2,454
	Cotati	7,306	35	0	0	6	29	86	28	55
	Covina	46,728	171	1	7	77	86	1,643	377	1,072
	Crescent City	7,809	28	0	8	2	18	287	87	190
	Cudahy	24,256	161	4	6	65	86	475	68	289
	Culver City	38,342	149	0	4	94	51	1,638	177	1,337
	Cupertino	54,403	60	0	6	17	37	981	216	728
	Cypress	47,320	63	0	2	37	24	787	121	584
	Daly City	101,939	250	2	9	105	134	1,804	332	1,152
	Dana Point	35,888	66	0	2	13	51	595	129	438
	Danville	41,500	32	0	2	10	20	531	91	406

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Davis	63,292	99	0	18	30	51	1,738	415	1,220
	Delano	54,298	247	0	6	55	186	1,651	773	446
	Del Mar	4,554	19	0	1	2	16	129	24	100
	Del Rey Oaks	1,529	1	0	0	0	1	57	6	50
	Desert Hot Springs	25,309	374	3	8	67	296	1,380	573	630
	Diamond Bar	57,130	48	0	4	14	30	808	250	480
	Dinuba	21,094	177	1	2	25	149	825	301	402
	Dixon	17,518	69	0	11	18	40	481	71	358
	Dorris	833	3	0	0	0	3	17	6	10
	Dos Palos	4,951	48	1	3	5	39	171	58	105
	Downey	106,992	394	6	17	199	172	3,956	656	2,372
	Duarte	21,789	72	0	4	24	44	440	115	249
	Dublin	46,209	69	0	5	20	44	720	122	526
	Dunsmuir	1,779	5	0	1	1	3	63	14	47
	East Palo Alto	34,294	271	4	18	103	146	846	364	248
	El Cajon	94,311	387	0	15	169	203	2,766	552	1,678
	El Centro	41,535	197	1	7	45	144	2,408	672	1,546
	El Cerrito	22,263	134	0	2	75	57	947	208	590
	Elk Grove	142,330	529	2	14	108	405	3,204	653	2,208
	El Monte	121,884	600	3	27	265	305	2,598	607	1,194
	El Segundo	16,181	34	0	5	17	12	541	141	360
	Emeryville	10,207	128	0	2	58	68	981	113	777
	Encinitas	61,898	146	1	9	37	99	947	216	639
	Escalon	7,463	15	0	3	1	11	179	54	110
	Escondido	140,662	597	3	37	212	345	4,033	743	2,460
	Etna	764	0	0	0	0	0	2	0	2
	Eureka	25,143	184	1	17	57	109	1,576	651	771
	Exeter	10,048	22	0	3	5	14	247	79	142
	Fairfax	7,071	14	0	1	2	11	129	32	83
	Fairfield	104,202	502	8	18	185	291	3,395	757	2,169
	Farmersville	10,211	68	3	1	7	57	207	54	129
	Ferndale	1,383	1	0	0	0	1	13	3	10
	Fillmore	15,363	38	2	2	5	29	277	51	206
	Firebaugh	7,079	21	0	0	2	19	176	53	88
	Folsom	69,497	105	0	9	32	64	1,484	262	1,159
	Fontana	192,595	759	6	37	240	476	3,681	804	2,130
	Fort Bragg	6,550	44	1	4	4	35	232	65	156
	Fort Jones	646	1	0	0	0	1	16	6	10
	Fortuna	11,434	40	0	4	4	32	438	87	324
	Foster City	29,283	24	0	1	2	21	416	103	273
	Fountain Valley	55,879	103	3	5	28	67	1,292	266	951
	Fowler	5,769	25	0	1	4	20	130	25	71
	Fremont	205,477	488	3	40	189	256	4,414	1,167	2,757
	Fresno	484,734	3,034	45	70	1,021	1,898	24,460	5,262	14,645
	Fullerton	133,139	425	3	26	145	251	3,847	680	2,825
	Galt	24,517	50	0	5	7	38	467	131	300
	Gardena	58,358	347	2	9	202	134	1,446	271	835
	Garden Grove	166,287	539	3	22	184	330	3,590	810	2,318
	Gilroy	51,108	205	1	14	78	112	1,555	237	1,126

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Glendale	196,877	277	0	17	119	141	3,717	642	2,747
	Glendora	49,720	62	0	9	24	29	1,249	228	946
	Goleta	29,605	57	0	5	11	41	407	121	277
	Gonzales	8,830	35	1	0	6	28	153	44	93
	Grand Terrace	12,233	20	0	1	6	13	278	83	157
	Grass Valley	12,330	111	0	8	15	88	500	111	370
	Greenfield	15,626	104	3	3	41	57	344	85	229
	Gridley	6,528	48	0	3	3	42	236	76	141
	Grover Beach	13,199	32	0	6	5	21	317	82	213
	Guadalupe	6,692	12	0	2	0	10	67	18	45
	Gustine	5,130	8	0	0	1	7	175	69	85
	Half Moon Bay	12,648	11	0	1	5	5	248	45	193
	Hanford	50,903	181	0	6	43	132	1,159	252	707
	Hawaiian Gardens	15,211	83	3	5	32	43	237	53	131
	Hawthorne	83,849	653	9	33	281	330	2,200	653	1,112
	Hayward	144,509	652	13	48	391	200	3,753	1,097	1,649
	Healdsburg	11,146	16	0	1	2	13	283	50	226
	Hemet	73,111	369	8	17	129	215	2,887	875	1,682
	Hercules	25,192	46	2	3	12	29	356	74	201
	Hermosa Beach	19,408	40	0	6	19	15	553	107	423
	Hesperia	88,876	287	2	27	67	191	1,919	626	1,025
	Hidden Hills	2,031	3	0	0	0	3	18	10	8
	Highland	51,622	242	4	8	96	134	1,492	504	738
	Hillsborough	10,951	4	1	1	0	2	95	26	69
	Hollister	35,056	159	1	9	30	119	889	421	374
	Hughson	6,617	9	0	0	1	8	92	31	50
	Huntington Beach	193,545	449	2	32	109	306	4,673	767	3,621
	Huntington Park	60,514	559	6	4	394	155	2,095	234	1,217
	Huron	8,220	70	0	1	13	56	129	32	81
	Imperial	14,727	5	0	0	2	3	84	21	44
	Imperial Beach	26,978	145	0	9	23	113	453	115	207
	Indian Wells	5,331	4	0	1	1	2	177	67	105
	Indio	89,621	453	10	32	113	298	2,729	878	1,336
	Industry	930	77	0	0	38	39	1,183	118	852
	Inglewood	112,100	843	20	32	381	410	2,672	627	1,342
	Ione	7,744	24	0	2	0	22	114	28	82
	Irvine	217,193	120	0	24	40	56	2,798	480	2,197
	Irwindale	1,431	19	1	0	5	13	136	37	77
	Isleton	843	5	0	0	1	4	8	0	7
	Jackson	4,258	22	0	1	4	17	136	45	84
	Kensington	5,430	2	0	0	0	2	110	37	61
	Kerman	13,293	49	1	0	11	37	681	172	371
	King City	11,704	56	4	7	9	36	205	102	80
	Kingsburg	11,461	26	1	1	2	22	458	128	253
	La Canada Flintridge	20,567	21	0	2	7	12	346	95	238
	Lafayette	25,527	20	0	4	7	9	447	116	293
	Laguna Beach	24,147	78	0	5	8	65	474	82	379
	Laguna Hills	31,909	43	0	4	14	25	510	78	404
	Laguna Niguel	64,812	40	2	0	10	28	641	107	504

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Laguna Woods	18,286	15	2	0	7	6	104	14	82
	La Habra	59,355	169	0	18	60	91	1,236	258	846
	La Habra Heights	5,876	7	0	1	0	6	81	32	42
	Lake Elsinore	54,018	108	0	15	38	55	1,571	398	959
	Lake Forest	75,780	92	0	8	32	52	959	161	736
	Lakeport	5,256	20	0	2	5	13	282	63	210
	Lake Shastina	2,409	3	0	0	0	3	1	1	0
	Lakewood	77,901	296	0	15	128	153	1,876	307	1,249
	La Mesa	55,580	184	0	12	68	104	2,025	427	1,328
	La Mirada	50,002	74	0	3	31	40	726	113	502
	Lancaster	148,632	900	7	60	255	578	3,411	1,033	1,939
	La Palma	15,733	9	0	0	5	4	218	65	141
	La Puente	40,367	162	2	4	49	107	581	134	306
	La Quinta	47,441	137	1	9	25	102	1,288	447	777
	La Verne	34,066	56	0	4	18	34	643	130	477
	Lawndale	31,132	228	4	10	67	147	513	152	223
	Lemon Grove	24,543	156	1	5	53	97	531	180	231
	Lemoore	24,766	110	0	11	18	81	689	114	508
	Lincoln	50,936	28	1	8	4	15	447	117	273
	Lindsay	10,725	69	0	2	3	64	333	82	191
	Livermore	81,769	323	0	16	53	254	1,770	369	1,250
	Livingston	13,679	103	0	4	13	86	346	163	151
	Lodi	61,812	243	1	12	112	118	2,002	531	1,272
	Loma Linda	21,896	28	0	3	7	18	554	173	298
	Lomita	20,106	86	0	4	21	61	330	99	195
	Lompoc	41,049	311	1	22	26	262	932	154	727
	Long Beach	462,267	2,720	32	134	1,202	1,352	11,642	2,929	6,524
	Los Alamitos	11,698	14	0	1	7	6	279	74	179
	Los Altos	28,652	8	0	4	3	1	233	67	163
	Los Altos Hills	8,740	1	0	0	0	1	45	19	26
	Los Angeles	3,841,707	21,484	293	923	10,924	9,344	89,704	17,410	55,248
	Los Banos	36,124	139	2	4	36	97	1,050	323	637
	Los Gatos	29,558	34	0	8	10	16	576	114	434
	Lynwood	69,677	615	4	14	271	326	1,328	392	442
	Madera	58,147	357	8	22	100	227	1,319	460	552
	Malibu	13,078	26	1	1	6	18	350	73	260
	Mammoth Lakes	7,413	46	0	8	2	36	230	68	156
	Manhattan Beach	36,803	48	1	6	21	20	839	162	627
	Manteca	67,344	241	1	10	71	159	1,883	344	1,304
	Marina	17,921	53	2	2	17	32	531	115	390
	Martinez	35,344	73	1	6	25	41	847	196	521
	Marysville	11,548	83	1	9	17	56	405	125	213
	McFarland	12,452	64	1	2	8	53	263	95	105
	Mendota	10,690	71	0	3	22	46	411	62	289
	Menifee	45,933	64	0	3	22	39	1,339	378	745
	Menlo Park	30,202	41	0	3	20	18	645	139	467
	Merced	77,484	549	7	33	141	368	2,808	633	1,934
	Millbrae	21,295	33	1	0	5	27	388	95	265
	Mill Valley	13,372	6	0	0	1	5	225	64	151

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Milpitas	68,371	91	0	9	53	29	1,981	264	1,461
	Mission Viejo	94,679	70	0	5	19	46	1,135	168	917
	Modesto	203,890	1,398	10	62	427	899	9,383	2,171	5,786
	Monrovia	37,544	72	0	3	26	43	1,080	158	797
	Montague	1,454	3	0	0	0	3	20	4	15
	Montclair	36,508	173	1	6	84	82	1,752	197	1,208
	Montebello	61,570	214	3	10	92	109	1,941	737	724
	Monterey	27,619	154	1	7	33	113	1,183	211	913
	Monterey Park	61,662	96	3	0	57	36	860	219	415
	Monte Sereno	3,672	1	0	0	1	0	37	13	24
	Moorpark	37,193	48	0	8	16	24	383	61	301
	Moraga	17,334	11	0	0	3	8	222	39	173
	Moreno Valley	197,294	724	15	33	373	303	5,222	1,843	2,595
	Morgan Hill	38,986	54	0	9	9	36	642	146	430
	Morro Bay	10,382	29	0	1	1	27	171	37	120
	Mountain View	72,321	168	1	4	46	117	1,458	177	1,179
	Mount Shasta	3,509	7	0	1	0	6	85	39	44
	Murrieta	104,343	99	1	10	33	55	1,407	429	852
	Napa	75,482	245	1	21	44	179	1,557	328	1,102
	National City	56,270	428	4	11	148	265	1,849	310	1,033
	Needles	5,338	19	0	0	3	16	253	89	125
	Nevada City	2,936	36	0	1	1	34	98	27	63
	Newark	42,099	187	4	7	66	110	1,428	327	974
	Newman	10,544	25	0	1	6	18	270	91	133
	Newport Beach	81,882	117	0	4	42	71	2,176	425	1,617
	Norco	26,699	41	2	3	10	26	669	174	420
	Norwalk	102,221	449	4	14	159	272	2,072	438	1,040
	Novato	54,009	99	0	3	29	67	1,035	204	722
	Oakdale	21,023	41	0	3	9	29	796	218	504
	Oakland	409,723	6,267	90	318	2,917	2,942	17,325	4,961	7,720
	Oakley	33,556	49	2	6	13	28	483	162	265
	Oceanside	173,901	650	4	47	177	422	3,909	765	2,799
	Ojai	7,794	19	0	0	1	18	163	31	128
	Ontario	172,814	630	3	48	237	342	4,918	850	3,170
	Orange	137,606	150	3	3	56	88	2,569	404	1,944
	Orinda	18,778	5	0	1	3	1	169	39	121
	Orland	7,326	36	0	1	9	26	223	68	111
	Oroville	14,718	218	1	10	26	181	1,011	291	632
	Oxnard	189,051	691	8	19	329	335	4,018	785	2,760
	Pacifica	37,917	69	0	7	17	45	760	114	580
	Pacific Grove	14,537	17	1	2	2	12	401	123	270
	Palmdale	146,819	832	8	41	261	522	3,334	959	1,890
	Palm Desert	52,625	48	0	6	30	12	1,911	638	1,150
	Palm Springs	48,696	282	1	22	69	190	1,973	607	1,188
	Palo Alto	60,288	58	0	4	39	15	1,346	217	1,080
	Palos Verdes Estates	13,553	5	0	0	1	4	116	44	69
	Paradise	26,424	104	1	11	11	81	546	174	340
	Paramount	54,914	343	4	12	185	142	1,554	297	770
	Parlier	13,532	155	0	9	20	126	465	128	231

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Pasadena	144,496	554	3	21	189	341	4,074	832	2,864
	Paso Robles	29,089	95	0	13	15	67	1,006	268	688
	Patterson	19,938	72	1	5	22	44	796	239	408
	Perris	58,622	160	2	10	89	59	1,735	502	875
	Petaluma	55,168	197	1	13	19	164	778	117	604
	Pico Rivera	62,783	247	2	15	97	133	1,553	235	989
	Piedmont	10,519	4	0	0	4	0	214	49	139
	Pinole	18,899	79	0	1	33	45	670	137	392
	Pismo Beach	8,639	24	0	3	5	16	347	75	267
	Pittsburg	65,930	154	6	4	83	61	2,055	501	1,046
	Placentia	50,237	85	0	5	23	57	844	158	614
	Placerville	10,124	65	0	5	6	54	247	77	156
	Pleasant Hill	33,048	94	1	2	43	48	1,407	206	1,085
	Pleasanton	67,823	78	0	4	24	50	1,294	210	1,002
	Pomona	152,673	877	16	37	323	501	4,504	867	2,406
	Porterville	52,777	222	4	11	59	148	1,852	449	1,154
	Port Hueneme	21,510	65	1	6	11	47	375	103	229
	Poway	50,010	90	2	5	18	65	525	157	328
	Rancho Cordova	63,895	387	4	13	159	211	2,293	657	1,349
	Rancho Cucamonga	176,686	340	2	14	111	213	3,703	879	2,505
	Rancho Mirage	17,175	17	0	3	7	7	555	197	332
	Rancho Palos Verdes	40,905	42	0	8	5	29	422	160	244
	Rancho Santa Margarit	49,665	26	3	4	5	14	364	83	272
	Red Bluff	13,836	142	0	14	14	114	900	292	578
	Redding	91,414	793	2	61	105	625	3,037	849	1,946
	Redlands	70,552	243	2	25	104	112	2,536	587	1,706
	Redondo Beach	66,985	210	1	1	68	140	1,557	216	1,238
	Redwood City	74,355	174	3	16	69	86	1,641	461	988
	Reedley	23,893	138	2	9	15	112	522	162	250
	Rialto	99,232	497	7	32	193	265	2,565	721	1,338
	Richmond	103,442	1,176	21	44	405	706	4,623	1,521	1,506
	Ridgecrest	25,973	130	3	12	12	103	611	210	348
	Rio Dell	3,181	12	0	1	1	10	78	20	48
	Rio Vista	8,340	27	0	1	3	23	138	55	74
	Ripon	15,271	22	0	3	4	15	251	33	198
	Riverbank	21,241	36	1	1	9	25	644	218	348
	Riverside	301,859	1,448	9	78	502	859	9,963	2,068	6,434
	Rocklin	55,524	59	0	7	24	28	1,032	215	750
	Rohnert Park	40,843	164	1	9	22	132	836	143	639
	Rolling Hills	1,904	4	0	0	0	4	8	5	3
	Rolling Hills Estates	7,841	15	0	0	3	12	137	30	101
	Rosemead	54,294	167	5	10	79	73	1,118	221	695
	Roseville	119,755	334	1	17	87	229	3,802	542	3,029
	Ross	2,281	1	0	0	0	1	35	10	25
	Sacramento	472,469	4,112	33	165	1,491	2,423	20,200	5,027	11,179
	Salinas	144,242	1,162	19	23	365	755	4,648	1,358	2,437
	San Anselmo	12,016	8	0	0	1	7	260	73	176
	San Bernardino	199,214	1,624	31	66	632	895	8,967	2,318	4,928
	San Bruno	41,517	81	1	5	30	45	909	127	641

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	San Clemente	62,796	61	3	1	24	33	782	199	526
	Sand City	372	3	0	0	2	1	125	7	116
	San Diego	1,313,433	5,616	29	300	1,636	3,651	30,753	6,387	17,977
	San Dimas	35,008	80	0	4	28	48	663	165	435
	San Fernando	23,719	63	0	0	24	39	379	79	213
	San Francisco	818,594	5,747	48	133	3,180	2,386	32,365	4,557	23,905
	San Gabriel	40,281	85	0	2	37	46	566	164	342
	Sanger	26,246	158	2	14	24	118	1,105	271	665
	San Jacinto	39,703	108	2	6	50	50	1,371	489	670
	San Jose	970,252	3,215	20	253	976	1,966	22,081	3,940	12,730
	San Juan Capistrano	35,241	41	0	3	15	23	503	116	348
	San Leandro	78,447	347	4	10	209	124	3,137	634	1,911
	San Luis Obispo	44,008	126	0	27	35	64	1,686	372	1,260
	San Marcos	83,671	237	1	16	70	150	1,642	350	1,054
	San Marino	12,725	13	0	0	1	12	224	69	153
	San Mateo	92,724	292	1	24	82	185	1,905	242	1,464
	San Pablo	31,122	241	2	7	109	123	1,369	296	560
	San Rafael	55,832	236	3	34	82	117	1,603	312	1,030
	San Ramon	50,006	35	0	6	17	12	975	215	693
	Santa Ana	340,240	1,510	28	88	719	675	6,580	1,116	4,189
	Santa Barbara	85,967	341	3	28	92	218	2,528	487	1,939
	Santa Clara	112,917	182	2	7	62	111	3,016	481	2,210
	Santa Clarita	170,458	375	1	21	123	230	2,670	574	1,853
	Santa Cruz	56,860	553	6	31	120	396	2,936	495	2,262
	Santa Fe Springs	17,120	73	2	1	38	32	1,206	186	842
	Santa Maria	87,803	771	3	32	152	584	2,319	506	1,496
	Santa Monica	87,817	392	1	12	167	212	3,120	413	2,541
	Santa Paula	28,810	101	1	3	26	71	517	100	376
	Santa Rosa	158,182	767	2	56	166	543	4,096	757	3,041
	Santee	55,533	153	0	9	22	122	959	172	628
	Saratoga	30,692	22	0	1	9	12	265	92	164
	Sausalito	7,180	9	0	1	0	8	195	43	141
	Scotts Valley	11,243	13	0	3	2	8	247	46	195
	Seal Beach	24,225	47	1	4	5	37	524	122	374
	Seaside	34,057	129	1	10	21	97	592	139	402
	Sebastopol	7,574	17	0	0	5	12	221	77	134
	Selma	23,169	141	0	3	41	97	1,355	293	735
	Shafter	16,247	43	0	7	11	25	549	178	285
	Sierra Madre	10,796	14	0	0	4	10	186	58	126
	Signal Hill	10,981	40	0	3	17	20	428	86	275
	Simi Valley	121,755	129	1	14	37	77	2,209	388	1,687
	Solana Beach	13,055	43	1	4	13	25	248	65	162
	Soledad	28,655	75	1	4	24	46	331	163	133
	Solvang	5,153	8	0	1	1	6	55	16	37
	Sonoma	10,068	33	2	3	1	27	225	61	159
	Sonora	4,627	24	0	2	6	16	381	78	290
	South El Monte	21,705	134	3	4	45	82	477	93	247
	South Gate	96,182	598	7	13	326	252	2,603	484	1,295
	South Lake Tahoe	23,540	164	0	14	26	124	377	171	190

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	South Pasadena	24,320	25	0	8	13	4	423	107	262
	South San Francisco	63,006	152	5	13	54	80	1,479	458	808
	Stallion Springs	1,674	7	0	0	0	7	17	4	8
	Stanton	37,912	156	2	1	63	90	643	151	405
	St. Helena	5,908	12	0	0	2	10	127	18	102
	Stockton	292,047	4,033	49	107	1,413	2,464	16,177	4,482	9,654
	Suisun City	27,053	81	2	14	33	32	665	158	426
	Sunnyvale	134,073	169	0	26	59	84	2,227	407	1,574
	Susanville	17,067	82	1	6	11	64	359	134	208
	Sutter Creek	2,690	4	0	0	0	4	76	14	54
	Taft	9,046	37	0	1	7	29	343	87	219
	Tehachapi	12,137	23	0	1	3	19	304	100	188
	Temecula	102,474	74	2	3	42	27	2,351	535	1,642
	Temple City	38,648	61	0	8	17	36	430	140	254
	Thousand Oaks	124,042	139	1	16	50	72	2,036	358	1,606
	Tiburon	8,728	4	0	1	1	2	89	10	74
	Torrance	140,411	290	4	19	152	115	2,859	516	2,008
	Tracy	81,712	135	4	9	57	65	2,105	334	1,526
	Truckee	16,491	25	0	0	2	23	209	50	151
	Tulare	58,790	390	5	21	75	289	2,613	527	1,645
	Tulelake	949	4	0	0	0	4	15	8	7
	Turlock	69,961	466	1	21	124	320	2,881	686	1,730
	Tustin	72,982	128	1	9	56	62	1,567	237	1,186
	Twentynine Palms	34,165	119	1	15	18	85	517	135	337
	Twin Cities	21,067	26	0	1	9	16	680	196	419
	Ukiah	14,781	92	0	12	10	70	466	156	291
	Union City	73,356	324	4	8	138	174	1,810	465	1,084
	Upland	73,341	208	2	9	86	111	2,358	495	1,509
	Vacaville	92,177	272	3	27	71	171	1,866	322	1,370
	Vallejo[5]	114,258	822	17	59	458	288	5,101	2,249	1,675
	Ventura	104,661	263	3	16	108	136	3,458	652	2,654
	Vernon	89	26	0	1	18	7	316	43	191
	Victorville	117,057	681	6	38	256	381	3,674	1,274	1,964
	Villa Park	5,991	6	0	0	1	5	69	20	48
	Visalia	125,036	578	6	26	176	370	5,334	1,237	3,497
	Vista	92,765	405	5	21	112	267	2,110	463	1,260
	Walnut	30,636	29	0	3	4	22	447	159	248
	Walnut Creek	63,897	115	1	5	38	71	2,372	436	1,783
	Waterford	9,127	40	2	1	6	31	265	52	173
	Watsonville	51,488	327	1	13	98	215	1,539	271	1,091
	Weed	3,023	21	0	4	3	14	99	32	57
	West Covina	105,395	318	0	19	120	179	2,979	531	1,854
	West Hollywood	35,885	389	6	12	154	217	1,545	288	1,124
	Westlake Village	8,460	6	1	0	2	3	143	48	92
	Westminster	89,604	259	2	17	102	138	2,539	419	1,848
	Westmorland	2,231	6	0	0	1	5	17	7	8
	West Sacramento	49,816	172	1	27	65	79	1,345	304	863
	Wheatland	3,715	5	0	1	0	4	48	9	34
	Whittier	81,611	343	2	20	96	225	2,433	413	1,734

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wildomar	22,816	59	0	11	15	33	703	188	365
	Williams	4,896	15	0	0	2	13	93	22	58
	Willits	4,931	41	0	3	12	26	112	30	62
	Willows	6,234	21	0	4	6	11	176	36	134
	Windsor	25,870	38	0	2	5	31	320	66	240
	Winters	7,096	6	0	3	0	3	169	58	99
	Woodlake	7,791	18	1	2	3	12	195	35	144
	Woodland	55,814	161	1	17	39	104	1,513	352	993
	Yorba Linda	66,813	58	0	3	9	46	804	150	621
	Yountville	3,293	5	0	1	1	3	57	9	47
	Yreka	7,345	54	0	2	2	50	263	69	176
	Yuba City	62,694	216	2	22	51	141	1,783	409	1,222
	Yucaipa	50,939	139	0	10	31	98	805	233	464
	Yucca Valley	20,746	104	2	11	13	78	528	157	306
COLORADO	Alamosa	8,660	64	0	9	18	37	514	76	428
	Arvada	107,227	135	1	30	28	76	2,716	386	2,123
	Aspen	6,012	14	0	3	0	11	359	32	321
	Ault	1,449	8	0	1	0	7	40	14	22
	Aurora	323,483	1,443	23	183	505	732	10,051	2,290	6,873
	Avon	6,737	4	0	2	0	2	143	23	117
	Basalt	3,347	5	0	0	1	4	61	8	50
	Bayfield	2,114	0	0	0	0	0	11	1	8
	Black Hawk	112	1	0	0	0	1	171	1	168
	Boulder	99,255	210	4	33	29	144	2,722	478	2,155
	Brighton	33,166	64	0	10	6	48	1,184	161	938
	Broomfield	57,126	41	3	10	12	16	1,161	118	995
	Brush	5,338	3	0	0	3	0	107	15	90
	Buena Vista	2,107	1	0	1	0	0	24	1	23
	Burlington	4,414	9	0	3	0	6	80	13	66
	Canon City	15,706	66	0	17	1	48	446	70	363
	Castle Rock	48,715	26	0	9	3	14	480	71	389
	Cedaredge	2,284	2	0	2	0	0	31	6	22
	Centennial	98,902	159	0	18	26	115	1,455	274	1,121
	Center	2,347	5	0	0	1	4	54	11	43
	Central City	650	4	0	0	1	3	34	1	33
	Cherry Hills Village	6,389	1	0	0	0	1	75	18	53
	Colorado Springs	397,886	1,957	20	319	526	1,092	16,794	3,452	12,054
	Commerce City	46,771	118	0	20	12	86	1,337	229	953
	Cortez	8,570	19	0	0	2	17	345	18	316
	Craig	9,178	14	0	7	0	7	277	49	222
	Crested Butte	1,663	0	0	0	0	0	5	0	5
	Cripple Creek	1,002	6	0	0	2	4	79	7	70
	Dacono	4,237	6	0	1	0	5	55	13	37
	Del Norte	1,543	0	0	0	0	0	24	6	17
	Delta	9,270	32	0	7	3	22	381	61	306
	Denver	607,051	3,291	22	367	926	1,976	20,671	4,501	12,944
	Durango	16,608	74	0	18	8	48	800	107	657
	Eagle	6,367	4	0	1	0	3	82	21	55

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Edgewater	5,055	20	0	5	8	7	330	37	269
	Elizabeth	1,443	2	0	0	0	2	40	10	28
	Empire	311	0	0	0	0	0	11	6	5
	Englewood	32,494	145	1	16	27	101	1,968	254	1,520
	Erie	18,772	1	0	0	0	1	42	12	26
	Estes Park	6,553	1	0	0	1	0	99	16	81
	Evans	20,440	35	2	3	8	22	414	89	294
	Fairplay	640	2	0	0	0	2	12	3	5
	Federal Heights	12,114	58	1	14	10	33	476	70	370
	Firestone	9,436	8	0	1	1	6	207	23	167
	Florence	3,533	4	0	0	0	4	40	5	32
	Fort Collins	138,689	438	0	64	50	324	4,551	643	3,706
	Fort Lupton	7,677	11	0	1	4	6	165	32	123
	Fort Morgan	10,262	24	1	1	7	15	281	47	225
	Fraser/Winter Park	1,825	12	0	0	0	12	41	9	27
	Frederick	9,196	0	0	0	0	0	116	27	84
	Fruita	12,848	12	1	5	1	5	275	52	215
	Glendale	4,790	29	1	1	8	19	447	33	377
	Glenwood Springs	9,105	30	0	6	2	22	396	40	351
	Golden	17,226	20	0	2	3	15	403	60	332
	Granby	1,636	9	1	2	0	6	43	7	36
	Grand Junction	59,029	206	2	42	28	134	2,167	333	1,734
	Greeley	92,804	425	1	41	56	327	2,970	537	2,285
	Greenwood Village	14,430	34	0	6	9	19	565	96	438
	Gunnison	5,451	24	0	2	0	22	366	53	307
	Hayden	1,623	7	0	2	1	4	37	7	30
	Holyoke	2,190	3	0	1	0	2	21	1	20
	Idaho Springs	1,648	15	0	1	1	13	94	8	78
	Ignacio	781	1	0	0	0	1	3	1	2
	Johnstown	10,277	20	0	1	1	18	153	43	99
	Kersey	1,472	7	0	1	0	6	25	5	18
	Kiowa	607	6	0	1	0	5	16	3	13
	Kremmling	1,451	6	0	0	0	6	20	3	15
	Lafayette	26,055	40	1	7	4	28	485	97	379
	Lakeside	19	1	0	0	1	0	10	2	8
	Lakewood	139,615	618	1	95	137	385	5,970	949	4,500
	La Salle	2,000	7	0	0	0	7	31	10	19
	Leadville	2,693	20	0	1	0	19	39	13	24
	Limon	1,644	1	0	0	0	1	7	3	4
	Littleton	40,544	53	1	3	22	27	1,185	238	851
	Lone Tree	9,718	22	0	5	5	12	494	19	468
	Longmont	88,913	277	1	5	36	235	2,205	329	1,736
	Louisville	19,429	8	0	0	0	8	239	36	196
	Loveland	66,857	128	0	21	15	92	1,592	199	1,325
	Mancos	1,256	9	0	1	0	8	18	6	11
	Manitou Springs	5,169	12	0	2	2	8	200	28	166
	Meeker	2,457	14	0	0	0	14	32	6	25
	Milliken	6,593	4	0	1	0	3	59	20	38
	Monte Vista	3,879	9	0	1	2	6	98	39	58

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Montrose	18,758	42	2	5	5	30	697	94	586
	Monument	5,257	1	0	1	0	0	105	15	86
	Morrison	409	6	0	0	0	6	7	1	6
	Mount Crested Butte	866	2	0	1	0	1	14	4	9
	Nederland	1,381	0	0	0	0	0	14	4	10
	Northglenn	34,467	88	1	13	7	67	1,047	150	785
	Olathe	1,755	0	0	0	0	0	21	8	12
	Pagosa Springs	1,814	9	0	1	1	7	101	15	82
	Parachute	1,301	1	0	1	0	0	14	6	6
	Parker	46,794	31	0	8	7	16	512	96	393
	Platteville	2,685	2	0	0	0	2	27	2	21
	Pueblo[5]	103,612	885	1	30	157	697	4,972	1,622	2,899
	Rangely	2,166	3	0	0	0	3	21	1	20
	Rocky Ford	3,830	15	0	0	0	15	115	44	69
	Salida	5,337	9	0	2	0	7	154	13	137
	Sheridan	6,150	40	1	10	7	22	374	58	268
	Silt	2,767	2	0	1	0	1	35	5	25
	Silverthorne	4,094	9	1	2	1	5	132	17	112
	Snowmass Village	2,009	0	0	0	0	0	52	2	48
	Springfield	1,221	7	0	1	0	6	7	1	4
	Steamboat Springs	12,426	34	0	6	1	27	308	41	254
	Sterling	12,517	61	0	16	0	45	429	120	290
	Telluride	2,380	6	0	1	1	4	170	22	144
	Thornton[6]	119,989		5	42	55		3,625	555	2,766
	Timnath	683	0	0	0	0	0	21	0	19
	Vail	4,794	13	0	1	0	12	346	42	301
	Westminster	108,383	231	1	34	48	148	3,250	529	2,395
	Wheat Ridge	30,400	172	0	22	30	120	1,306	241	932
	Windsor	18,088	18	0	5	0	13	251	47	198
	Woodland Park	6,540	3	0	0	0	3	64	5	59
	Yuma	3,240	1	0	0	0	1	38	10	27
CONNECTICUT	Ansonia	18,743	27	0	2	18	7	324	36	249
	Avon[5]	17,734	5	0	1	1	3	186	38	147
	Berlin	20,963	15	0	2	2	11	340	69	260
	Bethel	18,814	5	0	1	3	1	195	31	158
	Bloomfield	21,086	32	1	3	9	19	490	76	394
	Branford	29,415	37	1	0	6	30	804	101	653
	Bridgeport	138,810	1,412	22	57	561	772	4,683	1,448	2,377
	Bristol	61,879	200	1	27	32	140	1,335	290	974
	Brookfield	16,994	5	0	0	2	3	142	39	102
	Canton	10,392	5	0	0	1	4	114	14	98
	Cheshire	29,569	12	0	0	2	10	303	62	230
	Clinton	13,832	17	0	7	2	8	388	134	248
	Coventry	12,546	7	0	1	4	2	165	45	109
	Cromwell	13,919	17	0	1	12	4	354	48	290
	Danbury	81,242	116	2	21	46	47	1,515	258	1,177
	Darien	20,617	1	0	0	1	0	142	39	97
	Derby	12,542	36	0	2	9	25	380	69	280

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	East Hampton	13,122	9	0	0	3	6	160	54	97
	East Hartford	49,156	186	6	20	74	86	1,545	345	1,042
	East Haven	28,973	43	0	3	20	20	944	119	744
	Easton	7,483	0	0	0	0	0	35	15	20
	East Windsor	11,310	13	0	2	4	7	309	53	235
	Fairfield	58,331	35	0	2	15	18	1,044	118	849
	Farmington	25,615	11	0	6	4	1	698	40	634
	Glastonbury	33,921	29	0	1	11	17	349	85	258
	Granby	11,451	4	0	1	0	3	109	22	83
	Greenwich	63,281	22	0	1	9	12	553	94	421
	Groton	9,492	26	0	4	6	16	157	27	124
	Groton Long Point	703	0	0	0	0	0	7	1	6
	Groton Town	29,842	29	1	6	8	14	509	95	403
	Guilford	22,861	20	0	2	1	17	435	70	352
	Hartford	125,626	1,624	26	46	570	982	5,495	1,019	3,639
	Madison	19,155	18	1	3	1	13	211	58	150
	Manchester	57,271	131	8	11	36	76	1,847	253	1,510
	Meriden	60,032	144	0	6	70	68	1,837	416	1,289
	Middlebury	7,588	2	0	1	0	1	97	25	70
	Middletown	49,281	59	0	4	20	35	1,130	157	914
	Milford	57,565	55	1	3	19	32	1,628	183	1,365
	Monroe	19,696	4	0	0	0	4	132	34	92
	Naugatuck	32,529	30	0	9	9	12	623	75	503
	New Britain	71,344	308	2	6	157	143	3,052	762	1,886
	New Canaan	20,312	1	0	0	0	1	134	32	100
	New Haven	124,856	1,992	23	70	787	1,112	7,227	1,399	4,815
	Newington	30,246	32	0	5	17	10	814	104	668
	New London	26,517	286	2	14	50	220	912	257	585
	New Milford	29,006	18	0	3	1	14	356	18	325
	Newtown	27,366	16	1	3	2	10	204	48	154
	North Branford	14,619	8	0	1	0	7	277	48	206
	North Haven	24,306	17	2	0	8	7	583	74	493
	Norwalk	84,944	343	6	12	129	196	1,878	323	1,379
	Norwich	37,157	144	2	21	46	75	971	266	656
	Plainfield	15,720	6	0	2	1	3	53	27	24
	Plainville	17,511	54	0	0	11	43	596	59	512
	Plymouth	12,202	12	0	1	4	7	270	58	197
	Portland	9,785	12	0	0	1	11	71	22	38
	Putnam	9,458	30	0	3	3	24	176	32	139
	Redding	9,003	0	0	0	0	0	75	15	59
	Ridgefield	24,591	3	0	0	0	3	84	6	77
	Rocky Hill	19,152	10	0	4	4	2	289	34	238
	Seymour	16,616	20	0	3	3	14	189	46	124
	Shelton	41,037	28	0	5	11	12	488	115	333
	Simsbury	23,988	6	0	1	3	2	180	20	154
	Southington	43,354	26	0	5	12	9	733	124	558
	South Windsor	26,781	4	0	1	1	2	408	56	337
	Stamford	122,933	351	2	19	152	178	1,969	348	1,429
	Stonington	18,807	8	0	1	5	2	267	41	222

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Stratford	49,469	148	1	15	43	89	1,312	188	1,004
	Suffield	15,524	2	0	0	0	2	121	50	66
	Thomaston	7,928	1	0	0	0	1	127	27	95
	Torrington	35,876	51	0	20	10	21	862	140	703
	Trumbull	35,425	21	0	3	8	10	695	51	609
	Vernon	30,785	28	0	5	11	12	274	66	190
	Wallingford	45,636	31	0	4	15	12	776	101	646
	Waterbury	108,489	366	5	6	176	179	4,646	781	3,441
	Waterford	19,161	48	0	4	5	39	496	57	435
	Watertown	22,552	29	0	3	3	23	399	71	313
	West Hartford	61,603	61	1	2	44	14	1,464	210	1,190
	West Haven	53,746	428	4	1	56	367	1,400	208	995
	Weston	10,344	1	0	1	0	0	68	7	58
	Westport	27,242	14	0	2	5	7	393	78	299
	Wethersfield	26,042	24	0	1	10	13	479	81	378
	Willimantic	16,605	51	0	9	17	25	470	93	331
	Wilton	18,007	0	0	0	0	0	96	20	76
	Winchester	10,927	22	0	3	3	16	219	68	138
	Windsor	29,447	23	1	3	8	11	500	69	406
	Wolcott	16,799	4	1	1	1	1	269	55	206
	Woodbridge	9,324	1	0	0	0	1	156	27	114
DELAWARE	Bethany Beach	988	4	0	0	2	2	168	13	153
	Blades	1,206	7	0	1	1	5	27	11	15
	Bridgeville	1,724	16	0	0	5	11	80	10	67
	Camden	2,642	14	0	2	5	7	227	10	211
	Cheswold	526	3	0	2	0	1	16	0	16
	Clayton	1,520	8	0	0	0	8	29	7	21
	Dagsboro	596	1	0	0	0	1	23	4	19
	Delaware City	1,542	2	0	0	0	2	34	10	21
	Delmar	1,597	9	0	1	0	8	37	9	28
	Dewey Beach	325	13	0	1	2	10	73	12	58
	Dover	37,113	239	1	10	52	176	2,122	151	1,858
	Ellendale	371	0	0	0	0	0	5	0	5
	Elsmere	5,726	43	0	3	6	34	193	46	130
	Felton	922	0	0	0	0	0	19	4	15
	Fenwick Island	375	0	0	0	0	0	10	2	8
	Frankford	800	0	0	0	0	0	2	2	0
	Georgetown	5,313	46	0	6	16	24	279	75	199
	Greenwood	931	2	0	0	0	2	42	17	25
	Harrington	3,580	24	0	1	8	15	147	40	101
	Laurel	4,087	69	0	5	18	46	254	74	174
	Lewes	3,222	8	0	2	2	4	82	16	65
	Middletown	13,710	66	0	4	18	44	406	75	317
	Milford	8,792	133	0	9	42	82	649	90	543
	Millsboro	2,831	24	0	3	1	20	142	26	110
	Milton	1,882	26	0	1	2	23	133	79	51
	Newark	30,543	139	1	10	39	89	947	185	733
	New Castle	5,049	24	0	2	7	15	254	35	213

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Newport	1,138	5	0	0	0	5	50	14	33
	Ocean View	1,178	1	0	0	0	1	39	18	21
	Rehoboth Beach	1,624	13	0	0	8	5	227	27	198
	Seaford	7,403	56	1	3	19	33	419	78	331
	Selbyville	1,935	14	0	0	2	12	94	34	58
	Smyrna	9,322	54	0	8	14	32	273	65	203
	South Bethany	538	0	0	0	0	0	24	6	18
	Wilmington	73,270	1,399	28	27	633	711	4,147	1,176	2,428
	Wyoming	1,468	1	0	1	0	0	33	14	17
DISTRICT OF COLUMBIA	Washington	601,723	7,468	132	184	3,914	3,238	27,138	4,224	18,050
FLORIDA	Alachua	9,757	42	0	3	12	27	278	76	193
	Altamonte Springs	39,774	165	0	11	45	109	1,364	283	1,005
	Altha	514	1	0	0	0	1	11	2	9
	Apalachicola	2,192	0	0	0	0	0	12	2	9
	Apopka	40,095	244	2	9	106	127	1,411	406	929
	Arcadia	6,926	96	0	7	21	68	247	86	147
	Astatula	1,908	2	0	0	0	2	8	4	4
	Atlantic Beach	13,139	72	0	5	18	49	416	98	298
	Atlantis	2,088	11	0	0	3	8	8	7	0
	Auburndale	14,204	64	1	2	18	43	797	199	575
	Aventura	30,874	55	1	0	22	32	2,216	117	2,054
	Avon Park	8,850	56	0	2	15	39	337	85	243
	Bal Harbour Village	3,230	1	0	0	0	1	84	4	76
	Bartow	17,072	112	3	6	34	69	1,050	247	767
	Bay Harbor Islands	5,126	1	0	1	0	0	64	28	30
	Belleair	4,052	1	0	0	0	1	51	10	39
	Belleair Beach	1,572	4	0	1	0	3	29	6	22
	Belleair Bluffs	2,141	3	0	0	2	1	43	10	32
	Belle Glade	16,992	353	4	11	71	267	1,229	400	769
	Belle Isle	6,603	12	0	0	2	10	149	60	72
	Belleview	4,538	21	0	7	6	8	235	85	145
	Biscayne Park	3,054	4	0	0	0	4	104	63	36
	Blountstown	2,475	6	0	0	0	6	32	3	27
	Boca Raton	86,707	176	1	13	49	113	2,507	459	1,940
	Bonifay	2,696	4	0	1	0	3	29	6	22
	Bowling Green	2,986	8	1	1	0	6	71	28	42
	Boynton Beach	70,574	585	4	6	143	432	3,195	727	2,361
	Bradenton	54,337	383	0	28	114	241	2,064	530	1,435
	Bradenton Beach	1,585	2	0	0	1	1	33	6	26
	Brooksville	8,333	69	0	3	11	55	317	61	243
	Bunnell	3,096	48	0	1	6	41	157	27	97
	Bushnell	2,279	9	0	0	3	6	93	20	71
	Cape Coral	160,432	276	3	23	64	186	3,787	1,083	2,595
	Carrabelle	1,222	5	0	0	1	4	25	11	9
	Casselberry	24,802	213	0	16	45	152	869	191	645
	Cedar Key	970	0	0	0	0	0	21	5	15
	Center Hill	1,117	4	0	1	0	3	6	3	3

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Chattahoochee	3,661	39	0	0	3	36	44	14	28
	Chiefland	2,193	4	0	0	0	4	276	115	120
	Chipley	3,780	26	0	1	0	25	84	25	53
	Clearwater	105,647	775	5	35	245	490	4,338	777	3,360
	Clermont	13,802	93	1	12	27	53	932	194	697
	Clewiston	7,168	48	0	1	11	36	239	61	164
	Cocoa	16,469	442	2	20	75	345	1,431	474	892
	Cocoa Beach	11,790	95	0	8	14	73	890	81	786
	Coconut Creek	51,184	89	0	7	29	53	1,433	283	1,038
	Cooper City	29,679	50	0	5	10	35	624	156	452
	Coral Gables	44,559	93	2	3	35	53	1,953	376	1,512
	Coral Springs	127,113	261	1	8	78	174	2,884	517	2,192
	Crescent City	1,779	15	0	0	6	9	108	47	56
	Crestview	20,424	87	1	8	16	62	644	155	460
	Cross City	1,776	3	0	0	3	0	30	5	24
	Crystal River	3,497	33	0	1	5	27	227	32	191
	Cutler Bay	30,221	207	0	5	64	138	1,862	297	1,464
	Dade City	7,268	51	0	3	8	40	300	109	183
	Dania	28,533	227	0	14	76	137	1,477	366	984
	Davenport	3,002	6	0	3	3	0	50	23	18
	Davie	92,661	367	3	21	92	251	3,643	799	2,586
	Daytona Beach	63,736	811	3	31	229	548	4,635	1,083	3,089
	Daytona Beach Shores	5,137	31	0	4	2	25	228	100	110
	Deerfield Beach	75,195	429	1	24	156	248	2,509	581	1,752
	De Funiak Springs	5,122	72	0	5	1	66	193	69	118
	Deland	27,926	153	0	4	36	113	1,366	359	948
	Delray Beach	65,087	590	3	22	198	367	3,340	724	2,423
	Doral	32,645	88	0	3	24	61	2,737	319	2,257
	Dunedin	35,854	108	0	15	19	74	1,160	208	915
	Dunnellon	1,941	6	0	0	1	5	30	20	10
	Eatonville	2,359	30	1	1	2	26	122	39	72
	Edgewater	21,456	50	0	3	10	37	633	199	399
	Edgewood	2,116	3	0	0	2	1	90	29	56
	El Portal	2,393	7	0	0	3	4	84	21	41
	Eustis	19,455	41	1	5	12	23	642	138	476
	Fellsmere	5,194	13	0	0	5	8	94	26	52
	Fernandina Beach	11,721	43	0	2	15	26	351	73	274
	Flagler Beach	5,467	8	0	0	1	7	141	40	94
	Florida City	10,883	305	0	0	95	210	1,213	244	917
	Fort Lauderdale	186,170	1,356	7	73	627	649	9,914	2,841	6,437
	Fort Myers	66,053	698	7	29	152	510	2,699	628	1,877
	Fort Pierce	42,797	482	9	27	142	304	2,396	689	1,615
	Fort Walton Beach	18,432	98	1	11	17	69	929	186	681
	Fruitland Park	4,914	18	0	1	1	16	113	28	76
	Gainesville	116,880	906	4	86	199	617	5,404	1,213	3,859
	Golden Beach	909	1	0	0	0	1	29	6	20
	Graceville	2,411	2	0	0	1	1	80	23	54
	Greenacres City	33,244	179	2	15	60	102	1,057	342	651
	Green Cove Springs	6,731	70	0	9	11	50	239	48	174

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Gretna	1,749	20	0	0	1	19	29	17	11
	Groveland	8,353	21	0	1	0	20	163	35	111
	Gulf Breeze	6,704	5	0	1	1	3	82	13	66
	Gulfport	12,212	41	0	2	15	24	466	103	330
	Gulf Stream	744	1	0	0	0	1	12	4	8
	Haines City	19,411	127	0	5	40	82	832	239	560
	Hallandale	39,359	346	0	7	108	231	1,786	478	1,183
	Hampton	460	2	0	0	0	2	5	3	1
	Havana	1,668	6	0	0	2	4	71	27	43
	Hialeah	217,995	951	12	40	256	643	7,858	1,098	5,693
	Hialeah Gardens	20,554	52	0	3	17	32	989	119	792
	Highland Beach	4,016	3	0	1	0	2	39	7	31
	High Springs	4,775	23	0	2	2	19	133	37	91
	Hillsboro Beach	2,279	3	0	0	2	1	38	6	31
	Holly Hill	13,204	123	0	6	34	83	670	163	416
	Hollywood	142,793	596	7	40	237	312	7,265	1,833	4,797
	Holmes Beach	5,130	5	0	0	2	3	149	53	95
	Homestead	63,761	857	3	25	298	531	3,012	896	1,983
	Howey-in-the-Hills	1,270	0	0	0	0	0	13	5	7
	Hypoluxo	2,606	2	0	0	1	1	49	8	41
	Indialantic	2,905	4	0	1	0	3	88	21	67
	Indian Creek Village	40	0	0	0	0	0	0	0	0
	Indian Harbour Beach	8,253	9	0	0	3	6	167	34	125
	Indian River Shores	3,449	0	0	0	0	0	19	7	12
	Indian Rocks Beach	5,108	22	0	6	1	15	107	22	81
	Indian Shores	4,213	2	0	1	0	1	64	13	49
	Inglis	1,630	8	0	1	0	7	72	23	48
	Interlachen	1,497	12	0	0	3	9	89	27	56
	Jacksonville	822,414	5,469	80	316	1,693	3,380	37,424	9,588	25,863
	Jacksonville Beach	22,140	201	0	9	39	153	1,127	128	949
	Jasper	2,063	15	0	0	3	12	61	31	30
	Jennings	861	8	0	0	2	6	25	10	13
	Juno Beach	3,369	3	0	0	1	2	89	13	70
	Jupiter	51,785	122	2	10	37	73	1,068	203	818
	Jupiter Inlet Colony	392	0	0	0	0	0	4	1	3
	Jupiter Island	684	0	0	0	0	0	5	3	2
	Kenneth City	4,257	33	0	2	5	26	203	31	161
	Key Biscayne	10,097	2	0	0	0	2	191	8	170
	Key Colony Beach	760	1	0	0	0	1	23	5	17
	Key West	22,167	186	1	21	63	101	1,709	363	1,224
	Kissimmee	64,122	599	1	19	122	457	3,218	856	2,192
	Lady Lake	15,487	50	0	7	2	41	341	61	250
	Lake Alfred	4,652	14	0	0	2	12	99	26	69
	Lake City	12,850	188	3	6	27	152	777	175	581
	Lake Clarke Shores	3,341	9	0	0	1	8	76	19	50
	Lake Hamilton	1,494	5	0	0	3	2	53	14	32
	Lake Helen	2,767	6	0	1	0	5	64	18	43
	Lakeland	94,569	459	12	20	140	287	5,099	1,104	3,754
	Lake Mary	15,641	24	0	1	1	22	326	67	251

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lake Park	8,727	73	0	1	25	47	624	116	478
	Lake Placid	1,996	10	0	0	4	6	97	28	67
	Lake Wales	14,593	52	0	0	15	37	861	161	684
	Lake Worth	35,977	449	3	12	202	232	1,677	507	1,051
	Lantana	10,229	75	0	12	31	32	465	102	348
	Largo	73,019	506	3	39	131	333	3,347	527	2,668
	Lauderdale-by-the-Sea	5,874	16	0	1	6	9	177	48	120
	Lauderdale Lakes	32,139	329	5	10	90	224	1,602	532	975
	Lauderhill	67,442	538	2	33	205	298	2,582	1,021	1,368
	Lawtey	698	0	0	0	0	0	8	5	3
	Leesburg	22,949	198	1	14	58	125	1,095	207	856
	Lighthouse Point	11,232	14	0	0	5	9	339	54	273
	Live Oak	7,232	73	0	3	18	52	344	150	182
	Longboat Key	7,223	1	0	0	0	1	119	24	94
	Longwood	13,443	75	1	2	15	57	544	170	364
	Lynn Haven	15,678	58	0	1	9	48	592	67	512
	Madeira Beach	4,292	34	0	4	6	24	268	56	208
	Madison	2,992	40	0	2	4	34	218	72	142
	Maitland	15,489	35	0	1	12	22	456	136	293
	Manalapan	345	1	0	1	0	0	16	3	13
	Mangonia Park	1,240	65	0	4	22	39	241	72	145
	Marco Island	15,820	18	0	3	1	14	161	21	135
	Margate	54,478	151	1	3	44	103	1,141	337	725
	Marianna	6,170	78	2	12	14	50	288	57	215
	Mascotte	6,042	18	0	2	0	16	80	23	52
	Medley	1,077	16	1	0	3	12	339	30	263
	Melbourne	77,861	685	7	28	144	506	3,672	771	2,769
	Melbourne Beach	3,107	3	0	0	0	3	37	2	34
	Melbourne Village	666	0	0	0	0	0	10	2	8
	Mexico Beach	1,304	4	0	0	0	4	64	28	35
	Miami	440,482	4,879	68	46	1,856	2,909	21,218	4,604	14,165
	Miami Beach	87,990	864	8	39	352	465	8,743	1,192	6,957
	Miami Gardens	110,130	1,061	22	25	351	663	5,410	1,321	3,515
	Miami Lakes	22,578	55	2	2	17	34	672	121	490
	Miami Shores	10,132	46	0	0	30	16	631	146	454
	Miami Springs	12,924	45	1	3	21	20	503	105	352
	Milton	8,805	32	0	4	10	18	345	88	252
	Minneola	9,599	37	0	2	1	34	156	42	105
	Miramar	113,385	540	9	34	170	327	3,651	1,262	2,099
	Monticello	2,426	37	0	0	3	34	52	44	7
	Mount Dora	14,053	71	0	10	18	43	510	90	384
	Naples	22,239	25	1	1	8	15	630	88	533
	Neptune Beach	6,707	22	1	1	3	17	313	44	257
	New Port Richey	17,634	166	0	10	42	114	891	353	501
	New Smyrna Beach	23,656	117	1	3	22	91	1,151	290	821
	Niceville	12,145	17	0	3	1	13	235	49	171
	North Bay Village	8,316	9	0	0	0	9	181	59	103
	North Lauderdale	42,998	198	0	13	75	110	1,097	459	563
	North Miami	57,796	616	6	23	278	309	3,371	931	2,110

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	North Miami Beach	41,170	346	2	29	136	179	2,109	743	1,189
	North Palm Beach	12,255	24	0	0	9	15	296	80	194
	North Port	59,076	194	1	11	26	156	1,386	320	1,035
	North Redington Beach	1,464	6	0	0	0	6	42	7	35
	Oak Hill	1,654	12	0	6	1	5	75	23	45
	Oakland	1,228	6	0	1	1	4	41	13	23
	Oakland Park	42,572	300	3	17	133	147	2,121	611	1,387
	Ocala	56,396	461	3	34	155	269	3,171	712	2,372
	Ocean Ridge	1,654	3	0	0	0	3	44	14	30
	Ocoee	33,650	159	0	9	48	102	1,255	257	929
	Okeechobee	5,924	33	0	1	17	15	380	74	296
	Oldsmar	13,561	36	0	6	7	23	475	78	376
	Opa Locka	16,762	413	5	8	113	287	1,150	422	583
	Orange City	10,149	38	0	0	11	27	551	83	451
	Orange Park	9,066	36	0	2	7	27	231	65	155
	Orlando	240,222	2,574	18	113	672	1,771	15,565	4,015	10,357
	Ormond Beach	37,923	251	0	13	14	224	1,385	277	1,050
	Oviedo	33,670	78	3	8	9	58	564	106	438
	Pahokee	6,797	67	0	2	13	52	155	54	95
	Palatka	10,726	158	1	16	29	112	833	189	634
	Palm Bay	103,350	521	4	19	60	438	2,460	740	1,622
	Palm Beach	9,607	7	0	1	1	5	132	22	107
	Palm Beach Gardens	51,458	72	1	3	35	33	1,614	265	1,286
	Palm Beach Shores	1,576	0	0	0	0	0	43	14	24
	Palmetto	14,554	201	2	2	59	138	661	249	390
	Palmetto Bay	23,525	70	0	3	25	42	916	158	703
	Palm Springs	17,223	122	2	6	40	74	874	231	582
	Panama City	36,593	277	5	5	78	189	2,423	508	1,785
	Panama City Beach	15,482	94	0	14	21	59	1,069	156	911
	Parker	4,557	15	1	4	1	9	206	73	116
	Parkland	25,432	17	0	1	1	15	268	56	195
	Pembroke Park	4,904	39	0	0	19	20	361	74	241
	Pembroke Pines	147,343	276	4	12	92	168	5,026	1,102	3,619
	Pensacola	53,476	420	3	36	112	269	2,545	519	1,939
	Perry	6,647	111	1	16	8	86	249	92	156
	Pinellas Park	47,180	263	2	24	68	169	2,820	471	2,207
	Plantation	85,000	291	2	14	124	151	3,755	779	2,732
	Plant City	33,421	184	2	6	40	136	1,623	299	1,184
	Pompano Beach	102,749	992	7	50	364	571	4,997	1,101	3,529
	Ponce Inlet	3,165	1	0	0	1	0	37	9	28
	Port Orange	55,381	102	2	2	19	79	1,411	262	1,072
	Port Richey	3,426	22	1	0	14	7	142	29	111
	Port St. Joe	3,479	15	0	0	4	11	23	9	13
	Port St. Lucie	163,089	386	3	45	49	289	3,212	909	2,224
	Punta Gorda	17,389	27	0	1	2	24	376	176	198
	Quincy	6,736	110	1	8	18	83	380	106	266
	Redington Beaches	1,467	3	0	0	0	3	30	7	20
	Riviera Beach	37,637	584	14	13	125	432	1,851	638	1,050
	Rockledge	25,230	72	0	0	14	58	742	159	553

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Royal Palm Beach	31,800	111	0	14	22	75	1,062	174	826
	Safety Harbor	17,010	29	0	3	4	22	406	80	319
	Sanford	52,325	356	3	38	174	141	3,367	871	2,286
	Sanibel	5,526	3	0	0	1	2	108	18	89
	Sarasota	51,928	510	6	16	165	323	3,188	825	2,229
	Satellite Beach	11,792	41	1	3	5	32	172	49	121
	Sea Ranch Lakes	741	0	0	0	0	0	24	2	22
	Sebastian	21,063	50	0	6	8	36	553	163	378
	Sebring	10,518	59	1	4	15	39	462	129	323
	Seminole	19,055	71	0	3	12	56	592	80	497
	Sewall's Point	2,019	1	0	1	0	0	17	5	12
	Shalimar	687	1	0	0	1	0	12	8	4
	Sneads	1,944	5	0	2	0	3	98	3	94
	South Bay	4,606	43	0	1	6	36	149	72	74
	South Daytona	13,513	83	0	0	11	72	626	179	395
	South Miami	11,154	88	3	2	33	50	820	126	668
	South Palm Beach	1,474	0	0	0	0	0	17	5	12
	South Pasadena	5,496	7	0	0	1	6	154	14	132
	Southwest Ranches	7,298	13	0	2	3	8	185	44	127
	Springfield	8,858	59	1	5	10	43	353	126	208
	Starke	5,928	19	0	0	5	14	243	23	215
	St. Augustine	12,794	93	0	7	19	67	741	127	587
	St. Augustine Beach	6,522	7	0	0	1	6	190	26	157
	St. Cloud	30,245	133	1	9	18	105	949	283	642
	St. Pete Beach	9,855	35	0	6	5	24	532	152	364
	St. Petersburg	243,666	2,758	13	105	752	1,888	13,815	3,564	9,015
	Stuart	15,986	52	0	4	10	38	687	108	560
	Sunny Isles Beach	17,052	33	0	7	6	20	464	79	359
	Sunrise	90,016	338	2	13	124	199	3,972	832	2,957
	Surfside	4,684	13	0	1	2	10	154	19	131
	Sweetwater	13,563	40	0	3	11	26	248	43	178
	Tallahassee	174,516	1,802	13	130	492	1,167	8,579	2,920	5,310
	Tamarac	59,989	186	1	12	57	116	1,269	364	810
	Tampa	347,830	2,170	27	47	684	1,412	11,453	3,131	7,484
	Tarpon Springs	23,695	158	1	4	40	113	646	146	473
	Tavares	14,353	35	0	3	7	25	210	42	146
	Temple Terrace	22,760	111	0	5	36	70	843	277	535
	Tequesta	5,799	12	0	3	0	9	91	23	68
	Titusville	44,839	350	1	19	80	250	1,486	361	1,030
	Treasure Island	7,399	12	0	2	3	7	283	37	242
	Umatilla	3,564	12	0	1	0	11	103	3	95
	Valparaiso	5,783	6	0	1	2	3	58	14	43
	Venice	20,997	36	2	0	4	30	567	87	466
	Vero Beach	17,254	72	0	4	22	46	628	179	425
	Village of Pinecrest	19,367	22	0	5	7	10	574	81	474
	Virginia Gardens	2,241	2	0	0	0	2	25	6	13
	Wauchula	4,640	33	0	3	9	21	225	115	101
	Webster	922	4	0	0	0	4	23	6	15
	Welaka	800	0	0	0	0	0	5	1	4

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wellington	56,532	125	4	8	17	96	1,590	301	1,191
	West Melbourne	15,969	47	1	2	11	33	648	268	360
	West Miami	5,739	11	0	0	1	10	181	67	103
	Weston	65,406	38	0	3	5	30	756	135	585
	West Palm Beach	101,267	789	19	49	264	457	5,052	1,246	3,415
	West Park	14,516	83	2	2	34	45	606	232	321
	White Springs	843	6	0	0	1	5	23	4	15
	Wildwood	12,797	43	0	2	3	38	138	46	86
	Williston	2,919	29	0	0	4	25	122	27	89
	Wilton Manors	12,873	65	4	0	39	22	590	160	396
	Windermere	2,689	0	0	0	0	0	10	2	8
	Winter Garden	32,096	160	0	6	30	124	1,074	197	821
	Winter Haven	33,981	244	2	10	68	164	1,915	368	1,462
	Winter Park	28,069	69	0	2	26	41	879	272	565
	Winter Springs	32,862	56	0	5	9	42	412	112	278
	Zephyrhills	13,360	65	1	4	23	37	943	232	688
GEORGIA	Acworth	19,939	14	0	0	5	9	426	35	366
	Adairsville	3,358	17	0	1	6	10	148	38	107
	Adel	5,236	10	0	2	2	6	269	105	158
	Alamo	2,671	1	0	0	0	1	32	11	20
	Albany	73,034	722	11	28	203	480	5,037	1,629	3,108
	Alma	3,435	29	1	4	6	18	127	34	89
	Alpharetta	50,392	49	0	2	24	23	1,467	189	1,253
	Alto	911	2	0	0	0	2	12	3	8
	Americus	15,694	271	0	1	36	234	1,176	471	666
	Aragon	1,051	0	0	0	0	0	23	0	23
	Arcade	1,908	3	0	0	0	3	22	12	10
	Athens-Clarke County	112,851	371	5	29	110	227	4,931	1,334	3,299
	Atlanta	536,472	5,749	93	89	2,162	3,405	30,800	8,016	17,741
	Attapulgus	433	0	0	0	0	0	0	0	0
	Auburn	7,600	4	0	0	1	3	70	25	32
	Austell	7,024	42	0	1	3	38	267	55	188
	Avondale Estates	2,788	4	1	0	3	0	98	8	82
	Bainbridge	11,641	99	1	3	21	74	654	178	462
	Ball Ground	1,003	2	0	0	1	1	30	10	18
	Barnesville	6,159	57	1	3	6	47	181	35	133
	Baxley	4,377	28	0	2	6	20	262	62	194
	Berlin	602	0	0	0	0	0	2	1	1
	Blackshear	3,461	24	0	6	4	14	198	55	133
	Blairsville	697	0	0	0	0	0	0	0	0
	Blakely	4,960	34	0	1	0	33	129	41	86
	Bloomingdale	2,591	0	0	0	0	0	69	20	45
	Blythe	814	0	0	0	0	0	9	1	8
	Bowdon	2,008	23	0	0	0	23	65	18	44
	Braselton	6,538	10	0	4	5	1	106	9	84
	Brooklet	1,329	0	0	0	0	0	18	3	15
	Brunswick	15,871	238	2	8	76	152	1,418	406	960
	Buchanan	982	2	0	0	0	2	70	20	47

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Buena Vista	1,584	18	0	0	4	14	61	13	46
	Butler	1,705	10	0	0	1	9	16	5	8
	Cairo	9,607	22	0	6	8	8	269	61	191
	Calhoun	14,710	38	0	3	9	26	685	149	513
	Camilla	5,149	67	0	2	6	59	210	55	151
	Canton	24,697	17	0	3	5	9	471	51	394
	Carrollton	23,014	318	2	13	27	276	1,400	253	1,107
	Cartersville	18,646	58	0	7	16	35	904	161	692
	Cave Spring	1,020	4	0	0	0	4	25	5	15
	Cedartown	9,900	56	0	7	5	44	313	68	224
	Centerville	7,332	19	0	5	6	8	267	44	219
	Chamblee	10,990	91	2	2	60	27	677	80	540
	Chatsworth	4,086	14	0	0	0	14	146	19	124
	Chattahoochee Hills	2,315	14	1	0	0	13	35	10	19
	Chickamauga	2,554	10	0	0	0	10	82	21	61
	Clarkesville	1,708	13	0	0	0	13	43	5	37
	Claxton	2,289	10	0	0	1	9	138	32	99
	Cleveland	2,856	37	0	0	1	36	226	84	137
	Climax	269	0	0	0	0	0	0	0	0
	Cochran	5,087	15	0	2	3	10	210	60	148
	College Park	19,917	293	10	21	154	108	2,237	592	1,348
	Colquitt	1,871	6	0	3	0	3	40	16	23
	Columbus	184,576	1,005	15	38	477	475	13,442	3,454	8,981
	Commerce	6,477	24	0	2	2	20	180	27	145
	Conyers	13,738	74	4	2	34	34	1,020	205	757
	Coolidge	545	2	0	0	1	1	12	6	2
	Cordele	11,110	85	1	7	31	46	874	222	619
	Cornelia	3,725	12	0	4	3	5	181	28	148
	Cumming	5,891	17	2	2	2	11	368	51	309
	Cuthbert	3,286	5	0	0	4	1	63	15	47
	Dallas	11,260	41	1	1	5	34	348	83	236
	Dalton	33,064	76	0	4	27	45	1,182	285	838
	Danielsville	423	6	0	0	0	6	25	5	19
	Dawson	4,470	31	0	0	4	27	97	97	0
	Decatur	18,391	35	1	2	21	11	577	100	431
	Dillard	228	0	0	0	0	0	0	0	0
	Donalsonville	2,589	5	0	0	1	4	61	15	44
	Doraville	9,965	83	0	1	26	56	376	68	285
	Douglasville	32,033	209	1	9	36	163	2,173	221	1,863
	Dublin	17,200	145	0	3	42	100	1,400	314	1,046
	Duluth	26,199	42	1	3	15	23	643	140	469
	Dunwoody	32,815	103	3	8	50	42	1,691	240	1,334
	East Dublin	2,748	24	0	0	2	22	97	25	70
	East Ellijay	700	3	0	0	0	3	70	2	67
	Eastman	5,334	52	0	3	8	41	488	79	401
	East Point	42,311	359	7	15	205	132	3,644	1,228	1,955
	Edison	1,167	6	0	0	3	3	17	9	6
	Elberton	4,471	37	0	2	6	29	489	134	347
	Ellaville	1,820	2	0	0	0	2	20	7	13

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Ellijay	1,569	0	0	0	0	0	0	0	0
	Emerson	1,513	6	0	1	1	4	34	3	28
	Enigma	855	8	0	0	0	8	28	4	24
	Ephesus	374	0	0	0	0	0	0	0	0
	Eton	470	2	0	0	0	2	14	6	8
	Fairburn	11,644	39	0	2	14	23	500	144	302
	Fairmount	790	1	0	0	0	1	19	7	11
	Fayetteville	15,019	39	1	3	13	22	414	58	332
	Flowery Branch	4,287	0	0	0	0	0	50	16	34
	Folkston	3,076	14	0	1	1	12	90	23	61
	Forest Park	21,132	183	2	10	95	76	1,033	247	688
	Forsyth	5,111	21	0	2	6	13	190	17	164
	Fort Gaines	922	0	0	0	0	0	0	0	0
	Fort Oglethorpe	9,863	30	0	2	10	18	528	62	459
	Fort Valley	7,785	111	0	2	14	95	502	147	342
	Franklin	912	7	0	1	0	6	40	3	35
	Franklin Springs	708	0	0	0	0	0	12	1	11
	Gainesville	35,657	119	1	17	39	62	1,623	278	1,283
	Garden City	9,134	142	0	1	20	121	545	142	337
	Glennville	5,515	11	0	0	7	4	120	34	82
	Gordon	2,028	0	0	0	0	0	29	6	22
	Grantville	2,840	11	0	1	0	10	48	19	20
	Greensboro	3,136	32	0	1	0	31	167	41	120
	Greenville	884	11	0	0	1	10	50	10	38
	Griffin	23,186	152	6	7	48	91	1,632	285	1,285
	Grovetown	9,970	66	0	0	6	60	218	51	155
	Guyton	1,969	5	0	3	0	2	24	11	9
	Hahira	2,340	5	0	2	0	3	34	4	27
	Hampton	5,342	18	0	1	5	12	142	36	98
	Hapeville	6,624	34	1	2	20	11	392	96	230
	Harlem	2,119	13	0	3	2	8	41	14	27
	Harrison	452	0	0	0	0	0	0	0	0
	Hartwell	4,152	20	0	0	7	13	336	32	290
	Hazlehurst	3,780	7	0	0	2	5	248	52	195
	Helen	879	9	0	0	0	9	80	6	72
	Helena	2,268	3	0	0	0	3	14	13	1
	Hephzibah	4,531	15	0	0	0	15	139	46	79
	Hiawassee	828	5	0	1	0	4	21	1	20
	Hinesville	29,764	149	5	9	45	90	1,660	448	1,148
	Hiram	2,102	23	0	2	10	11	283	23	255
	Hoboken	511	0	0	0	0	0	4	1	2
	Hogansville	2,841	30	0	2	1	27	93	28	59
	Holly Springs	9,708	6	0	0	0	6	91	19	69
	Homeland	759	0	0	0	0	0	4	1	3
	Homerville	2,583	30	1	1	7	21	122	29	87
	Irwinton	566	0	0	0	0	0	0	0	0
	Jackson	4,481	10	0	1	3	6	118	23	89
	Jefferson	8,232	13	0	2	4	7	160	42	103
	Jesup	10,175	62	0	6	22	34	673	127	510

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Johns Creek	59,893	50	0	5	13	32	644	159	471
	Jonesboro	4,082	25	0	4	3	18	140	32	93
	Kennesaw	33,398	20	0	2	5	13	526	110	394
	Keysville	225	0	0	0	0	0	0	0	0
	Kingsland	14,033	70	0	2	6	62	516	112	391
	Lafayette	7,366	35	0	0	0	35	441	64	373
	LaGrange	27,712	132	0	6	60	66	1,686	376	1,234
	Lake City	2,586	11	0	0	10	1	176	23	126
	Lavonia	2,009	10	0	1	5	4	113	24	86
	Lawrenceville	29,625	98	4	5	54	35	1,251	263	907
	Leary	582	0	0	0	0	0	0	0	0
	Leesburg	2,932	16	0	3	2	11	101	14	82
	Lilburn	11,645	47	0	2	24	21	577	108	441
	Locust Grove	5,136	10	0	2	5	3	258	47	199
	Loganville	11,256	13	0	3	3	7	320	55	241
	Lookout Mountain	1,459	0	0	0	0	0	10	2	8
	Ludowici	1,578	5	0	1	2	2	47	20	25
	Lumber City	1,114	8	0	0	1	7	26	10	16
	Lumpkin	1,136	10	0	0	4	6	17	10	4
	Macon	89,125	708	22	34	284	368	7,277	2,136	4,516
	Madison	3,839	16	1	2	3	10	182	49	119
	Manchester	3,609	19	0	0	1	18	273	115	144
	Marietta	65,318	462	2	10	136	314	2,857	723	1,968
	Maysville	1,681	3	0	0	0	3	29	7	22
	McCaysville[3]	957	2	0	0	0	2		10	
	McDonough	21,010	101	0	8	13	80	843	139	638
	McIntyre	693	2	0	0	1	1	37	10	24
	McRae	4,385	19	0	0	1	18	90	19	66
	Meigs	1,053	8	0	0	1	7	18	7	11
	Midville	434	0	0	0	0	0	0	0	0
	Midway	1,514	14	0	2	3	9	69	23	43
	Milledgeville	20,543	59	3	7	19	30	984	290	661
	Milton	15,747	13	0	4	2	7	314	53	252
	Monroe	13,305	37	2	2	8	25	665	200	430
	Montezuma	3,547	56	1	0	3	52	168	42	116
	Morrow	5,423	26	0	0	19	7	955	70	819
	Moultrie	15,093	114	4	8	44	58	1,311	322	925
	Mountain City	718	0	0	0	0	0	1	0	1
	Mount Airy	1,285	2	0	0	0	2	7	5	2
	Mount Zion	1,574	0	0	0	0	0	13	0	9
	Nahunta	968	6	0	0	0	6	38	19	19
	Nashville	4,671	34	0	3	7	24	235	94	136
	Newington	288	4	0	0	0	4	9	3	6
	Newnan	32,623	131	2	1	32	96	1,216	302	859
	Newton	729	1	0	0	1	0	3	0	3
	Nicholls	2,787	5	0	0	1	4	45	13	32
	Norcross	10,870	54	0	7	28	19	354	94	228
	Oakwood	5,414	19	0	0	2	17	214	33	168
	Omega	1,367	0	0	0	0	0	0	0	0

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Oxford	2,548	3	0	0	0	3	36	11	24
	Palmetto	5,178	26	1	1	2	22	87	29	48
	Patterson	675	4	0	1	1	2	20	3	16
	Pavo	664	2	0	0	1	1	4	1	3
	Peachtree City	33,956	12	0	2	3	7	475	44	365
	Pembroke	2,575	3	0	0	0	3	67	16	48
	Pine Lake	636	0	0	0	0	0	15	5	10
	Pine Mountain	1,301	8	0	1	2	5	84	23	59
	Plains	576	1	0	0	0	1	10	2	8
	Pooler	17,306	15	0	0	7	8	632	123	468
	Porterdale	1,835	4	0	0	0	4	54	22	28
	Port Wentworth	4,928	17	0	1	3	13	131	26	90
	Poulan	843	3	0	0	0	3	22	5	17
	Powder Springs	15,768	36	1	1	7	27	355	137	191
	Quitman	4,173	83	1	4	7	71	263	80	165
	Reidsville	2,412	15	0	0	3	12	131	26	101
	Reynolds	994	0	0	0	0	0	0	0	0
	Richmond Hill	11,455	15	0	1	7	7	188	27	155
	Rincon	8,354	4	1	0	3	0	184	22	157
	Ringgold	2,777	24	0	3	0	21	196	24	167
	Riverdale	15,112	125	1	3	59	62	1,017	338	606
	Rockmart	4,489	33	0	7	3	23	166	52	105
	Rome	34,896	233	1	17	90	125	1,990	447	1,439
	Rossville	3,268	38	0	1	5	32	195	58	119
	Roswell	85,461	131	0	16	65	50	1,862	429	1,334
	Royston	2,640	1	0	0	0	1	56	0	56
	Sandersville	5,890	29	0	3	8	18	322	99	214
	Sandy Springs	82,898	189	7	18	115	49	2,666	718	1,756
	Savannah-Chatham Metropolitan	210,744	843	20	30	454	339	9,202	2,552	6,026
	Screven	770	2	0	0	0	2	10	5	5
	Senoia	3,866	4	0	1	0	3	63	15	45
	Shiloh	432	0	0	0	0	0	3	0	3
	Sky Valley	208	0	0	0	0	0	5	0	5
	Snellville	20,323	61	0	1	19	41	749	75	652
	Social Circle	4,858	3	0	0	0	3	74	22	47
	Sparta	1,193	11	0	1	1	9	75	41	34
	Springfield	2,353	4	0	1	0	3	68	16	47
	Statesboro	26,413	251	0	6	47	198	1,457	288	1,118
	Statham	3,041	16	0	1	4	11	85	33	45
	St. Marys	16,424	59	0	2	9	48	519	133	377
	Suwanee	17,028	21	3	0	3	15	388	51	320
	Sylvania	2,610	12	0	0	3	9	150	37	109
	Sylvester	5,540	17	0	1	2	14	332	79	240
	Tallapoosa	3,006	1	0	1	0	0	142	29	99
	Tallulah Falls	158	0	0	0	0	0	2	1	1
	Temple	4,620	27	0	0	5	22	136	28	102
	Tennille	1,386	17	0	1	2	14	44	11	32
	Thomaston	8,804	57	0	2	16	39	455	120	312
	Thunderbolt	2,575	4	0	0	3	1	105	30	66

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Tifton	17,012	185	1	5	64	115	1,285	328	916
	Tignall	591	1	0	0	0	1	5	1	4
	Toomsboro	598	0	0	0	0	0	0	0	0
	Trenton	2,325	3	0	0	0	3	35	4	25
	Tunnel Hill	1,199	10	0	0	2	8	46	12	30
	Tybee Island	3,817	6	0	0	1	5	107	12	94
	Tyrone	6,653	2	0	0	1	1	93	29	55
	Union City	17,584	347	2	6	43	296	1,404	329	879
	Union Point	1,467	1	0	1	0	0	63	17	42
	Valdosta	51,089	270	3	17	81	169	2,633	856	1,665
	Vidalia	10,973	108	1	5	35	67	819	200	568
	Villa Rica	13,906	109	0	5	6	98	514	88	380
	Warner Robins	61,332	341	4	19	95	223	3,575	810	2,589
	Washington	3,851	42	0	2	3	37	96	20	74
	Watkinsville	2,941	3	0	0	1	2	72	16	55
	Waverly Hall	773	4	0	0	0	4	7	0	7
	Waycross	14,182	58	1	5	26	26	1,084	177	880
	Waynesboro	5,602	41	3	1	13	24	314	76	211
	West Point	3,368	35	0	3	6	26	286	62	204
	Whigham	561	3	0	0	0	3	0	0	0
	Winder	14,658	116	0	4	8	104	705	162	527
	Winterville	1,177	3	0	0	0	3	18	4	14
	Woodbury	1,023	0	0	0	0	0	55	19	32
	Woodstock	24,370	48	0	7	8	33	518	77	432
	Wrens	2,111	13	0	0	2	11	139	24	109
	Zebulon	1,192	3	0	0	0	3	36	4	30
HAWAII	Honolulu	950,268	2,548	19	218	891	1,420	31,668	5,760	22,007
IDAHO	Aberdeen	1,762	2	0	0	0	2	9	7	2
	American Falls	4,075	7	0	3	0	4	61	3	58
	Bellevue	2,259	4	0	0	0	4	32	14	17
	Blackfoot	11,176	39	0	11	1	27	437	91	337
	Boise	205,902	539	3	89	58	389	5,707	888	4,660
	Bonners Ferry	2,550	4	0	1	1	2	21	6	14
	Buhl	4,105	15	0	0	0	15	95	24	70
	Caldwell	45,089	150	0	14	14	122	1,167	274	837
	Cascade	964	0	0	0	0	0	3	0	3
	Chubbuck	12,745	46	0	4	8	34	511	44	448
	Coeur d'Alene	44,626	254	0	21	17	216	1,579	284	1,244
	Cottonwood	1,039	2	0	1	0	1	4	2	2
	Emmett	6,329	8	0	1	0	7	94	15	78
	Filer	2,268	1	0	0	0	1	11	3	7
	Fruitland	4,853	9	0	1	0	8	105	27	73
	Garden City	11,969	35	0	6	7	22	360	72	268
	Gooding	3,179	5	0	0	1	4	42	13	27
	Grangeville	3,099	3	0	1	0	2	74	14	58
	Hagerman	825	0	0	0	0	0	9	3	6
	Hailey	8,242	36	0	2	0	34	100	64	30

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Heyburn	2,747	4	0	0	0	4	24	11	12
	Idaho Falls	55,524	182	3	23	14	142	1,582	327	1,194
	Jerome	9,714	31	0	3	2	26	214	58	149
	Kamiah	1,123	2	0	0	0	2	12	1	11
	Kellogg	2,146	9	0	1	0	8	66	19	43
	Ketchum	3,401	13	0	1	0	12	105	15	87
	Kimberly	3,302	5	0	1	1	3	35	10	21
	Lewiston	31,860	53	0	20	2	31	1,332	277	992
	McCall	2,595	12	0	4	1	7	142	18	121
	Meridian	72,688	108	3	17	11	77	1,185	197	952
	Montpelier	2,302	8	0	2	0	6	60	19	39
	Moscow	24,550	20	0	5	2	13	557	81	457
	Mountain Home	12,301	64	0	8	6	50	336	51	276
	Nampa	84,179	275	2	51	17	205	2,299	450	1,721
	Orofino	2,951	12	0	2	1	9	53	12	40
	Osburn	1,341	2	0	0	0	2	16	7	9
	Parma	1,884	4	0	1	1	2	22	7	14
	Payette	7,688	37	0	7	0	30	215	66	147
	Pinehurst	1,541	0	0	0	0	0	23	7	14
	Pocatello	55,215	132	1	24	6	101	1,726	296	1,360
	Ponderay	733	2	0	0	0	2	85	7	76
	Post Falls	27,882	39	2	11	2	24	640	114	501
	Preston	5,133	3	0	2	0	1	21	0	21
	Priest River	1,978	2	0	2	0	0	34	11	22
	Rathdrum	7,174	15	0	2	2	11	168	57	105
	Rexburg	30,200	10	0	2	1	7	243	17	221
	Rigby	3,568	6	0	3	0	3	97	15	78
	Rupert	5,166	15	0	1	3	11	111	20	88
	Salmon	3,120	10	0	0	0	10	50	12	35
	Sandpoint	8,503	12	0	3	1	8	228	34	185
	Shelley	4,403	4	0	1	1	2	52	5	46
	Soda Springs	3,062	1	0	0	0	1	23	3	20
	Spirit Lake	1,788	3	0	0	0	3	20	3	15
	St. Anthony	3,443	3	0	1	0	2	32	2	28
	St. Maries	2,593	5	0	1	0	4	13	7	5
	Sun Valley	1,483	3	0	0	0	3	14	4	10
	Twin Falls	43,434	145	1	21	13	110	1,374	219	1,107
	Weiser	5,181	7	0	1	0	6	40	4	30
	Wendell	2,426	3	0	1	0	2	33	4	26
	Wilder	1,482	2	0	0	0	2	22	5	17
ILLINOIS[5]	Addison	36,581	67	0	16	17	34	827	109	662
	Albany	917	0	0	0	0	0	24	14	9
	Aledo	3,466	11	0	0	0	11	91	23	63
	Algonquin	30,848	79	0	2	2	75	529	50	476
	Alton	28,841	174	4	16	27	127	1,265	292	913
	Antioch	14,266	5	0	1	0	4	296	26	264
	Arcola	2,685	3	0	0	0	3	11	4	7
	Arlington Heights	72,061	41	0	5	12	24	1,154	153	978

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Arthur	2,084	0	0	0	0	0	43	10	31
	Ashland	1,299	0	0	0	0	0	6	0	5
	Ashton	1,143	0	0	0	0	0	18	5	13
	Atwood	1,194	1	0	0	0	1	10	4	6
	Aurora	174,255	634	4	64	113	453	3,767	820	2,809
	Aviston	1,754	0	0	0	0	0	3	0	3
	Bannockburn	1,919	0	0	0	0	0	28	6	22
	Barrington	10,240	0	0	0	0	0	127	15	107
	Barrington Hills	4,373	2	0	0	1	1	46	4	42
	Bartlett	42,962	21	0	4	3	14	373	34	328
	Bartonville	6,142	27	0	0	2	25	216	36	173
	Batavia	27,759	40	0	3	3	34	509	56	447
	Beckemeyer	1,049	0	0	0	0	0	8	6	2
	Beecher	3,159	2	0	1	0	1	41	5	36
	Belgium	453	0	0	0	0	0	0	0	0
	Bellwood	18,500	73	2	0	22	49	369	87	228
	Belvidere	26,712	67	0	21	7	39	515	88	408
	Benton	6,836	46	0	0	1	45	330	77	244
	Berkeley	4,800	16	0	4	3	9	104	15	88
	Berwyn	48,737	205	1	15	74	115	1,257	397	753
	Bethalto	9,896	10	0	3	0	7	28	7	20
	Blandinsville	679	0	0	0	0	0	5	3	2
	Bloomingdale	21,638	11	1	3	3	4	849	42	802
	Bloomington	74,304	385	1	43	75	266	1,960	493	1,414
	Blue Mound	996	4	0	0	0	4	17	10	7
	Bourbonnais	19,340	24	0	8	0	16	333	49	276
	Bradley	15,131	47	1	7	6	33	798	66	724
	Braidwood	6,886	8	0	0	0	8	121	17	101
	Bridgeview	14,816	36	0	6	7	23	459	58	368
	Broadview	7,432	36	0	0	26	10	362	79	261
	Brooklyn	611	34	0	4	10	20	60	21	21
	Buda	553	0	0	0	0	0	1	0	1
	Buffalo Grove	42,361	8	0	3	4	1	392	46	341
	Bull Valley	1,129	0	0	0	0	0	8	3	5
	Bunker Hill	1,706	15	0	0	0	15	27	10	17
	Burbank	27,135	67	0	4	17	46	611	87	488
	Burr Ridge	11,359	1	0	0	0	1	156	26	129
	Byron	3,903	5	1	2	0	2	70	3	64
	Cahokia	14,826	58	1	3	27	27	864	253	611
	Cairo	2,909	93	0	8	5	80	212	84	118
	Calumet City	36,004	247	4	31	160	52	2,694	688	1,688
	Cambridge	2,054	0	0	0	0	0	10	3	7
	Campton Hills	9,739	2	0	0	0	2	63	12	50
	Canton	14,269	47	1	16	2	28	368	71	291
	Carbondale	25,959	244	1	33	47	163	1,155	302	821
	Carlinville	5,837	14	0	0	3	11	173	23	148
	Carlyle	3,292	8	0	1	1	6	90	1	82
	Carol Stream	39,577	44	0	7	9	28	577	75	476
	Carpentersville	38,387	43	1	1	13	28	579	113	463

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Carrier Mills	1,796	14	0	0	1	13	30	11	19
	Carrollton	2,395	7	0	0	0	7	37	4	32
	Carthage	2,404	4	0	0	0	4	53	9	44
	Caseyville	4,159	17	0	4	11	2	102	24	73
	Catlin	2,063	1	0	0	1	0	11	1	10
	Central City	1,285	0	0	0	0	0	33	6	23
	Centralia	13,237	101	0	13	13	75	805	212	569
	Cerro Gordo	1,321	9	0	0	0	9	15	3	12
	Charleston	21,538	60	0	15	2	43	329	116	204
	Chatham	10,950	14	0	2	0	12	134	25	104
	Chester	7,677	29	0	7	1	21	103	31	62
	Chicago[7]	2,833,649		432		14,213	13,757	120,045	26,203	74,764
	Clarendon Hills	8,581	0	0	0	0	0	76	15	60
	Clayton	814	0	0	0	0	0	7	1	6
	Coal City	5,817	6	0	1	0	5	158	19	139
	Coal Valley	4,026	1	0	0	0	1	50	5	45
	Cobden	1,071	1	0	0	0	1	7	0	7
	Colfax	1,003	0	0	0	0	0	14	5	9
	Collinsville	25,851	55	1	4	12	38	729	98	606
	Colona	5,150	23	0	11	1	11	82	23	58
	Columbia	9,520	6	0	1	0	5	136	20	111
	Cortland	4,501	5	0	0	0	5	54	3	51
	Country Club Hills	16,472	64	0	10	23	31	572	150	406
	Countryside	5,698	6	0	2	3	1	211	9	193
	Crestwood	10,845	15	0	1	7	7	478	55	370
	Crete	9,154	10	0	0	1	9	184	39	137
	Crystal Lake	42,137	54	1	3	3	47	827	97	717
	Danville	31,942	348	1	35	86	226	2,178	826	1,295
	Darien	22,097	12	3	0	6	3	277	40	221
	Decatur	74,857	468	4	20	136	308	3,121	1,514	1,481
	Deerfield	19,543	8	0	2	1	5	172	14	158
	Deer Park	3,339	0	0	0	0	0	47	7	39
	De Kalb	45,959	162	2	28	25	107	1,246	205	1,021
	Delavan	1,738	4	0	0	0	4	37	10	25
	De Pue	1,707	2	0	1	0	1	36	4	32
	De Soto	1,517	4	0	0	0	4	19	8	11
	Des Plaines	56,188	57	0	10	7	40	729	141	551
	Divernon	1,112	1	0	0	0	1	29	6	23
	Dixon	14,696	31	0	16	2	13	503	60	437
	Downers Grove	48,574	41	0	2	13	26	946	127	801
	Du Quoin	6,222	10	0	0	2	8	117	19	94
	Durand	1,070	3	0	0	0	3	18	1	17
	Dwight	4,223	3	0	0	1	2	30	8	20
	East Alton	6,450	15	1	3	2	9	328	48	264
	East Dubuque	1,870	13	0	0	0	13	32	4	25
	East Hazel Crest	1,503	1	0	0	1	0	78	31	43
	East Moline	20,589	74	1	13	8	52	563	174	357
	Easton	338	0	0	0	0	0	1	0	0
	East Peoria	22,638	118	0	32	9	77	754	175	542

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	East St. Louis	28,188	1,642	21	74	276	1,271	2,516	1,091	781
	Edinburg	1,085	1	0	0	0	1	9	4	4
	Edwardsville	24,437	20	0	2	1	17	432	42	380
	Effingham	12,442	25	1	9	2	13	360	53	300
	Elgin	107,731	355	4	86	99	166	2,186	425	1,653
	Elizabeth	633	0	0	0	0	0	13	9	3
	Elk Grove Village	32,620	38	0	10	6	22	752	97	595
	Elmhurst	46,160	22	0	5	7	10	655	85	545
	Elmwood	1,862	6	0	0	0	6	25	8	17
	Elmwood Park	23,536	29	1	1	10	17	376	85	263
	El Paso	2,853	3	0	3	0	0	20	5	15
	Energy	1,197	2	0	0	0	2	18	6	12
	Eureka	5,421	10	0	2	0	8	94	17	76
	Evanston	77,418	213	6	8	73	126	2,101	429	1,606
	Evergreen Park	18,888	33	0	7	18	8	689	48	620
	Fairfield	4,996	11	0	4	0	7	93	25	67
	Fairmont City	2,216	1	0	1	0	0	65	17	44
	Fairmount	617	0	0	0	0	0	1	0	1
	Fairview	472	0	0	0	0	0	1	1	0
	Fairview Heights	16,712	37	0	3	6	28	954	60	864
	Fithian	538	0	0	0	0	0	0	0	0
	Flora	4,595	4	0	0	0	4	137	6	126
	Flossmoor	9,152	7	0	0	3	4	177	50	125
	Forest Park	14,926	34	0	0	21	13	713	89	582
	Forest View	700	1	0	0	0	1	33	2	18
	Fox Lake	11,125	28	0	6	4	18	300	46	245
	Fox River Grove	5,168	5	1	0	0	4	87	15	71
	Frankfort	19,115	15	0	2	2	11	303	17	279
	Franklin Grove	988	3	0	2	0	1	17	4	13
	Freeport	24,277	49	0	5	15	29	880	238	633
	Fulton	3,775	6	0	1	0	5	54	14	37
	Geneseo	6,322	7	0	0	0	7	104	15	88
	Geneva	24,648	9	0	0	0	9	313	25	285
	Genoa	5,190	5	0	4	0	1	43	3	36
	Georgetown	3,356	8	0	2	0	6	72	28	42
	Germantown	1,126	0	0	0	0	0	1	0	1
	Gibson City	3,221	7	0	0	0	7	61	21	39
	Gifford	998	1	0	0	1	0	3	0	3
	Gilberts	7,297	6	1	2	0	3	49	11	37
	Gillespie	3,088	13	0	1	0	12	67	14	50
	Gilman	1,649	1	0	0	0	1	5	2	3
	Girard	2,120	8	0	0	0	8	18	8	9
	Glasford	1,029	2	0	0	0	2	3	1	2
	Glendale Heights	31,532	39	0	9	12	18	582	60	505
	Glen Ellyn	26,950	10	0	2	1	7	389	58	325
	Glenwood	8,310	19	0	2	9	8	204	84	77
	Grafton	678	1	0	0	0	1	25	7	17
	Grand Tower	564	0	0	0	0	0	9	3	6
	Grandview	1,381	10	0	0	0	10	34	17	15

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Granite City	30,254	158	0	31	22	105	777	281	490
	Grantfork	345	0	0	0	0	0	2	1	0
	Grant Park	1,717	5	0	0	2	3	12	2	10
	Granville	1,320	0	0	0	0	0	3	1	2
	Grayslake	21,790	24	0	4	2	18	469	61	399
	Grayville	1,554	15	0	0	1	14	24	4	18
	Greenville	7,233	2	0	0	0	2	126	22	103
	Gurnee	30,415	28	0	5	5	18	1,365	79	1,263
	Hampshire	6,006	2	0	0	1	1	64	18	45
	Hanover	768	24	0	0	0	24	20	3	17
	Hanover Park	36,166	49	0	10	15	24	536	81	436
	Harvard	10,063	4	0	1	1	2	89	16	72
	Harvey	27,461	401	12	20	239	130	1,766	755	753
	Harwood Heights	7,896	1	0	0	0	1	157	34	115
	Hawthorn Woods	8,205	1	0	0	0	1	34	0	29
	Hazel Crest	13,771	40	2	7	24	7	529	167	315
	Henning	225	0	0	0	0	0	0	0	0
	Henry	2,385	9	0	1	0	8	51	12	38
	Herrin	12,421	174	1	5	1	167	467	243	205
	Hickory Hills	13,050	20	0	2	4	14	297	31	252
	Highland	9,841	9	0	0	1	8	192	26	163
	Highland Park	31,306	17	0	2	0	15	364	60	296
	Highwood	5,317	9	1	2	0	6	46	5	39
	Hillsboro	6,017	21	0	2	0	19	46	5	41
	Hinckley	2,079	3	0	0	0	3	25	10	14
	Hinsdale	18,362	3	0	0	1	2	237	23	212
	Hodgkins	2,010	4	0	0	0	4	252	2	244
	Hoffman Estates	53,500	58	0	8	18	32	749	118	610
	Homer	1,111	6	0	0	0	6	6	2	4
	Hometown	4,004	0	0	0	0	0	54	7	46
	Homewood	18,062	32	0	0	23	9	738	104	613
	Hoopeston	5,507	23	0	9	1	13	208	64	137
	Huntley	26,256	7	0	0	2	5	206	22	181
	Indianola	217	0	0	0	0	0	0	0	0
	Irving	468	1	0	0	0	1	7	4	3
	Itasca	8,573	4	0	0	0	4	126	14	109
	Jacksonville	18,937	75	0	14	5	56	514	165	343
	Jerseyville	8,285	37	0	10	0	27	235	21	205
	Johnsburg	6,887	1	0	0	0	1	128	18	108
	Joliet	150,723	543	11	31	126	375	4,190	957	3,058
	Kankakee	26,481	245	4	42	99	100	1,132	339	746
	Kenilworth	2,354	0	0	0	0	0	38	5	33
	Kewanee	12,042	50	0	12	4	34	538	76	455
	Kildeer	4,131	1	0	0	0	1	40	5	35
	Kincaid	1,430	5	0	0	0	5	11	4	6
	Kingston	1,067	0	0	0	0	0	6	2	4
	Knoxville	2,860	1	0	0	0	1	58	16	39
	Lacon	1,797	1	0	0	0	1	18	5	12
	La Grange	14,987	11	0	0	8	3	202	46	150

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	La Grange Park	12,119	7	0	0	3	4	119	5	111
	Lake Bluff	6,173	0	0	0	0	0	31	11	19
	Lake in the Hills	30,023	32	0	0	3	29	238	41	189
	Lakemoor	6,129	12	0	0	1	11	79	37	41
	Lake Villa	8,922	13	0	1	2	10	97	7	87
	Lake Zurich	20,408	8	0	2	2	4	301	25	271
	La Salle	9,359	17	0	1	2	14	160	38	118
	Lawrenceville	4,201	15	0	1	0	14	60	23	31
	Leland Grove	1,408	0	0	0	0	0	22	7	14
	Lemont	16,379	5	0	0	0	5	170	18	148
	Le Roy	3,551	6	0	1	0	5	74	27	46
	Libertyville	21,709	17	0	10	2	5	360	40	312
	Lincoln	14,291	68	0	1	1	66	667	141	511
	Lincolnshire	8,080	3	0	0	2	1	108	9	99
	Lincolnwood	11,560	13	0	3	3	7	484	71	398
	Lindenhurst	14,743	4	0	3	0	1	76	10	66
	Lisle	22,976	16	0	0	8	8	314	34	264
	Litchfield	6,482	21	0	1	1	19	229	33	193
	Loami	777	0	0	0	0	0	4	1	3
	Lockport	25,986	35	1	4	4	26	312	31	275
	Lombard	42,394	53	0	5	12	36	1,187	94	1,069
	Loves Park	24,660	86	0	17	29	40	864	175	650
	Lyons	10,075	21	1	0	8	12	261	61	192
	Machesney Park	22,686	59	0	7	5	47	706	155	532
	Macomb	19,674	26	0	5	1	20	412	55	352
	Mahomet	6,784	11	0	1	1	9	74	16	56
	Manhattan	7,858	6	0	0	0	6	36	3	33
	Maple Park	1,352	0	0	0	0	0	5	0	5
	Marissa	1,965	6	0	0	2	4	51	18	31
	Maroa	1,538	6	0	0	0	6	18	4	13
	Martinsville	1,178	2	0	0	1	1	35	15	20
	Mascoutah	6,838	4	0	1	2	1	95	6	89
	Mattoon	16,834	91	2	21	5	63	486	141	323
	Maywood	24,448	221	3	9	98	111	962	297	562
	McCook	232	11	0	0	0	11	32	4	16
	McHenry	27,477	37	1	9	2	25	542	55	480
	McLean	790	0	0	0	0	0	5	0	5
	Melrose Park	21,405	57	0	10	15	32	628	93	439
	Mendota	6,908	3	0	1	1	1	177	24	152
	Meredosia	942	0	0	0	0	0	6	2	4
	Metropolis	6,414	45	0	7	6	32	278	50	226
	Midlothian	13,361	42	0	2	29	11	345	104	226
	Milan	5,124	11	0	4	1	6	130	23	98
	Milledgeville	903	1	0	0	0	1	29	7	22
	Millstadt	3,413	8	0	1	0	7	39	19	19
	Minooka	11,652	7	0	0	1	6	173	20	153
	Mokena	19,567	12	1	4	1	6	214	20	184
	Moline	42,510	216	1	26	22	167	1,487	302	1,140
	Momence	3,022	31	0	0	1	30	49	14	35

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Monmouth	9,092	56	1	6	5	44	473	78	380
	Montgomery	16,835	23	0	4	6	13	348	61	281
	Monticello	5,341	12	0	0	2	10	58	8	48
	Morris	14,035	33	0	5	5	23	505	65	432
	Morrison	4,245	5	0	1	0	4	76	19	57
	Morton	16,115	8	0	0	2	6	168	44	116
	Morton Grove	22,177	11	0	3	3	5	396	75	306
	Mount Carmel	7,227	21	0	7	0	14	114	24	83
	Mount Carroll	1,615	1	0	0	0	1	44	7	35
	Mount Morris	3,065	1	0	0	0	1	51	8	42
	Mount Prospect	52,190	35	1	5	4	25	666	72	567
	Mount Pulaski	1,549	2	0	0	0	2	13	1	12
	Mount Zion	5,214	4	0	1	1	2	54	10	43
	Moweaqua	1,798	0	0	0	0	0	3	2	1
	Mundelein	33,921	12	0	3	3	6	421	57	358
	New Athens	1,979	0	0	0	0	0	18	4	14
	New Lenox	24,716	10	0	1	2	7	266	18	244
	Normal	53,014	146	0	11	38	97	1,497	350	1,109
	Norridge	13,664	14	0	2	6	6	539	50	479
	North Aurora	16,276	35	0	6	3	26	283	28	253
	Northbrook	33,432	8	0	3	2	3	450	63	379
	Northfield	5,396	0	0	0	0	0	112	18	92
	Northlake	11,213	11	1	0	5	5	395	42	340
	North Riverside	6,092	16	0	2	7	7	541	20	506
	Oak Brook	8,753	3	1	0	0	2	609	13	591
	Oakbrook Terrace	2,371	3	0	0	1	2	121	8	111
	Oak Forest	27,339	39	0	3	15	21	459	88	356
	Oak Lawn	52,172	89	1	5	40	43	1,117	166	885
	Oak Park	52,629	192	1	5	138	48	1,725	380	1,274
	Oakwood	1,405	0	0	0	0	0	15	7	8
	Oakwood Hills	2,390	1	0	0	0	1	19	8	11
	Oblong	1,491	14	0	0	0	14	20	12	8
	O'Fallon	28,102	33	0	12	11	10	704	114	572
	Ogden	712	0	0	0	0	0	0	0	0
	Oglesby	3,644	5	0	0	0	5	46	3	41
	Old Shawneetown	245	1	0	0	0	1	4	1	3
	Olney	8,267	26	0	10	0	16	311	52	245
	Olympia Fields	4,665	10	0	3	4	3	204	23	171
	Orion	1,654	0	0	0	0	0	25	1	24
	Orland Park	55,051	23	1	1	7	14	1,159	38	1,106
	Oswego	31,336	32	0	11	2	19	473	36	434
	Palatine	66,024	34	0	9	10	15	893	39	840
	Palestine	1,296	1	0	0	0	1	9	1	8
	Palos Heights	12,369	3	0	0	3	0	220	9	210
	Palos Hills	16,571	4	0	0	2	2	188	23	158
	Palos Park	5,007	1	0	0	1	0	32	5	26
	Pana	5,601	3	0	0	0	3	110	29	76
	Paris	8,446	45	0	0	0	45	108	25	71
	Park City	6,644	9	0	3	3	3	142	34	97

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Park Forest	22,125	50	4	3	18	25	433	186	240
	Park Ridge	36,324	15	0	1	4	10	571	134	424
	Pawnee	2,514	4	1	0	0	3	31	4	26
	Pekin	33,196	116	3	15	6	92	843	170	634
	Peoria	114,557	878	22	31	306	519	5,163	1,460	3,436
	Peotone	4,374	2	0	1	0	1	49	7	42
	Peru	9,683	10	0	4	0	6	259	31	224
	Pinckneyville	5,303	7	1	0	0	6	26	5	20
	Pittsfield	4,328	0	0	0	0	0	6	0	6
	Plainfield	40,084	21	0	4	4	13	510	65	436
	Plano	13,645	19	0	11	3	5	198	44	146
	Plymouth	502	1	0	0	0	1	9	0	9
	Pontiac	11,076	53	0	6	2	45	360	57	300
	Pontoon Beach	6,094	6	0	2	3	1	114	31	79
	Posen	4,838	13	0	0	7	6	240	48	173
	Potomac	644	0	0	0	0	0	4	1	3
	Prairie du Rocher	557	0	0	0	0	0	0	0	0
	Prospect Heights	15,688	8	0	3	2	3	163	48	104
	Quincy	39,579	186	1	37	16	132	1,339	263	1,039
	Rankin	572	1	0	0	0	1	0	0	0
	Rantoul	12,053	129	0	20	6	103	318	123	181
	Raymond	874	0	0	0	0	0	1	1	0
	Red Bud	3,600	27	0	1	0	26	38	14	23
	Richmond	2,467	2	0	0	1	1	28	3	22
	Richton Park	12,694	35	0	7	17	11	385	135	205
	Ridge Farm	836	0	0	0	0	0	3	0	3
	River Forest	10,964	17	0	1	10	6	274	43	228
	River Grove	9,758	11	0	5	0	6	226	36	169
	Riverside	8,086	8	0	0	0	8	188	15	169
	Riverwoods	4,051	1	0	0	0	1	28	4	24
	Rochester	3,250	0	0	0	0	0	47	14	32
	Rock Falls	9,139	21	0	7	1	13	380	91	283
	Rockford	156,180	2,272	21	110	495	1,646	7,805	2,375	4,992
	Rock Island	37,534	307	3	21	51	232	1,306	356	872
	Romeoville	39,759	32	1	5	10	16	776	112	648
	Roodhouse	1,881	2	1	0	0	1	18	8	10
	Roselle	22,945	24	0	8	9	7	267	48	214
	Rosemont	3,836	4	0	0	0	4	231	12	206
	Round Lake	18,435	34	0	2	7	25	173	23	146
	Round Lake Beach	27,668	64	0	15	12	37	650	91	552
	Round Lake Heights	2,988	2	0	0	1	1	47	3	43
	Roxana	1,530	1	0	0	0	1	52	11	36
	Royalton	1,145	4	0	0	0	4	16	3	13
	Ruma	302	0	0	0	0	0	4	0	4
	Rushville	2,959	2	0	0	0	2	43	8	34
	Salem	7,180	16	0	2	1	13	357	69	284
	Sauget	236	17	1	3	1	12	58	2	51
	Schaumburg	70,170	85	1	18	35	31	2,282	243	1,974
	Schiller Park	11,279	21	0	4	10	7	241	49	177

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Shawneetown	1,219	2	0	0	0	2	12	0	12
	Sherman	3,945	5	0	0	0	5	39	7	31
	Shiloh	11,750	21	0	7	4	10	220	51	158
	Shorewood	16,666	15	0	3	2	10	172	38	131
	Sidell	580	0	0	0	0	0	0	0	0
	Silvis	7,728	28	0	3	2	23	319	44	268
	Skokie	66,088	157	0	9	61	87	1,800	368	1,356
	Sleepy Hollow	3,688	0	0	0	0	0	13	3	10
	Smithton	3,550	0	0	0	0	0	25	0	24
	Somonauk	1,847	1	0	1	0	0	30	3	27
	South Chicago Heights	3,701	20	0	0	8	12	149	22	117
	South Elgin	21,632	18	0	3	1	14	230	13	212
	Southern View	1,609	3	0	0	0	3	48	5	41
	South Holland	20,710	50	0	3	36	11	483	141	304
	South Jacksonville	3,145	5	0	3	0	2	40	3	37
	South Pekin	1,191	8	0	1	0	7	18	5	11
	Sparta	4,247	10	0	3	1	6	99	21	78
	Springfield	117,383	1,452	7	104	338	1,003	7,567	2,167	5,160
	Spring Grove	5,966	2	0	0	0	2	70	8	62
	St. Anne	1,238	2	0	1	0	1	33	8	25
	Staunton	5,025	9	0	1	2	6	107	15	89
	Steger	10,387	28	0	2	11	15	334	72	242
	Sterling	14,823	42	0	12	2	28	645	119	515
	Stockton	1,747	5	0	3	0	2	74	15	57
	Stone Park	4,774	14	0	0	1	13	97	42	51
	Streamwood	36,621	35	0	5	4	26	698	112	566
	Sugar Grove	10,523	6	0	3	1	2	73	13	56
	Summit	10,018	72	2	1	25	44	332	94	172
	Swansea	13,142	13	0	2	4	7	241	44	187
	Sycamore	18,283	7	0	2	1	4	286	22	257
	Thornton	2,331	3	0	1	1	1	50	11	34
	Tilton	3,008	11	0	2	4	5	51	16	34
	Tinley Park	59,607	49	0	8	16	25	975	108	845
	Trenton	2,600	2	0	1	0	1	22	0	22
	Troy	9,891	12	0	6	0	6	97	13	81
	Tuscola	4,531	3	0	0	0	3	53	7	46
	Urbana	39,784	292	0	23	64	205	1,253	341	889
	Vermont	739	0	0	0	0	0	0	0	0
	Vernon Hills	24,585	6	1	0	0	5	673	53	617
	Villa Park	21,984	30	1	2	12	15	492	65	401
	Warrensburg	1,136	1	0	0	0	1	12	1	11
	Warrenville	12,882	14	0	7	4	3	144	31	106
	Washburn	1,095	0	0	0	0	0	4	1	3
	Waterloo	10,073	3	0	0	0	3	81	7	74
	Watseka	5,290	13	0	0	1	12	166	45	118
	Wauconda	12,456	10	0	1	3	6	165	27	137
	Wayne	2,407	0	0	0	0	0	12	3	7
	Westchester	15,331	15	0	0	5	10	282	63	205
	West Chicago	26,470	29	0	7	3	19	361	82	267

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	West City	761	10	0	1	0	9	46	11	35
	West Dundee	8,220	8	0	1	2	5	240	11	227
	Western Springs	12,520	1	0	0	0	1	104	22	81
	West Frankfort	8,029	27	0	1	5	21	177	80	81
	Westmont	24,745	29	3	5	10	11	342	74	251
	Westville	2,922	14	0	2	2	10	46	13	29
	Wheaton	53,898	24	0	6	3	15	786	94	679
	Wheeling	35,500	62	1	9	8	44	637	99	512
	White Hall	2,397	1	0	1	0	0	29	6	23
	Willowbrook	8,674	9	0	1	0	8	167	22	141
	Willow Springs	5,872	1	0	0	1	0	48	7	39
	Wilmington	6,253	3	0	0	0	3	117	9	95
	Winfield	10,005	2	0	0	0	2	59	6	52
	Winnebago	3,228	1	0	0	0	1	56	24	31
	Winnetka	12,242	7	0	0	1	6	148	19	127
	Winthrop Harbor	7,171	10	0	4	1	5	96	22	69
	Witt	935	0	0	0	0	0	8	5	3
	Wood Dale	13,765	8	0	0	2	6	205	21	170
	Woodridge	34,137	48	0	8	13	27	429	42	366
	Wood River	10,787	44	0	11	8	25	541	66	455
	Woodstock	24,517	25	0	4	4	17	391	36	350
	Worth	10,210	9	0	0	2	7	157	31	117
	Yorkville	18,182	18	0	3	1	14	214	50	162
INDIANA	Albion	2,366	1	0	0	0	1	1	0	1
	Alexandria	5,609	4	0	1	0	3	255	40	208
	Anderson	57,156	199	3	32	85	79	3,072	753	2,095
	Angola	8,347	8	0	2	1	5	432	31	398
	Attica	3,239	6	0	2	2	2	66	15	44
	Auburn	13,229	14	0	5	3	6	361	76	276
	Aurora	4,120	19	0	1	1	17	134	24	110
	Austin	4,590	24	0	1	9	14	153	41	100
	Avon	13,259	51	0	0	5	46	548	47	487
	Bargersville	3,644	7	0	0	0	7	2	1	0
	Batesville	6,474	22	0	1	1	20	113	19	93
	Bedford	13,438	14	1	4	1	8	425	46	352
	Beech Grove	14,487	46	1	6	24	15	456	71	348
	Berne	4,451	5	0	1	0	4	31	7	22
	Bloomington	72,286	306	1	31	72	202	3,143	815	2,203
	Bluffton	9,160	0	0	0	0	0	386	71	314
	Boonville	6,863	11	0	0	0	11	178	7	160
	Brazil	8,266	50	0	4	0	46	198	23	167
	Bremen	4,682	1	0	0	0	1	81	11	67
	Brownsburg	21,380	32	0	2	1	29	276	57	210
	Burns Harbor	1,231	2	0	0	0	2	23	4	16
	Carmel	71,647	42	0	8	1	33	897	114	748
	Cedar Lake	11,411	7	0	3	4	0	417	57	341
	Charlestown	7,548	7	0	1	3	3	367	71	292
	Chesterfield	2,786	11	0	1	1	9	67	5	57

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Chesterton	13,140	14	0	3	3	8	281	46	226
	Clarksville	22,347	135	0	10	40	85	1,471	213	1,176
	Columbia City	8,501	10	0	5	1	4	181	26	145
	Columbus	40,554	78	0	17	21	40	2,269	282	1,834
	Corydon	2,819	1	0	0	0	1	45	12	31
	Crawfordsville	15,139	29	1	4	3	21	640	149	475
	Crown Point	25,011	19	0	2	8	9	522	36	460
	Culver	1,515	0	0	0	0	0	47	4	40
	Danville	8,652	4	0	2	0	2	109	13	91
	Decatur	9,682	3	0	0	1	2	66	18	46
	Delphi	2,828	3	0	1	0	2	88	11	74
	Dyer	16,198	10	1	0	4	5	353	25	292
	East Chicago	29,773	210	12	11	109	78	1,959	571	1,112
	Elkhart	53,296	156	1	35	116	4	2,330	709	1,507
	Ellettsville	6,169	43	0	1	1	41	85	26	57
	Elwood	9,042	13	0	5	4	4	536	117	411
	Evansville	116,541	493	5	63	143	282	5,544	1,086	4,248
	Fairmount	2,712	7	0	2	0	5	47	14	32
	Fishers	75,734	18	0	2	12	4	730	82	623
	Fort Wayne[5]	257,009	746	23	96	314	313	8,860	2,140	6,433
	Fowler	2,141	1	0	0	0	1	6	1	3
	Frankfort	16,533	43	0	4	9	30	716	144	541
	Franklin	24,118	51	0	6	3	42	903	96	799
	Gas City	5,661	42	0	5	2	35	247	63	179
	Goshen	32,812	33	0	11	15	7	1,040	242	764
	Greendale	4,427	8	0	1	2	5	33	13	20
	Greenfield	19,972	15	0	1	4	10	383	39	327
	Greenwood	49,847	179	0	3	21	155	1,772	113	1,602
	Griffith	16,252	36	1	6	10	19	621	93	470
	Hagerstown	1,618	1	0	1	0	0	59	19	39
	Hammond	76,216	663	10	27	209	417	3,881	1,070	2,317
	Hartford City	6,273	7	0	0	5	2	204	60	137
	Highland	22,583	17	0	1	6	10	821	81	683
	Hobart	28,136	78	0	2	19	57	1,467	158	1,225
	Huntingburg	6,113	0	0	0	0	0	88	10	73
	Huntington	16,803	21	0	2	1	18	366	76	277
	Jasper	14,292	4	0	2	0	2	173	29	136
	Jeffersonville	33,421	323	1	0	34	288	1,354	370	869
	Kokomo	45,412	152	3	20	63	66	2,380	475	1,862
	Lafayette	66,388	264	2	30	49	183	2,704	524	2,000
	Lake Station	13,253	27	1	5	8	13	541	85	428
	La Porte	21,282	36	0	5	18	13	1,111	186	895
	Lawrenceburg	4,856	10	0	4	5	1	210	15	191
	Ligonier	4,600	2	0	0	1	1	34	7	19
	Linton	5,679	2	0	1	0	1	208	0	207
	Logansport	18,544	21	0	7	3	11	872	96	724
	Long Beach	1,561	0	0	0	0	0	19	18	0
	Lowell	8,599	15	0	1	1	13	158	16	138
	Marion	30,342	90	0	21	53	16	1,435	268	1,079

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Martinsville	12,054	18	0	3	2	13	954	110	809
	Merrillville	33,839	95	3	4	35	53	1,273	110	1,038
	Michigan City	32,482	147	2	23	61	61	2,016	412	1,469
	Mishawaka	50,632	142	0	15	52	75	3,065	523	2,386
	Monticello	5,162	4	0	0	2	2	144	15	121
	Mooresville	11,970	7	0	1	1	5	331	51	261
	Mount Vernon	6,917	39	0	5	4	30	454	123	322
	Muncie	67,736	244	0	22	101	121	2,084	476	1,432
	Munster	22,188	29	0	0	8	21	453	43	400
	Nappanee	7,249	1	0	0	1	0	153	21	127
	New Albany	37,619	109	1	8	44	56	2,238	478	1,620
	New Castle	18,093	14	1	4	7	2	1,075	241	820
	New Haven	13,914	24	0	1	9	14	379	69	294
	New Whiteland	6,031	18	0	0	0	18	98	15	77
	Noblesville	44,661	31	1	7	3	20	872	119	720
	North Liberty	1,404	8	0	0	1	7	21	9	11
	North Vernon	6,274	5	0	3	0	2	255	43	198
	Oakland City	2,516	4	0	0	0	4	51	8	43
	Peru	12,184	16	0	1	2	13	220	69	137
	Plainfield	29,592	36	0	3	9	24	684	97	560
	Plymouth	11,294	11	0	4	2	5	417	54	345
	Portage	37,852	98	0	5	17	76	1,222	181	974
	Porter	5,475	4	0	0	0	4	82	11	67
	Portland	6,050	4	0	4	0	0	212	19	188
	Princeton	8,477	12	0	3	1	8	272	22	249
	Rensselaer	6,372	17	0	2	1	14	235	44	190
	Richmond	36,455	170	0	33	76	61	1,620	557	948
	Rushville	5,979	13	0	2	2	9	334	69	257
	Schererville	29,332	15	0	2	7	6	766	47	672
	Scottsburg	5,935	42	0	4	1	37	343	60	275
	Seymour	19,507	82	1	9	9	63	1,089	165	873
	Shelbyville[2]	18,797	8	0	2	0	6			934
	South Bend	104,182	746	6	52	339	349	5,929	2,216	3,411
	South Whitley	1,856	1	0	0	0	1	21	3	18
	Speedway	12,770	31	2	2	20	7	608	92	477
	St. John	13,874	1	0	0	1	0	171	10	156
	Tell City	7,465	9	0	4	1	4	214	46	162
	Terre Haute	60,156	146	2	33	68	43	4,202	1,086	2,760
	Tipton	4,982	3	0	1	1	1	148	31	116
	Valparaiso	30,981	46	0	5	14	27	811	112	668
	Vincennes	17,883	19	0	0	6	13	1,146	223	857
	Walkerton	2,175	2	0	0	0	2	30	9	18
	Warsaw	13,844	6	0	3	3	0	633	64	556
	Washington	11,706	21	0	1	0	20	559	156	369
	Waterloo	2,177	12	0	0	0	12	91	20	69
	Westfield	23,334	17	0	4	3	10	431	47	376
	West Lafayette	31,945	48	0	4	6	38	486	79	382
	Westville	5,034	2	0	1	0	1	58	12	44
	Whitestown	1,462	4	3	0	0	1	40	1	34

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Whiting	4,740	3	0	0	2	1	235	49	171
	Winchester	4,554	2	0	1	0	1	272	31	240
	Winona Lake	4,334	8	0	0	1	7	28	3	22
	Zionsville	14,472	3	0	0	0	3	194	36	157
IOWA	Adel	4,462	12	0	2	0	10	76	28	44
	Albia	3,541	4	0	1	0	3	69	13	55
	Algona	5,229	10	1	1	0	8	36	7	26
	Altoona	15,012	21	1	5	1	14	426	84	327
	Ames	57,817	177	1	24	10	142	1,556	289	1,217
	Anamosa	5,825	6	0	1	1	4	121	58	61
	Ankeny	44,995	47	1	12	8	26	704	105	578
	Atlantic	6,742	8	0	2	0	6	153	27	125
	Audubon	2,115	0	0	0	0	0	36	17	19
	Bettendorf	33,690	25	0	1	4	20	479	79	385
	Boone	12,565	37	0	3	0	34	298	99	191
	Burlington	25,650	164	1	16	19	128	1,002	255	711
	Camanche	4,315	7	0	0	0	7	60	16	40
	Carlisle	3,776	0	0	0	0	0	24	7	17
	Carroll	9,953	6	0	1	0	5	145	22	111
	Cedar Falls	39,350	71	1	10	3	57	684	113	552
	Cedar Rapids	129,605	379	1	33	123	222	4,966	1,026	3,701
	Centerville	5,367	24	0	3	0	21	190	43	133
	Chariton	4,366	12	0	1	0	11	100	29	63
	Charles City	7,373	9	0	0	0	9	134	22	110
	Cherokee	4,654	47	0	3	1	43	88	34	50
	Clarinda	5,316	19	0	3	0	16	168	31	127
	Clarion	2,669	1	0	0	0	1	32	4	24
	Clinton	26,591	148	1	13	20	114	1,166	246	875
	Clive	15,894	33	0	3	3	27	282	47	219
	Coralville	19,419	26	0	5	9	12	471	55	402
	Council Bluffs	61,181	636	1	60	77	498	3,646	801	2,412
	Cresco	3,714	3	0	0	1	2	101	41	56
	Creston	7,627	18	0	0	1	17	193	41	138
	Davenport	102,628	865	2	59	209	595	4,894	1,148	3,521
	Decorah	7,800	5	0	1	0	4	60	7	47
	Denison	7,241	7	0	1	0	6	77	15	59
	Des Moines	202,564	1,072	6	105	224	737	9,795	2,248	6,808
	De Witt	5,313	8	0	1	0	7	84	21	57
	Dubuque	57,744	333	0	18	36	279	1,771	463	1,257
	Dyersville	4,236	3	0	2	0	1	46	6	39
	Eldora	2,706	12	0	3	0	9	36	13	19
	Eldridge	5,078	3	0	0	1	2	67	8	55
	Emmetsburg	3,581	3	0	0	0	3	11	0	10
	Estherville	6,211	15	0	0	0	15	77	22	55
	Evansdale	5,177	7	0	3	0	4	134	45	79
	Fairfield	9,251	15	0	2	2	11	263	80	175
	Forest City	3,961	14	0	0	0	14	32	15	15
	Fort Dodge	25,204	79	0	3	23	53	1,270	380	835

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Fort Madison	10,901	63	0	17	1	45	357	88	244
	Glenwood	5,737	17	0	0	0	17	120	54	61
	Grinnell	9,147	20	0	3	1	16	172	26	144
	Hampton	4,187	1	0	0	0	1	23	1	22
	Hawarden	2,380	4	0	0	0	4	19	8	10
	Hiawatha	6,779	3	1	1	1	0	135	25	107
	Humboldt	4,205	1	0	0	0	1	21	9	10
	Independence	6,133	4	0	0	0	4	83	18	61
	Indianola	14,785	26	1	7	2	16	290	53	216
	Iowa City	70,411	183	0	32	31	120	1,533	283	1,176
	Iowa Falls	4,911	1	0	0	0	1	126	15	106
	Jefferson	4,109	4	0	0	0	4	54	17	35
	Johnston	17,024	19	0	1	3	15	193	28	154
	Keokuk	10,413	117	0	6	2	109	502	89	384
	Le Mars	9,199	17	0	5	0	12	261	39	204
	Lisbon	2,048	0	0	0	0	0	42	5	37
	Manchester	4,880	20	0	3	0	17	73	15	55
	Maquoketa	5,823	22	0	4	1	17	239	100	129
	Marion	34,562	53	0	10	5	38	581	132	418
	Marshalltown	26,041	107	0	1	3	103	1,061	293	718
	Mason City	27,344	47	0	11	1	35	1,058	203	807
	Monticello	3,742	2	0	0	0	2	35	8	23
	Mount Pleasant	8,751	40	0	4	0	36	247	71	169
	Mount Vernon	4,263	8	0	2	0	6	52	4	46
	Muscatine[2]	22,866	114	1	19	4	90		163	
	Nevada	6,806	55	0	6	0	49	174	26	142
	New Hampton	3,401	2	0	0	0	2	28	5	21
	Newton	14,909	19	1	0	0	18	473	70	385
	North Liberty	13,609	21	0	3	0	18	94	24	67
	Norwalk	9,331	7	0	1	0	6	104	15	85
	Oelwein	5,985	27	0	4	0	23	155	38	104
	Ogden	1,945	5	0	0	0	5	21	6	15
	Orange City	5,889	6	0	2	0	4	70	21	43
	Osage	3,461	3	0	0	0	3	33	7	25
	Osceola	4,814	3	0	1	0	2	101	15	82
	Oskaloosa	10,990	38	0	9	1	28	219	45	166
	Ottumwa	24,501	101	2	13	12	74	913	202	677
	Pella	10,332	31	0	1	0	30	126	23	95
	Perry	9,568	36	0	1	1	34	124	19	101
	Pleasant Hill	8,922	12	0	1	0	11	165	73	77
	Prairie City	1,446	3	0	0	0	3	16	10	5
	Red Oak	5,623	13	0	0	0	13	152	46	99
	Sac City	2,073	1	0	0	0	1	29	9	20
	Sergeant Bluff	4,142	9	0	0	0	9	66	8	57
	Sheldon	4,866	5	0	0	2	3	65	20	42
	Shenandoah	4,814	2	0	1	0	1	76	6	65
	Sioux City	83,494	285	0	22	32	231	3,103	618	2,333
	Spirit Lake	4,672	3	0	0	1	2	125	16	108
	St. Ansgar	1,036	0	0	0	0	0	3	0	3

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	State Center	1,348	1	0	0	0	1	14	3	11
	Storm Lake	9,582	45	0	1	2	42	276	87	181
	Story City	3,438	1	0	0	0	1	45	21	23
	Tipton	3,028	5	0	0	0	5	42	9	32
	Urbandale	40,124	58	0	12	4	42	718	122	576
	Vinton	5,144	10	0	3	0	7	67	11	54
	Washington	7,280	38	1	1	0	36	92	24	60
	Waterloo	67,203	435	3	33	70	329	2,558	812	1,635
	Waukee	14,091	15	0	2	0	13	207	61	142
	Webster City	7,664	32	0	4	0	28	263	71	181
	West Burlington	3,383	6	0	1	4	1	120	27	88
	West Des Moines	58,600	109	0	22	11	76	1,736	173	1,516
	West Liberty	3,725	2	0	0	0	2	59	26	31
	West Union	2,405	1	0	0	0	1	19	5	13
	Williamsburg	2,865	4	0	0	1	3	34	12	21
	Wilton	2,867	8	0	1	0	7	39	14	23
	Windsor Heights	4,657	13	0	3	4	6	182	16	160
	Winterset	4,883	6	0	1	0	5	174	85	86
KANSAS	Abilene	6,284	14	0	2	2	10	266	30	230
	Andover	11,091	14	0	4	0	10	361	34	315
	Anthony	2,130	1	0	0	0	1	42	12	25
	Arkansas City	10,960	53	0	9	2	42	495	89	388
	Arma	1,519	4	0	0	0	4	29	5	23
	Atchison	10,483	18	0	3	2	13	337	87	238
	Atwood	1,021	1	0	0	0	1	10	1	8
	Auburn	1,178	0	0	0	0	0	0	0	0
	Augusta	8,830	18	0	1	2	15	286	30	248
	Baldwin City	4,533	10	0	2	0	8	95	7	86
	Basehor	4,713	3	0	0	1	2	71	12	53
	Baxter Springs	4,132	6	0	2	0	4	60	20	36
	Bel Aire	7,009	3	0	0	1	2	53	9	42
	Beloit	3,659	12	0	1	0	11	44	14	29
	Bonner Springs	7,349	14	0	2	3	9	249	57	169
	Bucklin	794	0	0	0	0	0	0	0	0
	Burlington	2,685	2	0	0	0	2	16	4	12
	Bushton	284	0	0	0	0	0	0	0	0
	Caldwell	1,128	4	0	1	0	3	13	4	8
	Chanute	8,736	28	0	7	3	18	321	89	217
	Chase	447	0	0	0	0	0	0	0	0
	Chetopa	1,234	2	0	0	0	2	22	11	7
	Clay Center	4,378	6	0	1	0	5	116	32	78
	Clearwater	2,477	1	0	0	0	1	40	13	25
	Coffeyville	10,241	82	0	6	12	64	506	134	359
	Colby	4,811	10	0	0	0	10	141	28	109
	Columbus	3,179	5	0	1	1	3	51	10	37
	Concordia	5,091	14	0	7	0	7	154	32	113
	Council Grove	2,274	0	0	0	0	0	43	16	24
	Derby	23,607	46	0	5	0	41	574	83	470

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Dodge City	26,213	129	0	20	14	95	883	141	682
	Eastborough	815	1	0	0	0	1	0	0	0
	Edwardsville	4,595	10	0	1	1	8	90	30	49
	El Dorado	12,712	45	0	10	4	31	434	90	311
	Ellinwood	1,974	3	0	0	0	3	50	18	30
	Ellis	1,952	0	0	0	0	0	11	2	7
	Ellsworth	2,823	6	0	0	0	6	52	8	40
	Elwood	1,119	7	0	1	1	5	29	12	14
	Emporia	24,856	83	0	19	4	60	1,004	149	832
	Eskridge	563	0	0	0	0	0	4	3	1
	Eudora	6,540	9	0	0	0	9	143	20	116
	Fairway	3,912	3	0	0	1	2	26	6	19
	Fort Scott	7,959	24	0	2	2	20	399	94	289
	Frontenac	3,244	7	0	0	0	7	87	40	43
	Galena	3,126	14	0	0	0	14	90	25	55
	Garden City	28,736	116	0	22	13	81	1,019	144	840
	Gardner	19,112	30	0	4	3	23	378	49	321
	Garnett	3,166	22	0	1	0	21	61	20	36
	Geneseo	261	0	0	0	0	0	0	0	0
	Girard	2,719	7	0	1	0	6	101	18	81
	Goddard	4,352	6	0	1	0	5	74	13	58
	Grandview Plaza	1,432	11	0	2	0	9	36	11	25
	Great Bend	15,794	95	1	18	4	72	868	161	669
	Hays	20,537	62	0	7	2	53	630	73	542
	Haysville	10,765	41	0	14	4	23	269	35	223
	Herington	2,396	9	0	3	0	6	73	17	56
	Hesston	3,881	1	0	0	0	1	67	16	50
	Hiawatha	3,178	1	0	0	0	1	43	6	35
	Highland	936	0	0	0	0	0	33	12	19
	Hill City	1,292	5	0	0	0	5	32	5	26
	Hillsboro	2,607	4	0	3	0	1	52	9	41
	Hoisington	2,802	6	0	1	0	5	49	16	28
	Holcomb	2,176	0	0	0	0	0	30	18	12
	Holton	3,306	9	0	1	0	8	85	23	58
	Hoxie	1,076	0	0	0	0	0	11	0	10
	Hugoton	3,456	0	0	0	0	0	15	0	15
	Humboldt	1,812	2	0	1	0	1	21	4	16
	Hutchinson	40,981	244	2	23	35	184	2,870	588	2,177
	Iola	5,704	20	0	8	0	12	230	42	175
	Junction City	21,298	157	4	11	25	117	529	102	416
	Kansas City	143,867	823	25	62	289	447	7,735	1,922	4,684
	Lansing	11,003	34	0	2	0	32	197	67	124
	Larned	3,504	21	0	0	2	19	89	23	63
	Lawrence	93,945	413	0	40	61	312	3,841	522	3,163
	Leavenworth	35,290	257	2	15	47	193	1,225	391	762
	Leawood	32,422	13	0	2	1	10	479	66	389
	Lebo	912	1	0	0	0	1	7	2	5
	Lenexa	49,282	66	1	9	12	44	995	159	752
	Liberal	20,226	91	2	6	11	72	612	160	436

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lindsborg	3,237	3	0	1	0	2	60	18	40
	Louisburg	4,093	0	0	0	0	0	50	10	39
	Lyons	3,394	2	0	1	0	1	3	0	3
	Macksville	477	0	0	0	0	0	5	3	2
	Maize	3,477	12	0	0	0	12	95	25	70
	Marion	1,849	4	0	1	0	3	35	10	22
	Marysville	3,103	6	0	2	0	4	65	15	49
	Mayetta	363	0	0	0	0	0	0	0	0
	McLouth	822	7	0	0	0	7	19	2	16
	McPherson	13,371	29	0	5	0	24	282	60	211
	Meriden	752	0	0	0	0	0	0	0	0
	Minneapolis	1,956	3	0	2	0	1	53	14	36
	Mission	9,920	36	0	4	16	16	403	36	302
	Moran	521	0	0	0	0	0	0	0	0
	Moundridge	1,635	2	0	2	0	0	16	3	13
	Mulvane	6,033	9	0	1	2	6	102	22	77
	Neodesha	2,559	8	1	1	0	6	33	6	27
	Newton	18,637	92	0	15	5	72	430	83	329
	Norton	2,643	2	0	1	0	1	30	4	24
	Oakley	1,794	3	0	0	0	3	17	3	14
	Oberlin	1,600	2	0	0	0	2	14	6	8
	Olathe	126,090	216	4	41	28	143	2,307	243	1,922
	Osage City	2,766	12	0	0	0	12	69	11	56
	Osawatomie	4,554	23	0	1	0	22	110	20	87
	Ottawa	13,073	37	1	7	1	28	366	62	289
	Overland Park	178,669	289	0	40	36	213	4,185	491	3,389
	Paola	5,415	13	0	3	3	7	127	27	94
	Park City	8,295	24	0	5	1	18	158	32	116
	Parsons	11,026	132	0	6	18	108	735	249	469
	Pittsburg	19,817	72	2	8	10	52	1,140	209	884
	Prairie Village	21,821	51	0	5	1	45	331	75	239
	Pratt	6,336	18	0	0	1	17	156	36	117
	Roeland Park	7,059	17	0	5	9	3	265	27	220
	Rose Hill	4,187	3	0	1	0	2	53	7	44
	Russell	4,167	18	0	1	1	16	63	15	42
	Sabetha	2,454	7	0	0	1	6	34	10	21
	Salina	46,547	189	1	27	29	132	2,269	393	1,787
	Scott City	3,475	14	1	5	1	7	57	13	36
	Shawnee	63,652	119	4	22	22	71	1,215	223	868
	South Hutchinson	2,559	2	0	0	0	2	107	16	88
	Spring Hill	5,644	14	0	3	0	11	101	17	80
	Sterling	2,541	3	0	1	0	2	43	12	31
	St. Marys	2,326	1	0	1	0	0	19	1	17
	Tonganoxie	4,657	11	0	1	1	9	111	22	86
	Topeka	125,306	697	14	51	222	410	7,506	1,598	5,404
	Ulysses	5,512	14	0	0	2	12	84	19	62
	Valley Center	6,799	13	0	3	0	10	126	24	95
	Wa Keeney	1,730	2	0	0	0	2	13	3	9
	Wakefield	907	0	0	0	0	0	0	0	0

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wamego	4,414	1	0	0	0	1	73	7	63
	Wathena	1,280	3	0	0	1	2	35	7	25
	Wellington	7,639	31	0	2	1	28	328	83	230
	Wellsville	1,729	5	0	0	1	4	55	14	40
	Westwood	1,879	1	0	0	0	1	43	8	33
	Wichita	376,880	3,026	16	246	481	2,283	18,241	4,241	12,472
	Winchester	562	0	0	0	0	0	4	0	4
	Winfield	11,126	41	0	4	4	33	409	69	323
KENTUCKY	Alexandria	8,509	2	0	1	1	0	182	21	158
	Anchorage	3,414	0	0	0	0	0	23	11	12
	Ashland	21,209	76	0	9	46	21	1,408	408	953
	Auburn	1,508	1	0	0	0	1	8	5	2
	Audubon Park	1,680	3	0	0	0	3	55	20	31
	Barbourville	3,625	0	0	0	0	0	50	15	32
	Bardstown	11,339	22	0	3	6	13	323	84	223
	Bardwell	826	0	0	0	0	0	2	0	2
	Beattyville	1,096	2	0	0	2	0	10	5	5
	Beaver Dam	3,120	6	0	1	0	5	15	2	11
	Bellefonte	855	0	0	0	0	0	6	1	5
	Bellevue	5,822	7	0	0	4	3	299	47	242
	Benham	524	0	0	0	0	0	1	1	0
	Benton	4,346	0	0	0	0	0	92	18	68
	Berea	15,130	17	0	1	7	9	486	117	344
	Bowling Green	57,308	152	0	39	55	58	2,662	512	2,022
	Brandenburg	2,155	4	0	0	2	2	43	15	27
	Brownsville	995	2	0	0	0	2	6	4	0
	Burnside	995	1	0	0	0	1	42	11	30
	Cadiz	2,602	7	0	0	5	2	80	22	55
	Calhoun	774	0	0	0	0	0	1	1	0
	Calvert City	2,753	1	0	1	0	0	26	7	14
	Campbellsville	11,340	23	0	4	9	10	392	97	288
	Carrollton	3,933	6	0	0	0	6	82	21	56
	Catlettsburg	1,824	4	0	1	0	3	84	25	57
	Cave City	2,009	2	0	0	0	2	44	10	26
	Central City	5,655	9	1	3	1	4	57	8	47
	Clarkson	841	0	0	0	0	0	6	3	3
	Clay City	1,328	7	0	0	1	6	27	14	13
	Cloverport	1,222	1	0	1	0	0	2	2	0
	Coal Run Village	626	1	0	0	1	0	7	4	3
	Cold Spring	6,172	7	0	0	5	2	179	13	155
	Columbia	4,644	1	0	1	0	0	29	12	15
	Corbin	8,335	32	1	3	17	11	334	89	235
	Covington	43,054	321	1	39	186	95	2,330	695	1,454
	Cumberland	2,329	2	0	0	0	2	26	10	14
	Cynthiana	6,281	15	0	3	4	8	313	57	246
	Danville	15,646	48	1	8	19	20	582	139	427
	Dawson Springs	2,872	6	0	1	0	5	36	10	22
	Dayton	5,418	7	0	1	2	4	131	35	88

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Dry Ridge	2,222	1	0	0	1	0	7	1	4
	Earlington	1,550	1	0	1	0	0	4	1	2
	Eddyville	2,409	0	0	0	0	0	31	4	25
	Edgewood	8,885	3	0	1	2	0	148	24	121
	Edmonton	1,606	0	0	0	0	0	6	3	2
	Elizabethtown	24,712	48	0	13	22	13	956	139	784
	Elkton	1,988	1	0	0	0	1	30	11	15
	Elsmere	7,999	16	0	2	9	5	122	43	68
	Eminence	2,245	6	0	0	0	6	25	8	15
	Erlanger	21,384	36	0	13	14	9	678	114	535
	Falmouth	2,028	3	0	0	0	3	72	21	50
	Ferguson	940	0	0	0	0	0	4	4	0
	Flatwoods	7,678	6	0	0	6	0	104	57	42
	Flemingsburg	2,654	0	0	0	0	0	38	15	23
	Florence	28,869	63	0	18	27	18	1,586	206	1,317
	Fort Mitchell	7,539	3	0	0	2	1	173	23	135
	Fort Thomas	15,141	6	0	4	1	1	226	43	176
	Fort Wright	5,436	14	0	0	11	3	404	40	355
	Frankfort	27,319	76	5	6	42	23	951	188	745
	Franklin	7,944	17	0	4	7	6	329	72	240
	Fulton	2,388	9	0	4	1	4	95	22	63
	Georgetown	22,441	126	2	7	18	99	1,008	123	849
	Glasgow	14,381	22	0	3	6	13	301	62	221
	Graymoor-Devondale	3,156	2	0	0	2	0	81	23	55
	Grayson	3,871	5	0	2	3	0	99	36	57
	Greensburg	2,389	2	0	0	1	1	19	5	14
	Greenville	4,286	3	0	2	1	0	20	9	10
	Guthrie	1,455	6	0	1	2	3	13	4	9
	Hardinsburg	2,420	0	0	0	0	0	5	2	2
	Harlan	1,838	9	0	2	2	5	88	10	76
	Harrodsburg	8,154	18	0	6	3	9	121	54	62
	Hartford	2,632	1	0	0	1	0	7	1	4
	Hazard	4,736	15	0	3	4	8	316	93	211
	Henderson	27,978	23	0	3	8	12	1,045	174	828
	Highland Heights Southgate	10,660	65	0	2	4	59	145	46	93
	Hillview	7,601	10	0	1	4	5	201	56	136
	Hodgenville	2,732	1	0	0	0	1	18	8	10
	Hopkinsville	32,265	129	4	26	42	57	1,253	335	868
	Horse Cave	2,292	1	0	0	1	0	7	4	3
	Independence	22,935	14	0	7	2	5	319	66	240
	Indian Hills	3,555	3	0	0	1	2	34	18	15
	Inez	419	0	0	0	0	0	5	0	3
	Irvine	2,616	4	0	1	1	2	66	24	39
	Irvington	1,398	0	0	0	0	0	0	0	0
	Jackson	2,361	1	0	0	0	1	35	15	18
	Jamestown	1,755	2	0	0	0	2	17	7	9
	Jeffersontown	26,411	47	0	8	33	6	570	121	402
	Jenkins	2,190	2	0	0	1	1	9	5	4
	Junction City	2,211	1	0	0	1	0	11	6	5

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	La Grange	6,638	10	0	2	6	2	123	30	91
	Lakeside Park-Crestview Hills	6,458	7	0	1	2	4	141	14	124
	Lancaster	4,459	3	0	1	0	2	82	23	56
	Lawrenceburg	10,225	17	0	7	4	6	60	15	39
	Lebanon	6,371	9	1	2	4	2	175	71	98
	Leitchfield	6,562	8	0	2	0	6	182	47	125
	Lewisburg	912	0	0	0	0	0	6	1	5
	Lexington	300,069	1,724	18	87	593	1,026	11,024	2,679	7,704
	Liberty	1,914	3	0	0	1	2	8	6	1
	London	7,958	16	1	5	3	7	390	60	305
	Louisa	2,091	3	0	1	1	1	83	23	59
	Louisville Metro	637,428	3,734	52	229	1,603	1,850	29,551	7,571	20,005
	Loyall	697	0	0	0	0	0	24	12	12
	Ludlow	4,845	16	0	5	9	2	227	57	161
	Lynch	812	1	0	0	0	1	2	2	0
	Manchester	1,962	2	0	0	0	2	59	16	41
	Marion	3,031	2	0	1	0	1	51	13	36
	Mayfield	10,149	34	0	6	8	20	280	101	169
	Maysville	9,207	17	0	6	6	5	540	188	341
	Meadow Vale	861	1	0	0	0	1	10	1	7
	Middlesboro	9,775	31	1	3	15	12	599	96	490
	Monticello	6,152	13	0	0	6	7	175	71	101
	Morehead	7,714	14	2	2	3	7	202	42	149
	Morganfield	3,240	0	0	0	0	0	25	5	20
	Morgantown	2,558	1	0	0	0	1	9	3	5
	Mount Sterling	7,145	31	0	2	15	14	435	100	318
	Mount Vernon	2,555	12	0	1	7	4	52	20	28
	Mount Washington	12,414	8	0	2	1	5	185	50	124
	Munfordville	1,588	2	0	1	0	1	15	4	9
	Murray	16,677	24	1	8	6	9	670	164	493
	Newport	15,738	62	3	5	42	12	1,222	240	917
	Nicholasville	27,686	52	0	8	25	19	1,186	297	845
	Nortonville	1,223	0	0	0	0	0	10	2	7
	Oak Grove	9,673	27	0	7	9	11	273	111	141
	Olive Hill	1,758	0	0	0	0	0	21	5	15
	Owensboro	55,848	115	2	36	28	49	2,255	399	1,772
	Owenton	1,467	0	0	0	0	0	7	0	6
	Owingsville	1,645	3	0	1	0	2	38	8	30
	Paducah	25,643	92	0	14	50	28	1,232	183	1,005
	Paintsville	4,152	9	0	2	4	3	125	22	93
	Paris	9,189	22	0	4	9	9	250	80	155
	Park Hills	2,770	1	0	0	0	1	35	6	27
	Pikeville	6,407	11	0	1	4	6	389	28	352
	Pineville	2,041	1	0	1	0	0	50	14	34
	Pioneer Village	2,733	3	1	1	1	0	4	1	3
	Prestonsburg	3,825	12	0	1	4	7	100	26	68
	Princeton	6,366	19	1	1	11	6	192	50	133
	Providence	3,399	2	0	0	1	1	44	12	32
	Raceland	2,857	1	0	0	0	1	25	6	18

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Radcliff	22,251	171	0	10	13	148	710	164	521
	Richmond	34,068	126	2	8	66	50	1,923	461	1,405
	Russell	3,632	4	0	0	3	1	90	20	70
	Russell Springs	2,335	2	0	0	1	1	51	16	34
	Russellville	7,254	22	0	9	6	7	292	64	213
	Sadieville	333	0	0	0	0	0	1	1	0
	Science Hill	667	1	0	0	0	1	4	2	2
	Scottsville	4,558	0	0	0	0	0	0	0	0
	Shelbyville	11,637	37	0	6	18	13	302	103	191
	Shepherdsville	9,424	16	1	6	3	6	280	66	200
	Shively	16,609	92	1	5	64	22	690	197	408
	Silver Grove	1,150	0	0	0	0	0	26	9	16
	Simpsonville	1,500	0	0	0	0	0	16	4	11
	Somerset	12,266	33	0	8	20	5	686	112	558
	South Shore	1,277	1	0	0	1	0	3	2	1
	Springfield	2,785	0	0	0	0	0	15	4	11
	Stamping Ground	709	0	0	0	0	0	4	1	3
	Stanford	3,379	2	0	0	1	1	24	10	13
	Stanton	3,070	1	0	0	0	1	54	9	44
	St. Matthews	18,885	27	0	1	15	11	744	124	595
	Strathmoor Village	738	0	0	0	0	0	9	7	1
	Sturgis	1,889	1	0	0	0	1	5	0	5
	Taylor Mill	7,123	3	0	1	1	1	88	28	57
	Taylorsville	1,300	1	0	0	1	0	15	3	12
	Tompkinsville	2,603	3	0	1	1	1	3	2	1
	Uniontown	1,017	0	0	0	0	0	8	4	3
	Vanceburg	1,681	1	0	0	1	0	13	3	10
	Versailles	7,924	20	0	6	6	8	666	137	508
	Villa Hills	7,704	0	0	0	0	0	33	8	24
	Vine Grove	4,558	4	0	0	2	2	80	21	52
	Warsaw	1,798	0	0	0	0	0	18	5	10
	West Liberty	3,356	1	0	0	1	0	47	10	33
	West Point	968	0	0	0	0	0	5	1	4
	Whitesburg	1,452	2	0	0	1	1	17	1	15
	Wilder	2,956	3	0	0	2	1	77	8	66
	Williamsburg	5,176	9	0	3	0	6	141	49	87
	Williamstown	3,533	3	0	0	0	3	97	28	62
	Wilmore	6,028	0	0	0	0	0	85	11	73
	Winchester	16,754	76	2	4	21	49	841	200	622
	Worthington	1,700	0	0	0	0	0	9	8	1
LOUISIANA	Abbeville	12,310	123	1	5	14	103	428	160	259
	Addis	4,043	6	0	0	0	6	1	0	1
	Alexandria	49,283	592	4	11	184	393	3,787	943	2,714
	Amite	4,386	71	0	5	11	55	467	131	324
	Baker	13,460	23	0	2	12	9	503	132	347
	Basile	2,357	3	0	0	0	3	9	1	8
	Bastrop	11,542	118	0	3	26	89	1,349	454	832
	Berwick	4,266	5	0	0	1	4	66	25	39

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Blanchard	2,734	1	0	0	0	1	51	14	35
	Bogalusa	12,581	182	0	12	40	130	838	301	486
	Bossier City	64,232	397	1	27	71	298	2,663	480	2,036
	Broussard	8,227	43	2	5	9	27	665	349	316
	Brusly	2,129	0	0	0	0	0	2	1	1
	Carencro	6,897	71	0	1	11	59	260	65	183
	Church Point	4,664	34	0	2	3	29	67	39	25
	Clarence	501	0	0	0	0	0	0	0	0
	Clinton	1,867	11	0	0	1	10	40	11	27
	Coushatta	2,030	23	0	0	1	22	56	15	41
	Covington	9,325	34	0	2	4	28	272	49	213
	Crowley	13,878	112	1	4	15	92	526	129	382
	Cullen	1,345	18	0	0	1	17	12	5	7
	Denham Springs	10,504	53	0	5	16	32	817	135	665
	De Ridder	10,250	70	0	0	0	70	261	59	201
	Epps	1,090	9	0	0	0	9	2	2	0
	Erath	2,160	15	0	0	4	11	11	1	10
	Eunice	11,492	125	0	8	15	102	764	253	497
	Farmerville	3,574	39	0	3	2	34	194	55	132
	Ferriday	3,529	33	1	0	2	30	52	49	0
	Franklin	7,538	76	2	0	11	63	468	85	368
	Franklinton	3,771	25	0	1	1	23	219	46	166
	French Settlement	1,081	3	0	0	1	2	33	2	30
	Georgetown	320	1	0	0	0	1	1	1	0
	Golden Meadow	2,095	12	0	0	4	8	50	19	31
	Gonzales[6]	9,738	9	0	0	1	8			378
	Grambling	4,931	15	0	0	1	14	137	127	8
	Gramercy	3,266	27	0	0	0	27	79	8	63
	Greenwood	2,808	11	0	1	2	8	57	27	26
	Gretna	17,901	89	2	6	17	64	644	146	440
	Hammond	20,386	335	0	10	97	228	2,326	964	1,253
	Harahan	9,431	14	0	1	2	11	124	31	89
	Houma	32,688	254	4	12	86	152	1,576	358	1,131
	Independence	1,806	20	0	0	1	19	75	26	49
	Iowa	2,634	8	0	0	2	6	111	33	77
	Jeanerette	5,848	47	0	0	5	42	129	48	74
	Jena	2,845	3	0	0	1	2	2	1	0
	Jennings	10,418	58	2	2	7	47	312	85	222
	Kaplan	4,996	217	0	4	7	206	409	117	287
	Kenner	67,889	209	8	22	80	99	2,352	386	1,809
	Kentwood	2,315	22	1	0	5	16	209	78	128
	Kinder	2,403	11	0	1	0	10	82	0	80
	Lafayette	115,378	940	12	20	240	668	6,989	1,432	5,267
	Lake Arthur	2,857	4	0	1	0	3	95	18	76
	Lake Charles	71,795	488	7	27	148	306	3,047	1,826	1,088
	Lake Providence	4,128	37	0	0	2	35	27	19	8
	Leesville	5,817	69	0	8	21	40	355	27	324
	Lutcher	3,407	31	0	1	0	30	47	34	12
	Mamou	3,372	5	0	0	0	5	121	7	110

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Mandeville	12,825	32	0	0	2	30	339	32	304
	Mansfield	5,339	144	0	1	1	142	347	117	222
	Many	2,698	26	0	0	3	23	164	35	127
	Marion	753	8	0	0	0	8	15	7	8
	Minden	12,799	27	1	1	6	19	252	60	179
	Monroe	51,709	408	6	19	86	297	4,577	1,577	2,884
	Moreauville	931	4	0	0	0	4	6	0	5
	Morgan City	11,367	89	0	10	22	57	567	139	410
	Napoleonville	646	1	0	0	0	1	0	0	0
	Natchitoches	17,667	144	4	5	16	119	1,018	420	590
	New Orleans	356,317	2,593	175	144	953	1,321	12,645	3,695	6,540
	Norwood	327	0	0	0	0	0	1	1	0
	Oak Grove	1,918	15	0	1	0	14	70	36	28
	Oil City	1,212	2	0	0	0	2	15	4	10
	Olla	1,328	4	0	2	0	2	34	5	28
	Opelousas	23,268	248	6	15	41	186	1,364	370	931
	Pearl River	2,256	11	0	2	0	9	88	17	66
	Pineville	15,064	47	1	0	7	39	693	119	552
	Plaquemine	6,646	56	2	0	3	51	295	33	250
	Pollock	385	3	0	0	0	3	12	5	7
	Ponchatoula	6,524	74	0	5	8	61	350	117	218
	Port Allen	4,892	21	0	1	4	16	221	63	143
	Port Vincent	541	8	0	0	1	7	40	19	19
	Rayville	3,988	25	0	1	5	19	259	40	211
	Ruston	21,391	111	0	7	20	84	1,013	368	620
	Scott	9,335	27	1	1	2	23	204	37	156
	Shreveport	199,900	1,533	26	121	355	1,031	9,459	2,616	6,317
	Slidell	27,772	106	0	16	21	69	1,549	177	1,295
	Springhill	5,064	6	0	0	3	3	142	31	111
	Sterlington	1,447	4	0	1	0	3	6	4	2
	Stonewall	1,930	1	0	0	0	1	7	1	6
	Sulphur	19,632	269	0	3	19	247	999	220	753
	Tallulah	7,218	62	1	2	6	53	257	83	169
	Thibodaux	14,487	69	0	4	16	49	796	119	653
	Tickfaw	703	4	1	0	3	0	27	0	25
	Vidalia	4,070	39	0	2	3	34	176	38	137
	Vinton	3,385	11	0	1	0	10	105	28	71
	Walker	6,567	45	0	4	13	28	368	77	285
	West Monroe	12,930	71	2	7	11	51	949	205	709
	Westwego	10,226	15	0	0	3	12	196	45	138
	Winnfield	4,995	140	0	3	13	124	264	89	160
	Zachary	15,696	44	2	1	8	33	219	22	189
	Zwolle	1,737	13	0	1	2	10	40	39	1
MAINE	Ashland	1,457	1	0	0	0	1	16	13	3
	Auburn	22,953	41	0	9	19	13	895	134	742
	Augusta	18,514	57	0	13	12	32	1,208	222	965
	Baileyville	1,524	2	0	1	0	1	42	10	29
	Bangor	31,587	52	3	4	30	15	1,730	198	1,485

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Bar Harbor	5,243	1	0	1	0	0	55	5	49
	Bath	8,879	8	0	4	3	1	251	25	220
	Belfast	6,748	12	0	7	2	3	254	39	206
	Berwick	7,707	9	0	3	0	6	146	34	108
	Biddeford	21,511	66	0	17	18	31	1,029	157	850
	Boothbay Harbor	2,252	4	0	2	0	2	96	11	84
	Brewer	9,097	7	0	2	0	5	314	37	273
	Bridgton	5,608	5	0	3	0	2	107	16	90
	Brownville	1,288	0	0	0	0	0	53	17	36
	Brunswick	22,171	16	0	6	6	4	422	55	355
	Bucksport	4,951	13	0	1	0	12	116	32	81
	Buxton	8,179	7	0	2	3	2	97	22	67
	Calais	3,145	43	0	2	1	40	192	45	146
	Camden	5,279	1	0	1	0	0	85	12	71
	Cape Elizabeth	8,825	1	0	0	0	1	119	14	104
	Caribou	8,063	7	0	0	1	6	182	32	149
	Carrabassett Valley	474	1	0	1	0	0	55	1	53
	Clinton	3,328	11	0	4	1	6	62	29	31
	Cumberland	7,744	3	0	1	0	2	36	14	22
	Damariscotta	1,905	7	0	3	0	4	57	12	45
	Dexter	3,687	3	0	1	0	2	109	35	72
	Dixfield	2,532	2	0	1	0	1	46	8	38
	Dover-Foxcroft	4,165	5	0	1	0	4	145	34	105
	East Millinocket	3,177	1	0	1	0	0	41	6	33
	Eastport	1,509	0	0	0	0	0	10	3	7
	Eliot	6,358	2	0	2	0	0	24	9	15
	Ellsworth	7,243	15	0	1	4	10	263	36	219
	Fairfield	6,695	5	0	2	1	2	245	45	192
	Falmouth	10,921	3	0	0	2	1	146	26	116
	Farmington	7,602	10	0	7	1	2	224	19	203
	Fort Fairfield	3,443	7	0	0	0	7	31	4	25
	Fort Kent	4,212	5	0	0	0	5	24	4	20
	Freeport	8,392	2	0	1	1	0	181	31	149
	Fryeburg	3,313	7	0	1	0	6	69	25	43
	Gardiner	6,103	11	0	6	1	4	193	46	144
	Gorham	15,940	15	0	4	5	6	174	63	98
	Gouldsboro	2,011	0	0	0	0	0	15	9	6
	Greenville	1,721	6	0	0	0	6	39	14	25
	Hallowell	2,434	1	1	0	0	0	66	13	51
	Hampden	7,052	0	0	0	0	0	122	13	106
	Holden	3,048	1	0	0	1	0	50	15	35
	Houlton	6,105	7	0	1	0	6	145	19	126
	Jay	4,739	4	0	3	0	1	76	19	55
	Kennebunk	11,577	4	0	3	0	1	141	38	102
	Kennebunkport	4,031	0	0	0	0	0	52	4	47
	Kittery	10,632	6	0	4	2	0	183	35	144
	Lewiston	35,153	93	2	16	42	33	1,056	179	862
	Limestone	2,252	3	0	0	0	3	59	17	39
	Lincoln	5,318	5	0	2	0	3	217	67	144

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lincolnville	2,205	2	0	0	0	2	41	13	28
	Lisbon	9,355	6	0	2	1	3	107	24	80
	Livermore Falls	3,134	5	0	4	0	1	82	23	56
	Machias	2,124	9	0	3	0	6	39	9	30
	Madawaska	4,319	0	0	0	0	0	40	13	25
	Madison	4,578	2	0	1	0	1	186	38	145
	Mechanic Falls	3,254	1	0	1	0	0	27	5	22
	Mexico	2,828	2	0	0	1	1	108	25	83
	Milbridge	1,289	0	0	0	0	0	8	1	7
	Millinocket	4,891	3	0	0	0	3	102	22	76
	Milo	2,313	1	0	1	0	0	94	31	60
	Monmouth	3,959	2	0	2	0	0	66	18	48
	Mount Desert	2,188	0	0	0	0	0	44	19	25
	Newport	3,151	4	0	1	2	1	163	37	121
	North Berwick	4,921	3	0	0	1	2	57	25	30
	Norway	4,755	5	0	2	1	2	127	31	93
	Oakland	6,236	3	0	1	0	2	154	22	130
	Ogunquit	1,264	0	0	0	0	0	37	4	33
	Old Orchard Beach	9,494	27	0	5	6	16	317	64	238
	Old Town	7,731	3	0	0	1	2	303	34	265
	Orono	10,290	2	0	0	1	1	165	19	144
	Oxford	3,935	2	0	0	1	1	103	16	85
	Paris	4,942	6	0	3	2	1	82	15	65
	Phippsburg	2,185	0	0	0	0	0	13	3	8
	Pittsfield	4,186	4	0	2	0	2	90	14	72
	Portland	63,166	242	6	33	129	74	2,921	599	2,246
	Presque Isle	9,050	12	0	2	5	5	424	60	361
	Rangeley	1,183	1	0	0	0	1	15	4	11
	Richmond	3,457	1	0	0	0	1	43	19	20
	Rockland	7,458	5	1	1	0	3	408	45	357
	Rockport	3,563	0	0	0	0	0	34	9	25
	Rumford	6,236	10	0	9	0	1	171	41	125
	Sabattus	4,744	3	0	2	0	1	88	26	58
	Saco	18,417	21	0	1	6	14	570	110	439
	Sanford	21,216	42	0	15	7	20	831	158	635
	Scarborough	19,549	10	0	4	2	4	485	73	403
	Searsport	2,588	3	0	1	0	2	61	18	42
	Skowhegan	8,611	15	0	6	4	5	349	58	282
	South Berwick	7,221	1	0	1	0	0	70	13	57
	South Portland	24,144	49	0	2	11	36	902	92	788
	Southwest Harbor	1,962	1	0	0	0	1	43	6	36
	Swan's Island	302	0	0	0	0	0	0	0	0
	Thomaston	3,652	0	0	0	0	0	56	10	45
	Topsham	9,953	2	0	1	0	1	122	20	94
	Van Buren	2,464	1	0	0	0	1	13	4	8
	Veazie	1,910	2	0	1	1	0	17	2	13
	Waldoboro	5,007	7	0	0	2	5	80	20	55
	Washburn	1,572	0	0	0	0	0	43	9	33
	Waterville	16,076	30	0	11	11	8	664	84	566

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wells	10,005	1	0	0	1	0	143	31	108
	Westbrook	16,762	39	0	12	15	12	657	95	541
	Wilton	4,167	8	0	7	0	1	81	18	61
	Windham	17,187	18	1	5	2	10	411	90	306
	Winslow	7,825	6	0	4	0	2	168	58	104
	Winter Harbor	969	0	0	0	0	0	7	3	4
	Winthrop	6,419	2	0	2	0	0	128	29	97
	Wiscasset	3,798	2	0	0	2	0	77	9	68
	Yarmouth	8,157	5	0	2	2	1	91	12	76
	York	14,201	3	0	2	0	1	239	48	186
MARYLAND	Aberdeen	14,198	86	0	5	35	46	627	69	527
	Annapolis	37,180	226	4	7	91	124	1,101	197	800
	Baltimore	639,929	9,316	223	265	3,336	5,492	28,280	7,573	16,298
	Baltimore City Sheriff		0	0	0	0	0	0	0	0
	Bel Air	9,894	45	1	0	11	33	453	34	407
	Berlin	4,125	3	0	1	1	1	110	28	82
	Berwyn Heights	2,997	9	0	0	7	2	128	34	85
	Bladensburg	7,732	93	1	2	44	46	521	123	271
	Boonsboro	3,417	0	0	0	0	0	18	3	14
	Bowie	53,840	106	1	2	57	46	1,044	212	715
	Brentwood	2,853	0	0	0	0	0	4	1	1
	Brunswick	5,338	2	0	0	0	2	86	16	70
	Cambridge	12,167	140	1	7	47	85	566	107	442
	Capitol Heights	4,188	11	0	0	8	3	73	16	35
	Centreville	3,766	7	0	0	1	6	59	9	49
	Chestertown	5,101	30	0	2	8	20	175	54	112
	Cheverly	6,510	43	0	0	18	25	184	61	103
	Chevy Chase Village	2,180	1	0	0	1	0	42	7	34
	Colmar Manor	1,286	12	0	0	6	6	41	10	26
	Cottage City	1,147	7	0	0	0	7	60	9	39
	Crisfield	2,734	16	0	0	3	13	77	12	65
	Cumberland	20,449	196	1	17	40	138	1,442	370	1,049
	Delmar	3,524	12	0	3	2	7	78	27	48
	Denton	4,189	5	0	0	3	2	233	56	167
	District Heights	6,164	25	0	0	8	17	231	55	131
	Easton	15,252	58	0	5	15	38	503	74	416
	Edmonston	1,359	5	0	0	2	3	62	13	42
	Elkton	15,144	341	1	16	100	224	1,172	240	867
	Fairmount Heights	1,529	2	0	0	1	1	2	1	1
	Federalsburg	2,660	29	0	1	4	24	86	27	56
	Forest Heights	2,608	9	0	0	2	7	83	44	31
	Frederick	60,686	454	2	16	162	274	1,712	262	1,363
	Frostburg	7,831	18	1	2	3	12	234	37	193
	Fruitland	4,606	50	0	1	2	47	263	43	214
	Glenarden	6,451	13	0	0	5	8	106	35	56
	Greenbelt	21,585	172	2	11	106	53	1,115	221	761
	Greensboro	2,053	3	0	0	0	3	73	19	51
	Hagerstown	40,564	177	0	10	97	70	1,436	303	1,013

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Hampstead	5,510	7	1	1	1	4	108	13	92
	Hancock	1,763	6	0	1	1	4	55	7	47
	Havre de Grace	13,585	78	0	4	14	60	481	62	398
	Hurlock	2,043	16	0	1	4	11	105	42	56
	Hyattsville	15,688	128	0	1	88	39	1,496	166	1,233
	Landover Hills	1,545	6	0	0	3	3	34	17	14
	La Plata	9,266	51	0	0	15	36	341	44	287
	Laurel	22,960	148	0	5	69	74	1,084	163	768
	Lonaconing	1,121	1	0	0	0	1	4	0	4
	Luke	72	0	0	0	0	0	0	0	0
	Manchester	3,511	6	0	0	1	5	60	8	47
	Morningside	1,284	10	0	0	7	3	43	9	25
	Mount Rainier	8,497	86	0	1	58	27	314	58	192
	New Carrollton	12,734	78	0	5	42	31	453	92	296
	North East	2,898	10	0	0	5	5	136	23	102
	Oakland	2,002	0	0	0	0	0	50	10	40
	Ocean City	7,020	123	0	2	27	94	1,439	292	1,133
	Ocean Pines	11,442	4	0	2	1	1	126	22	101
	Oxford	696	0	0	0	0	0	2	0	2
	Perryville	3,852	10	0	0	4	6	125	18	100
	Pocomoke City	3,880	29	2	3	9	15	261	44	207
	Port Deposit	713	0	0	0	0	0	21	6	14
	Preston	685	2	0	0	1	1	6	3	3
	Princess Anne	3,079	28	0	1	6	21	128	40	85
	Ridgely	1,550	41	0	0	1	40	126	37	86
	Rising Sun	1,835	3	0	0	0	3	88	10	78
	Riverdale Park	6,484	77	2	0	46	29	270	58	151
	Rock Hall	1,493	1	0	0	0	1	24	9	15
	Salisbury	29,046	450	7	22	143	278	2,238	575	1,598
	Seat Pleasant	4,932	31	1	0	14	16	195	67	98
	Smithsburg	3,011	3	0	0	0	3	33	8	25
	Snow Hill	2,280	9	0	0	0	9	27	5	20
	St. Michaels	1,047	5	0	0	0	5	54	12	41
	Sykesville	4,489	2	0	0	0	2	49	2	44
	Takoma Park	18,200	76	0	2	48	26	577	149	364
	Taneytown	5,496	7	0	1	1	5	98	12	85
	Thurmont	6,179	5	0	2	0	3	108	36	70
	Trappe	1,142	0	0	0	0	0	7	1	5
	University Park	2,330	3	0	0	3	0	103	30	71
	Upper Marlboro	673	1	1	0	0	0	29	3	21
	Westminster	18,196	101	1	0	15	85	674	77	586
MASSACHUSETTS	Abington	16,836	46	0	2	9	35	346	112	213
	Acton	21,090	24	1	2	1	20	217	43	167
	Acushnet	10,275	21	0	2	2	17	146	61	75
	Adams	8,120	35	0	4	1	30	249	65	175
	Agawam	28,215	47	0	6	5	36	260	75	155
	Amesbury	16,549	44	0	5	0	39	266	52	201
	Amherst	36,004	81	0	20	2	59	560	274	257

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Andover	33,505	15	0	2	4	9	331	75	239
	Arlington	41,212	96	0	0	9	87	635	154	460
	Ashburnham	6,050	13	0	2	0	11	83	23	56
	Ashby	3,115	5	0	2	0	3	15	15	0
	Ashland	15,279	27	0	2	0	25	181	50	119
	Athol	11,773	65	1	9	5	50	250	75	171
	Attleboro	43,385	152	1	8	27	116	823	188	579
	Auburn	16,335	59	0	2	11	46	644	93	525
	Avon	4,323	8	0	0	1	7	139	26	106
	Ayer	7,828	40	0	3	7	30	151	67	71
	Barnstable	45,599	355	0	29	46	280	1,325	428	833
	Barre	5,599	19	0	0	1	18	84	30	45
	Becket	1,788	2	0	0	0	2	63	32	29
	Bedford	13,794	11	0	1	3	7	130	30	98
	Belchertown	14,252	24	0	3	2	19	171	46	117
	Bellingham	15,728	21	0	1	4	16	280	43	227
	Belmont	23,430	31	0	4	6	21	330	151	168
	Berkley	6,526	6	0	0	1	5	83	36	44
	Berlin	2,978	0	0	0	0	0	48	7	38
	Beverly	39,064	114	2	8	9	95	657	131	502
	Billerica[6]	39,519		0	10	9		592	105	462
	Blackstone	9,725	22	0	2	1	19	94	17	74
	Bolton	4,595	6	0	2	0	4	54	25	27
	Boston	644,064	5,819	73	256	1,926	3,564	20,628	3,587	15,004
	Bourne	19,239	77	0	3	6	68	659	240	382
	Boylston	4,384	2	0	0	0	2	133	10	116
	Braintree	35,298	60	1	2	10	47	936	119	769
	Brewster	9,854	21	0	0	2	19	224	53	166
	Brockton	92,383	1,086	9	61	243	773	2,870	750	1,675
	Brookline	55,751	161	0	3	30	128	828	149	656
	Burlington	25,782	47	0	0	12	35	689	71	600
	Cambridge	108,356	476	0	22	171	283	3,232	483	2,569
	Canton	22,291	52	0	3	4	45	230	67	150
	Carver	11,999	24	0	3	4	17	196	75	111
	Charlton	12,626	21	0	5	3	13	145	48	88
	Chatham	6,689	18	0	0	1	17	167	26	136
	Chelmsford	33,785	67	0	3	4	60	536	61	456
	Chelsea	37,335	620	8	34	186	392	1,370	447	745
	Cheshire	3,258	0	0	0	0	0	15	6	8
	Chicopee	55,444	274	1	12	56	205	1,689	533	1,016
	Chilmark	892	0	0	0	0	0	28	6	21
	Clinton	14,101	20	0	1	3	16	58	16	31
	Cohasset	7,347	10	0	0	1	9	94	33	57
	Concord	17,457	7	0	1	2	4	171	53	117
	Cummington	957	0	0	0	0	0	6	3	3
	Dalton	6,449	24	0	3	0	21	74	17	49
	Danvers	27,165	46	0	6	8	32	964	108	822
	Dartmouth	34,450	67	0	6	13	48	995	142	819
	Dedham	24,687	38	1	3	6	28	631	71	546

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Deerfield	4,627	9	0	0	1	8	113	40	68
	Dennis	15,212	74	0	10	6	58	636	231	392
	Dighton	6,760	20	0	0	2	18	59	29	28
	Douglas	8,109	10	0	3	0	7	69	39	26
	Dover	5,685	2	0	0	0	2	28	6	22
	Dracut	29,179	5	0	1	3	1	315	26	269
	Dudley	11,227	37	0	3	1	33	74	36	37
	Duxbury	14,222	12	0	1	2	9	108	27	78
	East Bridgewater	14,060	30	0	2	2	26	184	40	138
	East Brookfield	2,062	5	0	0	1	4	36	7	25
	Eastham	5,402	6	0	2	0	4	73	7	66
	Easthampton	16,116	27	0	3	3	21	178	47	123
	East Longmeadow	15,916	34	0	4	8	22	348	65	269
	Easton	22,807	41	0	4	10	27	235	67	153
	Edgartown	4,049	13	0	2	1	10	166	45	115
	Egremont	1,329	0	0	0	0	0	26	6	20
	Erving	1,538	6	0	1	0	5	38	18	18
	Essex	3,310	1	0	0	0	1	41	12	29
	Everett	37,897	220	3	13	70	134	1,196	320	767
	Fairhaven	15,916	61	1	6	10	44	415	99	303
	Fall River	89,741	1,087	5	52	252	778	3,297	940	2,006
	Falmouth	32,471	125	0	4	25	96	1,168	640	498
	Fitchburg	42,046	314	1	22	53	238	1,119	355	684
	Foxborough	17,023	47	0	7	3	37	207	75	122
	Framingham	66,493	189	0	5	25	159	1,409	313	1,025
	Franklin	31,979	12	0	3	5	4	127	24	99
	Freetown	9,027	33	0	1	4	28	121	33	73
	Gardner	20,743	94	0	10	13	71	621	212	380
	Georgetown	8,772	14	0	1	1	12	71	23	47
	Gill	1,381	1	0	0	0	1	24	9	15
	Gloucester	30,226	32	0	0	4	28	647	86	557
	Goshen	971	0	0	0	0	0	8	3	4
	Grafton	17,897	27	0	4	4	19	96	38	49
	Granby	6,228	10	1	1	1	7	83	20	57
	Granville	1,639	1	0	0	0	1	7	5	2
	Great Barrington	7,263	27	0	3	1	23	153	41	111
	Greenfield	17,625	124	1	10	8	105	533	226	295
	Groton	10,793	0	0	0	0	0	37	15	19
	Groveland	7,533	6	0	0	0	6	40	6	32
	Hadley	4,674	15	0	0	1	14	212	38	170
	Halifax	7,745	11	0	1	1	9	97	29	62
	Hamilton	8,155	5	0	1	0	4	51	16	33
	Hampden	5,346	1	0	1	0	0	57	18	36
	Hanover	14,051	5	0	0	2	3	320	35	280
	Hanson[6]	10,091		0	3	0		134	27	99
	Hardwick	2,648	12	0	0	0	12	36	11	25
	Harvard	6,100	3	0	0	0	3	66	27	38
	Harwich	12,104	34	0	5	5	24	271	148	118
	Hatfield	3,212	0	0	0	0	0	3	2	1

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Haverhill	61,179	350	2	24	26	298	1,625	822	682
	Hingham	23,433	7	0	0	1	6	307	43	256
	Hinsdale	1,890	5	0	0	0	5	2	2	0
	Holbrook	10,615	59	0	4	6	49	244	75	149
	Holden	17,657	13	0	1	0	12	96	18	71
	Holliston	14,076	8	0	1	0	7	67	18	44
	Holyoke	40,026	477	4	38	97	338	2,697	535	1,951
	Hopedale	6,215	19	0	2	0	17	64	31	32
	Hopkinton	14,627	2	0	1	0	1	98	0	97
	Hubbardston	4,483	22	0	1	1	20	42	16	22
	Hudson	19,985	24	2	1	5	16	251	51	186
	Hull	11,008	58	0	3	1	54	170	47	112
	Ipswich	13,307	4	0	0	0	4	133	57	69
	Kingston	12,419	38	0	3	6	29	319	54	255
	Lakeville	10,587	16	0	0	1	15	219	96	118
	Lancaster	7,013	8	0	3	1	4	71	22	45
	Lawrence	69,679	631	10	12	161	448	2,387	662	956
	Lee	5,654	6	0	0	0	6	135	27	106
	Leicester	11,072	27	0	5	0	22	205	26	168
	Lenox	5,027	8	0	1	2	5	108	30	76
	Leominster	41,884	284	1	22	29	232	1,324	238	1,015
	Lexington	30,649	19	0	0	3	16	300	58	237
	Lincoln	8,622	7	0	0	0	7	57	11	46
	Littleton	8,959	5	0	1	0	4	94	29	60
	Longmeadow	15,324	5	0	0	3	2	271	45	220
	Lowell	103,065	1,191	1	51	190	949	3,584	893	2,285
	Ludlow	22,028	28	0	2	9	17	324	66	230
	Lunenburg	10,111	17	0	0	2	15	255	86	161
	Lynn	86,340	764	3	41	208	512	2,496	595	1,595
	Lynnfield	11,954	11	2	0	3	6	185	36	142
	Malden	55,540	282	2	11	85	184	1,487	405	961
	Manchester-by-the-Sea	5,144	4	0	0	0	4	16	6	9
	Mansfield	23,749	47	0	6	5	36	389	126	246
	Marblehead	19,705	26	0	2	2	22	186	42	131
	Marion	5,131	10	0	0	1	9	78	18	56
	Marlborough	38,250	162	0	14	8	140	745	111	599
	Marshfield	24,675	38	0	4	1	33	307	73	226
	Mashpee	14,347	71	0	5	8	58	367	92	265
	Mattapoisett	6,474	9	0	0	1	8	88	17	65
	Maynard	10,534	36	0	3	2	31	83	11	71
	Medfield	12,134	5	0	0	0	5	64	16	45
	Melrose	26,796	35	0	3	8	24	291	92	184
	Mendon	5,676	9	0	2	1	6	55	18	33
	Methuen	43,938	105	1	5	21	78	992	178	723
	Middleboro	21,286	96	0	8	14	74	457	117	309
	Middleton	9,284	7	0	0	0	7	81	6	75
	Milford	27,375	101	0	5	17	79	487	98	359
	Millbury	13,483	36	0	7	2	27	296	54	237
	Milton	25,922	30	0	0	9	21	299	65	219

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Monson	9,031	15	0	1	0	14	121	61	56
	Montague	8,045	33	0	10	1	22	138	47	84
	Monterey	952	0	0	0	0	0	2	1	1
	Nahant	3,590	7	0	0	0	7	38	13	22
	Nantucket	11,393	66	0	3	3	60	355	46	296
	Natick	32,017	63	0	5	10	48	766	76	665
	Needham	28,765	9	0	2	3	4	269	28	236
	New Bedford	89,613	1,160	3	69	272	816	3,599	1,237	1,974
	Newbury	6,865	5	0	0	0	5	53	11	37
	Newburyport	17,447	21	0	1	5	15	232	25	198
	Newton	83,781	86	0	6	15	65	1,212	170	1,016
	Norfolk	11,136	1	0	0	0	1	69	28	40
	North Adams	13,590	128	0	7	9	112	616	174	421
	Northampton	28,184	107	2	5	7	93	836	189	604
	North Andover	27,581	7	0	0	2	5	338	48	277
	North Attleboro	27,559	10	0	2	2	6	476	44	419
	Northborough	14,774	10	0	0	1	9	115	24	86
	Northbridge	14,705	30	1	4	4	21	351	97	240
	North Brookfield[6]	5,034		0	2	0		55	13	40
	Northfield	3,003	3	0	0	0	3	45	12	33
	North Reading	14,417	21	0	2	1	18	128	41	84
	Norton	19,217	3	0	0	1	2	98	35	59
	Norwell	10,279	14	1	3	2	8	115	44	67
	Norwood	28,130	29	0	7	5	17	493	110	346
	Oak Bluffs	3,948	17	1	3	2	11	145	28	112
	Orleans	6,177	10	0	2	1	7	222	51	164
	Oxford	13,690	40	0	3	8	29	198	27	146
	Palmer	13,021	51	0	2	4	45	190	53	121
	Paxton	4,820	5	0	0	1	4	22	12	10
	Peabody	51,517	111	0	15	15	81	1,216	136	1,025
	Pelham	1,377	0	0	0	0	0	9	3	6
	Pembroke	18,843	31	0	2	2	27	281	86	184
	Pepperell	11,418	36	0	1	3	32	122	38	75
	Pittsfield	41,666	281	1	26	17	237	1,183	375	749
	Plainville	8,271	9	0	1	2	6	105	34	68
	Plymouth[6]	56,751		1	3	22		1,115	283	810
	Plympton	2,787	4	0	0	0	4	37	11	21
	Princeton	3,504	1	0	0	0	1	38	24	13
	Provincetown	3,378	21	0	0	0	21	215	19	196
	Quincy	90,304	414	11	22	112	269	1,782	505	1,152
	Randolph	30,701	113	1	8	16	88	605	106	462
	Raynham	13,601	26	0	0	4	22	333	62	262
	Reading	23,233	13	0	0	8	5	256	90	156
	Rehoboth	11,516	14	2	2	0	10	159	57	88
	Revere	51,597	308	0	10	86	212	1,599	361	1,048
	Rochester	5,304	1	0	0	0	1	54	22	32
	Rockland	17,932	52	1	1	13	37	442	101	322
	Rockport	7,580	5	0	2	0	3	13	5	7
	Rowley	5,795	7	0	1	0	6	30	6	20

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Rutland	8,189	21	0	2	0	19	52	22	26
	Salem	41,017	188	1	15	26	146	1,015	213	729
	Salisbury	8,612	36	0	7	4	25	189	79	98
	Sandwich	19,721	41	0	7	2	32	273	76	190
	Saugus	27,830	57	0	5	18	34	1,124	229	832
	Scituate	18,143	32	0	2	0	30	223	49	158
	Seekonk	13,635	35	0	0	9	26	401	65	320
	Sharon	17,903	4	0	0	1	3	115	36	77
	Sherborn	4,251	0	0	0	0	0	37	17	17
	Shirley	8,073	15	1	1	2	11	73	28	37
	Shrewsbury[6]	33,796		1	2	3		316	84	216
	Somerset	18,364	42	0	4	5	33	217	47	156
	Somerville	75,585	238	0	12	71	155	1,925	486	1,274
	Southampton	5,957	7	0	3	0	4	57	17	39
	Southbridge	17,305	102	0	10	9	83	362	118	231
	South Hadley	17,138	37	0	1	6	30	288	73	198
	Southwick	9,673	24	0	2	3	19	166	58	97
	Spencer	11,909	40	1	1	2	36	213	49	157
	Springfield	154,314	2,090	16	129	587	1,358	7,547	2,660	4,015
	Sterling	7,745	11	0	3	0	8	89	44	41
	Stockbridge	2,164	7	0	1	1	5	116	58	56
	Stoneham	21,285	35	0	2	17	16	358	134	204
	Stoughton	26,866	111	2	5	21	83	601	179	388
	Stow	6,678	3	0	0	1	2	33	10	23
	Sturbridge	8,865	26	0	2	2	22	165	45	110
	Sudbury	17,552	4	0	1	0	3	89	13	75
	Sutton	9,161	11	0	2	0	9	110	60	43
	Swampscott	13,883	19	0	0	4	15	269	44	216
	Swansea	16,012	37	0	4	2	31	301	45	244
	Taunton	55,156	304	2	13	60	229	940	410	487
	Tewksbury	30,447	88	0	8	16	64	625	127	466
	Tisbury	3,901	9	0	2	0	7	120	21	89
	Townsend	9,630	11	0	4	0	7	93	54	35
	Truro	2,104	0	0	0	0	0	24	6	17
	Tyngsboro	11,952	19	0	1	2	16	170	35	127
	Upton	6,745	5	0	0	0	5	74	22	49
	Uxbridge	12,909	16	0	2	1	13	185	70	108
	Wakefield	24,973	61	0	3	9	49	301	76	209
	Walpole	23,257	18	0	3	4	11	454	43	401
	Waltham	60,106	151	2	13	24	112	1,032	200	759
	Ware	9,748	44	0	4	11	29	191	53	132
	Wareham	21,218	165	0	7	20	138	729	174	515
	Warren	5,279	18	0	2	0	16	81	27	46
	Watertown	32,780	64	0	4	13	47	534	69	436
	Wayland	13,396	4	0	0	1	3	37	16	21
	Webster	16,721	96	0	7	19	70	436	93	317
	Wellesley	27,143	21	0	1	3	17	210	40	164
	Wellfleet	2,820	8	0	0	1	7	62	16	45
	Wenham	4,705	4	0	0	0	4	33	3	27

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Westborough	18,214	16	1	3	1	11	261	42	207
	West Boylston	8,085	10	0	3	1	6	156	32	116
	Westfield	41,899	95	1	11	8	75	809	194	576
	Westford	22,582	24	2	2	4	16	167	42	121
	Westhampton	1,581	0	0	0	0	0	6	2	4
	Westminster	7,447	8	0	0	1	7	101	35	62
	West Newbury	4,393	6	0	0	0	6	32	4	26
	Weston	11,815	5	1	0	0	4	56	12	42
	Westport	15,496	24	0	4	0	20	235	92	126
	West Springfield	27,861	154	0	12	34	108	1,337	269	947
	West Tisbury	2,652	8	1	2	0	5	29	14	12
	Westwood	14,190	15	0	1	1	13	170	34	128
	Weymouth	53,400	180	0	7	47	126	1,032	277	698
	Whately	1,554	2	0	0	0	2	17	4	11
	Whitman	14,062	51	0	3	13	35	247	67	170
	Wilbraham	14,070	12	0	0	2	10	249	47	178
	Williamstown	7,902	3	0	1	0	2	202	40	159
	Wilmington	22,230	35	0	4	6	25	334	105	213
	Winchendon	10,261	52	0	5	2	45	245	24	205
	Winchester	21,331	10	4	0	0	6	329	62	257
	Woburn	38,731	86	1	9	22	54	754	105	602
	Worcester	181,908	1,744	7	19	368	1,350	6,190	1,910	3,687
	Wrentham	11,166	5	0	0	0	5	225	48	173
	Yarmouth[6]	23,498		1	12	22		813	408	390
MICHIGAN	Albion	9,021	43	0	1	7	35	273	69	204
	Algonac	4,445	6	0	0	0	6	46	10	35
	Allegan	4,770	67	0	1	3	63	47	9	35
	Allen Park	24,833	47	0	2	10	35	605	110	424
	Alma	9,107	5	0	1	0	4	33	10	22
	Almont	2,691	9	0	2	0	7	60	19	39
	Alpena	10,184	22	1	6	1	14	368	52	312
	Ann Arbor	111,745	284	0	43	76	165	2,937	524	2,284
	Armada	1,644	0	0	0	0	0	18	1	16
	Auburn Hills	20,870	80	0	8	26	46	884	141	697
	Bad Axe	2,942	6	0	1	0	5	97	14	83
	Bangor	1,814	10	0	1	0	9	66	13	52
	Baroda Lake Township	870	3	0	1	0	2	48	13	31
	Barry Township	3,457	5	0	1	0	4	29	9	19
	Bath Township	11,955	12	0	1	5	6	114	39	70
	Battle Creek	60,386	702	5	63	120	514	3,134	1,075	1,910
	Bay City	33,200	250	1	53	45	151	1,056	340	681
	Beaverton	1,036	0	0	0	0	0	28	4	24
	Belding	5,599	16	0	11	1	4	171	26	141
	Bellaire	1,093	0	0	0	0	0	12	0	11
	Belleville	3,392	15	0	3	6	6	122	29	89
	Bellevue	1,329	0	0	0	0	0	11	1	9
	Berkley	14,609	13	0	1	1	11	203	31	164
	Beverly Hills	9,739	16	0	2	0	14	148	22	121

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Big Rapids	10,170	32	0	19	1	12	317	61	244
	Birch Run	1,624	9	0	4	2	3	138	11	122
	Birmingham	18,823	26	0	2	6	18	367	44	314
	Blackman Township	37,751	51	1	9	13	28	655	89	541
	Bloomfield Hills	3,731	1	0	0	0	1	68	23	45
	Bloomfield Township	40,490	19	0	4	6	9	552	139	392
	Boyne City	3,049	0	0	0	0	0	109	11	97
	Breckenridge	1,257	1	0	0	0	1	23	10	13
	Bridgeport Township	10,570	51	1	7	4	39	315	111	186
	Brighton	7,238	14	0	1	4	9	216	20	193
	Bronson	2,216	6	0	1	0	5	37	9	28
	Brownstown Township	28,102	43	1	7	6	29	490	152	288
	Buena Vista Township	9,156	115	0	6	16	93	370	194	154
	Burr Oak	730	6	0	1	0	5	25	5	19
	Cadillac	10,101	66	0	10	5	51	577	99	466
	Cambridge Township	5,737	0	0	0	0	0	38	4	32
	Canton Township	80,039	134	0	31	21	82	1,398	239	1,059
	Capac	2,052	3	0	0	1	2	59	10	49
	Carleton	2,537	5	0	1	1	3	39	8	28
	Caro	3,889	13	0	1	0	12	115	23	91
	Carrollton Township	5,810	22	0	4	2	16	141	37	100
	Caseville	805	1	0	0	0	1	30	5	25
	Cassopolis	1,872	3	0	1	0	2	16	3	11
	Cedar Springs	3,254	26	0	1	2	23	100	17	82
	Center Line	8,017	38	0	2	15	21	259	38	166
	Central Lake	941	0	0	0	0	0	8	0	8
	Charlevoix	2,570	7	0	1	1	5	96	9	86
	Charlotte	8,839	25	0	10	0	15	270	36	227
	Cheboygan	4,806	13	0	8	0	5	158	22	136
	Chelsea	5,051	6	0	1	0	5	115	16	94
	Chesaning	2,290	2	0	1	0	1	30	10	18
	Chesterfield Township	45,027	145	1	7	15	122	1,056	179	818
	Chikaming Township	3,641	3	0	0	1	2	56	11	44
	Chocolay Township	5,993	0	0	0	0	0	44	0	44
	Clare	3,021	17	0	6	0	11	131	16	108
	Clawson	12,025	16	0	5	1	10	108	24	74
	Clay Township	9,280	4	0	1	0	3	83	12	68
	Clinton Township	95,167	351	6	26	65	254	2,333	538	1,590
	Clio	2,434	9	0	2	1	6	83	17	61
	Coldwater	10,335	29	0	5	4	20	395	34	355
	Coleman	1,211	3	0	0	0	3	26	3	23
	Colon	1,137	0	0	0	0	0	34	2	30
	Columbia Township	7,431	7	0	0	2	5	128	19	107
	Corunna	3,218	6	0	2	0	4	93	10	79
	Covert Township	3,047	19	0	4	2	13	86	26	55
	Crystal Falls	1,513	1	0	0	0	1	28	4	23
	Dearborn	82,612	373	3	30	128	212	3,718	488	2,759
	Dearborn Heights	49,674	191	0	21	45	125	1,465	443	836
	Decatur	1,806	8	0	2	0	6	109	7	101

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Denton Township	5,247	3	0	2	0	1	81	12	61
	Detroit	899,447	16,976	310	405	5,538	10,723	47,787	17,090	18,095
	Dewitt	4,355	4	1	2	0	1	23	4	16
	Dewitt Township	13,074	18	0	2	3	13	151	47	99
	Dryden Township	4,490	1	0	0	0	1	50	11	37
	East Grand Rapids	10,423	7	0	3	1	3	123	29	92
	East Jordan	2,168	5	0	2	0	3	56	9	46
	East Lansing	45,058	166	1	7	26	132	1,089	272	771
	Eastpointe	32,016	238	2	17	61	158	1,036	261	556
	East Tawas	2,657	11	0	4	3	4	104	15	89
	Eaton Rapids	5,146	11	0	2	0	9	94	9	83
	Ecorse	9,399	120	2	7	19	92	411	137	187
	Elk Rapids	1,630	3	0	0	0	3	77	8	68
	Elsie	962	0	0	0	0	0	17	8	9
	Emmett Township	11,684	47	1	7	9	30	463	63	395
	Escanaba	11,918	34	0	4	2	28	730	108	600
	Essexville	3,421	6	0	0	0	6	68	5	61
	Evart	1,622	5	0	3	0	2	75	13	61
	Farmington	9,713	19	0	2	1	16	192	28	147
	Farmington Hills	77,646	118	1	16	13	88	1,381	292	959
	Fenton	11,542	15	0	1	2	12	325	38	268
	Ferndale	20,847	75	0	3	31	41	674	201	379
	Flint	109,245	2,412	53	92	670	1,597	6,237	3,648	1,936
	Flint Township	30,778	260	2	23	101	134	1,898	494	1,288
	Flushing Township	9,880	12	0	4	0	8	128	59	65
	Fowlerville	3,083	6	0	2	1	3	82	8	73
	Frankenmuth	4,556	10	0	2	1	7	115	21	91
	Frankfort	1,414	2	0	0	0	2	33	5	28
	Franklin	2,898	1	0	0	0	1	38	4	33
	Fraser	14,770	35	0	4	3	28	411	50	343
	Fruitport	1,058	13	0	3	3	7	768	51	703
	Garden City	25,549	85	0	4	26	55	729	153	483
	Gaylord	3,484	9	1	5	3	0	266	20	235
	Genesee Township	22,571	88	1	6	14	67	633	252	318
	Gerrish Township	2,996	1	0	1	0	0	41	9	28
	Gibraltar	4,731	10	0	0	0	10	124	19	100
	Gladstone	4,976	1	0	0	0	1	114	9	103
	Gladwin	2,813	14	0	2	1	11	122	28	92
	Grand Blanc	7,312	16	0	3	3	10	210	51	145
	Grand Blanc Township	34,634	85	0	12	17	56	765	209	512
	Grand Haven	10,574	27	0	6	1	20	359	40	314
	Grand Ledge	7,530	4	0	1	0	3	198	31	162
	Grand Rapids	191,566	1,645	9	90	521	1,025	7,760	2,771	4,609
	Grandville	16,653	29	0	1	9	19	772	81	682
	Grant	839	0	0	0	0	0	0	0	0
	Grayling	1,768	1	0	1	0	0	71	9	61
	Green Oak Township	17,817	20	0	1	2	17	287	51	223
	Greenville	7,957	38	0	10	7	21	412	62	339
	Grosse Ile Township	9,470	4	0	0	1	3	60	5	51

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Grosse Pointe	4,765	9	0	0	5	4	93	5	81
	Grosse Pointe Farms	8,218	8	0	1	3	4	117	17	89
	Grosse Pointe Park	10,498	10	0	0	2	8	238	25	176
	Grosse Pointe Shores	2,400	0	0	0	0	0	0	0	0
	Grosse Pointe Woods	14,470	23	0	1	3	19	261	31	206
	Hamburg Township	21,608	13	0	4	1	8	141	24	115
	Hampton Township	9,583	19	0	2	2	15	296	33	259
	Hamtramck	19,615	351	1	12	152	186	1,134	395	439
	Harbor Beach	1,550	0	0	0	0	0	53	17	36
	Harbor Springs	1,535	1	0	0	0	1	42	6	36
	Harper Woods	12,012	126	2	4	42	78	1,100	135	794
	Hart	1,885	1	0	0	0	1	113	9	103
	Hartford	2,437	8	0	3	3	2	62	16	41
	Hastings	6,685	16	0	5	1	10	246	39	201
	Hazel Park	17,715	71	0	9	19	43	611	159	318
	Hillsdale	7,574	8	0	2	0	6	178	39	130
	Holland	33,652	146	0	32	15	99	1,035	195	816
	Holly	6,226	13	0	4	3	6	120	25	94
	Howell	9,636	25	0	6	2	17	282	54	220
	Huntington Woods	5,732	0	0	0	0	0	64	9	53
	Huron Township	15,652	31	0	5	2	24	284	72	192
	Imlay City	3,600	8	0	3	0	5	93	11	80
	Inkster	25,428	449	11	33	87	318	944	449	390
	Ionia	11,342	26	0	10	4	12	204	25	171
	Iron River	2,845	5	0	2	0	3	74	28	42
	Ishpeming	6,402	10	1	0	1	8	123	7	104
	Ishpeming Township	3,594	0	0	0	0	0	13	3	10
	Jackson	32,741	319	5	42	54	218	1,586	406	1,127
	Jonesville	2,164	13	0	0	0	13	81	6	71
	Kalamazoo	71,775	721	9	81	185	446	3,534	1,039	2,320
	Kalamazoo Township	21,977	71	1	10	12	48	507	176	299
	Kalkaska	2,115	1	0	0	1	0	71	3	64
	Keego Harbor	2,828	5	0	0	0	5	44	12	32
	Kentwood	47,441	208	1	18	47	142	1,559	336	1,135
	Kingston	408	0	0	0	0	0	9	1	8
	Kinross Township	8,656	3	0	0	0	3	34	6	27
	Laingsburg	1,220	6	0	2	0	4	19	4	15
	Lake Odessa	2,180	10	0	1	0	9	12	2	10
	Lake Orion	2,696	6	0	0	0	6	46	5	40
	Lakeview	1,070	2	0	0	0	2	30	2	28
	Lansing	112,254	1,236	10	97	262	867	4,193	1,410	2,544
	Lapeer	8,947	35	0	11	4	20	332	26	295
	Lapeer Township	4,864	0	0	0	0	0	19	2	16
	Lathrup Village	4,012	11	1	1	4	5	82	20	55
	Lawton	1,780	4	0	3	0	1	45	9	32
	Leslie	2,280	2	0	1	0	1	22	1	21
	Lexington	1,009	0	0	0	0	0	18	4	14
	Lincoln Park	33,702	146	1	13	39	93	1,607	358	1,047
	Linden	3,341	1	0	1	0	0	59	16	43

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Litchfield	1,351	3	0	0	0	3	33	4	24
	Livonia	87,434	152	2	14	36	100	2,039	315	1,503
	Lowell	4,156	8	0	0	0	8	45	6	36
	Luna Pier	1,507	9	0	1	1	7	61	10	49
	Mackinac Island	449	4	0	2	1	1	251	4	246
	Mackinaw City	830	5	0	3	0	2	46	3	43
	Madison Heights	29,174	78	0	8	17	53	947	235	600
	Mancelona	1,318	0	0	0	0	0	23	6	15
	Manistee	5,985	9	0	3	2	4	151	25	124
	Manistique	2,969	11	0	1	0	10	115	29	83
	Manton	1,145	0	0	0	0	0	29	8	20
	Marquette	20,849	21	0	11	2	8	377	39	330
	Marshall	7,005	10	0	3	1	6	182	23	158
	Mason	8,169	8	0	2	0	6	143	15	125
	Mattawan	2,846	2	0	0	0	2	31	5	25
	Mayville	952	2	0	0	0	2	53	1	52
	Melvindale	9,443	53	0	9	19	25	343	74	226
	Mendon	887	4	0	1	0	3	2	1	1
	Meridian Township	38,105	83	0	9	22	52	922	155	753
	Metamora Township	4,540	4	0	2	0	2	48	14	33
	Midland	40,346	52	1	14	2	35	729	121	606
	Milan	5,752	16	0	2	2	12	155	23	123
	Milford	16,562	12	0	3	1	8	174	49	119
	Monroe	21,062	115	0	16	33	66	869	190	586
	Montague	2,251	1	0	1	0	0	41	7	34
	Montrose Township	7,508	15	0	3	0	12	103	34	62
	Mount Morris	3,091	11	0	0	4	7	99	28	65
	Mount Morris Township	21,614	178	0	14	52	112	1,082	517	472
	Mount Pleasant	26,580	63	1	18	8	36	519	99	407
	Mundy Township	13,810	20	0	4	7	9	469	104	347
	Munising	2,280	3	0	2	0	1	14	2	12
	Muskegon	38,829	371	1	46	90	234	2,234	528	1,609
	Muskegon Township	18,159	32	0	8	8	16	787	165	602
	Napoleon Township	6,871	8	0	1	0	7	85	17	64
	Nashville	1,620	9	0	0	0	9	49	3	45
	Negaunee	4,405	1	0	0	0	1	109	29	76
	Newaygo	1,668	6	0	0	0	6	84	11	73
	New Baltimore	11,701	17	0	4	1	12	245	26	210
	New Haven	5,368	6	0	1	0	5	16	3	13
	Niles	11,084	52	0	17	5	30	370	72	281
	North Branch	951	3	0	1	0	2	21	0	21
	Northfield Township	8,484	30	0	4	1	25	172	60	101
	North Muskegon	3,842	5	0	0	1	4	105	3	101
	Northville	5,839	1	0	0	0	1	114	11	99
	Northville Township	23,641	23	0	1	8	14	437	70	350
	Norton Shores	23,127	50	1	9	6	34	723	96	609
	Novi	54,857	36	1	4	3	28	1,000	96	856
	Oak Park	30,131	182	0	22	52	108	969	282	553
	Olivet	1,819	3	0	0	1	2	30	7	21

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Onaway	871	3	0	1	1	1	23	2	20
	Orchard Lake	2,205	9	0	0	0	9	42	5	36
	Oscoda Township	6,668	16	0	5	1	10	219	87	128
	Otsego	3,762	7	0	3	1	3	70	11	55
	Ovid	1,376	1	0	0	0	1	12	1	11
	Owendale	256	0	0	0	0	0	2	1	1
	Owosso	14,526	85	0	11	13	61	582	111	464
	Oxford	3,498	2	0	1	0	1	55	10	44
	Parchment	1,791	7	0	1	1	5	40	12	26
	Paw Paw	3,179	7	0	2	1	4	140	27	111
	Perry	1,966	0	0	0	0	0	16	2	14
	Petoskey	5,971	5	0	1	0	4	104	9	93
	Pinckney	2,429	3	0	2	0	1	65	13	50
	Pinconning	1,295	0	0	0	0	0	17	4	12
	Pittsfield Township	34,681	81	0	18	20	43	1,091	180	817
	Plainwell	3,801	11	0	8	1	2	127	7	119
	Pleasant Ridge	2,436	4	0	0	0	4	20	1	18
	Plymouth	8,297	7	0	3	2	2	171	22	134
	Plymouth Township	24,291	19	0	2	5	12	363	53	283
	Pontiac	65,517	1,113	9	67	239	798	2,055	1,074	765
	Portage	46,192	102	1	19	16	66	1,815	235	1,534
	Port Huron	30,132	199	3	9	54	133	1,185	335	784
	Potterville	2,121	5	0	1	0	4	51	7	44
	Prairieville Township	3,438	1	0	0	0	1	21	2	19
	Raisin Township	7,294	2	0	1	0	1	19	9	10
	Reading	1,037	0	0	0	0	0	15	2	13
	Redford Township	43,827	224	2	12	85	125	1,739	604	846
	Reed City	2,266	11	0	7	1	3	83	13	69
	Richfield Township, Genesee County	8,408	14	0	5	2	7	88	31	50
	Richfield Township, Roscommon County	3,971	16	0	3	0	13	61	14	46
	Richland	770	0	0	0	0	0	5	0	5
	Richland Township, Saginaw County	4,190	4	0	0	0	4	42	19	23
	Richmond	5,615	18	0	1	0	17	130	19	108
	River Rouge	8,036	60	1	1	13	45	373	146	141
	Riverview	11,306	10	0	0	3	7	204	14	147
	Rochester	10,982	18	0	3	0	15	139	29	108
	Rockford	5,525	9	0	0	1	8	113	24	83
	Rockwood	3,026	2	0	0	0	2	34	3	29
	Rogers City	2,921	3	0	3	0	0	42	11	30
	Romulus	22,214	147	1	16	32	98	968	298	550
	Roseville	46,221	210	1	19	46	144	1,931	293	1,415
	Rothbury	430	2	0	1	1	0	21	2	19
	Royal Oak	56,408	88	1	19	17	51	887	176	620
	Saginaw	54,155	1,209	4	61	192	952	2,195	1,310	763
	Saginaw Township	37,872	87	0	13	23	51	1,026	146	856
	Saline	8,942	13	0	0	1	12	176	17	149
	Sand Lake	514	0	0	0	0	0	8	1	7
	Sault Ste. Marie	13,849	83	0	10	8	65	659	113	514
	Shelby Township	71,589	89	2	17	9	61	945	182	691

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Somerset Township	4,584	1	0	1	0	0	51	9	41
	Southfield	74,587	396	5	27	111	253	2,760	660	1,690
	Southgate	26,575	67	1	8	20	38	1,133	213	803
	South Haven	5,112	19	0	4	3	12	247	36	208
	South Lyon	10,983	15	1	2	2	10	139	17	121
	South Rockwood	1,678	1	0	0	0	1	17	2	14
	Sparta	4,021	4	0	0	0	4	97	14	82
	Spaulding Township	2,132	1	0	0	0	1	10	2	8
	Spring Arbor Township	8,397	2	0	0	0	2	66	12	51
	Springfield	4,968	28	0	0	5	23	173	50	121
	Spring Lake-Ferrysburg	5,419	6	0	4	1	1	85	22	62
	Standish	1,774	0	0	0	0	0	6	0	6
	St. Charles	1,967	10	0	2	0	8	44	12	32
	St. Clair	5,646	8	0	4	0	4	163	32	127
	St. Clair Shores	59,522	152	0	9	28	115	1,086	194	805
	Sterling Heights	126,291	199	1	31	35	132	2,415	364	1,931
	St. Ignace	2,270	0	0	0	0	0	77	9	62
	St. Johns	7,191	4	0	2	0	2	132	20	109
	St. Louis	6,895	5	0	3	0	2	63	3	57
	Stockbridge	1,265	2	0	0	0	2	51	5	45
	Sturgis	10,544	35	0	5	1	29	293	44	238
	Sumpter Township	10,737	21	0	0	0	21	225	70	139
	Swartz Creek	5,118	6	0	1	0	5	149	42	98
	Sylvan Lake	1,616	0	0	0	0	0	17	7	9
	Taylor	58,158	348	2	29	78	239	2,500	629	1,640
	Thetford Township	7,657	2	0	1	0	1	21	11	9
	Thomas Township	12,096	17	0	2	0	15	216	28	178
	Three Rivers	6,974	62	0	7	6	49	327	107	206
	Tittabawassee Township	8,754	10	0	2	0	8	73	13	56
	Traverse City	14,012	37	1	10	7	19	463	64	386
	Trenton	17,217	41	0	1	3	37	256	48	185
	Troy	79,794	59	1	9	9	40	1,728	292	1,327
	Tuscarora Township	2,946	6	0	0	0	6	134	13	113
	Unadilla Township	3,420	2	0	0	0	2	59	11	45
	Union City	1,679	1	0	0	0	1	74	14	58
	Utica	4,911	21	0	2	4	15	204	18	172
	Van Buren Township	25,627	100	0	27	20	53	799	167	533
	Vassar	2,578	7	0	0	0	7	32	6	25
	Vicksburg	2,178	2	0	0	0	2	101	7	93
	Walled Lake	6,833	15	0	1	1	13	161	27	126
	Warren	132,266	770	5	69	171	525	3,703	953	2,035
	Waterford Township	70,013	228	1	45	56	126	1,467	360	1,028
	Waterloo Township	2,933	4	1	0	0	3	22	9	12
	Watervliet	1,719	6	0	1	0	5	26	6	19
	Wayne	16,454	120	1	17	33	69	537	119	368
	West Bloomfield Township	63,345	33	1	8	1	23	778	146	604
	West Branch	1,799	4	0	1	2	1	82	12	70
	Westland	75,726	367	3	42	83	239	2,353	607	1,427
	White Cloud	1,365	6	0	0	0	6	86	22	63

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Whitehall	2,756	6	0	0	2	4	197	129	68
	White Lake Township	29,890	23	0	3	3	17	531	90	419
	Williamston	3,781	4	0	1	0	3	28	6	22
	Wixom	13,344	18	0	2	4	12	297	54	227
	Wolverine Lake	4,263	7	0	1	0	6	66	8	56
	Woodhaven	12,239	12	0	2	7	3	240	20	197
	Wyandotte	23,607	46	0	5	8	33	658	143	437
	Wyoming	70,160	230	1	39	46	144	1,586	515	911
	Ypsilanti	21,245	217	0	16	54	147	953	311	558
	Zeeland	5,383	11	0	2	0	9	102	20	79
	Zilwaukee	1,610	0	0	0	0	0	19	2	17
MINNESOTA[7]	Albany	2,239		0		0	4	26	7	17
	Albert Lea	17,304		0		5	25	410	66	321
	Alexandria	12,003		0		2	10	363	66	288
	Annandale	3,212		0		0	2	125	10	114
	Anoka	17,323		0		21	21	748	98	627
	Appleton	2,971		0		0	7	49	13	34
	Apple Valley	50,579		0		17	28	1,511	172	1,308
	Arden Hills	9,860		0		0	1	151	18	122
	Aurora	1,745		0		0	0	0	0	0
	Austin	22,929		0		11	51	763	144	577
	Avon	1,342		0		0	0	3	1	2
	Babbitt	1,579		0		0	0	0	0	0
	Baxter	8,748		0		0	5	297	9	285
	Bayport	3,335		0		0	2	37	6	30
	Becker	4,387		0		0	4	28	6	19
	Belgrade	720		0		0	0	0	0	0
	Belle Plaine	7,244		0		0	4	160	30	126
	Bemidji	13,911		0		7	57	982	82	872
	Benson	2,930		0		0	2	61	23	35
	Big Lake	10,240		0		0	16	188	22	160
	Blackduck	790		0		0	2	43	6	36
	Blaine	57,561		0		11	35	1,953	203	1,708
	Bloomington	82,715		0		46	45	3,175	226	2,860
	Blue Earth	3,183		0		0	3	42	7	34
	Brainerd	13,779		0		1	34	558	77	464
	Breckenridge	3,151		0		0	1	49	5	41
	Brooklyn Center	27,378		1		59	59	1,363	185	1,056
	Browns Valley	579		0		0	0	0	0	0
	Brownton	777		0		0	1	4	1	3
	Buffalo	14,881		0		1	11	383	34	336
	Burnsville	59,028		0		0	0	0	0	0
	Cambridge	7,986		0		0	9	264	21	233
	Cannon Falls	4,050		0		0	3	200	14	180
	Centennial Lakes	11,423		0		1	6	136	12	119
	Champlin	24,139		0		4	12	510	50	450
	Chaska	25,424		0		0	12	398	49	337
	Chisholm	4,559		1		0	9	177	22	150

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Cloquet	11,486		0		3	17	454	78	367
	Cold Spring	5,108		0		0	3	66	5	60
	Coon Rapids	62,419		0		38	65	2,709	186	2,467
	Corcoran	5,749		0		0	4	38	6	32
	Cottage Grove	34,276		0		5	10	566	94	460
	Crookston	7,829		0		1	10	68	15	53
	Crosby	2,245		0		0	1	23	2	19
	Crystal	21,753		0		19	24	715	116	574
	Dawson	1,323		0		0	0	18	6	12
	Dayton	4,650		0		0	1	39	14	20
	Deephaven-Woodland	4,339		0		0	1	17	4	13
	Detroit Lakes	8,329		0		1	9	419	25	380
	Dilworth	3,787		0		0	3	103	2	99
	Duluth[2]	84,249		1		90	165		605	3,301
	Eagan	64,239		2		13	18	1,625	176	1,396
	Eagle Lake	2,416		0		0	1	14	6	7
	East Grand Forks	7,878		0		0	11	235	33	197
	Eden Prairie	63,159		1		5	21	1,020	135	866
	Edina	46,503		0		5	12	899	124	756
	Elk River	24,025		0		2	10	607	52	536
	Elmore	642		0		0	0	12	6	5
	Ely	3,459		0		0	1	76	9	64
	Eveleth	3,559		0		4	10	119	29	84
	Fairmont	10,029		0		2	6	279	36	243
	Falcon Heights	5,661		0		2	2	107	15	85
	Faribault	22,272		0		12	60	830	171	626
	Farmington	20,229		0		1	10	177	24	145
	Fergus Falls	13,531		0		2	19	350	35	309
	Floodwood	499		0		0	6	29	3	25
	Forest Lake	18,030		0		3	6	533	55	439
	Fridley	25,857		0		19	50	1,329	142	1,114
	Gilbert	1,748		0		0	0	0	0	0
	Glencoe	5,517		0		0	0	113	18	92
	Glenwood	2,467		0		0	1	8	1	6
	Golden Valley	20,527		1		7	12	466	89	348
	Goodview	3,737		0		0	4	91	24	58
	Grand Rapids	9,457		0		0	21	359	32	321
	Granite Falls	2,857		0		0	7	26	4	21
	Hallock	981		0		0	0	0	0	0
	Hastings	22,688		0		4	16	525	60	439
	Hermantown	9,755		0		1	6	294	33	250
	Hibbing	16,157		0		0	15	242	18	219
	Hilltop	680		0		3	5	69	6	60
	Hokah	553		0		0	1	16	5	11
	Hopkins	17,020		0		11	9	495	100	374
	Houston	943		0		0	2	16	3	13
	Hoyt Lakes	1,953		0		0	0	0	0	0
	Hutchinson	13,901		0		1	14	376	25	345
	International Falls	5,763		0		1	10	204	45	146

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Jackson	3,302		0		0	5	67	12	53
	Janesville	2,259		0		0	0	25	3	22
	Kasson	5,703		0		0	3	59	10	48
	Kimball	718		0		0	3	4	0	4
	La Crescent	4,897		0		0	1	89	5	82
	Lake City	5,313		0		1	2	159	11	142
	Lake Crystal	2,635		0		0	3	49	9	39
	Lakefield	1,614		1		0	0	39	19	20
	Lakes Area	8,654		0		0	11	222	32	183
	Lakeville	57,470		0		6	9	830	140	671
	Lauderdale	2,241		0		1	3	32	8	21
	Lester Prairie	1,769		0		0	2	9	4	5
	Lewiston	1,461		0		0	0	2	1	0
	Lino Lakes	20,953		0		0	7	193	26	162
	Litchfield	6,554		0		0	6	130	27	99
	Little Canada	9,644		0		4	14	295	47	206
	Little Falls	8,049		0		0	3	140	8	127
	Long Prairie	2,757		0		0	0	66	5	60
	Madison	1,527		0		0	3	17	4	12
	Mankato	36,921		1		14	59	1,527	248	1,231
	Maple Grove	64,861		0		9	25	1,241	132	1,087
	Mapleton	1,672		0		0	0	29	4	25
	Maplewood	36,907		0		25	43	2,317	269	1,884
	Medina	5,297		0		0	1	102	6	94
	Melrose	3,261		0		0	0	30	9	21
	Mendota Heights	11,697		0		1	10	221	36	179
	Milaca	3,015		0		0	1	29	7	21
	Minneapolis	385,704	4,064	37	438	1,596	1,993	18,299	4,787	11,609
	Minnetonka	50,753		1		7	13	983	184	772
	Minnetrista	8,796		0		0	4	82	10	70
	Montevideo	5,148		0		0	6	125	26	98
	Montgomery	3,305		0		0	8	57	14	41
	Moorhead	37,274		2		8	29	938	135	777
	Moose Lake	2,576		0		0	4	80	4	75
	Morris	5,074		0		0	2	114	12	98
	Mound	9,654		0		1	2	167	19	141
	Mounds View	12,000		0		3	19	378	48	307
	Mountain Iron	2,925		0		0	0	0	0	0
	Mountain Lake	1,878		0		0	0	0	0	0
	New Brighton	21,689		0		12	10	581	79	462
	New Hope	20,644		0		17	16	677	93	559
	Newport	3,495		0		2	5	134	21	103
	New Prague	7,065		0		1	7	142	13	128
	New Richland	1,148		0		0	1	0	0	0
	New Ulm	12,843		0		1	6	232	69	156
	North Branch	10,732		0		1	5	332	33	291
	Northfield	19,918		0		1	9	404	75	319
	North Mankato	12,748		1		4	5	232	22	207
	North Oaks	4,883		0		0	1	46	9	37

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	North St. Paul	11,433		0		2	2	288	43	226
	Oakdale	27,358		0		15	28	1,121	168	896
	Oak Park Heights	4,839		0		0	2	201	7	186
	Orono	12,294		0		0	5	111	17	92
	Ortonville	1,911		0		0	1	15	0	14
	Osakis	1,566		0		0	1	28	3	25
	Osseo	2,597		0		1	0	3	0	2
	Owatonna	25,210		0		4	28	482	76	386
	Park Rapids	3,654		0		0	5	248	22	213
	Paynesville	2,290		0		0	1	106	20	84
	Plymouth	73,579		0		15	30	1,226	232	970
	Princeton	4,839		0		0	2	146	10	131
	Prior Lake	26,241		0		2	20	427	91	325
	Proctor	2,840		0		1	3	107	11	88
	Red Wing	15,641		0		2	16	472	102	357
	Redwood Falls	5,050		0		0	17	166	29	132
	Richfield	33,188		0		34	36	873	144	677
	Robbinsdale	13,822		0		17	24	427	104	308
	Rochester	105,027		1		58	123	2,429	399	1,925
	Rogers	8,288		0		1	6	55	5	50
	Roseau	2,752		0		0	0	26	3	23
	Rosemount	22,870		1		5	6	316	48	262
	Roseville	33,176		1		15	24	1,482	144	1,232
	Sauk Centre	4,073		0		0	3	81	12	66
	Sauk Rapids	12,130		0		0	3	75	17	54
	Savage	29,151		0		4	26	686	114	548
	Shakopee	36,290		2		7	60	1,028	105	891
	Shoreview	25,419		0		3	4	299	33	251
	Silver Bay	1,804		0		0	0	1	0	1
	Silver Lake	794		0		0	3	13	4	7
	Slayton	1,809		0		0	0	16	3	12
	Sleepy Eye	3,363		0		0	1	0	0	0
	South Lake Minnetonka	12,329		0		0	13	156	32	117
	Springfield	2,103		0		0	0	0	0	0
	Spring Grove	1,233		0		0	0	0	0	0
	Spring Lake Park	6,577		0		6	10	366	41	301
	St. Anthony	8,484		0		3	2	298	49	233
	Staples	2,984		0		0	1	122	20	98
	St. Charles	3,566		0		0	3	20	4	14
	St. Cloud	67,942		3		43	134	2,542	347	2,102
	St. Francis	7,644		0		0	4	134	16	113
	Stillwater	18,208		0		0	12	603	92	496
	St. James	4,271		0		0	3	77	5	70
	St. Louis Park	45,690		2		27	21	1,473	188	1,227
	St. Paul	281,166	2,112	16	183	665	1,248	11,756	2,883	6,820
	St. Paul Park	5,262		0		0	5	134	23	106
	St. Peter	11,063		0		0	11	248	28	215
	Thief River Falls	8,575		0		0	1	139	18	113
	Tracy	2,063		0		0	0	0	0	0

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Two Harbors	3,245		0		0	7	45	7	36
	Vadnais Heights	12,733		0		1	6	289	35	213
	Virginia	8,419		0		1	25	508	56	435
	Wabasha	2,513		0		0	3	69	11	57
	Wadena	3,920		0		0	8	114	12	98
	Waite Park	6,873		0		7	13	683	29	648
	Warroad	1,649		0		0	3	21	2	19
	Waseca	8,668		0		0	13	183	20	153
	Wayzata	3,953		0		1	6	89	13	69
	Wells	2,299		0		0	0	5	3	2
	West Hennepin	5,680		0		0	2	38	11	26
	Wheaton	1,362		0		0	5	36	5	30
	White Bear Lake	24,365		0		8	29	946	161	726
	Willmar	17,854		0		2	44	576	54	502
	Windom	4,101		0		0	10	94	17	70
	Winnebago	1,308		0		0	2	27	12	13
	Winona	26,447		0		7	18	489	87	377
	Winsted	2,425		0		0	2	41	5	35
	Woodbury	58,503		0		9	19	1,307	195	1,062
	Worthington	11,114		0		3	17	232	59	156
	Wyoming	8,148		0		0	2	174	12	155
	Zumbrota	3,109		0		0	4	66	4	50
MISSISSIPPI	Aberdeen	5,966	15	0	0	4	11	218	80	136
	Amory	7,123	6	0	1	4	1	281	75	195
	Bay St. Louis	8,190	8	0	4	1	3	352	92	241
	Belzoni	2,315	11	1	0	0	10	7	2	5
	Biloxi	45,350	211	1	33	118	59	2,516	943	1,442
	Booneville	8,786	6	0	2	1	3	198	49	147
	Brandon	22,877	15	0	1	6	8	239	74	156
	Brookhaven	13,240	31	3	1	24	3	219	88	123
	Byhalia	1,302	4	0	0	1	3	41	12	25
	Carthage	4,904	4	0	0	1	3	99	49	45
	Charleston	1,793	15	1	0	5	9	12	7	5
	Clarksdale	17,484	104	3	10	28	63	1,152	681	415
	Cleveland	11,874	43	4	3	13	23	836	197	615
	Collins	2,881	9	0	1	3	5	219	55	153
	Columbia	6,516	28	1	2	3	22	172	95	75
	Columbus	23,638	83	2	1	34	46	945	192	730
	Como	1,290	9	0	1	0	8	36	12	19
	Crystal Springs	5,899	11	0	0	0	11	180	98	80
	D'Iberville	9,082	28	1	3	9	15	675	57	586
	Edwards	1,290	7	0	0	1	6	9	6	3
	Eupora	2,175	8	0	0	1	7	47	17	29
	Florence	3,869	3	0	0	1	2	29	10	19
	Flowood	7,238	43	0	9	3	31	480	87	382
	Fulton	4,049	12	0	1	4	7	75	14	60
	Gautier	16,435	46	1	12	10	23	686	230	411
	Gloster	996	1	0	0	0	1	7	7	0

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Greenville	34,826	86	9	17	49	11	2,162	1,017	1,040
	Greenwood	15,578	94	5	10	29	50	851	292	537
	Gulfport	70,806	161	6	23	67	65	3,715	920	2,642
	Hattiesburg	53,678	115	4	9	62	40	2,317	434	1,809
	Heidelberg	795	0	0	0	0	0	24	3	20
	Hernando	13,380	22	0	5	4	13	286	57	209
	Holly Springs	7,868	72	1	3	15	53	309	119	164
	Horn Lake	25,693	25	0	3	15	7	655	122	504
	Indianola	10,370	58	1	5	14	38	581	130	438
	Itta Bena	1,807	26	0	0	4	22	143	76	65
	Iuka	2,926	13	0	2	2	9	108	59	45
	Jackson	174,153	1,718	41	101	1,086	490	13,250	4,818	6,877
	Kosciusko	7,351	24	1	1	7	15	203	91	112
	Laurel	18,928	103	1	8	50	44	1,232	425	773
	Leland	4,678	13	0	0	1	12	197	101	95
	Long Beach	11,937	12	0	3	1	8	302	71	217
	Louisville	6,557	22	0	1	6	15	103	76	22
	Lucedale	3,154	8	0	0	4	4	70	15	51
	Macon	2,651	30	0	0	2	28	145	24	121
	Madison	22,275	15	0	0	1	14	209	9	197
	Magnolia	2,062	4	0	0	0	4	52	21	30
	McComb	13,689	81	1	2	41	37	826	226	574
	Meridian	39,566	202	7	27	106	62	2,398	1,056	1,195
	Moss Point	13,788	118	0	16	31	71	792	411	311
	Natchez	15,841	57	2	10	27	18	882	203	658
	New Albany	8,206	3	0	0	1	2	126	27	92
	Newton	3,690	0	0	0	0	0	8	2	5
	Ocean Springs	17,388	19	1	4	9	5	583	256	312
	Oxford	18,105	8	0	2	5	1	302	103	189
	Pascagoula	23,479	87	2	20	38	27	1,409	300	1,050
	Pass Christian	3,967	5	0	4	1	0	236	47	177
	Pearl	25,078	68	1	12	10	45	601	213	367
	Petal	10,906	2	0	0	1	1	117	71	39
	Philadelphia	7,964	39	0	6	14	19	440	212	216
	Picayune	12,194	31	0	4	11	16	456	104	333
	Port Gibson	1,596	6	1	0	2	3	16	4	12
	Purvis	2,757	2	0	0	0	2	16	5	11
	Ridgeland	21,847	34	1	1	15	17	632	84	522
	Ripley	5,773	7	0	0	0	7	91	27	60
	Rosedale	2,275	11	0	1	1	9	33	21	12
	Roxie	555	0	0	0	0	0	0	0	0
	Southaven[5]	47,435	131	1	19	15	96	1,875	301	1,481
	Starkville	24,588	57	1	3	18	35	626	128	471
	Summit	1,606	1	0	0	1	0	39	16	23
	Tupelo	36,574	81	2	26	30	23	1,729	361	1,270
	Vicksburg	24,773	196	2	28	32	134	1,800	568	1,173
	Waveland	5,592	15	0	3	5	7	385	72	303
	West Point	11,082	54	0	10	16	28	318	77	241
	Wiggins	5,162	23	0	1	1	21	226	93	133

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Winona	4,350	9	0	0	0	9	35	16	19
	Yazoo City	11,055	38	1	5	13	19	385	187	163
MISSOURI	Adrian	1,863	9	0	0	1	8	36	5	30
	Advance	1,180	0	0	0	0	0	13	5	8
	Alma	355	1	0	0	0	1	0	0	0
	Alton	630	0	0	0	0	0	4	1	2
	Appleton City	1,246	5	0	1	0	4	20	7	12
	Arbyrd	473	1	0	0	1	0	1	0	1
	Archie	1,036	0	0	0	0	0	23	7	15
	Arnold	20,535	49	0	1	5	43	888	49	819
	Ashland	2,230	1	0	0	0	1	34	2	31
	Aurora	7,430	61	0	4	3	54	381	83	285
	Auxvasse	989	1	0	0	0	1	23	3	20
	Ava	3,180	8	0	0	0	8	103	22	77
	Ballwin	29,774	16	0	1	6	9	321	50	262
	Bates City	261	1	0	0	0	1	2	0	1
	Battlefield	4,534	1	0	0	0	1	60	9	49
	Bella Villa	626	0	0	0	0	0	9	2	6
	Bellefontaine Neighbors	10,103	71	0	3	16	52	483	183	209
	Bellerive	250	0	0	0	0	0	0	0	0
	Bellflower	380	0	0	0	0	0	2	1	1
	Bel-Nor	1,457	2	0	0	0	2	22	4	16
	Bel-Ridge	2,852	51	1	0	11	39	140	71	59
	Belton	24,941	53	0	9	14	30	655	128	486
	Berkeley	9,245	218	2	8	21	187	483	250	191
	Bernie	1,740	7	1	0	1	5	15	4	9
	Bethany	3,020	9	0	0	1	8	50	14	33
	Beverly Hills	549	0	0	0	0	0	0	0	0
	Billings	1,139	5	0	1	0	4	19	0	17
	Birch Tree	613	0	0	0	0	0	3	1	2
	Birmingham	233	0	0	0	0	0	3	1	2
	Bismarck	1,541	0	0	0	0	0	9	5	1
	Bloomfield	1,812	7	0	0	0	7	43	11	30
	Blue Springs	56,226	99	0	16	25	58	1,701	268	1,272
	Bolivar	11,308	22	0	0	2	20	355	67	277
	Bonne Terre	7,456	12	3	1	1	7	36	14	17
	Boonville	8,622	8	0	1	0	7	240	24	213
	Bowling Green	5,268	0	0	0	0	0	123	14	108
	Branson	8,621	131	1	7	19	104	1,062	142	897
	Branson West	514	0	0	0	0	0	26	1	25
	Braymer	931	1	0	0	0	1	5	1	4
	Breckenridge Hills	4,413	26	0	0	8	18	206	69	127
	Brentwood	7,086	11	0	1	6	4	320	26	284
	Bridgeton	14,900	60	0	7	12	41	933	78	801
	Brookfield	4,254	10	0	1	1	8	120	37	81
	Brunswick	822	4	0	0	0	4	1	0	1
	Bucklin	470	2	0	0	0	2	2	0	2
	Buckner	2,900	10	0	0	1	9	71	24	42

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Buffalo	3,250	13	0	0	2	11	143	35	108
	Butler	4,178	4	2	0	0	2	147	25	118
	Butterfield Village	414	1	0	0	0	1	8	3	5
	Byrnes Mill	2,977	0	0	0	0	0	0	0	0
	Cabool	2,118	3	0	0	1	2	41	6	32
	California	4,123	4	0	0	3	1	72	9	58
	Calverton Park	1,255	5	0	0	1	4	21	7	9
	Camden Point	562	0	0	0	0	0	2	1	1
	Camdenton	3,659	19	0	0	0	19	153	22	130
	Cameron	8,946	27	2	2	1	22	218	45	168
	Campbell	1,795	3	0	0	1	2	41	8	30
	Canton	2,403	4	0	1	0	3	75	5	70
	Cape Girardeau	37,627	238	1	13	54	170	2,463	414	1,985
	Cardwell	701	2	0	1	0	1	4	1	3
	Carl Junction	7,649	8	0	3	0	5	149	38	102
	Carrollton	3,665	5	0	2	1	2	60	11	45
	Carterville	1,994	1	0	1	0	0	10	1	7
	Carthage	14,099	24	1	4	3	16	416	80	320
	Caruthersville	5,912	49	2	2	5	40	293	120	166
	Cassville	3,253	26	0	0	1	25	230	29	197
	Centralia	3,672	9	0	0	0	9	97	17	75
	Chaffee	2,928	3	0	0	0	3	69	28	36
	Charlack	1,329	4	0	0	1	3	47	9	35
	Charleston	5,008	45	2	0	3	40	131	44	84
	Chesterfield	45,709	46	0	2	11	33	996	99	876
	Chillicothe	8,622	22	0	0	1	21	232	48	175
	Clarkton	1,206	1	0	0	0	1	20	5	13
	Claycomo	1,376	4	0	1	1	2	45	11	33
	Clayton	15,979	13	0	1	2	10	292	41	237
	Cleveland	686	0	0	0	0	0	5	4	1
	Clever	1,894	7	0	0	0	7	2	1	1
	Clinton	9,316	50	0	3	6	41	447	128	298
	Cole Camp	1,140	3	0	0	0	3	10	2	8
	Columbia	103,417	530	3	37	131	359	3,816	552	3,129
	Concordia	2,333	3	0	0	0	3	31	7	23
	Conway	773	1	0	0	0	1	8	1	6
	Cool Valley	990	18	0	0	0	18	78	23	45
	Cooter	402	1	0	0	0	1	2	2	0
	Corder	404	1	0	0	0	1	0	0	0
	Cottleville	3,359	4	0	0	1	3	49	2	47
	Country Club Hills	1,258	8	0	1	5	2	61	23	31
	Country Club Village	2,437	6	0	1	1	4	15	4	9
	Crane	1,353	8	0	0	1	7	27	11	14
	Creighton	357	0	0	0	0	0	0	0	0
	Crestwood	11,289	14	0	0	4	10	347	37	306
	Creve Coeur	16,786	15	2	0	5	8	294	43	239
	Crocker	1,042	5	0	0	0	5	23	3	20
	Crystal City	4,517	19	0	2	1	16	157	20	134
	Cuba	3,563	17	0	0	3	14	181	23	152

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Deepwater	486	2	0	0	0	2	7	2	5
	Dellwood	4,837	36	1	0	13	22	152	71	66
	Delta	547	0	0	0	0	0	0	0	0
	Desloge	5,213	12	0	1	1	10	260	25	231
	De Soto	6,439	29	0	0	1	28	199	27	160
	Des Peres	8,541	6	0	2	3	1	392	28	361
	Dexter	7,493	12	0	1	1	10	320	70	239
	Diamond	896	0	0	0	0	0	0	0	0
	Dixon	1,624	0	0	0	0	0	58	8	48
	Doniphan	1,845	2	0	0	0	2	139	13	122
	Doolittle	664	0	0	0	0	0	2	2	0
	Drexel	1,099	4	0	1	0	3	29	5	23
	Duenweg	1,261	1	0	0	0	1	29	5	21
	Duquesne	1,762	7	0	1	0	6	52	13	38
	Edgerton	578	1	0	0	0	1	7	4	3
	Edina	1,092	5	0	2	0	3	2	2	0
	Edmundson	772	6	0	2	0	4	36	12	18
	Eldon	4,905	24	0	5	2	17	200	36	158
	El Dorado Springs	3,598	30	0	2	2	26	184	42	134
	Ellington	935	3	0	0	0	3	9	0	9
	Ellisville	9,162	10	0	0	1	9	138	21	114
	Elsberry	2,694	20	0	1	0	19	19	4	13
	Eureka	9,472	14	0	1	2	11	231	17	206
	Everton	297	0	0	0	0	0	1	1	0
	Excelsior Springs	12,674	43	0	5	4	34	357	102	238
	Exeter	736	0	0	0	0	0	0	0	0
	Fair Grove	1,433	2	0	0	0	2	16	4	9
	Fair Play	458	0	0	0	0	0	1	1	0
	Farber	383	0	0	0	0	0	0	0	0
	Farmington	16,461	20	1	2	1	16	547	38	498
	Fayette	2,647	3	0	0	0	3	13	0	13
	Ferguson	20,657	94	0	4	45	45	1,121	357	647
	Ferrelview	601	3	0	1	0	2	11	5	6
	Festus	11,457	37	0	2	3	32	243	51	185
	Fleming	116	0	0	0	0	0	0	0	0
	Flordell Hills	848	8	0	0	3	5	44	12	27
	Florissant	49,886	96	0	2	47	47	1,350	294	887
	Foley	215	1	0	0	0	1	2	0	2
	Fordland	765	1	0	0	0	1	19	4	13
	Foristell	374	1	0	0	0	1	36	4	30
	Forsyth	1,703	7	0	2	1	4	86	11	73
	Frankford	350	0	0	0	0	0	0	0	0
	Fredericktown	4,152	3	0	0	0	3	78	12	63
	Freeman	609	0	0	0	0	0	0	0	0
	Frontenac	3,838	8	0	1	1	6	55	5	50
	Fulton	12,796	41	0	4	1	36	516	71	413
	Gallatin	1,745	2	0	0	0	2	16	6	7
	Garden City	1,677	2	0	0	1	1	18	3	14
	Gerald	1,255	6	0	1	0	5	33	8	24

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Gideon	932	0	0	0	0	0	0	0	0
	Glasgow	1,175	4	0	0	0	4	11	5	6
	Glendale	5,421	2	0	0	0	2	43	7	36
	Goodman	1,281	1	0	0	0	1	14	7	7
	Gower	1,414	0	0	0	0	0	7	1	6
	Grain Valley	11,384	16	0	1	2	13	260	41	185
	Granby	2,224	0	0	0	0	0	7	1	5
	Grandview	24,552	177	0	7	54	116	944	226	616
	Greendale	681	1	0	0	0	1	13	7	6
	Greenfield	1,199	3	0	0	0	3	20	8	11
	Greenville	416	3	0	0	0	3	11	1	10
	Greenwood	4,836	3	0	0	1	2	64	6	55
	Hallsville	962	1	0	1	0	0	18	5	13
	Hamilton	1,748	4	0	0	0	4	37	9	25
	Hannibal	17,379	50	2	7	16	25	1,352	210	1,089
	Hardin	543	0	0	0	0	0	3	0	3
	Harrisonville	9,880	28	0	4	1	23	368	63	288
	Hartville	580	2	0	0	0	2	6	2	4
	Hawk Point	591	3	0	0	0	3	13	3	10
	Hayti	2,870	6	0	2	1	3	175	36	133
	Hazelwood	25,070	98	1	8	30	59	932	185	678
	Henrietta	427	0	0	0	0	0	1	0	1
	Herculaneum	3,728	3	0	1	1	1	88	4	81
	Hermann	2,671	9	0	1	0	8	77	13	63
	Higginsville	4,448	5	0	2	0	3	111	13	93
	High Hill	207	0	0	0	0	0	2	1	1
	Highlandville	973	1	0	0	0	1	3	0	3
	Hillsboro	2,579	15	0	1	0	14	99	12	82
	Hillsdale	1,392	25	1	2	4	18	46	29	14
	Holcomb	657	0	0	0	0	0	0	0	0
	Holden	2,556	14	0	0	1	13	100	9	85
	Hollister	4,041	22	0	2	1	19	128	29	90
	Holt	482	1	0	0	0	1	4	2	1
	Holts Summit	3,882	14	0	1	1	12	76	31	42
	Hornersville	639	2	0	0	0	2	1	0	1
	Houston	2,015	7	0	0	0	7	74	13	58
	Howardville	307	0	0	0	0	0	1	1	0
	Humansville	1,021	0	0	0	0	0	12	6	5
	Huntsville	1,620	0	0	0	0	0	12	1	10
	Hurley	147	0	0	0	0	0	0	0	0
	Iberia	657	2	0	0	0	2	3	2	0
	Independence[5]	121,141	484	8	43	123	310	7,223	1,246	5,242
	Indian Point	728	2	0	0	0	2	5	2	3
	Ironton	1,297	2	0	0	0	2	35	10	25
	Jackson	14,043	17	0	2	1	14	358	50	298
	Jasper	1,077	0	0	0	0	0	12	6	3
	Jefferson City	41,092	197	1	6	40	150	1,668	284	1,348
	Jennings	14,423	243	3	5	40	195	1,170	491	529
	Joplin	50,346	288	1	39	64	184	3,404	558	2,612

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Kahoka	2,143	9	0	1	0	8	16	7	8
	Kansas City[5]	483,191	5,506	102	234	1,626	3,544	26,919	7,124	16,625
	Kearney	9,442	3	0	0	0	3	144	17	126
	Kennett	10,409	56	0	3	7	46	550	157	369
	Kimberling City	2,408	3	0	1	0	2	34	11	22
	Kimmswick	109	0	0	0	0	0	0	0	0
	King City	860	2	0	0	0	2	3	2	1
	Kinloch	420	11	1	1	3	6	11	6	5
	Kirksville	17,406	90	0	0	2	88	527	76	441
	Kirkwood	26,573	29	0	4	5	20	854	135	685
	Knob Noster	3,359	4	0	0	0	4	86	15	71
	Ladue	8,111	8	0	0	2	6	116	21	94
	Lake Lafayette	366	1	0	0	0	1	4	1	2
	Lake Lotawana	2,191	0	0	0	0	0	30	9	18
	Lake Ozark	2,048	1	0	1	0	0	10	6	4
	Lakeshire	1,266	0	0	0	0	0	33	16	17
	Lake St. Louis	14,734	26	0	1	1	24	223	19	200
	Lake Tapawingo	802	0	0	0	0	0	16	2	14
	Lake Waukomis	926	0	0	0	0	0	8	1	7
	Lake Winnebago	1,167	2	0	0	0	2	8	2	6
	Lamar	4,385	10	0	1	2	7	91	22	68
	La Monte	1,102	2	0	0	0	2	20	10	10
	Lanagan	434	0	0	0	0	0	0	0	0
	La Plata	1,434	3	0	0	0	3	2	0	1
	Lathrop	2,319	4	0	0	0	4	54	19	31
	Laurie	707	2	0	0	0	2	44	10	34
	Lawson	2,316	2	1	0	0	1	63	20	42
	Leadington	422	0	0	0	0	0	11	1	6
	Leadwood	1,159	11	0	0	0	11	23	8	13
	Lebanon	14,403	51	2	5	3	41	704	109	567
	Lee's Summit	87,707	97	2	17	26	52	2,129	289	1,718
	Leeton	629	1	0	0	0	1	15	3	12
	Lexington	4,424	13	0	1	0	12	183	34	141
	Liberal	759	2	0	0	0	2	13	9	4
	Liberty	32,496	41	2	9	9	21	567	102	420
	Licking	2,957	2	0	1	0	1	55	5	49
	Lincoln	1,082	2	0	0	0	2	26	7	17
	Linn Creek	310	2	0	0	0	2	7	3	3
	Lockwood	887	0	0	0	0	0	8	3	4
	Lone Jack	1,002	1	1	0	0	0	19	5	14
	Lowry City	717	2	0	0	0	2	2	0	2
	Macon	5,349	12	0	2	3	7	150	34	109
	Malden	4,347	3	0	0	0	3	44	20	19
	Manchester	18,396	2	0	0	1	1	349	23	323
	Mansfield	1,303	2	0	0	0	2	50	10	40
	Maplewood	8,510	35	1	1	9	24	397	40	340
	Marble Hill	1,441	12	0	1	3	8	34	12	19
	Marceline	2,270	3	0	0	0	3	41	6	27
	Marionville	2,157	3	0	0	0	3	77	7	68

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Marshall	12,127	26	0	2	1	23	305	67	232
	Marshfield	7,368	2	0	1	0	1	137	21	110
	Marthasville	857	1	0	1	0	0	0	0	0
	Martinsburg	318	0	0	0	0	0	0	0	0
	Maryland Heights	25,591	41	0	2	13	26	679	95	561
	Maryville	10,782	28	0	0	1	27	182	23	145
	Matthews	520	1	0	0	0	1	13	1	12
	Maysville	1,120	0	0	0	0	0	0	0	0
	Memphis	1,934	3	0	1	0	2	27	2	24
	Mexico	10,736	34	0	5	3	26	210	40	161
	Milan	1,799	6	0	0	0	6	17	4	11
	Miner	1,335	14	0	0	1	13	30	9	19
	Moberly	14,011	27	0	2	4	21	588	84	492
	Moline Acres	2,487	29	0	1	8	20	110	32	73
	Monett	8,884	8	0	2	2	4	310	65	224
	Monroe City	2,413	28	0	0	0	28	41	7	30
	Montgomery City	2,427	2	0	1	0	1	47	18	28
	Morehouse	900	4	0	0	0	4	6	1	5
	Mosby	255	1	0	0	0	1	10	0	10
	Moscow Mills	2,749	18	0	1	0	17	67	9	57
	Mound City	1,045	2	0	0	0	2	30	11	17
	Mountain View	2,584	20	0	1	2	17	120	38	80
	Mount Vernon	4,605	9	0	1	0	8	223	24	189
	Napoleon	192	0	0	0	0	0	1	1	0
	Naylor	586	0	0	0	0	0	2	0	1
	Neosho	11,245	22	0	3	3	16	551	64	468
	Nevada	8,287	66	0	4	4	58	499	108	370
	New Bloomfield	740	1	0	1	0	0	5	2	3
	Newburg	461	0	0	0	0	0	15	5	10
	New Florence	737	3	0	0	0	3	14	3	11
	New Franklin	1,093	0	0	0	0	0	8	0	7
	New Haven	2,053	9	0	0	0	9	51	9	40
	New London	986	1	0	0	0	1	25	6	19
	New Madrid	2,945	0	0	0	0	0	21	2	19
	New Melle	302	1	0	0	0	1	4	2	2
	Niangua	496	1	0	0	0	1	6	6	0
	Nixa	20,220	33	0	5	7	21	323	49	270
	Noel	1,619	11	0	2	0	9	39	9	25
	Norborne	722	2	0	0	0	2	0	0	0
	Normandy	4,834	38	0	1	8	29	173	68	92
	North Kansas City	6,116	31	0	2	14	15	343	48	266
	Northmoor	415	1	0	0	0	1	11	1	5
	Northwoods	4,244	30	0	1	9	20	193	84	86
	Norwood	558	0	0	0	0	0	1	0	0
	Oak Grove	7,154	9	0	2	0	7	237	37	179
	Oakland	1,544	0	0	0	0	0	20	4	16
	Oakview Village	414	1	0	0	0	1	4	0	4
	Odessa	4,632	4	0	0	3	1	113	19	85
	O'Fallon	81,851	72	0	2	9	61	1,273	135	1,101

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Olivette	7,414	14	0	0	8	6	157	30	114
	Oregon	852	2	0	0	0	2	9	3	4
	Oronogo	2,963	4	0	0	0	4	40	12	26
	Orrick	805	2	0	0	0	2	19	12	5
	Osage Beach	4,787	15	1	1	0	13	336	39	286
	Overland	15,400	42	0	0	13	29	664	123	514
	Owensville	2,527	3	0	0	0	3	53	1	51
	Ozark	19,449	23	0	2	4	17	544	79	447
	Pacific	7,332	21	0	2	1	18	167	17	144
	Pagedale	3,360	30	2	0	9	19	159	44	99
	Palmyra	3,428	4	0	0	0	4	61	7	54
	Parkville	5,584	10	1	0	5	4	159	18	137
	Parma	744	7	0	0	0	7	20	3	17
	Pasadena Park	452	0	0	0	0	0	7	3	2
	Peculiar	4,977	8	0	1	1	6	91	28	60
	Perryville	8,185	39	0	2	4	33	250	42	199
	Pevely	6,112	10	0	3	2	5	131	22	103
	Piedmont	1,840	3	0	0	0	3	72	12	59
	Pierce City	1,459	0	0	0	0	0	33	4	27
	Pilot Grove	740	3	0	0	0	3	32	5	25
	Pine Lawn	3,938	56	2	5	13	36	177	76	69
	Platte City	5,034	6	0	1	0	5	133	13	116
	Platte Woods	467	1	0	0	0	1	7	2	3
	Plattsburg	2,390	9	0	1	0	8	25	8	17
	Pleasant Hill	7,409	0	0	0	0	0	136	23	105
	Pleasant Hope	605	0	0	0	0	0	6	2	4
	Pleasant Valley	3,721	6	0	2	0	4	41	7	29
	Polo	591	0	0	0	0	0	6	1	4
	Poplar Bluff	16,938	108	0	1	28	79	1,415	257	1,106
	Potosi	2,688	6	0	2	0	4	116	16	100
	Purdy	1,135	6	0	2	0	4	22	8	14
	Puxico	1,121	7	0	0	0	7	9	4	5
	Queen City	611	0	0	0	0	0	0	0	0
	Qulin	482	1	0	0	0	1	16	4	9
	Randolph	54	1	0	0	0	1	7	0	6
	Raymore	19,420	16	0	3	4	9	287	32	241
	Raytown	28,616	117	5	4	61	47	1,088	301	679
	Reeds Spring	810	0	0	0	0	0	4	1	3
	Republic	14,880	84	1	1	5	77	573	79	475
	Rich Hill	1,460	7	0	0	0	7	28	14	13
	Richland	1,844	7	0	0	0	7	57	14	42
	Richmond	5,787	17	0	0	0	17	214	33	176
	Richmond Heights	8,985	20	0	1	10	9	760	23	709
	Riverside	3,075	10	2	4	1	3	217	19	176
	Riverview	2,874	37	0	2	11	24	210	103	64
	Rockaway Beach	586	0	0	0	0	0	13	2	11
	Rock Hill	4,530	8	0	0	3	5	70	15	51
	Rock Port	1,275	1	0	0	0	1	1	1	0
	Rogersville	3,261	8	1	0	0	7	122	17	100

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Rolla	18,575	97	0	8	22	67	874	145	699
	Salem	4,898	8	1	0	0	7	198	18	174
	Salisbury	1,513	1	0	0	0	1	23	8	14
	Sarcoxie	1,382	14	0	0	1	13	44	9	32
	Savannah	5,104	0	0	0	0	0	56	11	43
	Scott City	4,525	5	0	0	0	5	79	22	54
	Sedalia	21,091	152	2	3	20	127	1,301	280	968
	Seligman	999	1	0	0	0	1	16	3	13
	Seneca	2,248	2	0	0	2	0	79	21	55
	Seymour	2,092	5	0	0	0	5	46	12	34
	Shelbina	1,743	4	0	0	0	4	31	18	13
	Shrewsbury	6,150	2	0	0	0	2	112	17	88
	Sikeston	16,953	269	1	7	29	232	948	228	692
	Slater	1,898	2	0	0	0	2	54	1	52
	Smithville	8,800	8	0	1	0	7	103	14	86
	Southwest City	939	6	1	0	0	5	12	2	8
	Sparta	1,246	1	0	0	0	1	18	3	15
	Springfield	157,110	1,328	11	120	310	887	15,216	2,188	12,024
	St. Ann	12,475	60	0	0	6	54	384	65	296
	St. Charles	65,729	126	2	8	35	81	1,891	323	1,517
	St. Clair	4,445	34	0	1	1	32	293	48	227
	Steele	2,017	21	2	0	1	18	95	40	53
	Steelville	1,486	11	0	1	0	10	70	13	53
	Stewartsville	734	0	0	0	0	0	1	0	1
	St. James	3,994	22	0	0	3	19	195	38	147
	St. John	6,283	29	0	1	2	26	226	41	175
	St. Joseph	75,922	305	5	20	70	210	3,605	870	2,547
	St. Louis	355,151	6,205	144	188	2,125	3,748	27,324	6,705	16,356
	St. Marys	374	2	0	0	0	2	5	1	4
	Stover	1,023	5	0	1	0	4	24	6	18
	St. Peters	56,518	104	0	4	9	91	1,499	120	1,349
	Strafford	2,232	7	0	0	1	6	126	14	105
	Strasburg	137	0	0	0	0	0	0	0	0
	St. Robert	3,702	32	1	4	2	25	398	68	324
	Sugar Creek	3,606	20	0	1	4	15	186	47	121
	Sullivan	6,757	9	0	0	3	6	401	53	325
	Summersville	548	0	0	0	0	0	21	14	7
	Sunset Hills	8,131	16	1	0	2	13	162	23	132
	Sweet Springs	1,518	1	0	0	0	1	15	1	13
	Tarkio	1,787	8	0	0	0	8	24	12	12
	Thayer	2,143	2	0	0	0	2	20	1	18
	Theodosia	251	1	0	0	0	1	6	2	4
	Tipton	3,278	1	0	0	0	1	27	3	24
	Town and Country	10,626	5	0	0	3	2	108	10	93
	Tracy	218	0	0	0	0	0	14	3	10
	Trenton	5,945	12	0	0	1	11	187	40	139
	Trimble	469	0	0	0	0	0	0	0	0
	Troy	13,056	3	0	0	0	3	353	43	298
	Truesdale	700	3	0	0	0	3	8	5	3

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Union	9,904	20	0	1	1	18	480	51	417
	Unionville	1,788	4	0	0	0	4	16	8	8
	Uplands Park	432	1	0	0	0	1	7	3	2
	Urbana	427	0	0	0	0	0	0	0	0
	Van Buren	801	0	0	0	0	0	8	5	3
	Vandalia	4,344	4	0	0	0	4	85	14	65
	Velda City	1,474	23	0	1	2	20	37	23	8
	Verona	718	0	0	0	0	0	11	3	7
	Versailles	2,654	3	0	0	0	3	93	13	76
	Viburnum	777	1	0	0	0	1	10	8	2
	Vienna	625	0	0	0	0	0	26	9	16
	Vinita Park	1,760	15	0	0	6	9	73	29	38
	Walnut Grove	666	3	0	0	0	3	3	1	1
	Wardell	385	5	0	0	0	5	2	0	2
	Warrensburg	19,376	23	0	1	8	14	627	115	501
	Warrenton	7,714	24	0	1	1	22	387	50	326
	Warsaw	2,226	6	0	0	0	6	126	35	83
	Warson Woods	1,817	0	0	0	0	0	20	3	17
	Washburn	475	0	0	0	0	0	0	0	0
	Washington	14,366	21	0	1	4	16	433	47	371
	Waverly	771	0	0	0	0	0	13	3	10
	Waynesville	4,337	26	0	4	3	19	145	37	104
	Webb City	11,795	1	0	1	0	0	443	55	358
	Webster Groves	22,106	21	0	2	6	13	297	74	207
	Wellington	744	0	0	0	0	0	0	0	0
	Wellsville	1,288	2	0	0	0	2	11	4	7
	Wentzville	27,351	40	0	8	6	26	516	64	444
	Weston	1,720	6	0	0	0	6	22	8	13
	West Plains	12,034	50	0	2	5	43	880	176	676
	Wheaton	744	0	0	0	0	0	7	2	4
	Willard	3,368	7	0	2	0	5	91	14	75
	Willow Springs	2,147	9	0	0	0	9	89	21	65
	Winfield	1,180	3	0	0	1	2	14	6	5
	Winona	1,309	8	0	0	0	8	66	23	39
	Wood Heights	738	0	0	0	0	0	1	1	0
	Woodson Terrace	3,963	12	0	1	3	8	131	35	66
	Wright City	3,256	6	0	1	0	5	78	23	48
MONTANA	Baker	1,647	2	0	0	0	2	20	3	16
	Belgrade	8,518	24	0	4	1	19	220	21	190
	Billings	108,039	280	2	25	42	211	5,021	848	3,811
	Boulder	1,503	3	0	0	0	3	11	3	7
	Bozeman	40,892	89	0	15	7	67	1,297	152	1,071
	Bridger	740	4	1	0	0	3	6	0	6
	Colstrip	2,395	11	0	0	0	11	25	1	22
	Columbia Falls	5,569	6	0	2	0	4	219	8	207
	Columbus	2,078	5	0	0	0	5	29	5	24
	Conrad	2,481	8	0	0	0	8	37	5	30
	Cut Bank	3,179	16	0	1	1	14	117	14	100

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Dillon	4,250	14	0	0	0	14	47	4	39
	East Helena	2,204	7	0	0	0	7	27	2	24
	Ennis	1,077	0	0	0	0	0	9	4	5
	Eureka	1,002	1	0	0	0	1	17	2	15
	Fort Benton	1,438	4	0	0	0	4	25	2	22
	Glasgow	2,854	7	0	0	1	6	63	10	52
	Glendive	4,635	6	0	0	2	4	153	25	123
	Great Falls	59,984	124	4	6	21	93	2,776	308	2,343
	Hamilton	5,129	24	0	3	1	20	201	22	169
	Havre	9,726	56	0	11	2	43	372	29	313
	Helena	30,520	117	0	24	4	89	974	111	827
	Hot Springs	590	7	0	1	0	6	6	0	6
	Joliet	650	0	0	0	0	0	7	2	2
	Kalispell	22,568	68	1	8	7	52	1,010	72	899
	Laurel	6,841	8	0	0	0	8	169	22	141
	Libby	2,898	14	0	1	0	13	102	10	90
	Livingston	7,461	21	0	0	0	21	138	23	105
	Manhattan	1,712	1	0	0	0	1	13	5	6
	Miles City	8,141	16	1	2	0	13	205	10	180
	Plains	1,268	1	0	0	1	0	18	3	13
	Polson	5,383	42	1	6	0	35	203	30	162
	Red Lodge	2,531	10	0	0	0	10	67	23	43
	Ronan City	2,030	15	0	2	0	13	94	11	82
	Sidney	4,855	4	0	2	0	2	61	4	48
	Stevensville	2,087	10	0	2	0	8	43	4	37
	St. Ignatius	814	4	0	0	0	4	29	2	26
	Thompson Falls	1,450	5	0	0	0	5	23	5	16
	Three Forks	2,004	1	0	0	0	1	10	2	7
	Troy	969	6	0	0	0	6	40	2	36
	West Yellowstone	1,549	2	0	0	1	1	4	0	3
	Whitefish	8,776	10	0	3	0	7	196	22	168
	Wolf Point	2,562	20	0	3	1	16	126	36	83
NEBRASKA	Alliance	8,005	16	0	0	1	15	154	31	114
	Ashland	2,728	3	0	0	1	2	8	1	7
	Auburn	3,237	0	0	0	0	0	43	0	41
	Aurora	4,240	1	0	1	0	0	33	14	13
	Bayard	1,095	3	0	0	0	3	8	3	5
	Beatrice	12,706	36	0	8	1	27	484	116	357
	Bellevue	52,330	69	1	19	16	33	1,345	169	1,054
	Bennington	1,029	0	0	0	0	0	11	0	11
	Blair	7,805	9	0	7	0	2	125	19	101
	Bridgeport	1,431	0	0	0	0	0	27	5	22
	Broken Bow	3,140	9	0	2	0	7	64	14	48
	Central City	2,827	1	0	0	0	1	51	1	49
	Chadron	5,480	14	0	3	0	11	161	11	140
	Columbus	22,246	27	0	6	5	16	460	60	380
	Cozad	4,355	5	0	2	2	1	44	12	28
	Crete	6,380	8	0	2	1	5	161	30	127

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Falls City	3,910	3	0	0	0	3	68	20	45
	Fremont	25,262	49	0	13	5	31	801	113	662
	Gering	7,825	8	0	0	0	8	198	50	141
	Gothenburg	3,753	5	1	2	1	1	66	11	54
	Grand Island	47,736	168	2	31	22	113	2,297	373	1,829
	Hastings	25,705	33	0	15	2	16	746	84	631
	Holdrege	5,128	4	0	1	0	3	112	18	93
	Imperial	1,759	6	0	3	0	3	12	2	9
	Kearney	31,436	62	0	10	3	49	872	112	734
	La Vista	17,702	16	0	5	1	10	272	53	200
	Lexington	10,415	31	2	8	3	18	305	68	221
	Lincoln	259,672	1,258	2	143	182	931	10,218	1,464	8,406
	Lyons	841	2	0	0	0	2	5	2	2
	Madison	2,218	4	0	2	0	2	26	3	20
	McCook	7,437	8	0	5	0	3	195	29	161
	Milford	2,069	1	0	1	0	0	21	2	19
	Minden	2,800	2	0	0	0	2	66	13	53
	Nebraska City	6,912	4	0	2	0	2	137	11	120
	Norfolk	23,523	44	2	23	10	9	706	74	601
	North Platte	24,429	55	0	20	3	32	1,131	162	918
	Ogallala	4,373	7	0	4	0	3	141	9	126
	Omaha	464,628	2,263	34	194	723	1,312	17,334	3,046	12,091
	O'Neill	3,242	1	0	0	0	1	5	2	3
	Papillion	25,213	27	0	8	3	16	322	23	283
	Plainview	1,185	1	0	0	0	1	23	4	19
	Plattsmouth	6,941	5	0	4	0	1	133	16	114
	Ralston	6,178	3	0	0	2	1	138	14	115
	Scottsbluff	15,053	35	0	8	5	22	874	138	719
	Seward	6,842	1	0	0	0	1	80	14	64
	Sidney	6,399	3	0	0	0	3	108	23	85
	South Sioux City	12,374	19	0	0	2	17	283	23	246
	Superior	1,729	0	0	0	0	0	8	3	5
	Valentine	2,530	12	1	2	0	9	46	8	33
	Valley	1,994	1	0	0	1	0	40	3	34
	Wahoo	4,212	10	1	0	2	7	44	8	36
	Wayne	5,386	8	0	6	0	2	114	24	88
	West Point	3,291	0	0	0	0	0	6	3	3
	Wilber	1,765	3	0	0	0	3	43	5	37
	York	7,681	5	0	0	2	3	181	30	144
NEVADA	Boulder City	14,794	14	0	1	1	12	120	49	53
	Carlin	2,103	6	0	0	0	6	30	14	16
	Elko	17,374	74	0	14	12	48	698	219	431
	Fallon	8,552	29	0	2	8	19	314	54	256
	Henderson	264,280	543	8	35	189	311	5,196	1,280	3,406
	Las Vegas Metropolitan Police Department	1,416,401	12,648	107	652	4,003	7,886	43,219	13,824	22,231
	Mesquite	18,130	29	0	1	7	21	254	47	189
	Reno	222,242	1,168	9	46	385	728	7,468	1,638	5,101
	Sparks	91,433	357	8	35	103	211	2,761	699	1,829

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	West Wendover	5,091	19	0	8	3	8	120	37	80
	Winnemucca	8,361	12	0	0	2	10	122	29	81
	Yerington	3,912	23	0	0	0	23	31	22	8
NEW HAMPSHIRE	Alexandria	1,541	3	0	1	1	1	34	11	23
	Alstead	2,090	1	0	1	0	0	28	14	11
	Alton	5,114	2	0	0	0	2	80	26	52
	Amherst	11,903	7	1	0	1	5	182	30	148
	Antrim	2,630	3	0	3	0	0	55	11	39
	Ashland	2,065	2	1	0	1	0	52	8	42
	Auburn	5,177	2	2	0	0	0	81	31	49
	Barnstead	4,619	6	0	3	0	3	103	36	62
	Barrington	8,576	10	0	1	0	9	98	21	73
	Bartlett	2,930	2	0	2	0	0	68	24	44
	Bedford	21,304	11	0	5	1	5	324	32	286
	Belmont	7,051	16	0	3	2	11	234	65	159
	Bennington	1,469	2	0	0	0	2	37	0	35
	Berlin	9,155	19	0	8	1	10	148	54	94
	Bethlehem	2,450	4	0	0	1	3	50	19	28
	Boscawen	3,958	3	0	2	0	1	80	13	63
	Bow	8,107	5	0	0	0	5	98	17	80
	Bradford	1,524	0	0	0	0	0	17	4	12
	Brentwood	3,998	0	0	0	0	0	58	13	41
	Bristol	3,110	5	0	2	2	1	81	12	60
	Campton	3,006	7	0	2	0	5	65	15	49
	Candia	4,177	3	0	0	0	3	76	18	55
	Canterbury	2,316	0	0	0	0	0	12	3	8
	Carroll	726	1	0	1	0	0	77	7	68
	Center Harbor	1,102	2	0	2	0	0	39	5	33
	Charlestown	4,804	2	0	0	0	2	31	13	17
	Chester	4,769	6	0	1	0	5	34	24	9
	Claremont	12,788	19	0	3	4	12	433	54	364
	Colebrook	2,282	4	0	0	1	3	51	21	29
	Concord	42,190	96	0	17	27	52	1,225	167	1,039
	Conway	9,195	24	0	9	3	12	504	92	393
	Dalton	858	0	0	0	0	0	23	10	13
	Danville	4,326	4	1	1	0	2	47	9	34
	Deerfield	4,243	7	0	1	0	6	77	26	47
	Deering	2,059	2	0	0	0	2	33	7	26
	Derry	34,075	89	0	4	18	67	816	195	582
	Dover	28,627	33	0	2	15	16	487	58	420
	Dublin	1,574	1	0	1	0	0	19	7	10
	Dunbarton	2,676	4	0	0	2	2	33	13	18
	Durham	14,465	15	0	9	0	6	158	18	135
	Enfield	4,811	3	0	1	1	1	74	31	43
	Epping	6,435	9	0	2	0	7	193	30	162
	Epsom	4,619	5	0	3	0	2	95	11	82
	Exeter	14,924	4	1	1	0	2	130	22	107
	Farmington	6,764	21	0	10	5	6	168	51	106

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Fitzwilliam	2,296	2	0	1	0	1	42	16	22
	Franconia	1,047	1	0	0	0	1	33	4	29
	Freedom	1,443	0	0	0	0	0	16	6	10
	Fremont	4,188	3	0	1	0	2	57	19	35
	Gilford	7,427	15	1	0	1	13	218	24	186
	Gilmanton	3,506	2	0	0	0	2	49	12	34
	Goffstown	17,774	10	0	2	1	7	302	87	210
	Gorham	2,718	1	0	0	0	1	34	2	32
	Grantham	2,544	1	0	0	0	1	9	3	6
	Greenland	3,435	2	0	0	0	2	47	3	41
	Hampstead	8,981	5	0	1	1	3	92	26	63
	Hampton	15,270	18	0	3	4	11	382	53	313
	Hancock	1,807	4	0	0	0	4	12	2	10
	Hanover	10,922	7	0	3	1	3	145	13	131
	Haverhill	4,672	12	0	3	0	9	112	19	89
	Henniker	5,021	4	1	3	0	0	101	15	85
	Hill	1,106	0	0	0	0	0	0	0	0
	Hillsborough	5,592	12	0	3	1	8	117	19	92
	Hinsdale	4,124	8	0	2	1	5	79	10	63
	Hooksett	14,075	13	0	4	5	4	401	79	313
	Hopkinton	5,561	1	0	0	0	1	46	11	34
	Hudson	24,901	29	0	4	2	23	408	76	302
	Jaffrey	5,603	9	0	3	2	4	77	27	47
	Keene	22,093	46	0	11	12	23	808	89	705
	Kingston	6,199	5	0	3	1	1	73	18	49
	Laconia	16,973	65	0	13	8	44	827	143	672
	Lancaster	3,151	0	0	0	0	0	122	18	99
	Lebanon	12,765	29	0	6	3	20	483	41	432
	Lee	4,461	1	0	0	1	0	43	9	32
	Lincoln	1,337	2	0	2	0	0	90	11	78
	Lisbon	1,648	2	0	0	0	2	15	3	12
	Litchfield	8,852	4	0	2	1	1	91	25	65
	Littleton	6,111	10	0	1	0	9	137	27	106
	Londonderry	25,014	29	1	5	3	20	338	78	246
	Loudon	5,213	1	0	1	0	0	145	19	119
	Madison	2,350	3	0	1	0	2	45	14	30
	Manchester	108,101	544	1	62	154	327	3,754	907	2,687
	Marlborough	2,052	3	0	0	1	2	36	6	29
	Meredith	6,617	10	1	5	1	3	157	38	112
	Merrimack	26,501	9	0	0	3	6	293	45	238
	Middleton	1,861	0	0	0	0	0	14	7	7
	Milford	15,089	25	0	4	9	12	301	52	235
	Milton	4,633	14	0	4	0	10	113	43	64
	Mont Vernon	2,378	4	0	0	0	4	17	3	12
	Moultonborough	5,028	7	0	0	0	7	87	24	61
	Nashua	86,523	173	1	39	47	86	2,209	398	1,744
	New Boston	5,209	4	0	1	0	3	54	19	32
	Newbury	2,120	2	0	1	0	1	19	1	17
	New Durham	2,569	4	0	0	0	4	43	11	30

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Newfields	1,625	1	0	1	0	0	20	5	15
	New Hampton	2,256	4	0	0	0	4	64	21	42
	Newington	797	2	0	0	1	1	255	2	253
	New Ipswich	5,438	1	0	0	1	0	51	19	27
	New London	4,402	0	0	0	0	0	44	10	34
	Newmarket	9,497	9	0	1	0	8	33	9	23
	Newport	6,474	10	0	4	2	4	201	31	169
	Newton	4,587	5	0	2	0	3	51	13	37
	Northfield	5,120	5	0	0	0	5	77	16	58
	North Hampton	4,509	5	0	2	0	3	75	18	56
	Northumberland	2,242	4	0	3	0	1	58	19	38
	Northwood	4,164	2	0	0	1	1	91	19	67
	Nottingham	4,601	2	0	1	0	1	55	9	44
	Orford	1,039	0	0	0	0	0	8	0	8
	Ossipee	4,706	5	0	0	1	4	108	15	84
	Pelham	12,770	11	0	2	1	8	176	63	99
	Pembroke	7,317	8	0	2	1	5	98	25	71
	Peterborough	6,176	5	0	2	2	1	118	8	108
	Pittsfield	4,348	5	0	1	1	3	84	11	63
	Plaistow	7,522	4	0	0	3	1	217	13	183
	Plymouth	6,647	12	0	3	2	7	252	43	205
	Portsmouth	20,281	28	1	5	6	16	615	68	523
	Raymond	10,260	10	0	5	2	3	216	31	176
	Rindge	6,451	8	0	1	2	5	70	26	40
	Rochester	30,827	102	0	15	25	62	978	163	794
	Rollinsford	2,611	5	0	1	1	3	33	15	17
	Rye	5,097	4	0	0	0	4	79	3	76
	Sandown	5,907	3	0	2	0	1	53	18	32
	Sandwich	1,318	0	0	0	0	0	50	13	35
	Seabrook	8,471	15	0	2	1	12	301	21	271
	Somersworth	11,940	50	0	5	12	33	546	61	480
	South Hampton	871	0	0	0	0	0	2	1	1
	Strafford	4,076	6	0	1	0	5	36	6	29
	Stratham	7,328	3	0	0	2	1	76	8	66
	Sunapee	3,365	1	0	1	0	0	7	1	5
	Thornton	2,144	1	0	0	0	1	18	1	16
	Tilton	3,542	12	0	0	3	9	177	17	152
	Troy	2,045	1	0	1	0	0	30	9	20
	Wakefield	5,455	5	0	2	0	3	128	25	93
	Walpole	3,637	2	0	0	1	1	38	5	29
	Warner	2,932	0	0	0	0	0	10	2	8
	Washington	1,087	0	0	0	0	0	10	5	5
	Waterville Valley	267	3	0	1	2	0	60	0	60
	Weare	9,240	4	0	1	0	3	99	17	75
	Webster	1,891	0	0	0	0	0	29	4	25
	Wilton	3,938	2	0	1	0	1	62	12	48
	Winchester	4,252	4	0	0	2	2	121	33	78
	Windham	13,484	5	0	2	0	3	170	39	123
	Wolfeboro	6,569	5	0	2	0	3	108	28	79

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Woodstock	1,155	5	0	2	1	2	29	4	25
NEW JERSEY	Aberdeen Township	18,575	21	0	3	10	8	272	56	208
	Absecon	8,728	26	0	1	19	6	235	50	175
	Allendale	6,641	3	0	1	0	2	60	9	50
	Allenhurst	699	3	0	0	2	1	15	3	12
	Allentown	1,847	0	0	0	0	0	18	2	16
	Alpha	2,382	0	0	0	0	0	20	2	18
	Alpine	2,552	1	0	0	0	1	8	4	4
	Andover Township	6,623	2	0	0	1	1	37	9	27
	Asbury Park	16,625	344	3	13	188	140	1,147	335	753
	Atlantic City	39,787	783	11	27	434	311	2,969	492	2,344
	Atlantic Highlands	4,609	5	0	0	1	4	79	12	67
	Audubon	8,908	6	0	0	5	1	268	23	240
	Audubon Park	1,057	5	1	0	0	4	16	4	12
	Avalon	2,094	0	0	0	0	0	313	65	246
	Avon-by-the-Sea	2,252	2	0	0	0	2	73	8	64
	Barnegat Light	859	1	0	0	0	1	9	1	8
	Barnegat Township	23,692	33	0	0	5	28	244	77	163
	Barrington	6,972	3	0	0	2	1	85	27	50
	Bay Head	1,284	1	0	0	1	0	85	6	79
	Bayonne	58,393	162	0	5	71	86	885	180	612
	Beach Haven	1,425	3	0	0	0	3	136	18	117
	Beachwood	11,001	9	0	0	4	5	284	45	230
	Bedminster Township	8,456	3	0	2	0	1	45	10	33
	Belleville	33,849	75	0	1	35	39	755	159	466
	Bellmawr	11,275	18	0	0	8	10	315	54	243
	Belmar	5,917	24	0	2	10	12	315	57	252
	Belvidere	2,638	2	0	0	0	2	23	1	22
	Bergenfield	25,680	30	0	1	9	20	107	29	76
	Berkeley Heights Township	13,523	1	0	0	0	1	102	19	80
	Berkeley Township	43,531	38	0	0	14	24	717	154	542
	Berlin	8,194	12	0	0	3	9	207	26	173
	Berlin Township	5,509	11	0	3	1	7	178	17	158
	Bernards Township	26,990	3	0	0	2	1	146	36	102
	Bernardsville	7,872	1	0	0	0	1	38	13	25
	Beverly	2,580	9	0	1	2	6	51	25	25
	Blairstown Township	5,985	3	0	0	0	3	50	17	31
	Bloomfield	43,669	111	0	6	70	35	1,045	207	707
	Bloomingdale	7,485	5	0	0	1	4	60	11	49
	Bogota	7,933	12	0	1	2	9	72	21	48
	Boonton	8,552	10	0	0	3	7	102	11	88
	Boonton Township	4,539	3	0	1	0	2	23	4	18
	Bordentown	3,830	1	0	1	0	0	72	7	61
	Bordentown Township	10,300	8	0	0	3	5	138	34	99
	Bound Brook	10,523	17	0	2	10	5	240	62	168
	Bradley Beach	5,046	6	0	1	4	1	155	31	121
	Branchburg Township	15,263	7	0	3	1	3	147	22	121
	Brick Township	79,569	104	1	7	26	70	1,372	333	1,000

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Bridgeton	25,243	320	4	1	126	189	1,047	360	637
	Bridgewater Township	45,176	15	0	1	6	8	688	80	591
	Brielle	4,925	1	0	0	0	1	56	16	39
	Brigantine	12,729	11	0	0	3	8	263	69	187
	Brooklawn	2,262	16	0	2	9	5	301	31	260
	Buena	3,733	15	0	1	1	13	88	35	49
	Burlington	9,423	44	1	3	27	13	198	49	137
	Burlington Township	21,558	36	0	6	13	17	355	56	283
	Butler	8,248	15	1	1	4	9	97	33	60
	Byram Township	8,544	3	0	1	1	1	39	14	24
	Caldwell	7,115	3	0	0	0	3	73	16	57
	Califon	1,043	0	0	0	0	0	7	3	4
	Camden	79,081	1,841	37	73	712	1,019	3,500	1,015	1,966
	Cape May	3,691	2	0	0	0	2	185	29	156
	Cape May Point	221	0	0	0	0	0	13	8	5
	Carlstadt	6,111	19	0	0	5	14	154	16	104
	Carney's Point Township	8,076	9	0	1	7	1	163	33	118
	Carteret	24,246	52	1	3	16	32	399	72	296
	Cedar Grove Township	12,774	9	0	3	3	3	128	30	97
	Chatham	8,263	0	0	0	0	0	72	14	57
	Chatham Township	10,302	0	0	0	0	0	46	15	31
	Cherry Hill Township	71,338	79	0	0	34	45	2,210	307	1,833
	Chesilhurst	1,997	5	0	0	3	2	41	22	14
	Chester	1,700	1	0	0	1	0	21	6	15
	Chesterfield Township	7,860	3	0	0	0	3	34	2	31
	Chester Township	7,866	0	0	0	0	0	26	7	19
	Cinnaminson Township	15,718	25	0	4	8	13	373	53	302
	Clark Township	14,505	2	0	0	1	1	206	20	177
	Clayton	7,682	12	0	3	4	5	138	30	103
	Clementon	4,914	16	0	0	8	8	238	70	159
	Cliffside Park	23,139	32	0	0	6	26	221	69	147
	Clinton	2,576	2	0	0	1	1	37	12	25
	Clinton Township	14,075	4	0	0	0	4	66	14	51
	Closter	8,759	2	0	0	1	1	61	12	49
	Collingswood	13,880	36	0	2	22	12	497	136	334
	Colts Neck Township	10,180	4	0	0	1	3	73	26	47
	Cranbury Township	4,023	3	0	0	0	3	39	6	31
	Cranford Township	22,147	10	0	0	5	5	247	50	191
	Cresskill	8,760	1	0	0	0	1	38	15	19
	Deal	1,051	3	0	1	1	1	57	19	35
	Delanco Township	5,000	7	1	2	1	3	125	37	87
	Delaware Township	4,760	0	0	0	0	0	31	8	20
	Delran Township	16,957	17	0	2	7	8	247	39	200
	Demarest	5,216	0	0	0	0	0	36	10	26
	Denville Township	16,708	7	1	0	2	4	157	36	117
	Deptford Township	31,340	105	0	3	46	56	1,906	270	1,585
	Dover	17,948	36	0	1	13	22	337	93	222
	Dumont	17,022	11	1	0	2	8	115	14	101
	Dunellen	7,150	12	0	4	4	4	190	51	137

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Eastampton Township	6,597	6	0	0	3	3	109	24	80
	East Brunswick Township	47,620	44	0	4	15	25	833	89	721
	East Greenwich Township	8,733	4	0	0	2	2	154	33	115
	East Hanover Township	11,500	6	0	0	0	6	172	18	148
	East Newark	2,116	3	0	1	0	2	27	10	16
	East Orange	65,118	487	6	31	178	272	1,367	351	656
	East Rutherford	8,846	14	0	0	3	11	214	33	162
	East Windsor Township	27,424	25	0	2	7	16	339	48	278
	Eatontown	14,428	54	0	4	15	35	602	70	514
	Edgewater	9,875	10	0	1	4	5	205	30	157
	Edgewater Park Township	7,757	29	0	2	17	10	167	43	111
	Edison Township	100,395	141	2	5	52	82	1,709	334	1,220
	Egg Harbor City	4,391	20	1	0	6	13	148	51	92
	Egg Harbor Township	41,573	116	1	2	30	83	1,007	217	758
	Elizabeth	126,494	1,392	13	42	760	577	4,734	924	2,665
	Elk Township	4,084	5	0	1	1	3	120	35	80
	Elmer	1,346	0	0	0	0	0	7	3	4
	Elmwood Park	18,736	21	0	0	13	8	382	87	278
	Elsinboro Township	1,053	4	0	1	0	3	16	9	7
	Emerson	7,504	3	0	0	0	3	72	5	67
	Englewood	30,023	64	1	5	15	43	511	177	295
	Englewood Cliffs	5,946	0	0	0	0	0	73	16	55
	Englishtown	1,944	4	0	1	1	2	21	4	17
	Essex Fells	2,149	2	1	0	0	1	7	2	4
	Evesham Township	45,959	41	0	3	19	19	711	99	595
	Ewing Township	36,612	121	2	1	31	87	710	182	466
	Fairfield Township, Essex County	7,531	15	0	1	7	7	228	37	176
	Fair Haven	5,984	3	0	1	2	0	51	6	45
	Fair Lawn	30,607	27	0	1	9	17	360	58	289
	Fairview	13,709	28	2	1	18	7	175	46	122
	Fanwood	7,164	0	0	0	0	0	90	6	81
	Far Hills	910	0	0	0	0	0	9	4	5
	Fieldsboro	568	0	0	0	0	0	0	0	0
	Flemington	4,452	7	0	0	1	6	86	12	72
	Florence Township	11,663	17	0	2	4	11	110	39	66
	Florham Park	12,669	2	0	1	1	0	65	7	56
	Fort Lee	36,580	34	0	0	16	18	320	42	262
	Franklin	5,115	6	0	0	1	5	143	11	130
	Franklin Lakes	11,816	4	0	0	1	3	73	23	49
	Franklin Township, Gloucester County	17,679	22	0	0	10	12	363	139	208
	Franklin Township, Hunterdon County	3,289	0	0	0	0	0	32	5	26
	Franklin Township, Somerset County	61,185	64	1	3	32	28	951	239	656
	Freehold	11,548	49	2	2	18	27	275	48	213
	Freehold Township	35,117	37	0	5	14	18	1,063	97	947
	Frenchtown	1,474	0	0	0	0	0	32	2	28
	Galloway Township	37,367	68	1	1	18	48	708	192	478
	Garfield	29,068	49	1	1	14	33	444	98	303
	Garwood	4,599	6	0	0	5	1	46	8	38
	Gibbsboro	2,447	2	0	0	0	2	64	20	42

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Glassboro	20,047	43	0	0	21	22	405	112	281
	Glen Ridge	6,642	7	0	0	2	5	187	76	103
	Glen Rock	11,158	5	0	0	2	3	102	9	93
	Gloucester City	11,614	29	0	5	14	10	330	82	232
	Gloucester Township	65,239	214	1	7	55	151	1,655	417	1,145
	Green Brook Township	7,098	7	0	0	2	5	132	31	98
	Greenwich Township, Gloucester County	5,040	2	0	0	1	1	111	14	95
	Greenwich Township, Warren County	5,193	4	0	1	0	3	92	2	90
	Guttenberg	10,643	38	0	0	12	26	96	29	62
	Hackensack	43,111	107	0	6	31	70	1,073	89	910
	Hackettstown	9,653	7	0	0	0	7	143	16	121
	Haddonfield	11,499	11	0	1	6	4	307	73	230
	Haddon Heights	7,736	6	0	0	1	5	154	35	115
	Haddon Township	14,432	32	0	0	18	14	468	80	377
	Haledon	8,806	17	0	0	13	4	220	86	118
	Hamburg	3,514	7	0	0	0	7	32	9	23
	Hamilton Township, Atlantic County	24,892	71	4	8	21	38	1,074	154	888
	Hamilton Township, Mercer County	91,439	189	2	3	101	83	1,845	434	1,315
	Hammonton	13,603	20	1	2	4	13	254	72	175
	Hanover Township	13,905	12	0	1	3	8	134	14	113
	Harding Township	3,375	5	0	1	0	4	14	3	11
	Hardyston Township	8,621	9	0	1	0	8	111	21	88
	Harrington Park	4,914	0	0	0	0	0	8	2	6
	Harrison	15,393	41	0	1	10	30	266	91	137
	Harrison Township	13,122	9	0	2	6	1	184	22	160
	Harvey Cedars	404	1	0	0	0	1	15	7	8
	Hasbrouck Heights	11,497	1	0	0	1	0	72	11	60
	Haworth	3,447	0	0	0	0	0	10	2	8
	Hawthorne	18,083	9	0	0	4	5	200	50	135
	Hazlet Township	21,013	10	0	1	4	5	305	27	272
	Helmetta	2,039	2	0	0	0	2	15	5	9
	High Bridge	3,712	10	0	5	0	5	47	13	33
	Highland Park	14,455	17	1	2	6	8	168	35	131
	Highlands	5,299	23	0	0	1	22	63	4	52
	Hightstown	5,370	9	0	0	6	3	73	25	46
	Hillsborough Township	40,011	14	0	2	2	10	270	61	203
	Hillsdale	9,884	1	0	0	0	1	50	5	45
	Hillside Township	21,346	110	0	10	63	37	609	147	322
	Hi-Nella	1,003	1	0	0	0	1	34	9	21
	Hoboken	41,515	131	0	4	35	92	927	166	674
	Ho-Ho-Kus	4,024	0	0	0	0	0	16	4	11
	Holland Township	5,314	1	0	0	0	1	27	2	24
	Holmdel Township	17,066	9	1	0	2	6	274	27	240
	Hopatcong	15,579	7	1	0	1	5	129	30	99
	Hopewell	2,001	1	0	0	0	1	11	4	6
	Hopewell Township	18,060	11	0	0	1	10	101	23	77
	Howell Township	52,130	66	1	5	19	41	757	162	571
	Independence Township	5,724	2	0	0	0	2	35	12	23
	Interlaken	877	0	0	0	0	0	11	2	9

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Irvington	56,019	900	14	29	374	483	2,159	625	852
	Island Heights	1,917	1	0	0	0	1	14	1	13
	Jackson Township	54,638	45	1	2	14	28	710	164	519
	Jamesburg	6,437	8	0	2	3	3	62	17	41
	Jefferson Township	21,997	22	0	2	3	17	202	53	146
	Jersey City	244,201	1,829	25	44	943	817	5,992	1,523	3,662
	Keansburg	10,579	42	0	0	10	32	301	62	228
	Kearny	36,400	86	0	3	30	53	895	151	631
	Kenilworth	7,711	7	0	2	2	3	108	16	85
	Keyport	7,516	11	0	0	1	10	69	5	61
	Kinnelon	9,703	1	0	0	0	1	81	17	64
	Lacey Township	26,852	42	0	0	11	31	802	118	668
	Lake Como	1,784	5	0	0	2	3	37	4	31
	Lakehurst	2,743	2	0	0	0	2	42	7	34
	Lakewood Township	72,960	113	4	5	51	53	1,048	247	746
	Lambertville	3,802	8	0	0	0	8	50	4	44
	Laurel Springs	1,912	4	0	1	3	0	48	9	38
	Lavallette	2,802	3	0	0	0	3	71	26	45
	Lawnside	2,870	23	1	0	11	11	67	9	56
	Lawrence Township, Mercer County	32,104	41	0	3	19	19	823	93	715
	Lebanon Township	6,291	0	0	0	0	0	31	5	23
	Leonia	8,636	2	0	0	1	1	54	19	33
	Lincoln Park	10,663	2	0	0	0	2	91	27	63
	Linden	39,680	117	2	0	84	31	1,380	201	1,034
	Lindenwold	17,875	140	2	6	55	77	657	225	400
	Linwood	7,275	4	0	1	0	3	128	37	87
	Little Egg Harbor Township	21,508	41	2	6	7	26	423	62	351
	Little Falls Township	11,703	17	0	1	3	13	185	33	137
	Little Ferry	10,510	7	0	0	1	6	118	31	74
	Little Silver	6,175	0	0	0	0	0	79	22	57
	Livingston Township	27,775	12	0	0	7	5	386	46	329
	Loch Arbour	274	1	0	0	0	1	13	4	9
	Lodi	23,895	30	0	0	11	19	320	69	227
	Logan Township	6,352	13	0	1	5	7	154	32	117
	Long Beach Township	3,628	5	0	0	0	5	124	18	106
	Long Branch	33,368	112	1	5	47	59	820	224	565
	Long Hill Township	8,676	3	0	0	2	1	67	15	50
	Longport	1,104	0	0	0	0	0	21	1	20
	Lopatcong Township	8,744	5	0	0	1	4	94	13	80
	Lower Alloways Creek Township	1,908	1	0	0	1	0	12	6	5
	Lower Township	20,114	17	0	2	4	11	464	113	336
	Lumberton Township	12,184	19	0	1	8	10	284	44	237
	Lyndhurst Township	19,403	11	0	1	2	8	307	59	233
	Madison	15,849	5	0	2	0	3	118	35	83
	Magnolia	4,353	26	0	0	6	20	109	27	73
	Mahwah Township	24,346	3	0	0	1	2	106	7	87
	Manalapan Township	40,301	19	0	0	12	7	386	93	281
	Manasquan	6,309	4	0	0	1	3	167	31	136
	Manchester Township	42,400	24	0	1	2	21	459	140	310

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Mansfield Township, Burlington County	8,405	2	0	1	1	0	119	13	105
	Mansfield Township, Warren County	8,139	7	0	1	1	5	133	25	107
	Mantoloking	461	0	0	0	0	0	36	3	33
	Mantua Township	15,414	12	0	3	4	5	278	54	223
	Manville	10,996	13	0	0	6	7	215	14	173
	Maple Shade Township	19,297	27	0	2	10	15	424	102	287
	Maplewood Township	21,944	58	2	1	32	23	443	106	300
	Margate City	8,612	5	0	1	2	2	191	23	167
	Marlboro Township	41,231	15	0	0	3	12	450	93	344
	Matawan	9,175	5	0	0	4	1	96	28	64
	Maywood	9,166	2	0	0	2	0	101	28	69
	Medford Lakes	4,129	0	0	0	0	0	74	8	66
	Medford Township	22,914	8	0	1	3	4	234	43	188
	Mendham	5,110	1	0	0	0	1	25	4	21
	Mendham Township	5,564	1	0	0	0	1	26	4	22
	Merchantville	3,784	3	0	0	0	3	65	15	49
	Metuchen	13,200	10	0	1	7	2	202	27	168
	Middlesex	13,732	7	0	0	6	1	144	21	114
	Middle Township	16,580	75	1	7	18	49	664	165	473
	Middletown Township	66,915	42	0	4	11	27	830	151	656
	Midland Park	6,783	6	0	0	0	6	71	9	62
	Millburn Township	18,548	20	0	0	12	8	504	55	437
	Milltown	7,007	4	0	1	1	2	102	12	87
	Millville	29,497	169	1	7	58	103	1,216	265	919
	Mine Hill Township	3,604	0	0	0	0	0	29	7	21
	Monmouth Beach	3,590	1	0	1	0	0	51	12	37
	Monroe Township, Gloucester County	33,950	41	0	4	11	26	797	211	560
	Monroe Township, Middlesex County	38,777	21	2	0	8	11	283	39	231
	Montclair	37,425	75	0	4	41	30	630	181	426
	Montgomery Township	23,760	6	0	1	4	1	138	36	100
	Montvale	7,746	2	0	0	1	1	54	2	51
	Montville Township	21,253	6	0	0	2	4	128	28	96
	Moonachie	2,770	5	0	0	1	4	58	15	35
	Moorestown Township	19,653	25	0	5	14	6	520	67	445
	Morris Plains	5,954	4	0	1	2	1	87	15	72
	Morristown	19,085	78	0	0	29	49	456	95	347
	Morris Township	21,418	19	0	1	3	15	114	50	60
	Mountain Lakes	4,306	5	0	0	0	5	57	5	52
	Mountainside	6,638	1	0	0	0	1	62	8	49
	Mount Arlington	5,862	3	0	0	1	2	51	11	40
	Mount Ephraim	4,443	13	0	0	9	4	156	20	122
	Mount Holly Township	10,246	31	1	0	14	16	279	46	225
	Mount Laurel Township	39,696	36	0	5	12	19	642	88	532
	Mount Olive Township	26,431	12	0	5	1	6	272	46	222
	Mullica Township	6,104	12	0	0	2	10	109	43	62
	National Park	3,258	5	0	1	1	3	61	15	43
	Neptune City	5,116	17	0	2	9	6	208	33	166
	Neptune Township	28,586	132	1	7	59	65	1,673	358	1,256
	Netcong	3,244	2	0	0	0	2	61	11	50

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Newark	280,379	2,885	90	79	1,604	1,112	9,209	1,928	3,661
	New Brunswick	52,245	361	3	16	164	178	1,372	410	842
	Newfield	1,689	0	0	0	0	0	29	9	18
	New Hanover Township	9,455	0	0	0	0	0	19	4	14
	New Milford	16,005	5	0	1	4	0	100	13	82
	New Providence	12,126	3	0	0	0	3	133	30	103
	Newton	8,161	5	0	0	2	3	142	22	119
	North Arlington	14,721	12	0	0	6	6	188	54	114
	North Bergen Township	54,933	90	0	4	43	43	761	136	504
	North Brunswick Township	40,123	57	1	2	16	38	747	137	547
	North Caldwell	7,086	4	0	0	0	4	27	16	10
	Northfield	7,965	2	0	0	2	0	91	26	64
	North Haledon	9,058	4	0	0	0	4	30	7	20
	North Hanover Township	7,421	8	0	0	0	8	72	30	41
	North Plainfield	21,373	61	0	2	35	24	448	69	346
	Northvale	4,874	1	0	0	1	0	16	0	16
	North Wildwood	4,840	14	1	1	2	10	352	43	308
	Norwood	6,290	3	0	0	0	3	21	4	16
	Nutley Township	26,145	24	0	1	4	19	291	74	201
	Oakland	13,454	4	0	0	1	3	137	16	120
	Oaklyn	4,047	7	0	0	6	1	136	44	90
	Ocean City	14,725	27	0	4	9	14	894	189	700
	Ocean Gate	2,171	2	0	0	0	2	29	10	19
	Oceanport	5,755	7	0	1	2	4	81	23	57
	Ocean Township, Monmouth County	28,503	41	1	1	15	24	819	119	680
	Ocean Township, Ocean County	9,501	5	0	1	0	4	130	19	108
	Ogdensburg	2,565	0	0	0	0	0	34	9	25
	Old Bridge Township	66,913	70	2	3	25	40	869	153	655
	Old Tappan	6,151	4	0	0	0	4	36	6	30
	Oradell	7,811	1	0	0	0	1	81	9	72
	Orange	31,057	335	7	6	201	121	1,095	433	422
	Oxford Township	2,612	1	0	0	0	1	9	2	7
	Palisades Park	19,789	24	2	0	3	19	127	42	83
	Palmyra	7,400	18	0	2	4	12	155	27	119
	Paramus	26,340	92	0	0	31	61	1,757	80	1,631
	Park Ridge	9,013	7	0	0	1	6	36	8	27
	Parsippany-Troy Hills Township	50,760	19	0	2	9	8	566	212	327
	Passaic	67,356	635	6	6	278	345	1,630	390	1,097
	Paterson	146,356	1,566	18	44	769	735	4,521	1,491	2,329
	Paulsboro	6,121	19	0	0	9	10	254	54	189
	Peapack and Gladstone	2,600	1	0	1	0	0	17	4	11
	Pemberton	1,634	8	0	0	2	6	28	6	17
	Pemberton Township	28,107	54	0	9	14	31	572	176	366
	Pennington	2,674	2	0	0	1	1	19	2	17
	Pennsauken Township	35,105	131	4	9	60	58	1,257	301	869
	Penns Grove	4,686	33	1	0	20	12	200	69	123
	Pennsville Township	13,402	31	0	2	7	22	496	90	389
	Pequannock Township	17,494	10	0	0	1	9	165	41	121
	Perth Amboy	49,156	200	1	0	101	98	1,136	268	758

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Phillipsburg	14,500	49	0	8	17	24	347	78	257
	Pine Beach	2,110	1	0	0	0	1	29	2	27
	Pine Hill	11,449	52	0	1	13	38	282	82	196
	Pine Valley	24	0	0	0	0	0	4	4	0
	Piscataway Township	52,897	60	1	4	18	37	620	102	465
	Pitman	9,271	4	0	0	2	2	150	18	128
	Plainfield	46,459	489	8	13	237	231	1,446	387	929
	Plainsboro Township	21,407	17	0	1	3	13	179	29	145
	Pleasantville	18,996	193	3	4	94	92	629	240	356
	Plumsted Township	8,446	9	0	1	1	7	64	18	44
	Pohatcong Township	3,331	7	0	0	2	5	109	5	103
	Point Pleasant	20,569	19	0	0	5	14	352	59	288
	Point Pleasant Beach	5,492	11	0	1	1	9	214	26	183
	Pompton Lakes	11,150	10	0	0	2	8	101	19	82
	Princeton	13,448	21	0	0	4	17	374	65	304
	Princeton Township	17,581	14	1	0	3	10	170	40	128
	Prospect Park	5,623	13	0	0	7	6	146	54	81
	Rahway	29,443	97	0	1	45	51	473	104	331
	Ramsey	14,846	10	0	0	0	10	156	13	136
	Randolph Township	25,391	5	0	1	1	3	223	35	184
	Raritan	7,487	11	0	0	2	9	164	18	144
	Raritan Township	22,934	11	0	0	3	8	231	23	200
	Readington Township	16,302	5	0	2	1	2	132	19	110
	Red Bank	11,992	55	0	5	26	24	285	48	229
	Ridgefield	10,953	9	0	0	6	3	59	17	31
	Ridgefield Park	12,426	24	1	1	6	16	136	27	100
	Ridgewood	24,260	7	0	0	0	7	215	50	165
	Ringwood	12,822	3	2	0	0	1	79	11	67
	Riverdale	3,590	5	0	0	0	5	105	9	93
	River Edge	10,733	2	0	1	0	1	106	17	88
	Riverside Township	7,703	13	0	3	5	5	112	24	81
	Riverton	2,633	5	0	2	2	1	48	4	44
	River Vale Township	9,730	0	0	0	0	0	15	5	10
	Robbinsville Township	12,573	6	0	0	2	4	117	31	82
	Rochelle Park Township	6,159	3	0	0	3	0	82	22	54
	Rockaway	6,276	3	0	1	0	2	59	13	42
	Rockaway Township	25,860	15	0	1	5	9	505	42	456
	Rockleigh	390	0	0	0	0	0	1	1	0
	Roseland	5,390	5	0	1	1	3	46	11	33
	Roselle	20,721	91	0	1	53	37	405	124	233
	Roselle Park	12,899	17	0	0	8	9	109	28	75
	Roxbury Township	23,485	8	0	0	3	5	253	22	225
	Rumson	7,371	4	0	0	0	4	64	19	45
	Runnemede	8,449	25	0	1	14	10	330	58	253
	Rutherford	17,491	8	0	0	1	7	247	73	160
	Saddle Brook Township	14,371	19	0	0	7	12	318	44	263
	Saddle River	3,883	1	0	0	0	1	19	6	11
	Salem	5,855	61	3	5	20	33	239	74	160
	Sayreville	42,680	42	0	3	11	28	635	126	457

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Scotch Plains Township	23,231	7	0	0	2	5	213	66	140
	Sea Bright	1,818	2	0	0	0	2	33	2	31
	Sea Girt	2,107	5	0	0	0	5	37	15	22
	Sea Isle City	2,938	8	0	0	1	7	314	124	187
	Seaside Heights	3,397	48	0	1	11	36	322	63	244
	Seaside Park	2,351	4	0	0	3	1	88	15	71
	Secaucus	15,852	30	0	0	17	13	480	46	412
	Ship Bottom	1,479	0	0	0	0	0	59	6	53
	Shrewsbury	3,815	6	0	0	3	3	101	11	87
	Somerdale	5,116	7	0	0	4	3	176	40	125
	Somers Point	11,401	48	0	2	11	35	425	92	330
	Somerville	12,847	14	0	3	4	7	177	28	137
	South Amboy	7,802	17	0	2	4	11	86	13	66
	South Bound Brook	5,242	2	0	0	0	2	16	4	12
	South Brunswick Township	41,861	31	0	2	9	20	466	99	343
	South Hackensack Township	2,271	6	0	1	2	3	71	9	52
	South Harrison Township	3,298	2	0	0	0	2	29	9	20
	South Orange	16,024	58	0	0	41	17	414	135	248
	South Plainfield	22,848	45	1	0	20	24	412	59	323
	South River	15,809	32	0	3	4	25	228	31	191
	South Toms River	3,759	9	0	0	4	5	92	21	66
	Sparta Township	19,466	1	0	0	0	1	132	15	116
	Spotswood	8,261	5	0	0	1	4	104	20	83
	Springfield	15,353	9	0	0	4	5	211	34	162
	Springfield Township	3,498	2	0	0	0	2	30	11	15
	Spring Lake	3,561	1	0	0	0	1	115	22	92
	Spring Lake Heights	5,164	1	0	0	0	1	35	10	25
	Stafford Township	27,444	14	0	2	3	9	404	48	348
	Stanhope	3,586	3	0	0	0	3	42	4	37
	Stone Harbor	1,011	1	0	1	0	0	152	14	136
	Stratford	7,067	13	0	0	3	10	143	37	100
	Summit	20,783	19	1	1	2	15	219	39	176
	Surf City	1,590	0	0	0	0	0	41	3	37
	Swedesboro	2,422	3	0	0	0	3	14	3	9
	Tavistock	33	0	0	0	0	0	0	0	0
	Teaneck Township	38,666	78	3	2	36	37	599	127	448
	Tenafly	14,864	3	0	0	0	3	101	21	74
	Teterboro	17	0	0	0	0	0	18	2	12
	Tewksbury Township	6,168	0	0	0	0	0	18	7	10
	Tinton Falls	20,257	10	0	1	5	4	449	54	380
	Toms River Township	98,282	101	3	5	52	41	2,849	547	2,274
	Totowa	10,809	20	0	0	3	17	314	30	253
	Trenton	83,552	1,198	15	13	500	670	2,516	865	1,289
	Tuckerton	3,984	6	1	0	0	5	51	7	40
	Union Beach	6,647	25	0	0	6	19	102	21	78
	Union City	61,855	261	7	0	111	143	1,310	237	921
	Union Township	53,945	104	1	2	64	37	1,023	130	777
	Upper Saddle River	8,612	2	0	0	0	2	44	10	30
	Ventnor City	12,177	25	0	1	11	13	367	119	245

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Vernon Township	24,993	16	0	1	1	14	414	47	361
	Verona	12,636	6	0	1	1	4	113	24	81
	Vineland	59,924	223	3	6	83	131	2,127	515	1,536
	Voorhees Township	32,441	37	0	5	14	18	807	139	646
	Waldwick	9,643	4	0	0	1	3	70	6	64
	Wallington	11,355	11	0	0	4	7	157	38	113
	Wall Township	26,387	18	0	0	2	16	375	98	263
	Wanaque	12,430	8	0	0	1	7	120	8	109
	Warren Township	16,356	5	0	1	1	3	75	16	59
	Washington	6,718	8	0	0	0	8	114	15	98
	Washington Township, Bergen County	9,664	5	0	2	0	3	26	8	18
	Washington Township, Glouchester County	52,251	87	0	1	34	52	1,218	189	985
	Washington Township, Morris County	18,615	7	0	1	0	6	87	15	69
	Washington Township, Warren County	6,949	1	0	0	0	1	64	7	55
	Watchung	6,752	4	0	1	2	1	333	21	309
	Waterford Township	10,774	22	0	2	7	13	189	43	142
	Wayne Township	54,234	32	0	4	15	13	1,321	113	1,147
	Weehawken Township	12,351	22	0	0	19	3	264	34	201
	Wenonah	2,376	0	0	0	0	0	32	13	17
	Westampton Township	8,877	19	1	3	10	5	171	39	128
	West Amwell Township	3,002	7	0	0	0	7	31	10	19
	West Caldwell Township	10,392	4	0	0	1	3	81	15	63
	West Cape May	981	0	0	0	0	0	34	5	27
	West Deptford Township	22,482	28	0	2	12	14	495	117	353
	Westfield	29,867	17	0	2	6	9	237	43	185
	West Long Branch	8,482	12	0	0	5	7	230	38	189
	West Milford Township	28,049	18	0	4	6	8	296	103	185
	West New York	46,907	171	3	5	79	84	736	203	448
	West Orange	42,590	87	0	5	35	47	581	131	402
	Westville	4,490	25	1	0	3	21	180	46	124
	West Wildwood	404	1	0	0	0	1	22	3	19
	West Windsor Township	27,202	12	0	1	8	3	399	47	343
	Westwood	10,739	6	0	0	0	6	73	12	49
	Wharton	6,108	6	0	1	0	5	122	39	80
	Wildwood	5,222	58	0	2	21	35	551	160	385
	Wildwood Crest	4,058	6	0	0	1	5	178	40	137
	Willingboro Township	36,888	108	0	15	41	52	652	216	401
	Winfield Township	1,445	0	0	0	0	0	24	7	16
	Winslow Township	40,393	186	0	4	24	158	772	255	468
	Woodbridge Township	98,576	167	1	9	67	90	2,296	267	1,904
	Woodbury	10,527	42	0	2	18	22	475	96	360
	Woodbury Heights	3,079	4	0	0	3	1	126	19	106
	Woodcliff Lake	6,020	1	0	0	1	0	43	4	38
	Woodland Park	12,383	15	0	0	9	6	210	46	151
	Woodlynne	2,693	21	0	1	8	12	115	43	61
	Wood-Ridge	7,491	2	0	0	1	1	91	19	62
	Woodstown	3,392	4	0	0	0	4	54	8	44
	Woolwich Township	10,659	4	0	0	2	2	79	14	63

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wyckoff Township	17,056	9	0	0	0	9	94	19	73
NEW MEXICO	Alamogordo	36,555	97	4	8	2	83	1,036	203	798
	Albuquerque	545,389	4,291	42	338	940	2,971	26,372	5,465	18,134
	Angel Fire	976	8	0	0	0	8	46	25	21
	Aztec	7,135	43	0	2	3	38	174	28	141
	Bayard	2,423	3	0	0	0	3	36	15	20
	Belen	7,522	82	0	3	9	70	736	342	352
	Bernalillo	9,878	124	1	2	5	116	330	91	221
	Bloomfield	7,462	86	0	7	1	78	166	38	117
	Bosque Farms	4,154	5	0	0	0	5	37	8	23
	Carlsbad	26,801	197	0	29	20	148	1,376	382	936
	Carrizozo	1,065	5	0	0	1	4	9	4	4
	Cimarron	799	2	0	0	0	2	5	2	2
	Clovis	33,359	226	2	34	30	160	1,892	706	1,124
	Cuba	1,550	33	0	1	0	32	0	0	0
	Deming	15,655	74	0	1	8	65	579	186	366
	Edgewood	4,823	4	0	0	1	3	38	16	20
	Espanola	9,846	229	2	2	19	206	846	325	494
	Estancia	1,606	2	0	0	0	2	28	10	18
	Eunice	2,905	5	0	0	0	5	49	23	25
	Farmington	44,563	477	3	63	25	386	1,678	319	1,270
	Gallup	19,825	364	2	29	56	277	1,546	250	1,178
	Grants[6]	8,845		0	8	6		265	151	89
	Hobbs	32,642	249	9	39	33	168	1,685	419	1,206
	Hurley	1,427	0	0	0	0	0	19	10	9
	Jal	2,133	6	0	0	1	5	27	10	13
	Las Cruces	97,065	408	3	11	62	332	4,326	1,110	3,026
	Las Vegas	13,797	175	1	9	9	156	542	173	342
	Logan	1,002	3	0	0	0	3	70	43	25
	Lordsburg	2,886	2	0	0	0	2	2	1	1
	Los Alamos[6]	18,311		0	2	1		186	33	148
	Los Lunas[6]	15,054		0	7	3		546	75	412
	Lovington	10,422	46	0	6	1	39	369	193	159
	Milan	2,566	20	1	0	0	19	74	37	31
	Moriarty	2,014	5	0	0	0	5	91	41	41
	Portales	12,468	69	1	7	3	58	374	108	256
	Raton	6,330	36	0	0	2	34	181	83	83
	Rio Rancho	87,608	160	0	7	18	135	1,476	344	1,023
	Roswell	47,238	351	6	16	36	293	2,325	541	1,714
	Ruidoso	9,504	30	1	4	2	23	240	92	142
	Ruidoso Downs	2,740	39	0	4	0	35	89	20	64
	Santa Clara	1,875	3	0	0	0	3	17	11	2
	Santa Fe	76,442	367	8	39	81	239	4,349	2,392	1,781
	Santa Rosa	2,593	17	0	0	0	17	66	32	31
	Silver City	10,459	98	0	6	6	86	628	156	442
	Socorro	9,056	77	0	0	4	73	336	93	229
	Sunland Park	15,224	20	0	5	2	13	215	41	149
	Taos	5,689	46	0	3	7	36	541	182	347

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Taos Ski Valley	59	2	0	0	0	2	7	2	5
	Tatum	793	0	0	0	0	0	39	0	38
	Texico	997	0	0	0	0	0	8	4	4
	Truth or Consequences	7,194	47	0	5	2	40	174	44	124
	Tucumcari	5,255	45	0	5	2	38	282	136	142
	Tularosa	3,078	24	0	3	0	21	83	23	60
NEW YORK	Adams Village	1,664	1	0	0	0	1	17	7	10
	Addison Town and Village	2,466	4	0	1	0	3	57	16	41
	Akron Village	2,923	2	0	0	0	2	37	7	30
	Albany	92,713	981	2	42	316	621	4,643	926	3,488
	Alexandria Bay Village	1,114	1	0	0	0	1	21	7	14
	Alfred Village	4,933	7	0	2	1	4	52	14	38
	Allegany Village	1,715	2	0	1	0	1	17	2	15
	Altamont Village	1,676	0	0	0	0	0	14	3	11
	Amherst Town	109,138	119	2	8	33	76	2,066	218	1,801
	Amity Town and Belmont Village	2,187	0	0	0	0	0	1	0	1
	Amityville Village	9,962	10	0	0	4	6	153	16	130
	Amsterdam[5]	17,187	45	1	1	9	34	566	138	416
	Arcade Village	1,836	1	0	0	0	1	45	4	40
	Ardsley Village	4,855	1	0	0	0	1	24	6	17
	Asharoken Village	658	0	0	0	0	0	1	1	0
	Attica Village	2,348	4	0	0	0	4	11	2	9
	Auburn	26,448	96	0	8	12	76	976	172	790
	Avon Village	2,850	4	0	0	1	3	30	2	28
	Baldwinsville Village	7,201	5	0	1	1	3	140	20	114
	Ballston Spa Village	5,444	8	0	0	2	6	144	39	103
	Batavia	14,871	44	0	7	7	30	516	88	419
	Bath Village	5,330	17	2	2	4	9	205	49	153
	Beacon	14,342	63	1	3	11	48	320	74	231
	Bedford Town	18,403	2	0	0	0	2	36	6	27
	Bethlehem Town	32,862	20	0	6	1	13	495	87	399
	Binghamton	43,628	266	4	18	70	174	2,085	423	1,644
	Bolivar Village	1,069	0	0	0	0	0	7	1	6
	Bolton Town	2,129	3	0	0	0	3	23	10	13
	Boonville Village	1,996	0	0	0	0	0	7	2	5
	Brant Town	1,801	1	0	0	0	1	34	10	24
	Brewster	2,088	0	0	0	0	0	7	1	5
	Briarcliff Manor Village	7,864	1	0	0	1	0	18	3	15
	Brighton Town	33,701	45	0	6	13	26	1,051	150	877
	Brockport Village	8,269	16	0	5	3	8	184	35	144
	Bronxville Village	6,452	4	0	0	2	2	52	6	43
	Brownville Village	1,052	0	0	0	0	0	9	1	8
	Buchanan Village	2,223	1	0	0	1	0	11	6	4
	Buffalo	265,128	3,599	55	157	1,466	1,921	14,753	4,296	9,027
	Cairo Town	6,411	5	0	0	0	5	29	5	24
	Cambridge Village	1,786	2	0	1	0	1	35	8	25
	Camden Village	2,219	1	0	0	0	1	85	16	64
	Camillus Town and Village	23,245	14	0	0	4	10	303	38	260

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Canandaigua	11,054	20	0	3	3	14	362	57	298
	Canisteo Village	2,175	3	0	0	0	3	43	6	37
	Canton Village	6,065	2	0	1	1	0	88	9	78
	Cape Vincent Village	785	0	0	0	0	0	7	0	7
	Carmel Town	34,119	12	0	0	2	10	272	48	218
	Carroll Town	3,410	2	0	0	0	2	8	5	3
	Carthage Village	3,734	3	0	0	0	3	101	17	82
	Catskill Village	4,128	12	0	1	3	8	130	12	118
	Cayuga Heights Village[5]	3,626	1	0	0	1	0	49	3	46
	Cazenovia Village	2,956	1	0	0	0	1	65	7	58
	Central Square Village	1,749	0	0	0	0	0	35	2	31
	Centre Island Village	441	0	0	0	0	0	4	0	4
	Chatham Village	1,639	15	0	0	0	15	61	9	48
	Cheektowaga Town	76,671	155	1	17	52	85	2,748	431	2,221
	Chester Town[5]	9,972	0	0	0	0	0	61	10	50
	Chester Village	3,548	4	0	0	3	1	148	5	142
	Chittenango Village	4,811	3	0	1	1	1	72	15	54
	Cicero Town	28,288	13	0	0	5	8	518	59	447
	Clarkstown Town	78,365	92	0	4	35	53	1,700	156	1,512
	Clifton Springs Village	2,117	0	0	0	0	0	16	2	14
	Clyde Village	2,043	4	0	0	1	3	32	8	24
	Cobleskill Village	4,486	4	0	1	2	1	162	19	140
	Coeymans Town	7,939	15	0	0	1	14	48	11	35
	Cohoes	14,884	40	0	1	11	28	302	92	195
	Colchester Town	1,988	0	0	0	0	0	0	0	0
	Colonie Town	77,078	54	0	3	31	20	2,259	228	1,988
	Cooperstown Village	1,849	1	0	0	0	1	28	4	24
	Copake Town	3,187	1	0	0	0	1	25	9	16
	Corning	10,046	51	0	5	6	40	398	66	330
	Cornwall Town[2]	9,724	0	0	0	0	0		6	
	Cortland[5]	17,930	45	0	6	10	29	357	112	228
	Crawford Town[5]	9,492	11	0	0	0	11	67	10	52
	Cuba Town	3,217	2	0	1	0	1	122	17	103
	Dansville Village	4,363	11	0	4	2	5	114	4	110
	Deerpark Town	8,495	8	0	0	3	5	142	60	81
	Delhi Village	2,749	3	0	0	1	2	42	11	29
	Depew Village	14,966	26	0	4	5	17	344	67	268
	Deposit Village	1,547	0	0	0	0	0	20	1	19
	Dewitt Town	21,202	37	1	1	14	21	592	81	492
	Dexter Village	1,194	0	0	0	0	0	1	0	1
	Dobbs Ferry Village	11,151	7	0	0	5	2	135	21	112
	Dolgeville Village	1,973	3	0	0	0	3	59	6	52
	Dryden Village	1,807	3	0	0	0	3	114	25	89
	Dunkirk	11,801	45	0	7	16	22	353	59	285
	Durham Town	2,664	0	0	0	0	0	10	5	5
	East Aurora-Aurora Town	13,307	3	0	0	0	3	144	29	108
	East Chester Town	18,612	8	0	0	5	3	203	23	174
	East Greenbush Town	16,873	14	0	1	6	7	405	41	359
	East Hampton Town	19,860	9	0	0	2	7	494	97	385

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	East Hampton Village	1,395	3	0	1	0	2	137	10	123
	East Rochester Village	6,153	9	0	1	1	7	131	19	109
	East Syracuse Village	2,924	9	0	0	4	5	165	25	132
	Eden Town	7,604	3	0	2	1	0	42	11	31
	Ellenville Village	3,851	33	0	0	4	29	95	30	62
	Ellicott Town	5,162	12	0	0	1	11	224	61	159
	Ellicottville	518	0	0	0	0	0	113	13	100
	Elmira	28,823	108	4	5	29	70	1,057	259	773
	Elmira Heights Village	3,849	7	0	0	3	4	88	19	67
	Elmira Town	5,808	1	0	0	0	1	4	1	3
	Elmsford Village	4,722	6	0	0	4	2	43	7	26
	Endicott Village	12,103	43	0	4	11	28	604	117	475
	Evans Town	16,561	25	0	3	3	19	328	75	242
	Fairport Village	5,382	1	0	0	1	0	40	10	28
	Fallsburg Town	12,285	30	2	2	1	25	207	63	135
	Fishkill Town	19,772	5	0	0	0	5	269	32	234
	Fishkill Village	1,666	0	0	0	0	0	30	1	28
	Floral Park Village	15,699	16	0	0	11	5	79	16	52
	Fort Plain Village	2,144	6	0	0	1	5	75	15	59
	Frankfort Town	4,704	4	0	0	0	4	55	16	37
	Franklinville Village	1,659	1	0	0	0	1	42	4	38
	Fredonia Village	10,982	18	1	2	4	11	309	24	281
	Freeport Village	43,458	213	1	3	103	106	1,026	153	772
	Friendship Town	1,788	0	0	0	0	0	12	3	9
	Fulton City	10,956	34	0	4	13	17	523	99	417
	Garden City Village	22,314	9	0	0	3	6	354	39	305
	Gates Town	28,357	44	0	1	20	23	938	89	828
	Geddes Town	10,269	7	0	0	2	5	226	28	197
	Geneseo Village	7,679	0	0	0	0	0	127	6	121
	Geneva	13,090	33	0	4	8	21	324	63	253
	Germantown Town	1,929	0	0	0	0	0	3	0	3
	Glen Cove	26,661	23	0	1	10	12	227	25	196
	Glen Park Village	501	0	0	0	0	0	5	1	4
	Glens Falls	13,650	42	0	2	3	37	209	29	177
	Glenville Town	21,844	15	0	1	5	9	372	65	303
	Gloversville	14,713	82	1	6	14	61	636	116	495
	Goshen Town	8,257	4	0	0	1	3	50	12	35
	Goshen Village	5,553	3	0	0	0	3	78	11	66
	Gouverneur Village	3,925	6	0	1	0	5	202	44	157
	Granville Village	2,490	3	0	0	0	3	43	14	29
	Great Neck Estates Village	2,760	0	0	0	0	0	5	4	1
	Greece Town	92,282	119	5	12	26	76	2,552	384	2,108
	Greenburgh Town	43,314	70	0	3	23	44	634	71	546
	Greene Village	1,597	0	0	0	0	0	0	0	0
	Green Island Village	2,529	6	0	0	0	6	59	11	43
	Greenwich Village	1,791	4	0	0	0	4	31	8	22
	Greenwood Lake Village	3,382	4	0	1	1	2	51	11	39
	Groton Village	2,380	3	0	1	0	2	66	7	59
	Guilderland Town	32,840	11	0	4	3	4	982	67	906

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Hamburg Town	43,642	37	0	3	13	21	998	179	789
	Hamburg Village	9,231	5	0	3	2	0	221	42	174
	Hammondsport Village	717	0	0	0	0	0	17	3	14
	Hancock Village	1,050	1	0	0	0	1	4	2	2
	Harriman Village	2,312	1	0	0	1	0	12	3	9
	Harrison Town	26,710	20	1	2	1	16	254	29	215
	Hastings-on-Hudson Village	7,887	7	0	1	1	5	139	14	122
	Haverstraw Town	37,489	65	0	6	27	32	438	106	312
	Hempstead Village	53,443	452	12	3	218	219	1,051	304	613
	Herkimer Village	6,824	74	0	2	6	66	354	49	305
	Highland Falls Village	3,674	0	0	0	0	0	47	6	41
	Holley Village	1,645	6	0	1	0	5	40	11	25
	Homer Village	3,135	1	0	0	0	1	59	8	51
	Hornell	8,441	19	0	1	0	18	157	22	132
	Horseheads Village	6,193	12	0	1	1	10	145	16	123
	Hudson	6,691	30	0	3	3	24	262	36	220
	Hudson Falls Village	6,491	18	0	2	2	14	139	29	105
	Hunter Town	2,650	3	0	0	1	2	6	4	2
	Huntington Bay Village	1,504	0	0	0	0	0	14	2	12
	Hyde Park Town	19,992	18	0	0	4	14	210	57	147
	Ilion Village	7,844	14	0	5	1	8	232	33	193
	Independence Town	1,009	0	0	0	0	0	4	1	3
	Inlet Town	363	0	0	0	0	0	10	4	6
	Irondequoit Town	49,101	93	0	2	32	59	1,482	251	1,181
	Irvington Village	6,615	0	0	0	0	0	29	6	23
	Ithaca	29,791	60	0	4	23	33	1,143	152	963
	Jamestown	28,785	180	0	24	35	121	1,281	342	895
	Johnson City Village	14,384	65	1	5	11	48	885	119	759
	Johnstown	8,354	14	0	4	2	8	301	45	253
	Jordan Village	1,297	0	0	0	0	0	3	1	2
	Kenmore Village	14,652	27	0	4	11	12	339	49	279
	Kensington Village	1,193	2	0	0	1	1	2	0	2
	Kent Town	13,999	5	0	0	1	4	91	19	66
	Kings Point Village	5,351	1	0	0	0	1	18	8	9
	Kingston	22,012	81	1	5	29	46	611	142	451
	Lackawanna	17,202	115	0	7	24	84	469	125	310
	Lake Placid Village	2,700	0	0	0	0	0	71	18	51
	Lake Success Village	2,869	3	0	0	1	2	42	8	31
	Lakewood-Busti	7,273	5	0	1	3	1	275	22	248
	Lancaster Town	23,380	21	0	3	4	14	507	73	430
	Larchmont Village	6,517	2	0	0	2	0	81	7	72
	Le Roy Village	4,057	12	0	1	5	6	110	25	85
	Lewisboro Town	12,425	0	0	0	0	0	40	2	37
	Lewiston Town and Village	16,604	4	0	0	2	2	204	43	142
	Liberty Village	3,804	20	0	3	0	17	174	35	135
	Little Falls	4,751	30	0	0	0	30	151	16	134
	Liverpool Village	2,305	0	0	0	0	0	33	10	23
	Lloyd Harbor Village	3,722	1	0	0	0	1	16	1	14
	Lloyd Town	10,623	9	0	2	0	7	117	23	92

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lockport	20,175	61	0	3	15	43	761	151	587
	Lowville Village	3,077	5	0	0	1	4	89	15	71
	Lynbrook Village	19,656	26	0	1	11	14	164	16	141
	Lyons Village	3,334	24	0	1	4	19	151	36	112
	Macedon Town and Village	8,770	5	0	2	1	2	60	8	52
	Malone Village	5,649	7	0	5	1	1	262	50	207
	Malverne Village	8,785	2	0	0	1	1	47	6	41
	Mamaroneck Town	11,466	8	0	0	5	3	144	21	121
	Mamaroneck Village	18,309	15	1	1	1	12	135	30	101
	Manchester Village	1,411	0	0	0	0	0	0	0	0
	Manlius Town	24,597	16	0	1	6	9	444	67	369
	Marcellus Village	1,792	0	0	0	0	0	11	3	8
	Marlborough Town	8,178	17	0	0	0	17	142	29	110
	Massena Village	10,286	19	0	3	7	9	397	64	328
	Mechanicville	4,827	5	0	0	2	3	105	21	78
	Medina Village	5,933	22	0	0	2	20	238	53	177
	Menands Village	3,734	6	0	0	2	4	169	27	141
	Middleport Village	1,746	0	0	0	0	0	36	2	34
	Middletown	25,701	150	1	7	63	79	1,171	194	949
	Monroe Village	8,172	19	0	6	7	6	348	37	303
	Montgomery Village	4,977	0	0	0	0	0	11	0	11
	Monticello Village	6,240	59	1	3	17	38	168	60	103
	Moravia Village	1,263	1	0	0	0	1	12	2	8
	Moriah Town	3,400	5	0	0	0	5	7	1	6
	Mount Hope Town	7,540	2	0	0	0	2	29	4	23
	Mount Kisco Village	10,314	27	0	1	6	20	164	25	134
	Mount Morris Village	2,804	5	0	1	0	4	102	7	93
	Mount Pleasant Town	26,257	9	0	1	4	4	186	29	155
	Mount Vernon	68,081	678	2	12	330	334	1,584	354	1,052
	Nassau Village	1,098	4	0	0	0	4	29	2	25
	Newark Village	8,871	41	0	3	1	37	293	64	228
	New Berlin Town	1,672	3	0	0	0	3	55	24	30
	Newburgh	27,836	522	11	7	195	309	1,132	342	724
	Newburgh Town	31,293	31	2	0	11	18	1,259	101	1,126
	New Castle Town	17,598	3	0	0	2	1	107	29	75
	New Hartford Town and Village	18,875	12	0	0	4	8	716	47	662
	New Paltz Town and Village	14,279	55	0	4	7	44	244	41	197
	New Rochelle	73,648	217	1	5	93	118	1,216	140	1,021
	New Windsor Town	25,211	24	1	0	8	15	472	85	372
	New York	8,336,002	48,489	536	1,036	19,608	27,309	139,615	17,926	111,370
	New York Mills Village	3,245	3	0	1	1	1	50	6	44
	Niagara Falls	50,321	610	5	23	185	397	2,924	956	1,834
	Niskayuna Town	21,735	13	0	1	5	7	394	56	332
	Nissequogue Village	1,608	0	0	0	0	0	9	1	8
	Norfolk Town	4,469	0	0	0	0	0	48	16	30
	North Castle Town	12,173	1	0	0	0	1	71	16	51
	North Greenbush Town	11,833	14	0	3	2	9	255	27	217
	Northport Village	7,633	1	0	0	0	1	75	18	57
	North Syracuse Village	6,477	6	0	0	0	6	79	10	64

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	North Tonawanda	30,564	54	0	8	12	34	583	147	422
	Northville Village	1,146	0	0	0	0	0	11	0	11
	Norwich	6,778	9	0	4	2	3	285	35	243
	Nunda Town and Village	2,892	0	0	0	0	0	15	1	12
	Ocean Beach Village	147	0	0	0	0	0	55	1	54
	Ogdensburg	10,814	31	1	4	3	23	564	95	455
	Ogden Town	19,177	18	0	2	2	14	380	42	331
	Old Brookville Village	2,310	0	0	0	0	0	72	11	59
	Old Westbury Village	5,329	2	0	0	0	2	25	4	21
	Olean	13,778	73	1	5	4	63	556	92	460
	Oneida	10,508	13	1	0	3	9	462	47	411
	Oneonta City	12,785	75	0	3	5	67	353	84	259
	Orangetown Town	36,021	43	0	0	18	25	472	68	386
	Orchard Park Town	28,384	14	0	1	4	9	370	55	305
	Oriskany Village	1,373	0	0	0	0	0	22	4	18
	Ossining Town	5,678	0	0	0	0	0	15	2	12
	Ossining Village	23,687	39	0	0	20	19	248	54	191
	Oswego City	16,897	64	0	8	11	45	729	155	561
	Oxford Village	1,493	0	0	0	0	0	4	0	4
	Oyster Bay Cove Village	2,290	0	0	0	0	0	8	2	6
	Painted Post Village	1,738	2	0	0	1	1	74	6	63
	Peekskill	24,699	30	1	1	6	22	232	57	172
	Pelham Village	6,418	20	0	0	10	10	100	19	79
	Penn Yan Village	5,025	4	0	1	0	3	177	36	140
	Perry Village	3,571	5	0	1	0	4	85	16	67
	Phelps Village	1,879	0	0	0	0	0	1	0	1
	Piermont Village	2,541	2	0	0	0	2	26	2	24
	Pine Plains Town	2,676	0	0	0	0	0	14	4	10
	Plattekill Town	10,755	17	0	0	1	16	120	38	77
	Plattsburgh City	19,219	30	0	8	7	15	601	112	477
	Pleasantville Village	7,069	2	0	0	1	1	3	0	3
	Port Byron Village	1,207	0	0	0	0	0	0	0	0
	Port Chester Village	27,939	51	0	2	28	21	678	92	558
	Port Dickinson Village	1,557	3	0	0	1	2	13	1	12
	Port Jervis	9,061	29	0	5	7	17	309	57	247
	Portville Village	927	1	0	0	0	1	3	0	3
	Port Washington	18,808	2	0	0	1	1	121	9	109
	Poughkeepsie	29,175	398	7	21	142	228	1,055	273	729
	Poughkeepsie Town	42,538	39	1	0	25	13	1,330	120	1,202
	Pound Ridge Town	4,915	0	0	0	0	0	97	7	90
	Pulaski Village	2,244	0	0	0	0	0	66	10	56
	Quogue Village	1,174	0	0	0	0	0	40	5	32
	Ramapo Town	77,482	80	1	2	16	61	758	94	648
	Red Hook Village	1,991	3	0	0	0	3	53	6	47
	Rensselaer City	7,760	19	1	2	7	9	213	34	160
	Rhinebeck Village	2,982	4	0	0	0	4	44	7	37
	Riverhead Town	36,120	82	0	2	28	52	1,062	155	879
	Rochester	203,802	2,229	41	99	816	1,273	11,820	3,448	7,620
	Rockville Centre Village	24,188	31	0	0	23	8	291	56	221

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Rome	32,930	40	1	5	8	26	648	158	464
	Rosendale Town	6,138	1	0	0	0	1	55	9	46
	Rotterdam Town	30,025	26	0	0	9	17	781	119	645
	Rouses Point Village	2,265	0	0	0	0	0	10	0	10
	Rye Brook Village	9,575	2	0	0	2	0	92	11	79
	Sag Harbor Village	2,423	1	0	0	0	1	32	5	27
	Salamanca	5,521	33	0	5	6	22	244	56	182
	Sands Point Village	2,848	0	0	0	0	0	13	0	12
	Saranac Lake Village	4,689	9	0	2	0	7	158	34	119
	Saratoga Springs	29,080	31	0	2	9	20	599	92	498
	Saugerties Town	19,375	4	0	2	1	1	278	71	203
	Scarsdale Village	17,530	5	0	0	2	3	215	43	167
	Schenectady	60,751	679	8	53	256	362	3,387	856	2,347
	Schodack Town	11,453	9	0	0	2	7	91	24	64
	Schoharie Village	957	2	0	0	0	2	8	0	8
	Scotia Village	7,978	8	0	0	4	4	219	26	187
	Seneca Falls Village	6,539	11	0	2	0	9	61	11	50
	Shandaken Town	2,990	5	0	0	0	5	101	20	78
	Shawangunk Town	12,570	12	0	0	0	12	121	26	93
	Shelter Island Town	2,555	0	0	0	0	0	51	10	38
	Sherburne Village	1,374	1	0	0	0	1	30	0	30
	Sherrill	3,077	0	0	0	0	0	21	7	14
	Shortsville Village	1,301	0	0	0	0	0	0	0	0
	Sidney Village	3,541	13	0	2	0	11	181	23	155
	Silver Creek Village	2,757	6	0	0	0	6	33	3	30
	Skaneateles Village	2,544	2	0	0	0	2	3	0	3
	Sleepy Hollow Village	10,212	11	0	0	3	8	102	20	80
	Sodus Point Village	1,091	2	0	0	0	2	8	3	5
	Sodus Village	1,572	1	0	0	0	1	47	9	37
	Solvay Village	6,318	21	0	1	8	12	197	36	151
	Southampton Town	52,425	55	0	4	10	41	1,140	248	837
	Southampton Village	4,502	2	0	0	0	2	154	19	131
	South Glens Falls Village	3,371	8	0	2	0	6	85	25	60
	South Nyack Village	3,306	2	0	0	1	1	47	7	40
	Southold Town	20,444	0	0	0	0	0	272	48	222
	Spring Valley Village	24,965	139	1	4	43	91	623	106	491
	Stillwater Town	6,556	0	0	0	0	0	27	2	25
	St. Johnsville Village	1,574	0	0	0	0	0	7	1	6
	Stockport Town	2,750	0	0	0	0	0	14	4	9
	Stony Point Town	15,050	9	0	0	2	7	97	23	71
	Suffern Village	10,917	4	0	0	1	3	56	5	45
	Syracuse	136,284	1,291	15	68	377	831	5,708	2,174	3,167
	Tarrytown Village	11,047	7	0	0	6	1	80	8	70
	Ticonderoga Town	4,853	10	0	4	0	6	67	16	46
	Tonawanda	14,475	21	0	1	2	18	312	32	271
	Tonawanda Town	55,706	129	2	4	33	90	1,115	231	830
	Troy	46,861	423	2	22	137	262	2,352	656	1,551
	Tuckahoe Village	6,196	4	0	0	1	3	8	1	7
	Tupper Lake Village	3,740	4	0	0	0	4	106	25	80

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Tuxedo Park Village	713	0	0	0	0	0	0	0	0
	Tuxedo Town	2,960	1	0	1	0	0	2	0	2
	Ulster Town	12,469	8	0	0	7	1	482	29	443
	Utica	57,153	416	2	25	146	243	2,717	577	2,059
	Vernon Village	1,125	0	0	0	0	0	19	7	12
	Vestal Town	27,146	14	0	0	8	6	546	41	500
	Walden Village	6,991	29	0	3	1	25	51	7	42
	Wallkill Town	27,941	27	0	0	15	12	858	100	745
	Walton Village	2,739	5	1	1	0	3	53	14	37
	Wappingers Falls Village	6,072	8	0	0	4	4	163	14	148
	Warsaw Village	3,527	2	0	0	0	2	76	11	65
	Washingtonville Village	6,122	8	0	1	0	7	74	4	67
	Waterford Town and Village	8,520	4	0	1	1	2	91	18	67
	Waterloo Village	4,905	13	0	4	2	7	160	22	137
	Watertown	27,267	118	3	14	20	81	1,166	171	972
	Watervliet	9,320	23	0	0	2	21	259	42	200
	Watkins Glen Village	1,951	0	0	0	0	0	95	12	82
	Waverly Village	4,216	3	0	0	0	3	127	30	97
	Wayland Village	1,746	0	0	0	0	0	27	3	24
	Webster Town and Village	41,839	19	0	4	4	11	531	121	399
	Weedsport Village	1,867	0	0	0	0	0	28	2	26
	Wellsville Village	4,728	36	0	1	3	32	143	18	123
	West Carthage Village	2,175	2	0	0	0	2	18	3	15
	Westfield Village	3,303	5	0	0	0	5	43	8	34
	Westhampton Beach Village	2,009	7	0	1	2	4	53	9	43
	West Seneca Town	43,061	48	0	3	11	34	976	194	754
	Whitehall Village	2,518	5	0	0	1	4	34	6	28
	White Plains	57,254	110	2	2	40	66	1,094	48	1,017
	Whitesboro Village	3,661	6	0	0	0	6	35	7	28
	Whitestown Town	9,088	4	0	1	1	2	77	19	53
	Windham Town	1,880	0	0	0	0	0	58	18	39
	Woodbury Town	10,242	3	0	1	2	0	363	8	352
	Woodstock Town	6,009	5	0	0	2	3	65	16	46
	Yonkers	199,296	895	9	29	455	402	2,851	521	2,086
	Yorktown Town	37,684	26	1	0	5	20	462	62	399
	Yorkville Village	2,503	5	0	0	3	2	51	2	49
	Youngstown Village	1,832	0	0	0	0	0	5	1	4
NORTH CAROLINA	Aberdeen	6,116	20	0	2	13	5	311	60	243
	Ahoskie	4,617	32	1	3	6	22	241	90	147
	Albemarle	15,446	67	0	4	14	49	795	220	527
	Archdale	9,344	10	0	0	4	6	368	82	265
	Asheboro	25,017	52	0	11	24	17	1,662	423	1,175
	Asheville	77,067	432	2	31	165	234	3,671	743	2,638
	Atlantic Beach	1,855	19	0	2	6	11	190	59	129
	Ayden	5,078	34	0	1	11	22	223	83	130
	Bailey	691	0	0	0	0	0	21	10	11
	Banner Elk	944	2	0	1	0	1	25	7	18
	Beaufort	4,368	20	0	0	3	17	201	40	156

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Belhaven	2,050	7	0	0	2	5	63	19	44
	Belmont	9,601	41	0	4	8	29	461	69	372
	Benson	3,632	47	0	0	14	33	243	76	148
	Beulaville	1,133	6	1	0	1	4	43	7	33
	Biscoe	1,685	0	0	0	0	0	112	25	85
	Black Mountain	7,953	5	0	1	1	3	182	53	117
	Boiling Spring Lakes	5,012	4	0	1	0	3	93	34	57
	Boone	14,209	24	0	7	6	11	440	82	349
	Brevard	6,722	21	0	4	3	14	207	52	149
	Burgaw	4,478	20	0	0	1	19	110	19	87
	Burlington	52,210	395	3	11	69	312	3,519	794	2,599
	Canton	3,841	25	0	1	2	22	214	50	154
	Cape Carteret	1,429	4	0	1	1	2	20	7	13
	Carolina Beach	5,968	22	2	5	4	11	309	51	245
	Carrboro	18,448	60	0	5	13	42	611	190	405
	Carthage	2,080	7	1	0	3	3	70	34	35
	Cary	141,461	120	1	14	35	70	2,179	535	1,580
	Catawba	836	0	0	0	0	0	16	6	8
	Chadbourn	2,043	21	2	0	1	18	168	73	93
	Chapel Hill	54,164	88	0	11	32	45	1,666	508	1,108
	Charlotte-Mecklenburg	797,733	4,891	61	239	1,795	2,796	34,701	9,325	22,711
	Cherryville	5,862	29	0	2	2	25	197	28	160
	China Grove	3,772	12	0	1	3	8	94	29	61
	Claremont	1,163	2	0	0	1	1	48	16	29
	Clayton	17,472	25	0	3	8	14	400	114	275
	Cleveland	846	0	0	0	0	0	36	11	24
	Clinton	8,753	33	0	0	13	20	479	127	339
	Clyde	1,282	0	0	0	0	0	35	19	15
	Columbus	1,056	3	0	1	0	2	51	5	45
	Concord	68,461	139	3	11	57	68	2,842	354	2,321
	Cornelius	26,180	34	0	2	7	25	618	148	452
	Cramerton	3,184	3	0	1	0	2	127	34	90
	Creedmoor	3,898	12	0	1	4	7	117	28	86
	Dobson	1,452	3	0	0	0	3	45	18	24
	Drexel	1,865	0	0	0	0	0	38	11	26
	Duck	504	1	0	0	0	1	81	52	29
	Durham	233,790	1,614	23	60	659	872	11,357	3,652	6,987
	Eden	15,310	92	0	5	19	68	834	232	556
	Edenton	5,052	33	1	0	8	24	217	55	152
	Elizabeth City	20,801	120	4	4	30	82	772	208	544
	Elkin	4,117	22	0	1	1	20	302	69	227
	Elon	7,198	20	0	1	3	16	137	41	90
	Emerald Isle	3,719	6	0	0	2	4	249	142	104
	Enfield	2,319	48	1	2	12	33	123	72	47
	Erwin	4,954	20	0	0	4	16	185	3	176
	Fairmont	2,625	26	0	0	7	19	162	47	112
	Farmville	4,679	41	0	0	4	37	173	48	120
	Fayetteville	208,263	1,101	17	57	461	566	12,566	3,928	7,916
	Fletcher	4,819	8	0	2	3	3	151	43	102

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Franklin	3,980	15	0	1	3	11	186	55	126
	Franklinton	2,041	11	1	0	5	5	89	30	54
	Garner	28,620	48	2	3	22	21	977	152	793
	Garysburg	1,093	6	0	0	0	6	40	17	22
	Gibsonville	4,905	4	0	1	0	3	90	25	59
	Goldsboro	38,179	386	5	3	105	273	2,525	734	1,663
	Graham	14,826	47	0	3	6	38	574	167	383
	Granite Falls	4,571	11	0	2	1	8	307	56	243
	Greensboro	257,237	1,512	20	56	626	810	13,776	4,221	8,755
	Hamlet	5,725	53	0	2	13	38	508	191	302
	Haw River	2,050	11	0	0	0	11	79	28	47
	Henderson	15,730	175	3	6	50	116	1,807	522	1,241
	Hendersonville	12,311	74	1	10	15	48	810	114	639
	Hertford	2,170	4	0	0	1	3	69	26	43
	Hickory	41,892	217	1	22	76	118	2,573	616	1,836
	Highlands	964	0	0	0	0	0	35	14	21
	High Point	105,278	608	2	28	220	358	4,879	1,313	3,346
	Hillsborough	5,831	31	0	3	10	18	369	92	268
	Holden Beach	859	3	0	0	0	3	54	22	32
	Holly Ridge	1,000	3	0	0	1	2	48	32	12
	Holly Springs	23,506	19	1	1	5	12	250	79	165
	Hope Mills	14,008	63	0	1	23	39	945	416	494
	Hudson	3,013	5	0	0	0	5	80	12	63
	Huntersville	47,537	45	0	5	9	31	1,041	256	766
	Indian Beach	95	0	0	0	0	0	6	0	6
	Jonesville	2,233	6	0	0	1	5	131	41	86
	Kannapolis	44,084	95	0	5	40	50	954	310	574
	Kenansville	1,168	5	0	1	1	3	31	6	24
	Kernersville	23,695	86	0	4	11	71	1,034	158	846
	King	7,092	22	0	4	4	14	212	54	151
	Kinston	21,900	223	2	10	50	161	1,231	379	807
	Kitty Hawk	3,351	7	0	0	1	6	128	69	57
	Knightdale	10,686	18	1	0	7	10	385	63	307
	Lake Lure	1,001	0	0	0	0	0	40	15	24
	Lake Royale		2	0	0	1	1	88	46	39
	Laurinburg	15,325	119	3	6	31	79	896	395	460
	Leland	6,165	23	0	2	1	20	392	133	246
	Lenoir	17,840	55	0	3	26	26	864	178	641
	Lexington	20,255	88	2	7	28	51	762	217	515
	Liberty	2,738	7	0	0	1	6	37	11	24
	Lincolnton	11,017	30	0	0	14	16	541	81	452
	Long View	5,005	19	0	4	6	9	236	102	116
	Louisburg	3,755	7	0	0	7	0	131	39	85
	Lumberton	22,019	438	5	13	138	282	2,647	693	1,779
	Madison	2,245	45	0	0	0	45	145	36	107
	Maggie Valley	906	9	0	2	2	5	110	9	99
	Magnolia	988	0	0	0	0	0	34	21	12
	Maiden	3,521	10	0	0	1	9	134	37	89
	Manteo	1,503	7	0	2	1	4	88	24	63

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Marion	7,015	36	0	1	10	25	438	136	285
	Marshville	3,389	15	0	0	2	13	106	40	60
	Matthews	27,989	49	0	4	18	27	739	112	587
	Maxton	2,727	21	1	0	10	10	112	54	51
	Mayodan	2,625	22	0	1	4	17	239	24	212
	Maysville	947	3	0	1	0	2	18	7	11
	Middlesex	872	2	1	0	0	1	15	3	12
	Mint Hill	21,032	53	0	5	16	32	451	132	294
	Mocksville	4,683	17	0	4	3	10	249	38	205
	Mooresville	22,430	84	0	7	22	55	1,451	262	1,143
	Morehead City	9,888	76	0	4	8	64	544	87	446
	Morganton	17,001	40	0	4	11	25	494	121	355
	Morrisville	15,446	12	0	1	5	6	401	66	321
	Mount Airy	10,612	57	2	4	7	44	620	187	406
	Mount Holly	10,228	52	0	4	7	41	407	122	267
	Mount Olive	4,344	42	2	1	11	28	405	106	286
	Murfreesboro	2,413	4	0	0	2	2	61	16	42
	Murphy	1,526	17	0	1	1	15	95	9	83
	Nags Head	3,097	16	0	6	1	9	334	141	190
	New Bern	29,657	141	1	8	23	109	1,806	779	973
	Newport	4,492	6	0	1	0	5	68	28	38
	Oak Island	8,487	27	0	2	3	22	278	120	150
	Old Fort	961	0	0	0	0	0	33	13	15
	Oxford	8,699	110	1	1	23	85	674	264	382
	Pinebluff	1,447	1	0	0	0	1	33	18	15
	Pinehurst	12,749	5	0	1	1	3	131	2	124
	Pinetops	1,228	10	0	0	1	9	53	25	27
	Pineville	7,313	47	1	1	18	27	1,305	207	1,033
	Pittsboro	2,820	8	0	1	1	6	75	8	65
	Plymouth	3,768	64	0	0	5	59	175	57	115
	Raeford	4,149	35	1	1	7	26	402	89	286
	Raleigh	419,700	1,740	14	99	643	984	12,995	3,021	9,104
	Ramseur	1,772	6	0	1	1	4	78	25	51
	Randleman	3,692	9	0	0	3	6	264	51	208
	Red Springs	3,503	49	0	0	16	33	349	147	179
	Reidsville	14,739	57	2	0	19	36	884	279	579
	Richlands	964	7	0	1	3	3	32	9	22
	Roanoke Rapids	16,121	76	3	7	29	37	868	209	638
	Robersonville	1,520	6	0	0	1	5	63	18	45
	Rockingham	8,727	50	0	1	28	21	948	194	735
	Rockwell	2,024	2	0	1	1	0	53	16	36
	Rocky Mount	59,688	688	11	14	210	453	3,566	1,057	2,339
	Rolesville	3,512	3	0	0	1	2	51	28	23
	Rowland	1,154	10	0	0	4	6	57	29	26
	Roxboro	8,683	68	0	5	12	51	504	140	349
	Rutherfordton	4,050	3	0	0	3	0	161	29	127
	Salisbury	31,106	211	6	9	78	118	1,667	361	1,210
	Scotland Neck	2,122	30	0	1	5	24	132	58	73
	Selma	7,172	51	0	4	16	31	437	201	214

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Shallotte	2,260	18	0	3	3	12	271	77	179
	Sharpsburg	2,412	17	0	1	4	12	69	30	36
	Shelby	21,430	145	1	11	47	86	1,033	337	654
	Siler City	8,938	40	1	1	11	27	354	100	240
	Smithfield	13,448	84	2	2	18	62	794	191	586
	Southern Pines	13,060	92	1	2	30	59	478	122	346
	Sparta	1,760	7	0	2	0	5	59	14	42
	Spencer	3,408	11	1	0	4	6	188	86	98
	Spring Hope	1,310	11	0	1	2	8	40	14	22
	Spruce Pine	1,947	7	0	2	3	2	62	4	54
	Stallings	9,612	17	0	1	3	13	301	60	234
	Stanley	3,228	58	0	2	1	55	110	48	62
	Star	796	4	0	0	0	4	12	2	9
	St. Pauls	2,036	12	1	0	5	6	107	34	73
	Sunset Beach	2,721	0	0	0	0	0	56	36	19
	Surf City	2,132	3	0	0	0	3	151	74	76
	Swansboro	2,071	3	0	0	1	2	134	47	84
	Tabor City	2,773	35	1	0	4	30	204	64	132
	Tarboro	9,930	54	0	3	14	37	375	102	262
	Taylorsville	1,815	3	0	0	0	3	137	33	102
	Thomasville	26,850	120	0	2	19	99	1,138	298	805
	Trent Woods	4,007	3	0	0	0	3	75	7	68
	Troutman	2,024	4	0	0	0	4	106	37	69
	Troy	3,458	13	0	1	1	11	123	25	92
	Valdese	4,530	2	0	0	1	1	77	26	50
	Vass	815	0	0	0	0	0	21	3	16
	Walnut Cove	1,604	3	0	1	0	2	56	2	49
	Warrenton	827	4	0	0	2	2	31	1	30
	Warsaw	3,193	4	0	1	1	2	177	66	107
	Washington	10,228	91	2	4	27	58	557	134	412
	Waxhaw	4,355	11	0	1	2	8	155	29	122
	Waynesville	10,261	27	0	4	4	19	432	165	256
	Weaverville	3,118	6	0	0	1	5	127	6	121
	Wendell	5,612	10	0	1	3	6	101	35	64
	Whispering Pines	2,180	0	0	0	0	0	21	10	10
	Whitakers	766	3	0	0	0	3	12	5	6
	Wilkesboro	3,123	16	2	2	4	8	322	38	277
	Williamston	5,313	35	1	2	10	22	463	183	265
	Wilmington	102,649	724	5	47	282	390	5,706	1,447	3,781
	Wilson	49,134	282	4	9	80	189	2,151	642	1,413
	Wilson's Mills	1,757	7	0	0	0	7	78	41	35
	Winston-Salem	232,928	1,517	11	96	449	961	13,349	4,482	8,225
	Winterville	4,886	16	2	2	4	8	186	44	139
	Wrightsville Beach	2,660	10	0	1	3	6	137	20	115
	Yadkinville	2,825	16	0	1	4	11	162	34	126
	Youngsville	798	1	0	0	0	1	64	17	47
NORTH DAKOTA	Belfield	844	1	0	0	0	1	5	2	2
	Beulah	2,976	2	0	0	0	2	44	5	38

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Bismarck	64,142	197	1	21	17	158	1,508	182	1,250
	Burlington	1,043	0	0	0	0	0	3	0	3
	Cando	1,033	0	0	0	0	0	20	2	18
	Carrington	2,001	0	0	0	0	0	4	1	1
	Cavalier	1,351	1	0	0	0	1	20	4	14
	Devils Lake	6,917	26	0	5	3	18	306	34	252
	Dickinson	16,917	42	0	0	5	37	420	63	336
	Ellendale	1,500	1	0	0	0	1	13	4	9
	Fargo	99,694	302	0	44	35	223	2,764	392	2,205
	Fessenden	493	0	0	0	0	0	1	0	1
	Grafton	4,052	8	0	2	1	5	97	15	73
	Grand Forks	53,382	119	0	33	7	79	1,424	252	1,095
	Harvey	1,604	4	0	0	0	4	33	3	29
	Jamestown	15,164	43	0	10	1	32	333	59	246
	Kenmare	1,125	0	0	0	0	0	1	1	0
	Killdeer	704	0	0	0	0	0	0	0	0
	Lincoln	3,140	0	0	0	0	0	9	0	8
	Lisbon	2,185	5	0	0	0	5	41	18	20
	Mandan	19,134	41	1	11	2	27	281	25	238
	Medora	99	1	0	0	0	1	0	0	0
	Minot	37,605	107	1	27	5	74	701	66	588
	Napoleon	702	0	0	0	0	0	7	5	2
	Northwood	944	1	0	0	0	1	23	6	16
	Oakes	1,797	2	0	0	0	2	1	0	1
	Rolla	1,483	0	0	0	0	0	25	5	19
	Rugby	2,566	0	0	0	0	0	43	6	35
	Sherwood	216	0	0	0	0	0	0	0	0
	Steele	632	1	0	0	0	1	1	0	1
	Thompson	985	0	0	0	0	0	2	1	1
	Valley City	6,477	4	0	1	0	3	80	20	54
	Wahpeton	7,592	10	0	3	0	7	149	16	127
	Watford City	1,450	2	0	0	0	2	39	6	26
	West Fargo	26,409	46	0	7	3	36	450	105	319
	Williston	13,569	32	2	7	2	21	290	24	236
OHIO	Ada	6,104	1	0	1	0	0	41	10	31
	Akron	205,760	1,665	22	159	602	882	10,851	4,247	5,855
	Alliance	22,467	69	1	21	15	32	918	219	675
	Amberley Village	3,563	1	0	0	0	1	42	9	33
	Amelia	3,644	6	0	4	2	0	106	18	88
	Amherst	11,705	10	1	1	6	2	254	25	225
	Archbold	4,430	1	0	1	0	0	67	6	61
	Arlington Heights	836	0	0	0	0	0	20	5	13
	Ashland	21,737	15	0	13	0	2	578	68	500
	Ashville	3,294	0	0	0	0	0	83	20	60
	Athens	22,161	21	0	3	7	11	475	88	375
	Aurora	14,712	8	0	4	2	2	148	22	121
	Austintown	34,548	23	0	0	22	1	1,381	263	1,043
	Bainbridge Township	11,705	9	0	0	1	8	197	22	171

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Barberton	26,332	51	1	18	19	13	1,183	264	890
	Barnesville	3,987	2	0	0	0	2	15	3	11
	Batavia	1,761	0	0	0	0	0	84	18	64
	Beavercreek	42,247	28	1	5	13	9	1,104	124	948
	Beaver Township	6,017	1	0	1	0	0	144	37	104
	Bedford	12,694	30	0	1	8	21	475	47	399
	Bedford Heights	10,328	26	1	2	14	9	224	50	122
	Bellbrook	6,792	1	0	1	0	0	98	15	83
	Bellefontaine	12,735	34	0	14	8	12	702	100	583
	Bellville	1,680	4	0	0	0	4	76	7	68
	Belpre	6,437	4	0	4	0	0	73	14	58
	Berea	17,858	8	0	1	0	7	323	38	280
	Bethel	2,648	3	0	0	3	0	165	37	126
	Beverly	1,320	0	0	0	0	0	28	6	22
	Bexley[5]	12,632	11	0	0	8	3	298	86	196
	Blanchester	4,284	1	0	1	0	0	77	12	63
	Blue Ash	12,764	11	0	3	4	4	339	42	291
	Bluffton	3,882	4	0	1	0	3	47	12	35
	Boardman	38,524	63	0	6	44	13	1,886	340	1,466
	Bowling Green	28,617	41	0	1	15	25	813	96	700
	Brecksville	12,675	5	0	1	1	3	58	11	47
	Bridgeport	2,031	1	0	1	0	0	8	1	6
	Brimfield Township	7,959	16	0	5	8	3	298	47	241
	Broadview Heights	17,249	10	0	1	1	8	26	10	15
	Brookfield Township	9,310	37	0	2	4	31	261	96	154
	Brooklyn	10,175	32	1	5	20	6	553	87	428
	Brooklyn Heights	1,428	0	0	0	0	0	22	7	12
	Brook Park	18,806	66	0	4	2	60	30	6	11
	Brookville	5,455	2	0	2	0	0	90	8	82
	Brunswick Hills Township	7,587	1	0	0	0	1	66	12	52
	Burton	1,489	1	0	0	0	1	14	1	13
	Butler Township	8,038	9	0	2	4	3	285	22	247
	Cadiz	3,239	8	1	3	1	3	70	17	51
	Cambridge	11,085	30	0	0	12	18	606	169	414
	Canal Fulton	5,037	4	0	3	0	1	86	9	75
	Canfield	6,754	2	0	1	0	1	71	10	60
	Canton	77,938	652	2	54	324	272	4,129	1,523	2,337
	Cardington	2,005	2	0	0	0	2	38	11	27
	Carrollton	3,205	20	0	0	5	15	16	14	0
	Celina	10,180	19	1	1	3	14	425	62	353
	Centerville	22,745	22	0	2	3	17	488	77	390
	Champion Township	9,059	6	0	1	0	5	193	61	129
	Chardon	5,452	8	0	0	1	7	110	6	104
	Cheviot	8,350	4	0	0	2	2	210	42	159
	Chillicothe	22,143	240	1	7	43	189	2,199	435	1,722
	Cincinnati	332,365	3,608	68	233	2,116	1,191	20,513	6,490	12,408
	Circleville	13,686	38	0	7	21	10	996	209	770
	Clayton	12,769	14	0	2	9	3	205	43	148
	Clay Township, Ottawa County	2,724	4	0	0	1	3	28	8	19

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Clearcreek Township	13,005	0	0	0	0	0	125	24	100
	Cleveland	426,042	5,525	81	341	3,181	1,922	23,436	9,854	10,079
	Cleveland Heights	44,799	73	0	1	68	4	670	166	417
	Cleves	2,724	2	0	0	1	1	59	22	37
	Clinton Township	4,075	38	0	0	29	9	375	83	264
	Coitsville Township	1,614	4	0	1	2	1	42	26	16
	Coldwater	4,374	0	0	0	0	0	20	3	17
	Columbus	772,974	5,451	94	566	3,359	1,432	50,168	15,234	30,784
	Conneaut	12,337	17	0	3	2	12	361	91	244
	Copley Township	14,009	1	0	0	1	0	91	25	65
	Cortland	6,257	7	0	1	2	4	87	19	67
	Covington	2,623	0	0	0	0	0	73	19	54
	Crestline	4,842	7	0	0	1	6	50	25	23
	Creston	2,117	0	0	0	0	0	39	4	35
	Cuyahoga Falls	51,140	68	0	20	11	37	1,217	234	935
	Danville	1,074	1	0	0	0	1	16	1	13
	Dayton	152,319	1,509	34	92	782	601	8,891	3,380	4,840
	Deer Park	5,745	3	0	0	3	0	103	17	81
	Defiance	15,912	20	0	8	6	6	656	76	575
	Delaware	35,468	55	0	19	10	26	915	201	691
	Delhi Township	31,310	21	0	5	4	12	501	98	394
	Delphos	6,720	6	0	3	0	3	209	54	152
	Delta	2,880	0	0	0	0	0	67	12	53
	Dover	12,408	9	0	3	3	3	114	21	88
	Dublin	40,073	12	0	1	8	3	758	118	621
	Eastlake	19,635	13	1	0	7	5	420	38	375
	Eaton	7,899	16	0	2	1	13	315	55	253
	Edgerton	1,916	0	0	0	0	0	45	9	36
	Elyria	54,701	221	1	28	100	92	2,139	590	1,446
	Englewood	12,647	23	0	3	8	12	420	46	362
	Evendale	3,007	19	0	0	4	15	222	11	206
	Fairborn	31,731	50	0	10	26	14	742	196	521
	Fairfield	42,494	125	0	6	28	91	1,308	205	1,050
	Fairlawn	6,961	12	0	0	3	9	331	10	311
	Fairport Harbor	3,246	9	0	4	2	3	162	40	117
	Findlay	36,324	75	1	17	16	41	1,381	265	1,087
	Forest	1,441	0	0	0	0	0	19	5	13
	Forest Park	18,476	34	0	3	30	1	422	105	304
	Fort Shawnee	3,663	1	0	0	1	0	49	14	35
	Frazeysburg	1,295	0	0	0	0	0	27	3	24
	Fredericktown	2,500	1	0	1	0	0	72	13	54
	Fremont	16,305	26	0	2	12	12	888	129	733
	Gahanna	34,335	21	0	7	11	3	770	119	625
	Gallipolis	4,087	8	0	2	5	1	403	47	351
	Gates Mills	2,231	0	0	0	0	0	23	4	19
	Geneva-on-the-Lake	1,479	1	0	0	0	1	23	7	15
	Genoa	2,265	2	0	0	2	0	45	4	40
	Germantown	4,990	3	0	1	0	2	86	14	71
	German Township, Montgomery County	3,274	4	0	1	0	3	45	16	27

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Gibsonburg	2,395	1	0	1	0	0	75	7	68
	Girard	9,896	64	0	8	3	53	385	112	253
	Glendale	2,224	0	0	0	0	0	54	19	33
	Glouster	1,979	1	0	0	1	0	88	18	68
	Goshen Township, Clermont County	16,559	4	0	0	0	4	317	65	241
	Goshen Township, Mahoning County	3,407	12	0	0	0	12	93	28	62
	Grandview Heights	6,342	1	0	1	0	0	85	20	63
	Granville[5]	5,229	8	0	7	1	0	75	7	68
	Greenhills	3,819	2	0	1	0	1	33	10	23
	Greenville	12,713	38	0	5	9	24	482	118	341
	Grove City	35,339	51	0	15	24	12	1,259	160	1,053
	Groveport	5,501	8	0	0	3	5	145	32	110
	Hamilton	62,805	414	2	64	205	143	3,866	1,000	2,661
	Harrison	9,697	1	0	0	0	1	311	44	264
	Hartville	2,596	2	0	0	1	1	41	8	32
	Heath	8,950	14	0	2	3	9	517	55	448
	Hebron	2,161	2	0	0	1	1	63	11	50
	Hicksville	3,358	1	0	0	0	1	48	7	40
	Highland Heights	8,665	0	0	0	0	0	73	17	54
	Highland Hills	1,374	0	0	0	0	0	2	0	1
	Hilliard	29,204	21	0	4	11	6	828	159	642
	Hillsboro	6,674	2	0	0	1	1	374	31	342
	Holland	1,323	4	0	0	2	2	173	11	160
	Hubbard	7,549	19	0	2	6	11	203	63	133
	Hubbard Township	5,612	7	0	0	0	7	220	95	120
	Hudson	23,023	3	0	0	1	2	158	34	122
	Independence	6,662	3	0	1	2	0	115	15	97
	Indian Hill	6,095	0	0	0	0	0	57	6	51
	Ironton	11,252	7	0	2	2	3	110	38	70
	Jackson	6,145	8	0	2	3	3	405	55	345
	Jackson Township, Mahoning County	2,246	1	0	0	0	1	80	43	36
	Jackson Township, Montgomery County	3,826	0	0	0	0	0	45	24	19
	Jackson Township, Stark County	40,877	55	0	10	17	28	1,256	179	1,040
	Jamestown	1,804	2	0	0	0	2	56	13	40
	Johnstown	4,100	0	0	0	0	0	73	6	65
	Kent	27,823	39	1	8	9	21	631	156	451
	Kenton	7,970	7	1	2	4	0	449	93	350
	Kettering	52,931	61	0	16	25	20	1,300	362	887
	Kirtland	7,524	1	0	0	0	1	56	17	39
	Kirtland Hills	824	0	0	0	0	0	7	3	3
	Lake Township	7,478	1	0	0	0	1	103	21	79
	Lakewood	49,526	76	0	6	38	32	901	220	655
	Lancaster	37,330	103	0	19	56	28	2,192	378	1,760
	Lawrence Township	8,437	5	0	0	0	5	57	13	36
	Lebanon	21,099	22	1	9	4	8	416	73	336
	Lexington	4,057	4	0	3	1	0	90	17	71
	Lima	37,182	336	3	37	88	208	2,222	792	1,328
	Linndale	86	5	0	0	2	3	16	0	16
	Liverpool Township	4,108	1	0	0	1	0	61	12	46

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lockland	3,463	24	0	1	11	12	170	50	105
	Logan	7,418	3	0	0	2	1	511	182	319
	London	9,692	16	0	4	7	5	308	45	255
	Lorain	70,242	343	1	29	139	174	3,161	1,278	1,768
	Lordstown	3,502	0	0	0	0	0	77	22	54
	Loudonville	3,055	0	0	0	0	0	70	16	53
	Louisville	9,481	7	0	0	2	5	217	40	174
	Madison	3,159	3	0	2	0	1	32	3	26
	Madison Township, Franklin County	18,751	11	0	1	3	7	141	45	84
	Madison Township, Lake County	17,187	29	0	4	5	20	471	77	370
	Mansfield	49,069	159	3	35	73	48	2,933	905	1,966
	Mariemont	3,169	0	0	0	0	0	80	6	72
	Marietta[5]	14,007	20	0	9	6	5	328	62	261
	Marion	35,540	91	1	18	35	37	1,935	551	1,336
	Marysville	18,580	14	0	9	2	3	398	46	341
	Mason	30,805	7	0	2	2	3	463	64	394
	Massillon	32,768	39	3	4	21	11	833	210	601
	Mayfield Heights	17,396	19	0	0	8	11	300	35	250
	McArthur	2,011	3	0	1	1	1	111	35	74
	Medina Township	9,182	0	0	0	0	0	76	11	62
	Mentor	51,924	40	0	5	21	14	1,200	125	1,010
	Mentor-on-the-Lake	8,392	7	1	0	2	4	93	23	68
	Miamisburg	19,679	35	0	4	15	16	561	156	376
	Miami Township, Clermont County	40,101	22	0	4	11	7	876	144	723
	Miami Township, Montgomery County	24,822	42	1	8	20	13	1,170	152	973
	Middlefield	2,515	1	0	0	0	1	47	0	47
	Middleport	2,448	3	0	0	1	2	11	6	5
	Middletown	51,464	344	2	23	98	221	3,999	1,142	2,712
	Milford	6,324	18	0	3	5	10	372	37	333
	Millersburg	3,675	3	0	1	1	1	62	8	52
	Minerva	3,900	0	0	0	0	0	75	19	55
	Mingo Junction	3,233	34	0	0	0	34	71	30	38
	Monroe	15,513	56	0	8	7	41	702	97	598
	Montgomery	10,606	4	0	1	1	2	204	24	175
	Montpelier	3,928	14	0	6	0	8	144	27	114
	Moraine	6,376	22	1	5	9	7	864	90	760
	Moreland Hills	3,010	1	0	1	0	0	10	2	7
	Mount Gilead	3,558	2	0	2	0	0	164	32	131
	Mount Healthy	6,062	28	1	4	15	8	277	89	174
	Munroe Falls	5,119	0	0	0	0	0	41	10	31
	Napoleon	8,664	14	0	6	5	3	374	76	292
	Navarre	1,883	3	0	0	2	1	33	11	21
	Nelsonville	5,717	9	0	4	3	2	260	96	158
	New Albany	7,766	1	0	0	1	0	67	11	56
	Newark	47,409	103	1	29	39	34	2,197	482	1,645
	New Boston	2,131	10	0	3	5	2	223	68	144
	New Franklin	14,976	2	0	2	0	0	122	43	76
	New Lebanon	4,059	7	0	1	2	4	135	46	87
	New Lexington	4,539	0	0	0	0	0	64	6	56

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	New Middletown	1,494	0	0	0	0	0	7	1	6
	New Philadelphia	17,238	5	0	1	1	3	136	6	129
	New Richmond	2,545	5	0	0	3	2	166	33	131
	Newtown	4,153	1	0	0	0	1	22	6	16
	New Washington	901	2	0	0	0	2	14	3	11
	Niles	18,906	45	0	8	22	15	1,122	196	845
	North Canton	16,737	10	0	2	7	1	312	72	234
	North College Hill	9,515	39	1	1	28	9	409	93	295
	Northfield	3,616	0	0	0	0	0	15	3	11
	North Olmsted	30,689	23	0	3	8	12	397	94	293
	North Ridgeville	29,437	26	1	5	2	18	226	46	170
	Northwood	5,542	13	0	2	6	5	255	32	215
	Norton	11,451	5	0	1	2	2	272	60	196
	Norwood	20,240	112	0	12	83	17	1,284	292	953
	Oberlin	8,447	13	0	5	5	3	213	30	180
	Olmsted Falls	8,092	5	0	0	0	5	65	14	48
	Ontario[5]	5,157	12	0	4	3	5	515	36	475
	Orange Village	3,222	2	0	0	0	2	16	3	12
	Oregon	18,912	25	0	2	10	13	877	125	726
	Orrville	8,367	1	0	1	0	0	157	34	120
	Ottawa Hills	4,578	5	0	0	0	5	52	10	37
	Oxford	23,202	80	0	11	9	60	576	122	438
	Painesville	19,084	35	0	13	11	11	364	100	252
	Parma Heights	19,343	27	0	8	4	15	337	67	241
	Pepper Pike	5,667	3	0	1	0	2	45	9	35
	Perrysburg	17,658	14	0	2	2	10	405	56	340
	Perry Township, Allen County	3,565	2	0	0	0	2	61	7	54
	Perry Township, Franklin County	3,719	0	0	0	0	0	53	12	40
	Perry Township, Montgomery County	3,812	1	0	1	0	0	48	19	26
	Pickerington	18,801	17	0	3	9	5	342	38	300
	Pierce Township	11,189	10	0	4	5	1	444	94	349
	Piqua	20,478	18	0	8	10	0	1,120	232	862
	Plain City	3,630	0	0	0	0	0	36	14	22
	Poland Township	10,929	4	0	0	1	3	33	17	15
	Poland Village	2,620	0	0	0	0	0	19	1	17
	Pomeroy	1,940	3	0	0	0	3	9	0	6
	Port Clinton	6,087	5	0	1	2	2	207	37	167
	Portsmouth	20,254	117	3	12	78	24	2,340	642	1,642
	Powell	14,121	0	0	0	0	0	87	22	65
	Powhatan Point	1,642	4	0	0	0	4	19	7	12
	Reading	10,469	24	0	7	11	6	412	80	313
	Reminderville	2,864	0	0	0	0	0	11	4	7
	Reynoldsburg	34,208	92	0	5	47	40	1,155	264	848
	Richfield	3,611	1	0	0	0	1	32	6	21
	Richmond Heights	10,048	12	0	0	7	5	234	31	198
	Rio Grande	849	0	0	0	0	0	24	3	21
	Rittman	6,257	5	0	0	4	1	195	47	146
	Riverside	24,938	51	0	8	16	27	712	183	489
	Russells Point	1,518	0	0	0	0	0	32	7	24

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Russell Township	5,840	1	0	0	0	1	9	5	4
	Sabina	2,764	1	0	1	0	0	44	9	34
	Salem	11,676	3	0	2	0	1	315	30	282
	Sandusky[5]	25,380	150	0	7	20	123	1,273	310	960
	Sebring	4,451	2	0	1	0	1	89	21	67
	Seville	2,438	3	0	0	1	2	55	10	41
	Shaker Heights	25,852	35	0	0	26	9	592	199	350
	Sharonville	13,337	21	0	6	15	0	562	100	445
	Shawnee Township	8,742	7	0	1	2	4	113	37	71
	Sheffield Lake	8,848	6	0	0	2	4	164	31	131
	Shelby	9,195	3	0	0	1	2	378	87	282
	Sidney	19,809	59	0	15	15	29	1,060	210	827
	Silverton	5,134	6	0	2	1	3	118	29	80
	Smith Township	4,774	3	0	1	0	2	73	13	55
	Smithville	1,294	1	0	0	0	1	37	6	30
	Solon	21,837	11	0	0	5	6	188	22	156
	Somerset	1,558	2	0	0	0	2	61	3	58
	South Bloomfield	1,682	0	0	0	0	0	38	5	31
	South Charleston	1,762	0	0	0	0	0	12	0	11
	South Euclid	20,750	36	0	5	24	7	491	147	315
	South Point	4,058	8	0	0	0	8	52	52	0
	South Russell	4,059	2	0	0	1	1	5	1	4
	Spencerville	2,130	2	0	2	0	0	56	10	45
	Springboro	18,460	9	0	2	3	4	228	41	177
	Springdale	10,436	35	0	6	17	12	674	74	569
	Springfield	61,540	480	4	37	216	223	4,494	1,501	2,723
	Springfield Township, Hamilton County	39,931	61	1	6	36	18	723	220	466
	Springfield Township, Mahoning County	5,985	5	0	0	0	5	111	52	58
	Springfield Township, Summit County	18,150	28	0	4	11	13	1,022	147	857
	St. Bernard	4,623	7	0	0	7	0	132	21	107
	St. Clair Township	7,560	0	0	0	0	0	59	0	59
	Steubenville	18,522	75	2	5	34	34	1,098	190	872
	Stow	33,938	25	0	9	6	10	622	101	512
	St. Paris	1,957	0	0	0	0	0	34	7	27
	Strasburg	2,744	3	0	0	0	3	94	13	79
	Streetsboro	14,937	3	0	0	1	2	46	2	44
	Strongsville	42,134	11	0	2	6	3	767	76	670
	Struthers	10,548	16	0	7	7	2	408	134	253
	Sugarcreek Township	6,821	8	0	4	2	2	237	29	202
	Swanton	3,639	11	0	2	0	9	94	15	74
	Sycamore	862	0	0	0	0	0	2	0	2
	Sylvania Township	25,964	29	0	1	12	16	737	113	607
	Tallmadge	17,397	38	0	5	8	25	431	88	333
	Tipp City	9,238	5	0	1	2	2	213	42	168
	Toledo[6]	315,647	2,854	23	140	1,097	1,594		7,287	
	Trotwood	25,685	98	0	10	50	38	1,114	460	556
	Twinsburg	17,325	5	0	2	0	3	138	25	105
	Uhrichsville	5,437	5	0	1	1	3	181	48	125
	Union	6,309	12	0	1	1	10	135	20	109

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Union Township, Clermont County	44,619	20	0	6	13	1	1,682	233	1,427
	University Heights	12,396	28	0	3	11	14	260	52	199
	Upper Arlington	32,111	21	2	2	11	6	508	99	398
	Upper Sandusky	6,327	0	0	0	0	0	16	0	16
	Utica	2,103	2	0	1	0	1	66	8	51
	Vandalia	14,015	13	0	4	3	6	422	102	294
	Van Wert	10,022	30	1	6	4	19	454	97	349
	Vermilion	10,708	21	0	1	6	14	269	73	185
	Village of Leesburg	1,293	3	0	1	0	2	38	11	27
	Wadsworth	21,212	11	0	7	1	3	492	85	398
	Waite Hill	575	0	0	0	0	0	3	3	0
	Walbridge	3,110	2	0	0	2	0	67	17	50
	Walton Hills	2,244	0	0	0	0	0	22	8	11
	Wapakoneta	9,433	4	0	0	1	3	137	21	115
	Warren	42,850	262	4	22	123	113	2,313	1,068	1,099
	Warrensville Heights	13,341	48	0	4	38	6	452	223	176
	Warren Township	5,940	6	0	0	1	5	73	28	43
	Washington Court House	13,468	17	0	3	4	10	465	109	348
	Wauseon	7,209	8	0	3	2	3	245	21	222
	Waverly	4,459	0	0	0	0	0	72	4	68
	Wells Township	2,764	2	0	2	0	0	54	21	32
	West Alexandria	1,275	1	0	1	0	0	17	2	15
	West Carrollton	12,556	29	0	9	11	9	455	128	292
	West Chester Township	56,305	71	0	21	21	29	1,520	334	1,160
	Westerville	36,966	19	0	5	9	5	903	124	769
	West Jefferson	4,255	4	0	2	0	2	139	37	98
	West Lafayette	2,424	0	0	0	0	0	38	8	29
	West Liberty	1,719	0	0	0	0	0	24	1	22
	West Salem	1,471	1	0	1	0	0	30	3	27
	West Union	3,076	3	1	0	0	2	175	53	120
	Whitehall	18,332	146	1	15	97	33	1,433	272	1,092
	Willard	6,553	7	0	3	2	2	210	25	167
	Williamsburg	2,390	4	0	0	1	3	82	16	64
	Willoughby	22,909	18	0	3	8	7	374	64	299
	Willowick	13,802	12	1	5	4	2	149	31	112
	Wilmington	12,578	15	0	0	8	7	623	71	548
	Woodlawn	2,636	13	0	1	6	6	159	34	119
	Woodsfield	2,362	0	0	0	0	0	14	0	12
	Wooster	26,244	45	1	23	13	8	884	194	673
	Worthington	13,401	15	0	2	8	5	355	72	275
	Wyoming	8,331	0	0	0	0	0	132	25	106
	Xenia	27,702	44	0	4	15	25	1,134	182	928
	Yellow Springs	3,223	4	0	0	0	4	81	10	67
	Youngstown	71,380	694	25	28	235	406	4,431	2,101	1,806
	Zanesville	24,776	82	2	16	42	22	1,668	296	1,319
OKLAHOMA	Achille	549	1	0	0	0	1	3	2	1
	Ada	17,298	138	1	8	10	119	762	205	529
	Allen	1,015	1	0	0	0	1	7	3	4

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Altus	18,983	42	0	4	8	30	728	270	443
	Alva	4,822	6	0	1	2	3	115	34	78
	Anadarko	6,422	27	0	1	1	25	229	69	142
	Antlers	2,547	7	0	0	1	6	86	28	51
	Apache	1,540	6	0	0	1	5	16	8	7
	Ardmore	25,238	295	2	11	30	252	1,363	394	923
	Arkoma	2,194	1	0	0	0	1	19	7	11
	Atoka	3,092	12	0	1	1	10	103	27	74
	Bartlesville	36,586	146	3	11	27	105	1,226	273	894
	Beggs	1,374	3	0	0	1	2	38	14	20
	Bethany	19,923	55	0	7	15	33	572	197	317
	Bixby	22,683	23	0	2	3	18	346	115	206
	Blackwell	7,238	12	0	2	1	9	149	44	101
	Blanchard	7,061	10	1	2	0	7	110	40	48
	Boise City	1,207	4	0	0	0	4	15	11	3
	Boley	1,097	6	0	0	0	6	4	1	3
	Bristow	4,425	17	0	2	1	14	166	49	114
	Broken Arrow	97,581	143	2	31	28	82	2,037	353	1,560
	Broken Bow	4,135	30	0	4	2	24	199	59	119
	Caddo	1,009	0	0	0	0	0	13	9	4
	Calumet	553	1	0	0	0	1	3	0	3
	Caney	212	0	0	0	0	0	4	2	2
	Carnegie	1,619	5	0	0	0	5	25	14	10
	Catoosa[3]	8,193		0	4	1		181	41	112
	Chandler	2,874	10	0	2	0	8	63	12	50
	Checotah	3,496	6	0	1	2	3	90	9	67
	Chelsea	2,261	1	0	0	0	1	5	0	5
	Cherokee	1,376	4	0	0	0	4	7	1	5
	Chickasha	17,507	129	1	12	22	94	815	209	582
	Choctaw	11,942	9	0	1	1	7	193	67	119
	Chouteau	2,208	7	0	0	0	7	74	15	55
	Claremore	17,741	32	0	7	2	23	557	106	423
	Cleveland	3,270	8	0	2	0	6	77	18	58
	Clinton	8,948	23	0	6	3	14	136	43	84
	Collinsville	5,380	14	0	6	1	7	113	38	64
	Comanche	1,528	2	0	0	0	2	45	14	29
	Cordell	2,983	15	0	1	0	14	28	0	26
	Coweta	9,248	29	0	8	3	18	202	26	153
	Crescent	1,463	8	0	0	0	8	11	5	6
	Cushing	9,838	31	0	0	1	30	192	31	148
	Davis	2,699	11	0	0	0	11	82	25	52
	Del City	22,549	152	1	13	28	110	1,255	383	775
	Dewey	3,367	16	0	2	2	12	113	24	89
	Dibble	674	2	0	2	0	0	7	2	4
	Drumright	2,908	10	0	1	1	8	100	20	75
	Duncan	22,814	51	0	10	10	31	1,119	292	779
	Durant	17,357	130	0	14	4	112	785	253	502
	Edmond	83,337	74	1	9	19	45	1,691	372	1,274
	Elk City	11,748	20	0	3	0	17	118	25	92

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	El Reno	17,262	89	2	12	4	71	440	144	281
	Enid	48,581	226	2	28	25	171	2,173	466	1,642
	Eufaula	2,808	10	1	1	0	8	84	24	55
	Fairfax	1,429	2	0	0	0	2	23	11	8
	Fairview	2,561	1	0	0	0	1	145	38	103
	Forest Park	1,193	1	0	0	0	1	8	5	3
	Fort Gibson	4,440	6	0	1	1	4	77	22	50
	Frederick	3,778	17	0	2	1	14	111	48	60
	Geary	1,243	2	1	0	0	1	40	17	18
	Glenpool[3]	10,685		0	6	1		224	46	162
	Goodwell	1,251	0	0	0	0	0	5	0	5
	Grove	6,575	21	0	1	0	20	193	28	157
	Guthrie	11,797	20	1	2	1	16	301	40	247
	Guymon	11,294	25	0	1	7	17	332	84	235
	Harrah	5,402	5	0	1	1	3	98	24	73
	Hartshorne	2,088	2	0	0	0	2	63	19	29
	Healdton	2,816	7	0	3	0	4	87	19	58
	Heavener	3,254	6	0	0	1	5	67	20	43
	Henryetta	6,053	6	0	3	0	3	156	49	89
	Hinton	3,746	2	0	1	0	1	20	3	14
	Hobart	3,512	4	0	0	1	3	103	48	53
	Holdenville	5,638	14	0	0	0	14	159	70	82
	Hollis	1,949	3	0	0	0	3	66	32	34
	Hominy	3,588	4	0	0	0	4	19	6	9
	Howe	728	0	0	0	0	0	0	0	0
	Hugo[5]	5,434	4	0	1	0	3	67	19	47
	Hulbert	544	2	0	0	0	2	9	4	3
	Hydro	1,014	0	0	0	0	0	22	2	16
	Idabel	6,829	37	1	8	3	25	260	67	184
	Jay	3,051	8	0	1	0	7	62	13	48
	Jenks	17,170	32	0	3	4	25	261	50	195
	Jones	2,805	2	0	1	0	1	24	8	13
	Kingfisher	4,418	5	0	1	0	4	48	7	40
	Kingston	1,652	0	0	0	0	0	12	4	5
	Krebs	2,164	5	0	1	0	4	78	22	52
	Lawton	92,025	831	3	60	113	655	5,254	1,757	3,279
	Lexington	2,185	10	0	0	0	10	41	12	26
	Lindsay	2,916	8	0	0	0	8	69	11	54
	Locust Grove	1,615	5	0	0	0	5	59	12	44
	Lone Grove	5,496	11	0	3	2	6	109	24	77
	Madill	3,855	6	0	2	0	4	105	38	66
	Mangum	2,709	6	0	1	0	5	52	21	27
	Mannford	2,938	2	0	0	0	2	44	13	28
	Marietta	2,540	17	1	0	1	15	25	4	18
	Marlow	4,639	15	0	1	0	14	171	46	122
	Maysville	1,306	0	0	0	0	0	20	4	16
	McAlester	18,675	38	1	3	10	24	773	164	583
	McCurtain	491	1	0	0	0	1	6	3	3
	McLoud[5]	4,784	12	0	1	1	10	120	26	80

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Medicine Park	396	0	0	0	0	0	2	0	2
	Meeker	983	2	0	0	0	2	31	11	19
	Miami	12,967	74	0	11	7	56	570	105	448
	Midwest City	58,095	265	2	24	52	187	2,737	817	1,752
	Minco	1,850	0	0	0	0	0	8	1	6
	Moore	55,788	58	1	13	19	25	2,145	423	1,578
	Mooreland	1,270	1	0	1	0	0	22	9	12
	Morris	1,325	0	0	0	0	0	5	0	3
	Mountain View	758	1	0	0	0	1	4	1	3
	Muldrow	3,201	12	0	2	0	10	53	16	34
	Muskogee	40,499	373	6	18	57	292	1,689	578	1,026
	Mustang	19,200	27	0	1	4	22	412	92	304
	Newcastle	7,845	7	0	1	0	6	212	51	134
	Newkirk	2,158	3	0	1	0	2	59	20	39
	Nichols Hills	4,147	2	0	0	1	1	74	18	50
	Nicoma Park	2,464	1	0	0	0	1	30	12	15
	Noble	6,046	9	0	6	1	2	121	25	94
	Norman	111,534	138	2	47	36	53	3,551	811	2,628
	Nowata[3]	3,956		0	2	0		61	8	53
	Oilton	1,141	1	0	0	0	1	16	9	7
	Okemah	2,833	9	0	2	0	7	148	40	100
	Oklahoma City	571,865	5,304	54	340	1,112	3,798	33,263	9,901	19,760
	Okmulgee	12,648	101	1	7	13	80	584	159	400
	Oologah	1,180	3	0	0	0	3	22	10	10
	Owasso	30,431	42	0	2	11	29	826	108	680
	Pauls Valley	6,112	34	0	3	5	26	362	89	262
	Pawhuska	3,350	78	0	0	0	78	107	51	51
	Pawnee	2,160	3	0	0	1	2	33	20	11
	Perkins	2,680	1	0	0	0	1	15	1	12
	Perry	4,972	8	0	1	0	7	99	25	68
	Piedmont	6,079	1	0	0	0	1	48	24	22
	Pocola	4,581	3	2	0	0	1	50	14	34
	Ponca City	24,928	113	1	17	17	78	1,236	299	902
	Porum	748	4	0	1	0	3	13	7	6
	Poteau	8,408	35	0	3	1	31	271	46	192
	Prague	2,153	8	0	2	0	6	44	12	27
	Pryor[3]	9,400		1	8	4		310	93	202
	Purcell	6,359	13	0	4	0	9	235	45	183
	Ringling	1,065	5	0	0	0	5	18	6	11
	Roland	3,605	7	0	0	0	7	57	14	39
	Sallisaw	8,985	5	0	2	1	2	286	44	229
	Sand Springs	19,204	33	1	3	11	18	636	98	481
	Sapulpa	21,567	44	0	11	15	18	656	118	487
	Sawyer	269	4	0	0	0	4	13	2	9
	Sayre	4,137	12	0	0	1	11	37	13	24
	Seminole	6,895	38	0	5	12	21	532	148	351
	Shawnee[3]	31,002		2	10	19		1,757	528	1,091
	Skiatook	7,118	106	0	9	0	97	276	75	184
	Snyder	1,329	4	0	1	0	3	8	1	7

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	South Coffeyville	777	6	0	0	0	6	17	4	13
	Spencer	4,150	11	0	0	1	10	83	33	39
	Spiro	2,362	1	0	0	0	1	33	2	29
	Stigler	2,979	3	0	1	0	2	58	10	46
	Stillwater	47,414	100	1	16	16	67	1,548	269	1,191
	Stilwell	3,530	7	0	2	1	4	77	16	58
	Stratford[5]	1,497	5	0	1	0	4	15	3	9
	Stroud	2,722	5	0	0	1	4	59	13	41
	Sulphur	4,964	2	0	0	0	2	122	41	81
	Tahlequah	17,067	33	0	7	6	20	694	103	577
	Talihina	1,245	5	0	0	0	5	43	13	28
	Tecumseh	6,857	16	0	0	3	13	206	63	128
	The Village	9,923	49	0	2	3	44	324	73	232
	Tishomingo	3,266	9	1	3	0	5	63	23	39
	Tonkawa	3,194	8	0	2	0	6	103	25	74
	Tryon	452	1	0	0	0	1	8	2	6
	Tulsa	393,412	4,304	54	252	1,381	2,617	21,355	7,146	11,857
	Tuttle	6,450	31	0	4	0	27	167	32	126
	Valliant	743	6	0	0	0	6	17	7	10
	Verdigris	3,245	1	0	1	0	0	29	11	18
	Vian	1,562	3	0	0	0	3	25	7	17
	Vinita	6,115	16	0	0	0	16	156	27	117
	Wagoner	8,270	71	1	3	3	64	425	108	302
	Walters	2,468	1	0	0	0	1	13	4	9
	Warner[5]	1,560	4	0	0	0	4	32	17	11
	Warr Acres	9,579	71	1	5	14	51	455	134	279
	Washington	570	0	0	0	0	0	5	2	1
	Watonga	5,833	15	0	1	2	12	50	15	30
	Waynoka	906	0	0	0	0	0	13	5	8
	Weatherford[3]	10,551		0	4	1		311	88	215
	Weleetka	903	6	0	0	1	5	51	18	31
	Westville	1,658	7	0	1	0	6	43	15	24
	Wetumka	1,416	1	0	0	0	1	35	15	18
	Wewoka	3,320	10	0	1	1	8	177	64	103
	Wilburton	2,928	13	0	0	1	12	65	20	44
	Wilson	1,669	14	0	0	0	14	30	10	16
	Woodward	12,535	17	0	10	1	6	446	165	265
	Wright City	788	3	0	1	0	2	15	2	12
	Wynnewood	2,286	2	1	0	0	1	37	2	33
	Yale[5]	1,504	4	0	1	0	3	22	9	10
	Yukon	24,023	12	0	1	0	11	381	74	291
OREGON[5]	Adair Village	800	1	0	0	0	1	17	3	13
	Albany	48,777	86	0	12	26	48	1,287	204	1,023
	Amity	1,431	2	0	2	0	0	38	7	30
	Ashland	20,942	25	0	7	8	10	550	81	445
	Astoria	9,639	13	1	1	4	7	631	142	460
	Aumsville	3,727	5	0	0	0	5	44	7	34
	Aurora	1,056	6	0	0	0	6	11	3	7

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Baker City	9,309	3	1	0	0	2	207	29	169
	Bandon	3,222	0	0	0	0	0	93	12	78
	Beaverton	93,993	239	0	31	45	163	1,773	198	1,439
	Bend	79,556	247	5	14	31	197	2,410	387	1,951
	Black Butte		0	0	0	0	0	10	2	8
	Boardman	3,032	6	0	2	0	4	53	12	41
	Burns	2,596	1	0	0	0	1	79	28	49
	Canby	15,935	19	0	2	6	11	362	65	286
	Cannon Beach	1,714	1	0	0	1	0	57	8	49
	Carlton	1,720	2	0	0	0	2	19	7	11
	Central Point	16,819	15	0	6	2	7	477	61	401
	Clatskanie	1,615	1	0	0	0	1	41	6	35
	Coburg	1,075	1	0	0	0	1	23	7	11
	Condon	610	0	0	0	0	0	1	1	0
	Coos Bay	15,227	64	0	9	10	45	832	156	652
	Cornelius	11,703	24	0	2	5	17	318	87	209
	Corvallis	51,276	57	0	9	12	36	1,377	209	1,132
	Cottage Grove	9,173	44	0	0	3	41	440	52	348
	Creswell	5,237	23	0	3	3	17	194	53	109
	Dallas	16,416	30	0	3	4	23	290	46	238
	Eagle Point	8,673	4	0	2	1	1	198	25	169
	Enterprise	1,728	0	0	0	0	0	28	13	14
	Estacada	2,712	5	0	1	0	4	133	24	106
	Eugene	153,269	416	0	80	168	168	7,028	1,293	5,136
	Florence	8,824	6	0	1	1	4	314	76	227
	Forest Grove	21,600	53	0	8	4	41	700	129	548
	Gearhart	1,196	0	0	0	0	0	14	4	10
	Gervais	2,488	11	0	0	1	10	57	10	35
	Gladstone	12,162	34	0	5	7	22	339	57	252
	Gold Beach	1,878	3	0	0	0	3	26	3	23
	Gresham	102,540	470	7	42	176	245	4,055	674	2,714
	Hermiston	15,399	60	1	10	9	40	679	116	542
	Hines	1,341	0	0	0	0	0	35	7	27
	Hubbard	2,861	2	0	1	0	1	33	4	28
	Independence	9,835	8	0	2	0	6	215	19	183
	Jacksonville	2,182	0	0	0	0	0	28	2	26
	John Day	1,440	0	0	0	0	0	17	2	13
	Junction City	5,754	1	0	0	1	0	45	7	37
	Keizer	36,191	64	0	5	11	48	870	128	699
	King City	2,993	3	0	1	1	1	52	12	39
	Klamath Falls	19,922	95	0	23	24	48	849	203	588
	La Grande	12,600	18	0	5	3	10	328	60	258
	Lake Oswego	37,349	30	0	5	5	20	495	79	400
	Lakeview	2,319	25	0	2	0	23	41	14	26
	Lebanon	16,084	24	0	2	9	13	619	104	506
	Lincoln City	8,144	49	0	5	3	41	356	63	281
	Madras	5,815	11	1	2	2	6	325	64	232
	Manzanita	851	0	0	0	0	0	27	18	9
	McMinnville	31,748	60	1	13	10	36	1,050	164	832

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Medford	73,525	300	3	46	40	211	3,219	379	2,678
	Milwaukie	20,674	21	0	7	11	3	517	99	389
	Molalla	7,727	13	0	4	0	9	215	34	171
	Monmouth	9,851	16	0	4	2	10	145	25	117
	Mount Angel	3,374	16	0	3	1	12	72	7	63
	Myrtle Creek	3,401	3	0	2	0	1	29	5	23
	Newberg-Dundee	26,738	30	1	8	4	17	458	44	383
	Newport	9,877	38	0	11	5	22	380	64	300
	Oakridge	3,195	10	0	1	0	9	85	29	53
	Ontario	10,822	45	1	3	2	39	713	93	596
	Oregon City	32,045	38	0	9	15	14	929	119	744
	Pendleton	16,263	53	1	8	14	30	677	94	548
	Philomath	4,542	1	0	1	0	0	58	22	34
	Phoenix	4,387	2	0	1	1	0	107	22	77
	Pilot Rock	1,487	1	0	1	0	0	25	6	18
	Portland	564,392	3,051	22	230	1,005	1,794	28,391	4,120	21,026
	Port Orford	1,073	6	0	1	0	5	39	5	34
	Rainier	1,798	0	0	0	0	0	40	9	27
	Redmond	25,480	89	0	17	12	60	1,360	187	1,120
	Reedsport	4,093	1	0	1	0	0	116	8	106
	Rockaway Beach	1,351	4	0	0	0	4	40	22	18
	Rogue River	1,918	1	0	1	0	0	65	13	47
	Roseburg	20,169	52	1	8	24	19	985	133	813
	Salem	155,820	483	1	48	118	316	6,056	868	4,761
	Sandy	9,426	8	0	3	3	2	268	38	208
	Scappoose	6,480	13	0	5	0	8	123	13	102
	Sherwood	18,483	9	0	5	1	3	199	25	170
	Silverton	9,900	22	0	1	1	20	147	23	108
	Stayton	7,369	28	0	3	1	24	375	51	299
	St. Helens	12,708	11	0	4	2	5	258	41	203
	Sunriver		2	0	1	0	1	55	15	40
	Sutherlin	7,064	7	0	6	0	1	131	21	101
	Sweet Home	8,950	17	0	3	2	12	452	74	369
	Talent	6,242	9	0	0	5	4	141	12	126
	The Dalles	12,186	12	0	2	7	3	697	103	563
	Tigard	49,466	89	1	11	58	19	1,955	192	1,695
	Tillamook	4,333	4	0	2	0	2	212	27	175
	Toledo	3,239	26	0	2	6	18	172	41	127
	Troutdale	15,692	25	0	8	7	10	488	87	361
	Turner	1,782	4	0	0	0	4	43	16	26
	Umatilla	6,387	8	0	0	1	7	76	8	61
	Veneta	4,565	46	0	5	0	41	232	70	154
	West Linn	25,614	9	0	1	6	2	295	45	241
	Wilsonville	19,718	6	0	2	3	1	268	23	223
	Winston	5,463	7	0	2	2	3	162	33	123
	Woodburn	23,032	64	0	2	16	46	665	142	453
	Yamhill	923	0	0	0	0	0	16	4	10
	Abington Township	54,235	96	0	1	43	52	1,258	189	1,037

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Adamstown	1,597	0	0	0	0	0	20	5	15
	Adams Township, Butler County	10,107	8	0	3	0	5	64	8	54
	Adams Township, Cambria County	6,024	0	0	0	0	0	25	0	22
	Akron	4,053	4	0	0	0	4	30	6	22
	Alburtis	2,449	0	0	0	0	0	22	2	20
	Aldan	4,284	9	0	0	2	7	119	9	110
	Aleppo Township	1,220	0	0	0	0	0	9	2	7
	Aliquippa	10,497	84	5	3	14	62	168	63	89
	Allegheny Township, Westmoreland County	8,288	9	0	1	0	8	126	15	111
	Allentown	108,473	732	9	67	460	196	5,089	1,327	3,345
	Altoona	46,213	167	0	29	51	87	947	294	616
	Ambler	6,228	13	0	2	2	9	155	14	136
	Amity Township	12,299	7	2	1	0	4	159	30	121
	Annville Township	4,808	1	0	0	0	1	62	19	43
	Apollo	1,598	2	0	0	0	2	1	1	0
	Archbald	6,584	25	0	0	1	24	92	19	73
	Arnold	5,178	29	0	4	11	14	112	33	63
	Ashland	3,088	4	0	0	0	4	59	15	42
	Ashley	2,670	0	0	0	0	0	18	4	13
	Aspinwall	2,692	1	0	0	1	0	46	13	33
	Aston Township	17,100	24	0	2	9	13	354	43	303
	Atglen	1,403	0	0	0	0	0	9	1	8
	Athens	3,175	1	0	0	0	1	45	8	36
	Athens Township	5,042	5	0	3	0	2	111	2	107
	Avoca	2,659	1	0	1	0	0	43	12	30
	Avondale	1,100	0	0	0	0	0	2	0	2
	Avonmore Boro	761	0	0	0	0	0	0	0	0
	Baden	3,965	2	0	0	0	2	55	6	46
	Baldwin Borough	18,450	30	0	4	8	18	189	45	133
	Baldwin Township	1,992	3	0	0	0	3	16	6	9
	Bally	1,108	0	0	0	0	0	0	0	0
	Bangor	5,343	23	0	2	1	20	153	18	133
	Barrett Township	4,327	2	0	0	0	2	60	20	39
	Beaver	4,321	6	0	0	0	6	104	18	82
	Beaver Falls	8,926	77	3	6	18	50	342	29	295
	Beaver Meadows	951	0	0	0	0	0	3	1	2
	Bedford	2,967	6	3	0	0	3	28	4	24
	Bedminster Township	6,480	2	0	1	1	0	45	2	43
	Bell Acres	1,357	0	0	0	0	0	0	0	0
	Bellefonte	6,179	5	0	0	0	5	75	7	68
	Bellevue	7,969	20	1	2	11	6	257	60	186
	Bellwood	1,871	0	0	0	0	0	4	1	3
	Ben Avon	1,764	0	0	0	0	0	31	3	28
	Ben Avon Heights	358	0	0	0	0	0	3	0	3
	Bendersville	613	1	0	0	0	1	4	2	2
	Bensalem Township	59,028	110	0	6	67	37	2,147	305	1,718
	Berks-Lehigh Regional	31,334	15	0	0	5	10	279	56	210
	Berlin	2,046	1	0	1	0	0	15	2	12
	Bern Township	7,311	23	0	2	1	20	78	16	57

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Bernville	888	0	0	0	0	0	0	0	0
	Berwick	10,169	31	0	9	3	19	447	82	353
	Bessemer	1,086	0	0	0	0	0	0	0	0
	Bethel Park	31,514	35	0	4	5	26	292	50	237
	Bethel Township, Armstrong County	1,188	0	0	0	0	0	0	0	0
	Bethel Township, Berks County	4,572	0	0	0	0	0	22	0	21
	Bethel Township, Delaware County	12,017	5	0	0	1	4	125	20	101
	Bethlehem	73,634	234	0	18	110	106	2,069	445	1,522
	Bethlehem Township	24,220	32	0	3	9	20	403	51	336
	Biglerville	1,168	1	0	0	0	1	10	0	10
	Birdsboro	5,237	6	0	0	0	6	81	15	61
	Birmingham Township	4,366	5	0	0	0	5	28	4	24
	Blacklick Township	2,063	0	0	0	0	0	4	0	4
	Blair Township	4,781	0	0	0	0	0	47	8	38
	Blairsville	3,333	18	0	0	7	11	106	16	84
	Blakely	6,716	4	0	1	1	2	96	15	77
	Blawnox	1,435	1	0	0	0	1	6	2	3
	Bloomsburg Town	12,873	19	0	3	1	15	342	60	272
	Blythe Township	916	0	0	0	0	0	0	0	0
	Boswell	1,231	2	0	0	0	2	0	0	0
	Boyertown	3,960	8	0	1	2	5	100	12	83
	Brackenridge	3,234	12	0	0	2	10	81	12	69
	Braddock	2,662	10	0	0	0	10	5	4	0
	Braddock Hills	1,816	2	0	0	0	2	7	3	4
	Bradford	8,271	49	2	3	3	41	355	37	306
	Bradford Township	4,927	7	0	1	1	5	44	12	28
	Brecknock Township, Berks County	5,008	0	0	0	0	0	24	11	12
	Brentwood	9,470	21	0	1	7	13	230	38	180
	Briar Creek Township	3,128	1	0	0	0	1	46	11	34
	Bridgeport	4,425	7	0	0	3	4	139	16	109
	Bridgeville	4,869	6	0	0	0	6	56	17	37
	Bridgewater	871	2	0	0	1	1	57	11	44
	Brighton Township	7,956	11	0	0	0	11	44	9	35
	Bristol	9,699	24	0	1	15	8	342	33	288
	Bristol Township	54,171	127	1	12	74	40	1,474	261	1,088
	Brockway	2,022	1	0	0	0	1	8	1	6
	Brookhaven	8,024	16	0	0	5	11	233	38	189
	Brookville	3,932	9	0	0	1	8	53	5	46
	Brownsville	2,586	6	0	0	2	4	61	18	41
	Bryn Athyn	1,346	0	0	0	0	0	22	2	18
	Buckingham Township	20,119	1	0	0	0	1	167	24	138
	Buffalo Township	7,411	8	0	0	0	8	53	16	36
	Bushkill Township	8,546	19	1	0	0	18	74	18	52
	Butler	13,916	82	0	0	35	47	602	111	481
	Butler Township, Butler County	16,659	18	0	0	3	15	368	40	321
	Butler Township, Luzerne County	9,568	48	0	6	1	41	112	29	75
	Butler Township, Schuylkill County	6,105	2	0	0	0	2	28	16	12
	Caernarvon Township, Berks County	3,650	9	0	1	0	8	85	5	77
	California	6,411	12	0	0	3	9	73	11	61

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Caln Township	12,496	48	0	1	9	38	263	30	223
	Cambria Township	6,168	10	0	0	3	7	124	22	98
	Cambridge Springs	2,651	4	0	0	0	4	7	1	6
	Camp Hill	7,454	12	0	2	4	6	122	8	113
	Canonsburg	8,776	5	1	0	2	2	150	18	132
	Canton	1,681	2	0	0	0	2	21	10	10
	Carbondale	9,155	14	0	0	2	12	135	39	87
	Carlisle	18,708	54	0	10	27	17	557	72	482
	Carmichaels	516	0	0	0	0	0	1	1	0
	Carnegie	7,929	12	0	0	3	9	225	30	185
	Carrolltown	955	0	0	0	0	0	11	0	10
	Carroll Township, Washington County	5,481	17	0	0	0	17	76	21	51
	Carroll Township, York County	6,070	6	0	1	0	5	109	15	90
	Carroll Valley	3,604	2	0	1	0	1	67	2	65
	Cass Township	1,795	3	0	0	1	2	13	6	3
	Castle Shannon	8,069	21	0	0	2	19	81	18	60
	Catasauqua	6,628	10	0	0	3	7	153	17	132
	Catawissa	1,532	2	0	1	0	1	44	5	38
	Cecil Township	10,821	2	0	0	0	2	16	3	13
	Center Township	11,649	18	1	4	2	11	454	51	401
	Centerville	3,216	0	0	0	0	0	20	5	14
	Central Berks Regional	9,487	10	0	1	4	5	184	32	132
	Chalfont	4,221	0	0	0	0	0	37	2	34
	Charleroi	5,692	30	0	4	11	15	187	29	150
	Chartiers Township	7,507	4	0	1	0	3	65	12	52
	Cheltenham Township	36,084	98	1	7	50	40	1,015	239	729
	Cherry Tree	410	0	0	0	0	0	0	0	0
	Chester	37,308	911	24	31	206	650	1,252	466	638
	Chester Township	4,495	48	0	2	5	41	136	51	74
	Chippewa Township	9,777	8	0	0	2	6	205	16	185
	Christiana	1,118	1	0	0	0	1	16	5	11
	Churchill	3,216	26	0	0	1	25	22	8	14
	Clarion	5,177	3	0	0	2	1	86	7	71
	Claysville	673	0	0	0	0	0	5	0	5
	Clay Township	6,114	2	0	0	1	1	43	6	35
	Clearfield	6,088	39	0	4	3	32	268	42	223
	Cleona	2,150	1	0	0	0	1	21	10	11
	Clifford Township	2,449	0	0	0	0	0	3	1	0
	Coaldale	2,104	0	0	0	0	0	7	3	4
	Coal Township	10,195	38	0	1	0	37	200	8	183
	Coatesville	11,920	140	3	7	60	70	487	111	340
	Cochranton	1,059	0	0	0	0	0	10	0	10
	Colebrookdale District	6,483	3	0	1	0	2	107	2	101
	Collegeville	5,117	4	0	0	3	1	74	6	67
	Collier Township	6,588	7	0	1	2	4	156	17	136
	Collingdale	8,436	97	0	4	11	82	208	33	157
	Colonial Regional	20,560	10	0	4	5	1	483	65	409
	Columbia	10,116	22	1	3	10	8	217	54	155
	Conemaugh Township, Cambria County	2,441	3	0	0	0	3	10	2	8

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Conemaugh Township, Somerset County	7,171	2	0	0	0	2	43	16	27
	Conewago Township, Adams County	6,215	3	0	0	1	2	113	3	110
	Conewango Township	3,542	9	0	4	1	4	146	18	128
	Conneaut Lake Regional	3,501	1	0	0	0	1	45	17	28
	Connellsville	8,313	21	0	3	9	9	309	54	243
	Conoy Township	3,430	0	0	0	0	0	50	18	31
	Conshohocken	8,593	22	0	3	2	17	205	23	177
	Conway	2,112	6	0	0	0	6	11	2	9
	Conyngham	1,840	0	0	0	0	0	0	0	0
	Coopersburg	2,586	4	0	1	0	3	18	1	17
	Coplay	3,401	1	0	0	0	1	75	12	62
	Coraopolis	5,575	50	0	0	2	48	107	15	87
	Cornwall	3,562	0	0	0	0	0	1	0	1
	Corry	6,315	38	0	5	1	32	136	19	111
	Coudersport	2,357	0	0	0	0	0	9	4	5
	Covington Township	2,215	2	0	0	0	2	36	4	28
	Cranberry Township	28,107	3	1	0	1	1	316	51	265
	Crescent Township	2,778	12	0	0	1	11	44	13	29
	Cresson	1,463	1	0	0	0	1	47	1	46
	Cresson Township	4,533	10	0	0	0	10	17	0	17
	Croyle Township	2,220	0	0	0	0	0	10	0	10
	Cumberland Township, Adams County	6,469	2	0	1	0	1	43	25	18
	Cumberland Township, Greene County	6,351	8	0	2	1	5	151	32	116
	Cumru Township	15,163	11	1	1	6	3	321	35	274
	Curwensville	2,431	2	0	0	0	2	39	12	27
	Dale	1,342	0	0	0	0	0	5	2	3
	Dallas	2,477	2	0	0	0	2	23	3	20
	Dallas Township	9,187	7	1	3	0	3	61	14	47
	Dalton	1,231	2	0	0	0	2	21	4	17
	Danville	4,410	24	0	1	0	23	92	10	80
	Darby	9,980	413	0	12	66	335	454	155	247
	Darby Township	9,624	32	1	3	15	13	280	55	212
	Darlington Township	2,023	0	0	0	0	0	0	0	0
	Decatur Township	5,884	7	0	1	0	6	60	15	41
	Delaware Water Gap	785	0	0	0	0	0	0	0	0
	Delmont	2,449	1	0	0	0	1	43	12	31
	Denver	3,714	5	0	1	0	4	63	14	48
	Derry	2,763	9	0	0	0	9	12	0	12
	Derry Township, Dauphin County	22,348	41	0	7	3	31	593	58	510
	Dickson City	5,876	14	0	1	2	11	301	25	272
	Donegal Township	2,923	2	0	0	0	2	6	2	4
	Donora	5,242	14	0	3	0	11	72	18	50
	Dormont	8,411	25	0	0	6	19	84	9	69
	Douglass Township, Berks County	3,603	5	0	0	2	3	32	12	18
	Douglass Township, Montgomery County	10,372	13	0	3	0	10	136	4	128
	Downingtown	8,093	27	1	0	8	18	244	23	209
	Doylestown	8,169	9	0	0	2	7	175	24	147
	Doylestown Township	18,844	16	0	3	4	9	295	42	247
	Dublin Borough	2,162	2	0	0	1	1	11	6	5

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Du Bois	7,558	21	0	6	0	15	330	39	279
	Duboistown	1,187	0	0	0	0	0	1	0	1
	Duncannon	1,498	0	0	0	0	0	17	1	15
	Duncansville	1,235	0	0	0	0	0	30	2	28
	Dunmore	13,943	18	0	1	5	12	170	33	129
	Dunnstable Township	983	0	0	0	0	0	4	0	4
	Duquesne	6,678	94	3	7	30	54	314	124	164
	Duryea	4,332	8	0	2	2	4	93	24	60
	Earl Township	7,293	2	0	2	0	0	38	7	30
	East Bangor	1,222	0	0	0	0	0	7	0	7
	East Berlin	1,452	0	0	0	0	0	0	0	0
	East Bethlehem Township	2,351	3	0	0	0	3	48	9	36
	East Brandywine Township	7,133	12	1	0	2	9	61	8	53
	East Buffalo Township	5,945	3	0	0	0	3	19	3	14
	East Cocalico Township	10,642	1	0	0	0	1	119	18	91
	East Conemaugh	1,150	5	0	0	0	5	5	2	3
	East Coventry Township	7,177	4	0	0	0	4	34	5	29
	East Deer Township	1,321	1	0	0	0	1	34	6	26
	Eastern Adams Regional	10,116	7	1	3	2	1	99	6	85
	Eastern Pike Regional	5,602	15	0	0	1	14	242	22	219
	East Fallowfield Township	8,075	0	0	0	0	0	61	15	41
	East Franklin Township	3,910	6	0	1	0	5	29	1	28
	East Hempfield Township	24,035	33	0	6	17	10	435	61	368
	East Lampeter Township	15,465	27	0	5	9	13	660	39	604
	East Marlborough Township	8,316	0	0	0	0	0	16	1	13
	East McKeesport	2,918	7	0	0	0	7	42	18	22
	East Norriton Township	13,787	15	0	1	9	5	270	10	242
	East Norwegian Township	832	0	0	0	0	0	0	0	0
	Easton	26,506	127	3	9	63	52	793	108	641
	East Pennsboro Township	20,147	13	0	4	6	3	324	33	286
	East Penn Township	2,786	7	0	1	0	6	23	4	17
	East Petersburg	4,374	1	0	0	0	1	34	7	26
	East Pikeland Township	7,113	8	0	2	3	3	63	5	57
	East Pittsburgh	1,937	50	0	2	7	41	95	25	68
	East Taylor Township	2,514	3	0	0	1	2	19	8	10
	Easttown Township	10,706	4	0	1	3	0	142	50	89
	East Union Township	1,431	0	0	0	0	0	0	0	0
	East Vincent Township	6,688	2	0	0	2	0	68	16	51
	East Washington	1,859	8	0	1	0	7	55	11	44
	East Whiteland Township	10,899	6	0	1	1	4	153	16	135
	Ebensburg	2,898	16	0	0	0	16	68	16	50
	Economy	9,150	1	0	0	1	0	42	4	36
	Eddystone	2,360	17	0	0	2	15	226	9	212
	Edgewood	3,116	8	0	0	5	3	199	15	181
	Edgeworth	1,586	0	0	0	0	0	0	0	0
	Edinboro	6,567	10	0	3	1	6	144	19	125
	Edwardsville	4,651	37	0	2	2	33	141	10	125
	Elizabethtown	12,186	13	0	2	3	8	167	25	137
	Elizabeth Township	12,902	7	0	0	3	4	150	26	120

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Ellwood City	7,887	24	0	2	8	14	281	75	203
	Emelton Borough	726	0	0	0	0	0	7	1	6
	Emmaus	11,485	13	1	1	8	3	216	39	174
	Emsworth	2,381	8	0	0	0	8	31	4	27
	Ephrata	13,247	31	1	2	10	18	249	43	201
	Ephrata Township	9,982	12	1	3	1	7	172	17	151
	Erie	104,077	491	12	78	173	228	3,490	1,106	2,245
	Etna	3,612	15	0	0	2	13	130	17	107
	Everett	1,838	6	0	0	0	6	19	8	11
	Everson	774	0	0	0	0	0	0	0	0
	Exeter	5,965	20	0	1	0	19	114	19	89
	Exeter Township, Berks County	25,876	19	0	5	7	7	358	37	307
	Exeter Township, Luzerne County	2,546	4	0	0	0	4	28	9	17
	Fairfield	520	0	0	0	0	0	4	1	3
	Fairview Township, Luzerne County	4,328	4	0	0	2	2	44	13	31
	Fairview Township, York County	17,419	30	0	5	10	15	324	48	269
	Fallowfield Township	4,200	1	0	0	0	1	25	5	18
	Falls Township, Bucks County	33,850	52	0	3	33	16	775	108	627
	Fawn Township	2,337	4	0	0	0	4	45	8	34
	Fayette City	657	1	0	0	0	1	2	0	2
	Ferguson Township	16,966	13	0	2	3	8	185	24	156
	Ferndale	1,630	3	0	0	0	3	1	0	1
	Findlay Township	5,090	6	0	0	0	6	44	12	31
	Fleetwood	4,038	2	0	0	1	1	84	7	69
	Folcroft	6,901	23	0	0	5	18	112	31	62
	Ford City	3,108	2	0	0	1	1	59	12	47
	Forest City	1,702	5	0	0	0	5	27	9	17
	Forest Hills	6,459	3	0	1	1	1	82	16	64
	Forks Township	15,331	4	0	2	0	2	139	11	126
	Forty Fort	4,231	2	0	0	1	1	102	20	81
	Forward Township	3,495	3	0	0	0	3	28	8	20
	Foster Township	4,187	1	0	0	0	1	36	1	35
	Fountain Hill	4,622	16	0	2	5	9	118	21	93
	Fox Chapel	5,430	0	0	0	0	0	12	3	9
	Frackville	4,106	2	0	0	0	2	5	3	0
	Franconia Township	13,128	11	0	2	0	9	142	9	132
	Franklin	6,590	13	0	1	3	9	167	32	132
	Franklin Park	12,529	10	0	0	0	10	78	15	61
	Frazer Township	1,195	1	0	0	0	1	75	4	69
	Freedom	1,577	11	0	2	1	8	37	7	26
	Freedom Township	3,334	4	0	1	0	3	42	8	33
	Freemansburg	2,091	2	0	0	1	1	53	10	42
	Freeport	1,771	3	0	0	0	3	12	4	8
	Gaines Township	572	0	0	0	0	0	0	0	0
	Galeton	1,200	1	0	0	0	1	6	1	5
	Gallitzin Township	1,305	0	0	0	0	0	2	1	1
	Gettysburg	8,172	33	0	13	7	13	182	26	155
	Gilpin Township	2,480	0	0	0	0	0	2	1	1
	Girard	2,932	5	0	1	1	3	71	7	64

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Glassport	4,511	20	1	0	2	17	163	48	112
	Glenolden	7,264	24	0	0	7	17	170	36	125
	Granville Township	4,933	3	0	2	1	0	92	7	82
	Greencastle	4,135	8	0	1	2	5	77	17	56
	Greenfield Township, Blair County	3,775	3	0	1	0	2	129	22	107
	Greensburg	15,271	35	1	1	5	28	444	72	365
	Green Tree	4,407	8	0	0	5	3	57	12	45
	Greenville	6,057	14	0	2	4	8	160	48	110
	Greenwood Township	2,083	0	0	0	0	0	0	0	0
	Grove City	7,670	3	0	0	1	2	110	36	71
	Halifax	840	0	0	0	0	0	4	3	1
	Hamburg	4,260	12	0	0	2	10	77	10	62
	Hamiltonban Township	2,834	3	0	0	0	3	5	0	5
	Hampden Township	27,801	11	0	3	4	4	304	36	262
	Hampton Township	17,361	14	0	1	0	13	148	13	132
	Hanover	15,234	32	0	3	10	19	484	34	439
	Hanover Township, Luzerne County	11,014	15	0	2	6	7	186	30	145
	Hanover Township, Washington County	2,747	4	0	0	0	4	11	6	3
	Harleton	263	0	0	0	0	0	6	4	2
	Harmar Township	3,088	4	0	0	0	4	83	8	68
	Harmony Township	3,016	5	0	0	1	4	94	10	77
	Harrisburg	47,509	780	14	63	446	257	2,235	666	1,377
	Harrisville	882	0	0	0	0	0	6	2	4
	Harveys Lake	2,952	0	0	0	0	0	70	19	48
	Hastings	1,285	13	0	0	0	13	41	8	31
	Hatboro	7,166	9	0	0	0	9	96	20	72
	Hatfield Township	20,276	23	0	5	4	14	282	30	243
	Haverford Township	48,500	14	0	0	11	3	513	60	451
	Hawley	1,301	0	0	0	0	0	14	1	13
	Hazleton	21,705	90	1	9	26	54	509	130	325
	Heidelberg Township, Berks County	1,787	1	0	0	1	0	9	2	7
	Heidelberg Township, Lebanon County	4,274	0	0	0	0	0	17	4	13
	Hellam Township	9,222	25	0	2	0	23	103	12	88
	Hellertown	5,781	18	0	1	5	12	87	13	72
	Hemlock Township	2,285	4	0	3	0	1	158	7	147
	Hermitage	16,260	21	0	5	9	7	478	79	393
	Highland Township	1,231	1	0	1	0	0	1	1	0
	Highspire	2,630	18	0	0	2	16	77	15	58
	Hilltown Township	13,752	9	1	0	3	5	259	31	222
	Hollidaysburg	5,519	4	1	0	0	3	95	11	82
	Homer City	1,690	2	0	0	0	2	10	2	8
	Homestead	3,638	47	0	4	26	17	194	42	129
	Honesdale	4,740	8	0	2	2	4	112	23	87
	Honey Brook	1,636	0	0	0	0	0	1	0	1
	Hooversville	695	0	0	0	0	0	6	1	5
	Hop Bottom Borough	300	0	0	0	0	0	0	0	0
	Hopewell Township	12,292	15	0	2	2	11	226	37	178
	Horsham Township	24,983	15	1	0	2	12	259	32	211
	Houston	1,242	2	0	0	0	2	2	1	1

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Hughesville	2,034	1	0	0	0	1	66	6	58
	Hulmeville	896	0	0	0	0	0	0	0	0
	Hummelstown	4,476	11	0	0	1	10	81	9	68
	Huntingdon	6,790	2	0	0	0	2	91	9	77
	Independence Township, Beaver County	2,690	1	0	0	0	1	22	5	16
	Indiana[3]	15,062		0	5	5		329	35	287
	Indiana Township	7,036	4	0	0	0	4	54	15	37
	Industry	1,770	0	0	0	0	0	22	5	17
	Ingram	3,375	1	0	1	0	0	24	3	20
	Irwin	4,031	3	0	0	0	3	5	0	5
	Ivyland	852	0	0	0	0	0	12	1	11
	Jackson Township, Butler County	3,782	5	0	0	0	5	50	14	35
	Jackson Township, Luzerne County	4,742	1	0	0	0	1	13	2	11
	Jamestown	628	0	0	0	0	0	13	1	12
	Jeannette	9,824	11	0	0	1	10	97	23	74
	Jefferson Hills Borough	9,862	14	0	0	1	13	91	25	62
	Jefferson Township, Mercer County	2,315	0	0	0	0	0	7	6	1
	Jenkins Township	4,949	4	0	0	1	3	108	18	84
	Jenkintown	4,334	4	0	0	3	1	45	22	23
	Jennerstown	685	0	0	0	0	0	2	1	1
	Jermyn	2,227	23	0	0	0	23	46	17	27
	Jim Thorpe	4,915	23	0	3	0	20	144	15	124
	Johnsonburg	2,625	2	0	0	0	2	55	12	43
	Johnstown	22,900	105	3	6	43	53	786	256	502
	Juniata Valley Region	2,684	2	0	0	0	2	7	0	7
	Kennett Square	5,339	15	0	0	7	8	120	20	93
	Kidder Township	1,490	6	0	1	1	4	139	21	115
	Kilbuck Township	626	0	0	0	0	0	14	0	14
	Kingston	12,912	17	0	0	7	10	339	42	285
	Kingston Township	7,086	6	0	0	1	5	63	4	56
	Kiskiminetas Township	4,731	2	0	0	0	2	90	21	67
	Kittanning	4,261	5	0	0	1	4	48	15	30
	Kline Township	1,492	1	0	0	0	1	23	3	20
	Knox	1,072	10	0	0	0	10	17	3	14
	Kulpmont	2,752	2	0	0	0	2	56	11	45
	Kutztown	5,159	7	0	2	3	2	118	17	96
	Laflin Borough	1,493	3	0	1	0	2	14	3	11
	Lake City	2,916	7	0	0	1	6	52	8	44
	Lamar Township	2,388	0	0	0	0	0	15	2	13
	Lancaster	55,582	511	5	55	214	237	2,857	583	2,160
	Lancaster Township	14,950	20	0	1	12	7	578	66	496
	Lanesboro	545	0	0	0	0	0	0	0	0
	Langhorne Manor	1,068	0	0	0	0	0	7	0	7
	Lansdale	15,622	33	0	8	9	16	249	39	200
	Lansdowne	10,737	28	0	1	13	14	212	63	136
	Lansford	4,152	2	0	0	0	2	72	24	47
	Larksville	4,437	2	0	0	2	0	98	20	71
	Latimore Township	2,915	4	0	0	1	3	32	4	27
	Latrobe	8,307	45	1	5	3	36	225	29	192

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Laureldale	3,772	0	0	0	0	0	21	5	12
	Lawrence Park Township	3,690	3	0	0	1	2	56	5	51
	Lawrence Township, Clearfield County	7,424	61	0	3	1	57	250	30	212
	Lawrence Township, Tioga County	1,711	12	0	0	0	12	0	0	0
	Lebanon	24,357	98	4	10	31	53	678	169	473
	Leetsdale	1,111	5	0	0	0	5	26	5	19
	Lehighton	5,450	14	0	2	4	8	186	36	141
	Lehigh Township, Northampton County	11,215	13	2	0	0	11	121	26	90
	Lewisburg	5,515	11	0	0	1	10	59	12	47
	Liberty	2,413	2	0	0	0	2	11	0	10
	Liberty Township, Adams County	1,331	2	0	0	0	2	24	2	13
	Ligonier	1,598	4	0	0	0	4	10	1	9
	Ligonier Township	6,763	7	0	0	0	7	54	10	43
	Limerick Township	17,476	10	0	1	3	6	458	24	428
	Lincoln	1,075	0	0	0	0	0	6	4	2
	Linesville	1,086	2	0	0	0	2	5	0	5
	Lititz	9,107	3	0	1	1	1	112	13	98
	Littlestown	4,190	13	0	2	4	7	72	14	58
	Lock Haven	8,484	14	1	3	3	7	236	35	200
	Locust Township	2,563	2	0	1	0	1	47	13	34
	Logan Township	12,341	45	0	5	5	35	352	46	301
	Loretto	1,397	0	0	0	0	0	0	0	0
	Lower Allen Township	18,025	4	0	0	2	2	199	20	176
	Lower Burrell	12,078	10	0	2	0	8	128	23	97
	Lower Frederick Township	4,859	0	0	0	0	0	13	2	10
	Lower Gwynedd Township	11,627	19	1	0	2	16	186	13	168
	Lower Heidelberg Township	5,620	4	0	0	0	4	30	5	25
	Lower Makefield Township	32,410	16	0	0	5	11	321	64	251
	Lower Merion Township	57,561	36	0	1	27	8	1,115	226	866
	Lower Milford Township	3,973	1	0	1	0	0	6	2	3
	Lower Moreland Township	12,940	8	1	1	2	4	197	63	127
	Lower Paxton Township	46,144	93	2	16	27	48	1,216	208	977
	Lower Pottsgrove Township	12,361	27	0	2	3	22	267	33	230
	Lower Providence Township	26,475	53	0	0	3	50	278	57	202
	Lower Salford Township	14,832	7	0	0	0	7	67	8	59
	Lower Saucon Township	11,625	20	0	0	1	19	105	19	84
	Lower Southampton Township	19,137	36	1	2	12	21	405	70	325
	Lower Swatara Township	8,829	4	0	1	2	1	139	19	116
	Lower Windsor Township	7,996	12	0	1	1	10	86	9	67
	Luzerne Township	6,684	2	0	0	0	2	29	1	26
	Lykens	1,867	0	0	0	0	0	12	1	11
	Macungie	3,165	4	0	0	1	3	13	4	8
	Mahanoy City	4,359	10	0	1	0	9	133	33	92
	Mahanoy Township	3,502	0	0	0	0	0	0	0	0
	Mahoning Township, Carbon County	4,493	32	0	0	0	32	142	15	127
	Mahoning Township, Montour County	4,248	25	0	0	1	24	26	2	21
	Main Township	1,293	0	0	0	0	0	0	0	0
	Malvern	3,174	8	0	0	0	8	21	1	19
	Manheim	4,680	10	0	1	2	7	101	16	83

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Manheim Township	36,619	29	0	2	11	16	711	82	617
	Manor	2,966	3	0	1	0	2	30	9	18
	Manor Township, Armstrong County	3,881	0	0	0	0	0	0	0	0
	Manor Township, Lancaster County	20,161	11	0	0	4	7	227	25	194
	Mansfield	3,266	0	0	0	0	0	8	1	7
	Marcus Hook	2,249	24	0	1	1	22	70	14	55
	Marietta	2,629	1	0	0	0	1	53	7	46
	Marion Township, Beaver County	883	0	0	0	0	0	3	0	3
	Marion Township, Berks County	1,827	2	0	0	0	2	5	2	3
	Marlborough Township	3,337	4	1	2	0	1	28	8	18
	Marple Township	23,682	12	0	2	7	3	351	15	328
	Martinsburg	2,139	3	0	0	0	3	30	8	21
	Marysville	2,456	2	0	0	1	1	14	5	9
	Masontown	3,334	3	0	0	1	2	96	25	63
	Mayfield	1,697	0	0	0	0	0	0	0	0
	McAdoo	2,074	3	0	2	0	1	46	5	40
	McCandless	27,188	6	0	2	1	3	277	33	242
	McKeesport	22,009	293	6	8	60	219	787	278	469
	McKees Rocks	6,038	82	0	3	43	36	322	115	186
	McSherrystown	2,839	2	0	0	0	2	25	6	18
	Meadville	13,229	19	0	0	7	12	339	57	282
	Mechanicsburg	8,744	33	0	2	1	30	242	25	212
	Media	5,448	26	0	0	8	18	88	7	78
	Mercer	2,184	2	0	0	0	2	17	9	8
	Mercersburg	1,593	1	0	0	1	0	33	6	26
	Middleburg	1,333	3	0	1	0	2	50	8	40
	Middlesex Township, Butler County	5,518	3	0	1	0	2	40	9	28
	Middlesex Township, Cumberland County	7,124	9	0	1	3	5	196	17	169
	Middletown	8,781	19	0	4	4	11	127	25	100
	Middletown Township	47,432	46	0	4	23	19	1,356	194	1,106
	Midland	2,809	10	0	1	2	7	379	29	344
	Midway	924	0	0	0	0	0	1	1	0
	Mifflin	600	0	0	0	0	0	1	1	0
	Mifflinburg	3,514	3	0	1	1	1	54	10	44
	Mifflin County Regional	30,294	40	0	7	3	30	592	83	480
	Mifflin Township	2,272	0	0	0	0	0	0	0	0
	Milford	2,930	3	0	0	3	0	40	9	30
	Millbourne	914	7	0	0	1	6	13	3	10
	Millcreek Township, Erie County	52,537	47	1	11	15	20	1,077	237	823
	Millcreek Township, Lebanon County	3,274	3	0	0	0	3	49	10	38
	Millersburg	2,479	11	0	0	0	11	42	8	33
	Millersville	7,350	8	0	0	4	4	104	23	80
	Mill Hall	1,456	0	0	0	0	0	0	0	0
	Millvale	3,643	1	0	0	0	1	36	17	19
	Milton	6,360	28	0	1	0	27	114	20	94
	Minersville	4,187	11	0	0	2	9	64	10	50
	Mohnton	3,110	6	0	0	1	5	18	4	14
	Monaca	5,675	12	0	1	2	9	125	25	95
	Monessen	7,977	51	2	2	13	34	244	68	170

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Monongahela	4,409	22	0	1	7	14	133	22	107
	Monroeville	27,622	86	0	3	11	72	389	94	276
	Montgomery	5,379	5	0	0	0	5	29	5	24
	Montgomery Township	24,720	6	0	0	5	1	443	22	410
	Montoursville	4,600	0	0	0	0	0	40	2	38
	Montrose	1,509	6	0	0	1	5	38	6	30
	Moon Township	23,197	11	0	1	2	8	345	42	293
	Moore Township	9,775	6	0	1	0	5	67	5	62
	Moosic	5,811	31	0	0	5	26	240	37	197
	Morris-Cooper Regional	5,623	6	0	0	0	6	16	7	8
	Morrisville	9,639	26	0	2	4	20	252	49	181
	Morton	2,658	9	0	0	3	6	121	23	98
	Moscow	1,941	6	0	2	0	4	27	2	25
	Mount Carmel	5,869	27	0	1	2	24	87	12	72
	Mount Carmel Township	2,582	6	0	0	2	4	9	1	7
	Mount Gretna Borough	237	0	0	0	0	0	0	0	0
	Mount Holly Springs	1,923	6	0	1	0	5	32	6	26
	Mount Jewett	983	2	0	0	0	2	4	3	1
	Mount Joy	7,426	14	0	1	1	12	120	27	93
	Mount Lebanon	30,380	15	0	0	5	10	250	36	203
	Mount Oliver	3,644	54	2	3	32	17	155	51	75
	Mount Pleasant	4,357	6	0	0	1	5	64	7	56
	Mount Pleasant Township	3,667	7	0	0	1	6	22	5	16
	Mount Union	2,313	10	0	0	2	8	89	16	68
	Mountville	2,886	4	0	0	0	4	37	3	31
	Muhlenberg Township	19,028	26	0	0	7	19	559	32	490
	Muncy	2,444	0	0	0	0	0	0	0	0
	Munhall	11,048	24	0	0	8	16	187	43	134
	Murrysville	19,688	9	0	0	4	5	93	28	63
	Myerstown	3,163	10	0	0	0	10	58	5	51
	Nanticoke	10,183	58	0	9	11	38	425	110	293
	Nanty Glo	2,763	5	0	1	0	4	77	17	58
	Narberth	4,063	2	0	0	0	2	51	11	39
	Nazareth Area	6,118	16	0	1	1	14	107	14	91
	Nelson Township	567	0	0	0	0	0	3	0	3
	Nescopeck	1,426	0	0	0	0	0	4	0	2
	Neshannock Township	9,282	6	0	1	0	5	135	17	110
	Nether Providence Township	13,298	29	0	3	3	23	234	25	207
	Neville Township	1,120	3	0	2	0	1	39	3	36
	New Berlin	813	0	0	0	0	0	3	1	2
	Newberry Township	15,825	19	1	2	1	15	383	57	315
	New Brighton	9,246	77	0	0	17	60	462	72	386
	New Britain	2,279	10	0	0	1	9	17	5	11
	New Britain Township	11,109	3	0	1	1	1	100	17	77
	New Castle	23,968	270	6	9	52	203	1,162	491	612
	New Castle Township	396	2	0	0	0	2	19	0	19
	New Cumberland	7,061	3	0	2	0	1	151	26	123
	New Florence	724	0	0	0	0	0	2	1	1
	New Garden Township	12,307	12	0	1	5	6	194	31	151

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	New Hanover Township	10,029	3	0	0	1	2	76	13	58
	New Holland	5,223	7	0	0	1	6	74	13	56
	New Hope	2,298	5	0	0	0	5	64	6	58
	New Kensington	13,583	53	1	12	13	27	465	112	333
	New Philadelphia	1,085	0	0	0	0	0	6	1	4
	Newport	1,469	6	0	0	2	4	26	7	19
	New Sewickley Township	7,651	17	0	1	1	15	129	33	92
	Newton Township	2,812	2	0	0	0	2	10	3	7
	Newtown	2,404	1	0	0	1	0	39	8	30
	Newtown Township, Bucks County	19,713	8	0	0	0	8	205	32	168
	Newtown Township, Delaware County	11,937	3	0	0	0	3	150	25	118
	Newville	1,309	1	0	0	0	1	35	2	32
	Norristown	32,217	394	6	23	172	193	1,048	229	688
	Northampton	10,064	11	4	1	2	4	184	32	147
	Northampton Township	41,145	11	0	1	2	8	285	63	218
	North Belle Vernon	1,941	11	0	0	2	9	94	21	71
	North Catasauqua	2,919	5	0	0	1	4	57	8	46
	North Cornwall Township	6,683	13	0	2	0	11	129	16	104
	North Coventry Township	7,924	11	0	2	1	8	194	14	176
	North East, Erie County	4,186	8	0	0	1	7	137	11	125
	Northeastern Regional	11,441	16	0	5	1	10	188	26	155
	Northern Berks Regional	12,828	10	0	0	1	9	184	34	146
	Northern Cambria Borough	3,875	2	0	2	0	0	111	35	71
	Northern Regional	29,057	5	0	1	0	4	232	16	213
	Northern York Regional	68,116	56	0	3	17	36	1,035	92	888
	North Fayette Township	13,375	12	0	0	3	9	424	15	407
	North Franklin Township	4,642	19	0	1	5	13	114	7	102
	North Huntingdon Township	29,816	14	0	0	4	10	376	43	323
	North Irwin	835	4	0	0	0	4	2	0	2
	North Lebanon Township	11,141	5	0	0	4	1	274	37	230
	North Londonderry Township	7,114	4	1	0	0	3	81	11	69
	North Middleton Township	11,191	16	0	1	4	11	85	17	65
	North Sewickley Township	5,628	4	0	2	0	2	124	26	97
	North Strabane Township	12,876	7	0	0	0	7	154	23	126
	Northumberland	3,505	6	0	1	0	5	68	11	55
	North Union Township	1,264	1	0	0	0	1	1	1	0
	North Versailles Township	12,051	81	1	4	10	66	248	51	191
	North Wales	3,245	1	0	0	0	1	60	7	49
	Northwest Lancaster County Regional	18,254	6	0	2	1	3	195	6	188
	Norwood	5,825	14	0	1	1	12	105	15	88
	Oakland	565	0	0	0	0	0	3	2	0
	Oakmont	6,411	22	0	0	3	19	127	18	103
	O'Hara Township	9,361	0	0	0	0	0	72	16	53
	Ohio Township	4,397	0	0	0	0	0	91	1	89
	Oil City	10,461	14	0	6	3	5	129	14	113
	Old Forge	8,525	6	0	0	1	5	85	20	60
	Old Lycoming Township	5,276	3	0	0	2	1	110	10	91
	Oley Township	3,750	5	0	0	0	5	32	2	25
	Olyphant	4,973	4	0	0	1	3	40	8	27

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Orangeville Area	1,697	0	0	0	0	0	13	6	7
	Orwigsburg	2,970	3	0	0	0	3	36	8	28
	Osceola Township	709	0	0	0	0	0	0	0	0
	Otto Eldred Regional	2,420	1	0	0	0	1	9	4	5
	Oxford	4,776	27	0	0	10	17	111	9	99
	Paint Township	3,156	13	0	0	0	13	11	3	8
	Palmerton	5,235	0	0	0	0	0	120	8	108
	Palmer Township	21,029	16	0	1	6	9	462	45	402
	Palmyra	7,099	7	0	0	1	6	148	17	127
	Palo Alto	1,073	1	0	0	0	1	2	0	2
	Parkesburg	3,514	12	1	4	0	7	51	12	32
	Patterson Township	2,930	4	0	0	2	2	43	12	31
	Patton	1,829	0	0	0	0	0	2	1	1
	Patton Township	13,570	9	0	2	5	2	247	30	213
	Paxtang	1,493	4	0	0	2	2	41	5	33
	Pen Argyl	3,693	5	0	1	0	4	61	17	41
	Penbrook	2,937	2	0	0	2	0	24	7	16
	Penn Hills	44,001	177	5	15	64	93	939	388	502
	Pennridge Regional	10,783	9	0	0	0	9	111	16	89
	Penn Township, Butler County	5,212	2	0	0	0	2	37	15	20
	Penn Township, Lancaster County	8,973	17	0	1	0	16	122	18	86
	Penn Township, Perry County	3,284	3	0	0	0	3	33	8	24
	Penn Township, Westmoreland County	20,387	8	0	0	1	7	111	21	88
	Penn Township, York County	16,193	12	0	1	2	9	275	27	242
	Pequea Township	4,581	9	0	1	1	7	61	17	41
	Perkasie	8,695	13	0	1	2	10	197	27	167
	Perryopolis	1,693	0	0	0	0	0	15	1	12
	Peters Township	20,731	4	0	0	1	3	98	21	76
	Philadelphia	1,558,378	18,535	306	945	8,363	8,921	57,788	10,796	39,924
	Phoenixville	16,923	49	0	6	3	40	416	19	394
	Pine Creek Township	3,192	5	0	0	0	5	46	0	46
	Pitcairn	3,308	26	0	2	7	17	165	43	117
	Pittsburgh	312,737	2,810	55	66	1,190	1,499	11,284	2,949	7,678
	Pittston	7,539	28	0	2	1	25	215	20	185
	Plainfield Township	6,370	4	0	0	0	4	68	14	50
	Plains Township	10,460	7	0	0	0	7	174	29	138
	Pleasant Hills	7,959	3	0	0	3	0	80	15	63
	Plum	26,311	39	0	1	5	33	156	63	93
	Plumstead Township	11,937	6	0	1	1	4	145	22	115
	Plymouth Township, Montgomery County	16,534	43	1	10	23	9	577	69	479
	Pocono Mountain Regional	36,242	75	0	10	23	42	1,045	444	572
	Pocono Township	11,430	9	1	1	4	3	388	85	292
	Point Marion	1,225	13	0	1	0	12	22	6	16
	Point Township	3,940	6	0	0	0	6	44	8	36
	Polk	992	1	0	0	0	1	3	1	2
	Portage	2,555	7	0	0	1	6	68	12	56
	Port Allegany	2,160	4	0	0	1	3	8	4	4
	Port Carbon	1,766	1	0	0	0	1	2	1	1
	Port Vue	3,838	13	0	2	4	7	73	19	50

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Pottstown	21,491	222	0	25	78	119	1,006	165	785
	Prospect Park	6,545	30	0	0	8	22	171	26	139
	Pulaski Township, Lawrence County	3,393	1	0	0	0	1	30	7	23
	Punxsutawney	5,855	53	0	2	0	51	105	14	90
	Pymatuning Township	3,555	4	0	0	1	3	119	28	85
	Quakertown	8,690	40	0	2	6	32	241	29	209
	Quarryville	2,184	7	0	1	3	3	55	7	48
	Raccoon Township	3,218	1	0	1	0	0	13	6	7
	Radnor Township	31,260	23	0	0	6	17	368	54	306
	Ralpho Township	3,938	3	0	0	0	3	14	3	10
	Rankin	2,101	10	0	0	0	10	3	3	0
	Reading	81,370	767	10	21	384	352	3,662	1,425	1,582
	Redstone Township	5,959	2	0	0	1	1	11	6	5
	Resa Regional	2,558	2	0	0	0	2	10	4	5
	Rice Township	3,098	5	0	0	1	4	7	3	3
	Richland	1,514	0	0	0	0	0	0	0	0
	Richland Township, Bucks County	13,124	5	0	0	4	1	250	29	215
	Richland Township, Cambria County	12,562	13	0	1	2	10	549	27	519
	Ridgway	4,013	8	0	3	1	4	196	38	153
	Ridley Park	7,048	12	0	2	0	10	77	9	64
	Ridley Township	30,135	63	1	5	21	36	568	99	438
	Ringtown	759	0	0	0	0	0	3	0	3
	Riverside	1,871	0	0	0	0	0	9	1	8
	Roaring Brook Township	1,815	1	0	0	0	1	29	7	22
	Roaring Spring	2,259	1	0	0	0	1	69	5	60
	Robeson Township	7,807	6	0	0	1	5	75	12	52
	Robinson Township, Allegheny County	13,742	21	0	1	5	15	320	19	294
	Robinson Township, Washington County	2,144	0	0	0	0	0	30	3	26
	Rochester Township	2,839	3	0	0	0	3	79	6	69
	Rockledge	2,491	4	0	0	0	4	46	11	33
	Rosslyn Farms	421	0	0	0	0	0	0	0	0
	Ross Township	30,615	33	0	1	12	20	802	101	687
	Rostraver Township	11,729	12	0	2	8	2	429	66	353
	Royalton	964	0	0	0	0	0	2	2	0
	Royersford	4,763	16	0	1	1	14	80	16	62
	Rush Township	3,756	8	0	1	0	7	115	6	108
	Ryan Township	2,550	3	0	0	0	3	8	2	6
	Sadsbury Township, Chester County	3,443	2	0	0	1	1	4	0	4
	Salem Township, Luzerne County	4,121	5	0	0	0	5	36	7	29
	Salisbury Township	14,197	7	0	0	3	4	263	54	201
	Saltsburg	874	1	0	0	0	1	8	0	8
	Sandy Lake	685	1	0	0	1	0	3	1	2
	Sandy Township	11,527	9	0	0	0	9	272	40	219
	Sankertown	649	1	0	0	1	0	6	1	5
	Saxton	756	0	0	0	0	0	0	0	0
	Scott Township, Allegheny County	15,778	13	0	1	4	8	248	44	197
	Scott Township, Columbia County	5,049	1	0	1	0	0	84	2	82
	Scott Township, Lackawanna County	4,911	4	0	0	0	4	14	12	2
	Scranton	71,920	234	1	23	103	107	2,422	675	1,631

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Selinsgrove	5,465	129	0	4	4	121	192	34	149
	Seven Springs	99	0	0	0	0	0	5	0	5
	Seward	451	0	0	0	0	0	1	1	0
	Sewickley Heights	975	0	0	0	0	0	7	0	7
	Shaler Township	27,862	20	1	1	5	13	259	43	213
	Shamokin	7,337	4	0	0	0	4	29	6	22
	Shamokin Dam	1,451	3	0	1	0	2	45	4	41
	Sharon	14,672	104	1	12	29	62	618	246	357
	Sharon Hill	5,367	51	0	2	11	38	159	18	131
	Sharpsburg	3,281	17	0	0	1	16	98	24	64
	Sharpsville	4,040	71	0	0	2	69	90	9	80
	Shenandoah	5,121	20	0	1	10	9	137	23	110
	Shenango Township, Lawrence County	7,652	8	0	2	2	4	211	42	159
	Shillington	5,042	3	0	0	0	3	131	7	115
	Shippensburg	5,609	6	0	1	2	3	80	14	61
	Shiremanstown	1,466	2	0	0	0	2	3	1	2
	Shohola Township	2,541	1	0	0	0	1	31	19	12
	Silver Lake Township	1,719	3	0	0	0	3	16	3	11
	Silver Spring Township	14,067	2	1	0	1	0	167	17	148
	Sinking Spring	3,767	10	0	1	1	8	69	11	52
	Slatington	4,452	9	0	0	0	9	82	9	70
	Slippery Rock	2,957	4	0	2	0	2	15	3	12
	Smethport	1,547	0	0	0	0	0	24	9	14
	Smithfield	792	0	0	0	0	0	0	0	0
	Smithton Borough	406	0	0	0	0	0	4	3	1
	Smith Township	4,508	0	0	0	0	0	0	0	0
	Solebury Township	8,957	0	0	0	0	0	78	18	56
	Somerset	6,294	14	0	1	3	10	201	36	158
	Souderton	6,601	11	1	0	2	8	61	5	53
	South Abington Township	9,588	7	0	0	0	7	85	12	71
	South Beaver Township	2,845	1	0	0	0	1	34	9	25
	South Buffalo Township	2,771	0	0	0	0	0	20	4	16
	South Centre Township	1,924	1	0	0	0	1	94	13	79
	South Coatesville	1,185	15	0	1	0	14	20	4	11
	South Connellsville Borough	2,121	1	0	0	0	1	9	0	9
	Southern Regional Lancaster County	3,914	7	0	0	0	7	40	3	37
	Southern Regional York County	10,136	8	0	1	5	2	168	25	141
	South Fayette Township	13,359	5	1	1	1	2	70	12	58
	South Fork	1,018	0	0	0	0	0	0	0	0
	South Greensburg	2,216	3	0	0	0	3	27	7	20
	South Heidelberg Township	7,542	9	0	1	0	8	70	6	63
	South Heights	487	0	0	0	0	0	0	0	0
	South Lebanon Township	8,867	3	0	0	0	3	110	24	86
	South Londonderry Township	7,691	2	0	1	1	0	55	18	36
	South Park Township	14,057	4	0	0	1	3	51	21	28
	South Strabane Township	8,975	16	0	6	4	6	417	18	393
	Southwestern Regional	18,477	17	1	6	0	10	120	18	100
	Southwest Greensburg	2,187	15	1	2	0	12	56	11	45
	Southwest Mercer County Regional	11,071	19	0	2	6	11	189	50	123

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Southwest Regional	2,918	2	0	0	0	2	44	15	29
	South Whitehall Township	20,110	37	0	3	9	25	629	80	544
	Spring City	3,438	11	0	1	0	10	73	11	62
	Springdale	3,474	3	0	0	0	3	52	3	49
	Springdale Township	1,650	3	0	0	0	3	15	5	10
	Springettsbury Township	25,205	39	0	2	20	17	911	64	832
	Springfield Township, Delaware County	22,990	21	2	1	6	12	673	39	618
	Springfield Township, Montgomery County	18,926	31	0	0	5	26	291	61	225
	Spring Garden Township	12,218	25	0	1	13	11	494	60	422
	Spring Township, Berks County	27,157	11	0	1	1	9	327	39	274
	Spring Township, Centre County	7,243	0	0	0	0	0	25	1	22
	Spring Township, Snyder County	1,569	0	0	0	0	0	4	1	3
	State College	54,649	74	0	9	16	49	892	111	769
	St. Clair Boro	2,962	2	0	0	2	0	111	2	109
	St. Clair Township	1,338	0	0	0	0	0	0	0	0
	Steelton	5,636	36	0	6	17	13	284	91	176
	Stewartstown	2,036	3	0	0	1	2	49	10	37
	St. Marys City	13,273	12	1	2	1	8	170	25	141
	Stockertown	773	0	0	0	0	0	1	1	0
	Stoneboro	1,007	0	0	0	0	0	7	0	6
	Stowe Township	6,029	29	0	4	5	20	133	43	90
	Strasburg	2,802	3	0	1	0	2	26	5	20
	Stroud Area Regional	35,282	106	0	22	41	43	1,444	154	1,252
	Sugarcreek	4,932	6	0	1	0	5	60	3	55
	Sugarloaf Township, Luzerne County	4,112	0	0	0	0	0	21	1	20
	Sugar Notch	957	0	0	0	0	0	15	2	13
	Summerhill Township	2,554	1	0	0	0	1	34	4	29
	Summit Hill	2,981	0	0	0	0	0	7	2	5
	Summit Township	2,229	3	0	0	0	3	18	6	12
	Sunbury	9,784	74	1	4	6	63	236	45	178
	Susquehanna Depot	1,538	0	0	0	0	0	10	5	4
	Susquehanna Regional	7,673	2	0	1	0	1	91	15	74
	Susquehanna Township, Dauphin County	23,556	50	1	9	12	28	467	59	399
	Sutersville	586	0	0	0	0	0	0	0	0
	Swarthmore	6,161	1	0	1	0	0	83	21	61
	Swatara Township	22,781	158	0	1	31	126	700	111	575
	Sweden Township	711	0	0	0	0	0	0	0	0
	Swissvale	8,721	109	0	0	25	84	272	82	177
	Swoyersville	4,830	11	0	1	1	9	116	26	86
	Sykesville	1,152	0	0	0	0	0	0	0	0
	Tamaqua	6,525	9	0	3	2	4	220	31	182
	Tarentum	4,501	20	0	2	4	14	149	28	118
	Tatamy	1,112	0	0	0	0	0	14	0	14
	Taylor	6,134	6	0	0	0	6	162	18	141
	Telford	4,632	17	0	2	1	14	75	9	64
	Throop	4,061	19	0	1	1	17	51	12	34
	Tiadaghton Valley Regional	6,613	31	0	0	1	30	87	4	76
	Tidioute	713	0	0	0	0	0	4	0	4
	Tilden Township	3,895	3	0	0	1	2	53	1	49

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Tinicum Township, Bucks County	4,259	3	0	2	0	1	26	5	21
	Tinicum Township, Delaware County	4,237	22	0	0	2	20	223	17	183
	Titusville	5,687	11	1	1	2	7	149	25	121
	Towamencin Township	17,830	26	0	3	3	20	184	24	156
	Towanda	2,796	10	0	4	0	6	51	12	38
	Tower City	1,313	0	0	0	0	0	7	1	6
	Trafford	3,080	17	0	2	3	12	19	10	9
	Tredyffrin Township	29,336	10	0	0	2	8	249	26	220
	Troy	1,445	3	0	0	0	3	30	7	23
	Tulpehocken Township	3,611	2	0	0	0	2	17	5	11
	Tunkhannock	1,760	5	0	0	0	5	29	5	20
	Tunkhannock Township, Wyoming County	4,294	3	0	0	0	3	52	10	39
	Turtle Creek	5,489	15	0	0	0	15	20	3	16
	Tyrone	5,216	13	0	0	1	12	127	22	104
	Union City	3,295	5	0	3	2	0	57	11	46
	Union Dale	341	0	0	0	0	0	0	0	0
	Uniontown	11,514	52	0	1	14	37	526	120	371
	Union Township, Lawrence County	4,992	5	0	0	2	3	185	18	166
	Union Township, Schuylkill County	1,348	0	0	0	0	0	0	0	0
	Upland	2,889	58	0	1	6	51	116	39	71
	Upper Allen Township	18,659	0	0	0	0	0	156	19	131
	Upper Burrell Township	2,128	2	0	1	0	1	20	3	17
	Upper Chichester Township	17,847	43	1	2	19	21	464	82	364
	Upper Darby Township	79,046	439	4	17	240	178	2,084	317	1,637
	Upper Dublin Township	26,118	22	0	3	3	16	332	44	285
	Upper Gwynedd Township	16,481	17	1	2	2	12	142	11	129
	Upper Leacock Township	8,785	13	0	0	2	11	99	29	66
	Upper Makefield Township	8,691	5	0	0	0	5	107	24	82
	Upper Merion Township	26,693	29	2	1	18	8	1,497	81	1,372
	Upper Moreland Township	24,291	13	0	1	7	5	477	53	410
	Upper Perkiomen	6,422	8	0	3	1	4	121	19	98
	Upper Pottsgrove Township	5,455	12	0	1	0	11	50	7	43
	Upper Providence Township, Delaware County	11,280	5	0	0	0	5	58	14	41
	Upper Providence Township, Montgomery County	20,416	9	0	1	1	7	329	32	289
	Upper Saucon Township	15,514	5	0	2	1	2	151	41	109
	Upper Southampton Township	15,349	9	1	2	4	2	178	49	123
	Upper St. Clair Township	18,666	3	0	0	1	2	134	11	122
	Upper Uwchlan Township	12,202	0	0	0	0	0	47	4	43
	Upper Yoder Township	5,450	6	0	0	0	6	30	1	29
	Uwchlan Township	19,079	14	0	1	2	11	193	22	168
	Valley Township	7,223	10	0	0	1	9	82	11	70
	Vandergrift	4,970	17	0	0	3	14	17	9	8
	Vandling	697	1	0	0	0	1	2	0	2
	Vernon Township	5,453	1	0	0	1	0	109	6	102
	Verona	2,634	9	0	2	3	4	97	22	73
	Vintondale	473	0	0	0	0	0	0	0	0
	Walker Township	985	2	0	0	0	2	10	3	7
	Wampum	620	1	0	0	0	1	6	0	5
	Warminster Township	35,027	31	0	8	14	9	557	84	453

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Warren	9,302	87	0	1	0	86	194	24	165
	Warrington Township	23,663	17	0	1	6	10	237	36	198
	Warwick Township, Bucks County	15,090	4	0	0	0	4	159	19	139
	Warwick Township, Lancaster County	17,596	9	0	2	3	4	95	9	82
	Washington, Washington County	14,745	72	0	10	26	36	526	110	366
	Washington Township, Fayette County	4,095	5	0	0	0	5	56	12	44
	Washington Township, Franklin County	12,440	9	1	2	2	4	264	48	202
	Washington Township, Northampton County	5,022	2	0	1	1	0	58	17	39
	Washington Township, Westmoreland County	7,409	4	0	1	0	3	59	15	43
	Watsontown	2,107	20	0	0	0	20	21	3	18
	Waymart	1,417	0	0	0	0	0	3	0	3
	Waynesboro	10,259	13	0	2	3	8	240	43	192
	Waynesburg	4,196	7	0	0	1	6	102	30	71
	Weatherly	2,604	18	0	0	1	17	65	18	46
	Wellsboro	3,254	0	0	0	0	0	36	2	31
	Wesleyville	3,310	8	0	1	0	7	121	22	97
	West Brandywine Township	8,049	11	0	0	1	10	86	23	55
	West Brownsville	1,022	1	0	0	0	1	2	1	1
	West Caln Township	8,657	14	0	0	0	14	96	35	61
	West Carroll Township	1,339	5	0	0	0	5	15	5	8
	West Chester	18,578	65	0	9	20	36	448	78	344
	West Cocalico Township	7,265	2	1	0	0	1	70	28	41
	West Conshohocken	1,513	6	0	1	0	5	20	2	16
	West Cornwall Township	2,052	2	0	0	0	2	5	2	2
	West Deer Township	12,079	4	0	0	0	4	89	25	59
	West Earl Township	7,975	2	0	0	1	1	46	9	32
	Western Berks Regional	4,569	3	0	0	2	1	83	12	69
	West Fallowfield Township	2,621	0	0	0	0	0	17	1	16
	Westfield	1,123	1	0	0	0	1	4	1	3
	West Goshen Township	22,211	21	1	1	5	14	408	36	360
	West Grove Borough	2,808	1	0	0	0	1	15	5	8
	West Hazleton	3,295	19	2	0	6	11	162	35	121
	West Hempfield Township	16,388	17	0	0	3	14	229	27	195
	West Hills Regional	10,549	3	0	1	1	1	100	21	77
	West Homestead	1,984	16	1	0	3	12	56	18	35
	West Lampeter Township	15,972	11	0	1	8	2	147	15	126
	West Lebanon Township	857	1	0	0	1	0	72	3	69
	West Mahanoy Township	2,982	0	0	0	0	0	6	4	1
	West Manchester Township	18,665	35	0	2	16	17	795	62	717
	West Manheim Township	7,965	6	1	0	2	3	80	2	77
	West Mayfield Borough	1,065	2	0	0	0	2	8	2	5
	West Mead Township	5,051	0	0	0	0	0	0	0	0
	West Mifflin	20,352	51	1	1	16	33	525	89	421
	West Newton	2,840	19	0	1	2	16	72	8	63
	West Norriton Township	14,593	34	0	4	13	17	324	16	293
	West Nottingham Township	2,883	0	0	0	0	0	6	1	5
	West Penn Township	4,389	2	0	1	0	1	15	6	8
	West Pike Run	1,719	0	0	0	0	0	9	0	8
	West Pittston	4,932	10	0	0	2	8	111	20	90

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	West Pottsgrove Township	3,789	13	0	2	4	7	147	11	132
	West Reading	4,075	28	0	2	4	22	249	27	210
	West Sadsbury Township	2,560	3	0	0	0	3	72	0	71
	West Salem Township	3,329	5	0	0	1	4	32	17	14
	West Shore Regional	6,620	13	0	0	9	4	119	31	82
	Westtown-East Goshen Regional	32,298	37	0	1	5	31	360	42	306
	West View	6,628	14	0	1	2	11	169	8	154
	West Vincent Township	5,164	3	0	0	1	2	29	7	20
	West Whiteland Township	18,636	15	0	2	5	8	552	22	516
	West Wyoming	2,687	5	0	1	0	4	25	7	17
	West York	4,219	13	0	0	9	4	82	12	64
	Whitaker Borough	1,208	1	0	0	1	0	33	13	19
	Whitehall	13,364	10	0	1	2	7	51	10	41
	Whitehall Township	27,352	35	1	4	21	9	1,386	104	1,253
	White Haven Borough	1,143	2	0	0	1	1	10	1	8
	Whitemarsh Township	17,991	7	0	0	1	6	247	36	203
	White Oak	8,116	3	0	1	2	0	81	23	55
	White Township	1,295	7	0	2	0	5	25	4	20
	Whitpain Township	19,018	25	0	0	6	19	243	27	203
	Wiconisco Township	1,114	1	0	0	0	1	2	0	2
	Wilkes-Barre	40,970	196	2	13	111	70	1,814	352	1,373
	Wilkes-Barre Township	3,081	7	0	2	4	1	679	19	654
	Wilkinsburg	17,047	221	3	7	80	131	615	273	279
	Wilkins Township	6,483	9	0	2	1	6	117	25	88
	Williamsburg	1,250	0	0	0	0	0	11	0	11
	Williamsport	29,320	102	2	12	55	33	1,220	232	954
	Willistown Township	10,984	3	0	0	0	3	129	15	113
	Wilson	7,760	60	0	4	15	41	319	64	245
	Windber	3,953	19	0	0	1	18	46	5	35
	Wind Gap	2,833	2	0	0	0	2	49	3	41
	Womelsdorf	2,856	8	0	0	0	8	15	7	8
	Woodward Township	2,252	0	0	0	0	0	31	4	27
	Worthington	707	0	0	0	0	0	3	0	3
	Wrightsville	2,255	1	0	0	0	1	32	7	25
	Wright Township	5,945	0	0	0	0	0	84	11	73
	Wyoming	2,988	7	0	0	0	7	97	10	86
	Wyomissing	10,533	7	0	0	2	5	517	31	478
	Yardley	2,524	1	0	0	0	1	22	2	20
	Yeadon	11,462	75	0	2	47	26	313	53	225
	York	40,553	421	5	37	248	131	2,071	555	1,330
	York Area Regional	59,342	69	2	13	14	40	641	108	492
	Youngsville	1,652	7	0	0	0	7	7	1	6
	Zelienople	3,958	11	0	0	0	11	90	8	81
	Zerbe Township	1,874	4	0	0	0	4	2	0	2
RHODE ISLAND	Barrington	16,276	5	0	1	2	2	203	40	156
	Bristol	22,266	22	0	4	5	13	279	31	240
	Burrillville	16,637	9	0	1	1	7	185	55	120
	Central Falls	18,676	101	0	16	30	55	512	153	289

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Charlestown	8,093	11	0	5	1	5	120	20	97
	Coventry	35,021	26	0	4	4	18	665	110	522
	Cranston	80,125	115	1	17	24	73	1,901	382	1,339
	Cumberland	34,589	27	1	1	8	17	550	94	429
	East Greenwich	13,361	6	0	1	2	3	186	31	149
	East Providence	48,507	64	1	12	17	34	732	146	529
	Foster	4,561	0	0	0	0	0	33	20	11
	Glocester	10,602	7	0	0	1	6	52	13	35
	Hopkinton	8,021	5	0	0	0	5	86	18	63
	Jamestown	5,451	5	0	2	0	3	74	12	61
	Johnston	28,623	39	0	3	10	26	587	125	412
	Lincoln	22,133	33	0	3	12	18	529	70	437
	Little Compton	3,516	0	0	0	0	0	75	26	48
	Middletown	15,895	7	0	2	1	4	266	45	215
	Narragansett	16,485	15	0	2	4	9	281	52	220
	Newport	23,173	138	0	11	18	109	1,011	213	755
	New Shoreham	1,036	1	0	1	0	0	43	7	35
	North Kingstown	26,656	21	0	5	4	12	449	67	369
	North Providence	32,740	63	2	4	17	40	621	153	424
	North Smithfield	11,629	13	0	1	2	10	141	25	110
	Pawtucket	71,782	289	5	38	107	139	2,281	715	1,337
	Portsmouth	16,845	12	0	2	1	9	306	105	190
	Providence	171,565	1,214	15	74	405	720	8,229	2,034	5,078
	Richmond	7,678	2	0	0	0	2	95	21	72
	Scituate	10,894	5	0	0	0	5	114	31	78
	Smithfield	21,242	8	0	1	2	5	286	34	234
	South Kingstown	29,291	17	0	2	4	11	368	103	253
	Tiverton	14,836	13	2	1	3	7	267	69	177
	Warren	10,840	20	0	3	1	16	214	33	174
	Warwick	84,568	85	0	14	24	47	2,119	381	1,628
	Westerly	23,524	12	0	4	5	3	431	73	343
	West Greenwich	6,531	2	0	0	1	1	115	32	79
	West Warwick	29,251	66	0	17	13	36	628	154	434
	Woonsocket	43,320	177	1	29	48	99	1,180	346	744
SOUTH CAROLINA	Abbeville	5,443	53	0	4	4	45	225	44	169
	Aiken	29,875	112	4	6	38	64	1,191	167	979
	Allendale	3,510	78	1	0	7	70	171	70	93
	Anderson	27,325	200	6	15	36	143	1,924	466	1,342
	Andrews	2,965	21	0	3	3	15	173	42	123
	Bamberg	3,303	21	0	0	5	16	122	23	94
	Barnwell	4,714	27	0	2	11	14	351	130	218
	Batesburg-Leesville	5,670	40	0	3	5	32	261	69	183
	Beaufort	12,076	135	0	3	33	99	804	153	631
	Belton	4,709	9	0	2	1	6	154	25	117
	Bennettsville	8,941	120	4	2	18	96	456	90	353
	Bishopville	3,773	26	0	0	6	20	251	67	175
	Blacksburg	1,913	22	0	0	1	21	118	36	77
	Blackville	2,807	20	0	0	5	15	101	25	69

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Bluffton	14,899	31	1	2	6	22	416	72	323
	Briarcliffe Acres	564	0	0	0	0	0	10	1	8
	Burnettown	2,701	3	0	0	0	3	66	21	39
	Calhoun Falls	2,151	13	0	1	1	11	32	6	25
	Camden	7,152	55	0	2	6	47	418	106	291
	Cayce	13,161	140	0	8	15	117	755	170	526
	Central	4,127	17	0	0	3	14	245	55	182
	Chapin	770	2	0	0	1	1	36	6	28
	Charleston	117,551	429	10	18	151	250	3,980	601	3,150
	Cheraw	5,372	43	0	3	8	32	292	44	236
	Chesnee	1,115	4	0	0	1	3	63	15	44
	Chester	5,915	102	0	8	23	71	322	108	201
	Chesterfield	1,321	3	0	0	3	0	46	5	40
	Clemson	13,134	27	0	3	6	18	431	78	327
	Clinton	8,910	87	0	5	15	67	450	121	319
	Clio	714	2	0	0	0	2	37	13	23
	Clover	5,292	136	1	3	5	127	183	41	135
	Columbia	130,498	1,306	16	74	345	871	7,898	1,699	5,528
	Conway	16,742	159	1	6	34	118	956	263	647
	Cottageville	674	6	0	0	0	6	19	3	16
	Coward	691	2	0	0	0	2	15	6	9
	Cowpens	2,480	29	0	1	1	27	109	31	71
	Darlington	6,482	75	0	5	18	52	458	68	368
	Denmark	2,900	31	0	1	7	23	169	66	92
	Dillon	6,468	117	2	4	21	90	762	223	523
	Due West	1,266	0	0	0	0	0	5	2	3
	Duncan	3,258	5	0	1	1	3	90	11	68
	Easley	20,818	70	2	4	10	54	1,034	161	826
	Edgefield	4,357	3	0	0	0	3	62	12	48
	Edisto Beach	724	4	0	0	0	4	62	21	41
	Ehrhardt	530	5	0	0	1	4	25	9	15
	Elgin	1,320	8	0	1	2	5	87	7	78
	Elloree	674	2	0	0	0	2	10	4	6
	Estill	2,306	41	0	0	4	37	100	33	63
	Eutawville	294	2	0	0	2	0	20	5	14
	Fairfax	3,081	30	0	0	0	30	108	43	65
	Florence	32,273	354	2	8	108	236	2,891	546	2,215
	Folly Beach	2,511	14	0	5	2	7	195	13	176
	Forest Acres	9,871	77	1	0	26	50	569	156	387
	Fort Lawn	801	3	0	0	1	2	36	11	23
	Fort Mill	11,024	37	0	1	7	29	305	51	230
	Fountain Inn	8,063	44	0	1	2	41	166	32	118
	Gaffney	13,155	88	1	3	23	61	430	105	279
	Georgetown	8,393	126	0	4	14	108	668	107	541
	Great Falls	2,001	20	0	0	1	19	116	33	76
	Greeleyville	369	4	0	0	0	4	19	9	8
	Greenville	62,368	468	3	20	132	313	3,265	597	2,499
	Greenwood	22,762	433	2	9	39	383	1,693	399	1,217
	Greer	26,760	138	2	19	28	89	838	113	661

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Hampton	2,730	21	0	1	6	14	130	22	105
	Hanahan	16,639	70	2	4	16	48	419	99	291
	Hardeeville	3,795	22	0	3	6	13	199	43	140
	Harleyville	699	6	0	0	2	4	30	7	17
	Hartsville	7,326	125	1	2	34	88	808	171	607
	Hemingway	475	5	0	0	4	1	32	3	29
	Holly Hill	1,308	9	0	0	4	5	78	19	55
	Honea Path	3,734	78	0	3	3	72	244	77	148
	Inman	2,154	7	0	0	3	4	76	22	48
	Irmo	12,023	40	0	4	8	28	287	55	219
	Isle of Palms	4,736	6	0	2	0	4	159	50	105
	Jackson	1,669	6	0	0	2	4	53	15	27
	Jamestown	108	0	0	0	0	0	2	0	2
	Johnsonville	1,505	6	0	0	1	5	29	6	23
	Johnston	2,334	23	0	1	4	18	64	27	33
	Kingstree	3,139	48	0	6	16	26	259	45	203
	Lake City	6,719	69	1	3	13	52	462	121	327
	Lake View	782	2	0	0	1	1	38	16	21
	Lamar	978	7	0	0	1	6	30	9	18
	Lancaster	10,376	141	2	6	31	102	588	135	428
	Landrum	2,693	15	0	1	1	13	95	17	74
	Latta	1,483	16	0	1	0	15	98	12	80
	Laurens	9,464	110	0	5	19	86	583	105	459
	Lexington	17,046	59	0	2	8	49	548	41	488
	Liberty	3,079	17	0	1	0	16	155	46	102
	Loris	2,412	25	0	3	9	13	205	40	153
	Lyman	3,065	4	0	1	1	2	114	15	95
	Manning	3,855	44	0	4	14	26	273	57	209
	Marion	6,649	108	0	3	25	80	585	148	416
	Mauldin	23,218	75	0	2	17	56	548	83	428
	McBee	734	4	0	0	2	2	21	6	15
	McColl	2,284	32	0	1	5	26	125	31	92
	McCormick	2,689	27	0	1	2	24	54	7	46
	Moncks Corner	7,390	36	0	1	6	29	384	47	302
	Mount Pleasant	68,555	155	2	4	24	125	1,277	192	1,040
	Mullins	4,595	74	1	2	19	52	317	123	185
	Myrtle Beach	32,907	483	1	39	189	254	4,155	793	3,061
	Newberry	11,144	57	0	4	12	41	363	52	303
	New Ellenton	2,252	18	0	0	0	18	79	24	53
	Nichols	386	5	0	0	0	5	11	1	10
	Ninety Six	1,951	10	0	1	0	9	58	14	38
	North	788	8	0	0	1	7	29	7	21
	North Augusta	21,242	53	0	2	24	27	1,050	192	795
	North Charleston	99,447	851	12	51	293	495	5,960	966	4,469
	North Myrtle Beach	16,832	101	0	11	31	59	1,813	476	1,183
	Orangeburg	13,252	96	4	4	40	48	594	216	340
	Pacolet	2,886	14	0	3	1	10	91	29	58
	Pageland	2,508	53	1	1	2	49	214	49	161
	Pamplico	1,164	1	0	0	0	1	6	1	4

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Pelion	613	2	1	0	0	1	21	2	19
	Pickens	3,039	14	1	2	4	7	149	20	119
	Pine Ridge	2,025	0	0	0	0	0	27	5	21
	Port Royal	11,663	20	0	3	8	9	269	73	180
	Prosperity	1,063	8	0	0	0	8	29	7	22
	Ridgeland	2,577	23	0	1	11	11	131	27	98
	Rock Hill	71,456	537	6	28	80	423	2,512	453	1,914
	Saluda	2,980	57	0	0	0	57	78	12	63
	Santee	722	15	0	1	9	5	90	13	73
	Scranton	1,093	2	0	0	0	2	16	7	9
	Seneca	7,852	62	0	9	5	48	319	63	251
	Simpsonville	18,119	82	1	5	10	66	668	133	512
	South Congaree	2,458	7	0	0	0	7	53	7	38
	Spartanburg	40,448	646	6	18	129	493	3,087	679	2,207
	Springdale	2,819	6	0	1	3	2	69	8	55
	St. George	2,156	23	0	1	9	13	128	32	94
	St. Matthews	1,918	18	0	1	1	16	50	12	37
	Sullivans Island	1,891	1	0	0	0	1	43	6	35
	Summerton	1,009	13	0	0	1	12	53	12	39
	Summerville	47,479	157	1	8	45	103	1,611	240	1,291
	Sumter	38,228	459	4	15	88	352	2,747	879	1,760
	Surfside Beach	4,884	19	0	2	4	13	362	90	230
	Swansea	828	10	0	0	2	8	52	8	42
	Tega Cay	5,293	3	0	0	1	2	109	16	91
	Timmonsville	2,403	32	0	0	7	25	204	58	127
	Travelers Rest	4,685	8	0	0	2	6	257	7	246
	Turbeville	700	1	0	0	0	1	15	8	7
	Union	7,832	120	0	5	17	98	444	109	318
	Wagener	885	6	0	0	1	5	51	18	29
	Walhalla	3,477	24	0	2	0	22	106	23	75
	Walterboro	5,841	83	1	4	18	60	665	189	448
	Ware Shoals	2,372	13	0	0	1	12	128	17	105
	Wellford	2,618	6	0	0	3	3	40	10	25
	West Columbia	14,145	153	3	8	42	100	933	122	750
	Westminster	2,651	16	0	4	3	9	107	16	88
	West Union	300	1	0	0	0	1	24	1	23
	Whitmire	1,583	3	0	0	2	1	18	4	14
	Williamston	4,015	13	0	1	1	11	148	24	112
	Williston	3,121	17	0	0	1	16	139	43	92
	Winnsboro	3,615	61	0	1	6	54	293	43	241
	Woodruff	4,169	14	0	0	0	14	108	31	72
	Yemassee	874	4	0	0	0	4	34	5	19
	York	8,327	87	1	3	17	66	348	73	260
SOUTH DAKOTA	Aberdeen	24,818	63	0	22	1	40	531	87	406
	Avon	499	0	0	0	0	0	0	0	0
	Belle Fourche	4,972	6	0	1	0	5	23	5	17
	Box Elder	4,340	17	0	1	2	14	138	22	110
	Brandon	8,330	2	0	2	0	0	57	2	51

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Brookings	20,200	7	0	1	0	6	106	8	96
	Burke	544	0	0	0	0	0	0	0	0
	Canton	4,378	3	0	1	0	2	68	14	50
	Centerville	818	0	0	0	0	0	1	1	0
	Chamberlain	2,273	5	0	1	0	4	11	5	5
	Deadwood	1,254	4	0	0	0	4	37	3	31
	Delmont	208	0	0	0	0	0	0	0	0
	Eagle Butte	928	0	0	0	0	0	3	1	2
	Estelline	663	0	0	0	0	0	9	1	8
	Eureka	904	0	0	0	0	0	0	0	0
	Flandreau	2,171	5	0	1	0	4	35	2	27
	Freeman	1,157	0	0	0	0	0	2	0	2
	Gettysburg	987	1	0	0	0	1	4	0	4
	Hermosa	353	0	0	0	0	0	0	0	0
	Hot Springs	4,063	0	0	0	0	0	40	10	29
	Hoven	367	0	0	0	0	0	0	0	0
	Irene	391	0	0	0	0	0	0	0	0
	Jefferson	617	0	0	0	0	0	0	0	0
	Kadoka	611	2	0	0	0	2	16	13	3
	Kimball	692	0	0	0	0	0	0	0	0
	Lead	2,813	1	0	0	0	1	23	3	18
	Lemmon	1,142	0	0	0	0	0	7	1	5
	Lennox	2,920	0	0	0	0	0	5	1	4
	Leola	374	0	0	0	0	0	0	0	0
	Madison	6,573	3	0	0	0	3	119	11	106
	Martin	966	2	0	0	0	2	3	1	2
	McIntosh	201	0	0	0	0	0	0	0	0
	Menno	633	0	0	0	0	0	1	1	0
	Miller	1,296	1	0	0	0	1	5	0	5
	Mitchell	14,669	17	1	5	2	9	519	75	425
	Mobridge	3,085	8	0	0	0	8	53	5	47
	North Sioux City	2,619	0	0	0	0	0	32	4	28
	Pierre	14,003	26	0	5	2	19	449	81	345
	Rapid City	67,436	404	2	91	59	252	2,823	518	2,178
	Rosholt	425	0	0	0	0	0	0	0	0
	Scotland	762	0	0	0	0	0	0	0	0
	Selby	635	0	0	0	0	0	1	1	0
	Sioux Falls	160,679	482	3	96	55	328	4,854	989	3,637
	Sisseton	2,430	6	0	1	0	5	76	19	51
	Spearfish	10,057	12	0	6	0	6	339	70	253
	Springfield	1,456	0	0	0	0	0	0	0	0
	Sturgis	5,897	5	0	0	0	5	154	21	128
	Tea	5,058	10	0	0	1	9	121	33	84
	Tripp	606	0	0	0	0	0	2	2	0
	Tyndall	1,061	0	0	0	0	0	0	0	0
	Vermillion	10,369	4	0	0	0	4	56	8	48
	Viborg	747	0	0	0	0	0	4	0	4
	Wagner	1,487	5	0	0	0	5	11	0	9
	Watertown	20,232	60	0	19	1	40	596	88	472

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Whitewood	852	2	0	1	0	1	3	1	2
	Wilmot	515	0	0	0	0	0	0	0	0
	Winner	2,614	4	0	0	0	4	24	5	17
TENNESSEE	Adamsville	2,134	2	0	0	0	2	61	16	31
	Alamo	2,402	11	1	0	3	7	38	11	25
	Alexandria	957	5	0	0	0	5	18	7	11
	Algood	3,472	7	0	1	0	6	98	13	82
	Ardmore	1,177	7	0	0	2	5	24	4	19
	Ashland City	4,707	14	1	0	2	11	237	49	179
	Athens	14,352	185	0	8	28	149	1,052	208	799
	Atoka	7,978	16	0	0	1	15	148	32	109
	Baileyton	492	0	0	0	0	0	32	5	23
	Baneberry	489	0	0	0	0	0	3	1	2
	Bartlett	48,358	103	1	7	9	86	839	197	589
	Baxter	1,435	5	0	0	0	5	48	13	31
	Bean Station	3,085	10	0	1	4	5	148	37	106
	Belle Meade	3,572	0	0	0	0	0	38	9	29
	Bells	2,283	17	0	1	3	13	47	19	25
	Benton	1,182	3	0	0	0	3	51	21	29
	Berry Hill	830	4	0	0	1	3	61	9	52
	Bethel Springs	778	0	0	0	0	0	8	2	4
	Big Sandy	502	6	0	0	0	6	16	8	8
	Blaine	1,777	3	0	0	2	1	25	11	12
	Bluff City	1,689	0	0	0	0	0	31	6	25
	Bradford	1,061	1	0	0	0	1	18	6	11
	Brentwood	38,371	29	2	2	8	17	440	85	341
	Brighton	2,782	9	0	0	0	9	38	13	24
	Bristol	25,799	140	0	12	9	119	1,003	182	778
	Brownsville	10,138	164	1	8	20	135	539	200	318
	Bruceton	1,418	1	0	0	0	1	20	5	13
	Burns	1,461	1	0	0	0	1	25	7	17
	Calhoun	525	0	0	0	0	0	5	0	5
	Camden	3,545	8	0	1	1	6	173	30	136
	Carthage	2,222	6	0	0	0	6	79	20	55
	Caryville	2,373	12	0	0	0	12	118	20	88
	Celina	1,342	4	0	0	0	4	18	5	13
	Centerville	3,947	3	0	0	0	3	98	29	63
	Chapel Hill	1,368	3	0	0	0	3	20	3	16
	Charleston	674	1	0	0	0	1	13	2	9
	Chattanooga	172,460	1,557	18	78	512	949	10,866	2,691	7,350
	Church Hill	6,876	32	1	1	4	26	131	33	91
	Clarksburg	368	0	0	0	0	0	1	0	1
	Clarksville	126,548	802	9	55	121	617	4,102	1,373	2,525
	Cleveland	40,452	351	0	19	29	303	1,983	439	1,470
	Clifton	2,673	1	0	0	0	1	12	2	9
	Clinton	9,715	44	0	1	5	38	470	90	360
	Collegedale	8,343	5	0	0	2	3	155	29	119
	Collierville	40,286	67	0	0	9	58	739	98	602

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Collinwood	995	5	0	0	0	5	8	4	4
	Columbia	35,364	282	4	13	31	234	1,397	305	1,043
	Cookeville	30,179	98	1	8	21	68	1,764	426	1,270
	Coopertown	3,520	2	0	0	0	2	26	9	15
	Copperhill	428	1	0	0	1	0	10	5	5
	Cornersville	986	0	0	0	0	0	10	1	8
	Covington	9,396	69	0	4	21	44	514	124	378
	Cowan	1,705	0	0	0	0	0	39	4	35
	Cross Plains	1,728	5	0	0	0	5	36	9	26
	Crossville	12,084	122	1	7	17	97	1,039	165	811
	Crump	1,464	17	0	0	0	17	61	37	24
	Cumberland City	329	1	1	0	0	0	11	3	8
	Cumberland Gap	208	5	0	0	0	5	3	2	1
	Dandridge	2,784	14	0	1	3	10	96	13	81
	Dayton	6,945	18	0	5	6	7	258	33	215
	Decatur	1,512	1	0	0	0	1	45	11	33
	Decaturville	832	0	0	0	0	0	17	11	6
	Decherd	2,113	12	0	1	0	11	70	17	48
	Dickson	14,100	97	1	11	11	74	776	86	663
	Dover	1,642	0	0	0	0	0	21	5	13
	Dresden	2,810	6	0	0	0	6	91	15	74
	Dunlap	5,672	25	0	1	2	22	183	62	109
	Dyer	2,396	3	0	0	0	3	32	10	18
	Dyersburg	17,104	167	0	5	26	136	1,490	371	1,071
	Eagleville	533	0	0	0	0	0	6	5	1
	East Ridge	19,882	175	0	5	39	131	1,066	279	725
	Elizabethton	13,694	53	0	0	5	48	639	111	514
	Elkton	591	0	0	0	0	0	10	3	6
	Englewood	1,815	5	0	0	0	5	44	8	35
	Erin	1,448	12	0	1	2	9	34	12	21
	Erwin	5,759	12	0	0	0	12	71	19	49
	Estill Springs	2,232	13	0	0	0	13	32	13	17
	Ethridge	560	1	0	0	0	1	9	5	4
	Etowah	3,770	18	0	2	0	16	123	20	99
	Fairview	8,324	11	0	0	0	11	118	23	93
	Fayetteville	7,216	45	0	2	6	37	376	59	303
	Franklin	62,127	104	2	14	9	79	1,066	115	921
	Friendship	604	2	1	0	0	1	8	6	2
	Gadsden	539	2	0	0	0	2	7	2	4
	Gainesboro	835	3	0	0	0	3	9	3	6
	Gallatin	31,229	115	2	6	20	87	535	79	442
	Gallaway	760	1	0	0	1	0	11	2	9
	Gates	836	3	0	1	0	2	10	0	7
	Gatlinburg	6,104	20	0	2	7	11	479	188	281
	Germantown	41,347	39	0	1	13	25	455	124	319
	Gibson	415	0	0	0	0	0	17	3	12
	Gleason	1,397	8	0	0	0	8	24	2	20
	Goodlettsville	17,658	102	0	8	28	66	1,185	213	927
	Gordonsville	1,311	6	0	0	0	6	39	8	28

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Grand Junction	298	1	0	0	0	1	31	10	21
	Graysville	1,468	8	0	0	0	8	17	1	15
	Greenbrier	6,899	19	0	1	1	17	108	32	68
	Greeneville	15,294	76	0	9	25	42	802	163	606
	Greenfield	2,011	2	0	0	0	2	32	6	24
	Halls	2,145	6	0	0	1	5	61	17	42
	Harriman	6,612	48	0	2	11	35	326	82	228
	Henderson	6,445	25	0	2	1	22	250	84	161
	Hendersonville	49,010	143	1	7	15	120	1,257	193	1,019
	Henning	1,251	10	2	0	1	7	30	10	20
	Henry	551	0	0	0	0	0	10	4	6
	Hohenwald	3,808	33	0	0	0	33	98	16	78
	Hollow Rock	924	1	0	0	0	1	6	2	3
	Hornbeak	410	1	0	0	0	1	2	0	2
	Humboldt	9,114	121	0	3	17	101	470	131	322
	Huntingdon	4,074	8	0	0	2	6	110	16	92
	Huntland	862	0	0	0	0	0	9	1	7
	Jacksboro	2,086	9	0	1	2	6	204	11	190
	Jackson	63,969	541	2	25	145	369	4,044	1,096	2,704
	Jamestown	1,916	5	0	0	1	4	99	9	88
	Jasper	3,060	11	0	1	0	10	86	9	73
	Jefferson City	8,232	20	0	3	9	8	401	74	311
	Jellico	2,511	5	0	2	1	2	116	21	87
	Johnson City	63,750	278	1	25	59	193	3,010	574	2,346
	Jonesborough	5,583	23	0	1	2	20	96	22	70
	Kenton	1,286	2	0	0	0	2	17	1	14
	Kimball	1,390	0	0	0	0	0	82	5	74
	Kingsport	44,587	377	1	26	52	298	2,864	509	2,257
	Kingston	5,609	9	0	0	1	8	97	16	77
	Kingston Springs	2,996	0	0	0	0	0	14	5	9
	Knoxville	185,554	1,755	15	122	625	993	12,322	2,723	8,789
	Lafayette	4,588	12	0	0	2	10	54	12	38
	La Follette	8,082	77	0	3	20	54	752	255	460
	Lake City	1,848	10	0	0	0	10	32	11	18
	Lakewood	2,659	3	0	0	1	2	91	18	65
	La Vergne	32,335	128	1	14	18	95	961	290	627
	Lawrenceburg	10,877	109	2	13	3	91	655	154	463
	Lebanon	25,446	215	0	5	37	173	1,239	233	945
	Lenoir City	8,202	86	0	2	11	73	572	105	447
	Lewisburg	11,126	49	0	4	4	41	277	68	197
	Lexington	7,876	92	1	5	4	82	435	82	336
	Livingston	3,552	23	0	1	1	21	67	10	54
	Lookout Mountain	1,884	0	0	0	0	0	11	6	5
	Loretto	1,800	6	0	0	0	6	30	10	17
	Loudon	4,995	12	0	0	0	12	122	13	103
	Lynnville	335	0	0	0	0	0	0	0	0
	Madisonville	4,761	22	0	0	2	20	278	54	208
	Manchester	10,210	65	3	2	1	59	541	98	427
	Martin	10,145	53	0	3	4	46	367	79	283

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Maryville	27,638	61	2	5	19	35	915	132	752
	Mason	1,356	11	0	1	2	8	37	12	24
	Maury City	702	1	0	0	0	1	16	4	11
	Maynardville	1,940	4	0	0	1	3	115	39	71
	McEwen	1,678	5	0	0	1	4	14	2	12
	McKenzie	5,283	18	0	3	2	13	124	38	83
	McMinnville	13,647	88	0	6	8	74	539	120	386
	Medina	2,465	3	0	0	0	3	37	13	23
	Memphis	673,650	10,384	89	422	3,236	6,637	42,138	13,094	25,114
	Middleton	605	1	0	0	0	1	14	5	9
	Milan	7,913	67	1	3	10	53	256	69	176
	Millersville	6,565	20	0	0	1	19	133	49	81
	Millington	10,875	86	0	2	12	72	462	95	343
	Minor Hill	446	0	0	0	0	0	2	1	1
	Monteagle	1,204	1	0	0	1	0	16	4	9
	Monterey	2,944	11	1	1	0	9	102	25	74
	Morristown	28,147	243	1	16	43	183	2,099	178	1,838
	Moscow	559	5	0	0	0	5	19	4	14
	Mountain City	2,360	5	0	0	0	5	65	13	48
	Mount Carmel	5,525	6	0	0	1	5	59	17	39
	Mount Juliet	24,544	49	1	3	6	39	495	77	406
	Mount Pleasant	4,532	27	0	1	2	24	167	49	106
	Munford	6,880	9	0	1	0	8	122	27	90
	Murfreesboro	109,199	603	5	37	151	410	4,610	1,310	3,144
	Nashville	616,366	6,995	55	367	1,817	4,756	30,517	7,731	20,881
	Newbern	3,173	17	0	2	1	14	87	25	59
	New Hope	1,049	0	0	0	0	0	4	0	3
	New Johnsonville	1,961	5	0	0	0	5	25	3	21
	New Market	1,397	0	0	0	0	0	4	0	4
	Newport	7,556	77	0	4	16	57	784	120	633
	New Tazewell	2,845	3	0	0	1	2	63	15	48
	Niota	811	1	0	0	0	1	8	5	2
	Nolensville	3,178	1	0	0	0	1	50	12	36
	Norris	1,490	0	0	0	0	0	16	10	6
	Oakland	5,878	4	0	0	0	4	123	16	107
	Oak Ridge	27,728	133	1	8	31	93	1,232	365	825
	Obion	1,074	5	0	0	1	4	47	8	36
	Oliver Springs	3,346	4	0	2	0	2	107	10	89
	Oneida	3,812	12	0	0	0	12	251	50	194
	Paris	9,946	56	1	2	8	45	490	107	377
	Parsons	2,480	6	0	0	0	6	35	9	26
	Petersburg	610	0	0	0	0	0	8	2	5
	Pigeon Forge	6,532	72	1	6	15	50	598	150	410
	Pikeville	1,863	3	0	0	0	3	32	7	22
	Piperton	1,508	6	0	0	2	4	19	6	12
	Pittman Center	716	0	0	0	0	0	14	8	6
	Plainview	2,062	2	0	1	0	1	30	9	17
	Pleasant View	4,304	3	0	0	0	3	57	13	42
	Portland	11,682	73	0	3	2	68	267	75	182

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Powells Crossroads	1,246	0	0	0	0	0	0	0	0
	Pulaski	7,790	33	0	5	2	26	398	84	303
	Puryear	676	2	0	0	0	2	13	1	10
	Red Bank	11,680	59	0	4	14	41	544	149	366
	Red Boiling Springs	1,114	3	0	0	1	2	30	11	19
	Ridgely	1,486	7	0	2	0	5	34	20	14
	Ridgetop	1,796	2	0	0	0	2	20	5	12
	Ripley	7,473	120	0	5	18	97	508	209	286
	Rockwood	5,536	38	0	2	2	34	334	69	251
	Rogersville	4,340	29	0	0	9	20	375	65	299
	Rossville	637	0	0	0	0	0	17	2	15
	Rutherford	1,248	2	0	1	0	1	18	7	11
	Rutledge	1,294	4	0	1	0	3	45	9	34
	Samburg	249	0	0	0	0	0	3	0	3
	Savannah	7,330	55	1	4	12	38	618	163	427
	Scotts Hill	932	1	0	0	0	1	7	0	7
	Selmer	4,699	19	0	0	4	15	241	59	179
	Sevierville	17,854	78	1	7	17	53	966	186	711
	Sewanee	2,634	0	0	0	0	0	53	14	38
	Sharon	901	0	0	0	0	0	31	2	28
	Shelbyville	20,527	123	1	13	11	98	662	143	487
	Signal Mountain	7,217	3	0	1	1	1	58	9	49
	Smithville	4,465	19	0	1	4	14	226	39	178
	Smyrna	41,071	87	1	4	6	76	828	345	451
	Sneedville	1,282	14	0	3	0	11	65	14	51
	Soddy-Daisy	12,967	50	0	2	3	45	493	74	379
	Somerville	2,970	40	0	1	2	37	107	17	86
	South Carthage	1,355	7	0	0	0	7	40	9	31
	South Fulton	2,373	14	0	1	2	11	79	25	49
	South Pittsburg	3,079	16	0	0	2	14	72	10	58
	Sparta	5,012	18	0	1	5	12	384	114	254
	Spencer	1,687	1	0	0	0	1	25	10	14
	Spring City	2,140	4	0	0	0	4	41	6	35
	Springfield	17,903	208	1	22	40	145	606	88	485
	Spring Hill	30,829	39	0	5	2	32	406	73	328
	St. Joseph	864	0	0	0	0	0	17	2	13
	Surgoinsville	1,834	1	0	0	0	1	16	3	12
	Sweetwater	6,740	34	0	1	7	26	291	80	192
	Tazewell	2,185	15	0	0	6	9	145	36	100
	Tellico Plains	973	2	0	0	0	2	24	7	17
	Tiptonville	3,959	5	0	0	0	5	24	9	15
	Toone	344	3	0	1	0	2	6	3	3
	Townsend	549	4	0	1	0	3	12	4	6
	Tracy City	1,605	16	0	0	3	13	47	20	26
	Trenton	4,480	54	0	0	2	52	250	36	208
	Trezevant	868	4	0	0	0	4	19	9	9
	Trimble	721	1	0	0	0	1	5	3	2
	Troy	1,201	0	0	0	0	0	32	5	26
	Tullahoma	18,535	127	3	2	20	102	784	181	582

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Tusculum	2,317	1	0	0	1	0	19	2	16
	Union City	10,486	60	0	2	9	49	606	125	464
	Vonore	1,516	10	0	0	2	8	83	14	66
	Wartburg	912	1	0	0	0	1	17	4	13
	Wartrace	614	1	0	0	0	1	2	0	2
	Watauga	428	0	0	0	0	0	1	0	1
	Watertown	1,422	4	0	1	0	3	30	10	19
	Waverly	4,192	2	0	0	0	2	73	14	57
	Waynesboro	2,090	4	0	0	0	4	28	11	16
	Westmoreland	2,243	5	0	1	1	3	40	5	31
	White Bluff	2,570	12	0	1	3	8	41	5	34
	White House	10,626	18	0	1	3	14	186	23	152
	White Pine	2,202	9	1	0	2	6	125	20	101
	Whiteville	4,480	11	0	0	1	10	65	18	44
	Whitwell	1,572	11	0	1	1	9	66	17	44
	Winchester	7,911	80	0	5	7	68	341	84	249
	Winfield	994	3	0	0	0	3	41	27	13
	Woodbury	2,619	13	0	2	0	11	80	21	53
TEXAS	Abernathy	2,748	3	0	0	1	2	30	7	20
	Abilene	116,938	578	4	68	112	394	4,897	1,340	3,375
	Addison	15,862	97	1	7	20	69	862	105	651
	Alamo	17,687	154	0	13	18	123	1,441	239	1,057
	Alamo Heights	7,488	9	0	3	4	2	230	49	176
	Alice	19,690	166	0	8	7	151	1,236	356	843
	Allen	89,459	65	0	12	18	35	1,615	319	1,232
	Alpine	6,490	6	0	1	0	5	55	16	39
	Alto	1,157	3	0	0	1	2	63	23	39
	Alton	12,349	27	0	1	7	19	482	116	324
	Alvarado	4,379	13	2	1	2	8	112	25	81
	Alvin	23,399	45	0	5	20	20	744	174	544
	Amarillo	190,393	1,184	10	91	238	845	11,064	2,590	7,827
	Andrews	10,508	49	0	9	0	40	242	75	159
	Angleton	19,138	75	1	11	13	50	500	110	374
	Anna	1,999	7	0	3	1	3	120	28	84
	Anson	2,194	11	1	0	0	10	43	14	25
	Anthony	4,550	21	0	1	4	16	216	19	195
	Aransas Pass	8,787	42	2	7	12	21	611	184	414
	Archer City	1,778	4	0	0	0	4	7	3	4
	Arcola	1,252	1	0	0	0	1	35	17	13
	Argyle	3,753	3	0	0	0	3	29	5	21
	Arlington	383,715	1,925	16	119	532	1,258	19,350	4,763	13,342
	Arp	981	1	0	0	0	1	4	0	4
	Athens	12,173	62	0	9	16	37	535	152	347
	Atlanta	5,380	26	0	4	5	17	256	67	174
	Austin	796,310	3,790	38	265	1,231	2,256	45,826	8,749	34,827
	Azle	11,689	30	1	1	6	22	371	101	250
	Baird	1,644	1	0	0	0	1	17	6	10
	Balch Springs	20,265	222	1	27	51	143	1,615	242	1,238

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Balcones Heights	2,997	24	0	0	4	20	548	40	486
	Ballinger	3,607	12	0	1	0	11	101	41	56
	Bangs	1,532	2	0	0	0	2	22	4	16
	Bastrop	8,790	24	0	1	9	14	565	47	507
	Bay City	17,523	45	2	12	12	19	824	219	599
	Bayou Vista	1,663	0	0	0	0	0	0	0	0
	Baytown	71,082	301	6	21	148	126	3,849	822	2,707
	Beaumont	109,430	900	10	65	312	513	5,941	1,611	4,041
	Bedford	49,993	215	4	20	34	157	1,773	342	1,333
	Bee Cave	3,435	3	0	0	0	3	122	15	105
	Beeville	12,439	44	0	3	5	36	341	86	247
	Bellaire	18,378	15	0	1	10	4	339	93	231
	Bellmead	9,659	157	2	8	19	128	1,021	71	918
	Bellville	4,552	13	0	6	1	6	92	28	60
	Belton	17,955	79	0	0	10	69	766	171	586
	Benbrook	23,589	37	1	4	11	21	448	105	319
	Bertram	1,455	4	0	0	0	4	24	7	17
	Beverly Hills	2,031	12	0	0	4	8	94	23	68
	Big Sandy	1,348	3	0	0	2	1	6	5	1
	Big Spring	24,357	178	0	17	9	152	1,401	353	1,001
	Bishop	3,100	9	0	0	0	9	73	8	64
	Blanco	1,673	7	0	0	0	7	32	12	19
	Bloomburg	359	0	0	0	0	0	0	0	0
	Blue Mound	2,385	2	0	0	0	2	51	26	20
	Boerne	11,152	21	0	2	1	18	261	29	228
	Bogata	1,209	3	0	0	0	3	31	11	18
	Bonham	10,547	26	0	7	1	18	313	72	231
	Borger	12,469	186	1	15	7	163	633	119	480
	Bovina	1,697	1	0	0	0	1	23	11	12
	Bowie	5,487	14	0	2	3	9	257	50	189
	Brackettville	1,769	0	0	0	0	0	3	0	3
	Brady	5,286	18	0	0	1	17	99	37	61
	Brazoria	3,021	20	0	1	4	15	65	15	45
	Breckenridge	5,606	10	0	2	1	7	75	23	52
	Bremond	851	6	0	1	0	5	13	8	5
	Brenham	16,267	62	0	2	9	51	521	113	386
	Bridge City	8,421	17	0	10	1	6	167	44	117
	Bridgeport	6,263	12	0	0	2	10	144	33	107
	Brookshire	4,010	18	3	0	6	9	164	74	84
	Brookside Village	1,823	4	0	0	0	4	23	14	8
	Brownfield	8,863	21	0	0	7	14	183	55	117
	Brownsville	180,040	563	7	31	165	360	9,316	1,286	7,784
	Brownwood	18,725	123	0	10	12	101	738	163	564
	Bruceville-Eddy	1,562	6	1	0	2	3	54	11	39
	Bryan	75,350	410	4	34	90	282	3,647	890	2,632
	Bullard	1,979	2	0	0	0	2	36	11	24
	Bulverde	4,894	6	0	0	1	5	69	12	56
	Burkburnett	10,424	5	0	0	1	4	229	102	125
	Burleson	37,902	69	0	9	9	51	963	163	757

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Burnet	6,114	16	0	1	0	15	163	28	126
	Cactus	2,699	11	1	2	2	6	10	7	1
	Caddo Mills	1,216	6	0	0	0	6	50	27	20
	Caldwell	3,693	5	0	0	0	5	21	4	16
	Calvert	1,340	12	1	2	1	8	43	13	29
	Cameron	5,608	13	0	2	0	11	234	33	200
	Canton	3,639	3	0	1	2	0	137	35	94
	Canyon	14,634	13	1	1	2	9	119	15	102
	Carrollton	130,862	184	4	4	63	113	3,510	897	2,256
	Carthage	6,650	34	0	0	2	32	152	26	122
	Castle Hills	4,227	4	0	0	2	2	319	65	245
	Castroville	3,083	6	0	0	0	6	83	17	66
	Cedar Hill	46,674	104	1	10	29	64	1,742	430	1,213
	Cedar Park	70,363	58	2	8	12	36	796	147	622
	Celina	6,115	6	0	3	0	3	77	22	53
	Center	5,769	41	0	2	4	35	292	53	225
	Childress	6,463	22	0	0	0	22	72	38	32
	Chillicothe	655	4	0	1	0	3	30	13	14
	Cibolo	18,403	17	0	4	1	12	194	36	153
	Cisco	3,684	4	0	0	0	4	78	25	51
	Clarksville	3,301	1	0	0	1	0	35	18	17
	Cleburne	30,209	169	0	23	16	130	1,328	241	1,029
	Cleveland	7,903	89	1	5	22	61	752	133	592
	Clifton	3,488	0	0	0	0	0	30	6	24
	Clint	972	3	0	0	1	2	12	1	10
	Clute	10,930	54	1	3	6	44	361	107	244
	Clyde	3,774	1	0	0	0	1	87	23	58
	Cockrell Hill	4,287	22	0	3	7	12	130	34	83
	Coffee City	208	0	0	0	0	0	9	2	7
	Coleman	4,573	10	0	0	2	8	231	114	97
	College Station	88,416	220	3	37	44	136	2,655	475	2,091
	Colleyville	25,480	5	0	0	2	3	300	69	224
	Collinsville	1,539	3	0	0	0	3	21	6	14
	Colorado City	3,895	13	0	4	0	9	163	32	130
	Columbus	3,854	25	1	2	2	20	142	50	89
	Comanche	4,173	18	0	1	3	14	203	49	151
	Combes	2,925	13	0	1	0	12	73	25	43
	Commerce	9,187	38	0	7	12	19	374	112	249
	Conroe	60,677	248	5	22	80	141	2,815	601	2,079
	Converse	18,890	31	2	2	12	15	396	65	315
	Coppell	39,870	66	1	7	11	47	626	153	424
	Copperas Cove	30,791	149	2	1	15	131	1,075	258	803
	Corinth	22,185	20	0	1	2	17	295	45	229
	Corpus Christi	287,559	2,068	16	191	389	1,472	15,101	2,626	12,027
	Corrigan	1,881	4	0	1	0	3	37	5	31
	Corsicana	26,344	112	0	7	25	80	1,314	327	920
	Cottonwood Shores	1,235	3	0	0	0	3	26	11	12
	Crandall	4,036	14	0	2	1	11	56	23	29
	Crane	3,318	5	0	2	0	3	35	3	31

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Crockett	6,623	26	0	1	2	23	198	62	128
	Crosbyton	1,561	5	0	0	0	5	24	11	13
	Crowell	912	0	0	0	0	0	0	0	0
	Crowley	13,600	29	0	1	3	25	290	66	214
	Crystal City	7,052	22	0	0	0	22	70	21	49
	Cuero	6,445	17	0	1	0	16	86	31	48
	Daingerfield	2,354	8	0	3	1	4	91	32	56
	Dalhart	7,101	26	0	3	0	23	129	32	90
	Dallas	1,306,775	9,161	148	505	4,487	4,021	64,125	19,594	36,147
	Dalworthington Gardens	2,473	5	0	1	2	2	45	13	28
	Danbury	1,707	1	0	0	0	1	22	2	19
	Dayton	7,828	15	0	6	5	4	182	44	121
	Decatur	6,641	10	0	0	2	8	195	16	169
	Deer Park	31,087	28	3	8	5	12	1,015	255	725
	De Kalb	1,842	9	0	0	1	8	54	32	22
	De Leon	2,329	8	0	1	0	7	35	16	19
	Del Rio	36,840	73	0	2	16	55	731	148	558
	Denison	24,196	77	1	2	13	61	1,109	215	858
	Denton	127,251	326	3	67	65	191	3,256	564	2,535
	Denver City	4,146	5	0	3	0	2	69	26	40
	Desoto	49,328	135	1	11	46	77	1,659	538	996
	Devine	4,610	1	0	0	0	1	122	29	88
	Diboll	5,519	19	0	6	2	11	114	29	84
	Dickinson	17,854	45	0	5	15	25	534	129	373
	Dilley	3,589	8	0	0	2	6	55	23	28
	Dimmitt	3,622	8	0	0	0	8	219	64	151
	Donna	17,737	113	1	7	12	93	1,159	273	819
	Double Oak	3,444	2	0	0	1	1	11	2	9
	Driscoll	800	6	0	0	0	6	16	1	14
	Dublin	3,769	11	0	0	0	11	58	21	36
	Dumas	14,158	39	0	8	2	29	319	58	247
	Duncanville	36,397	135	1	8	65	61	1,662	527	1,009
	Eagle Lake	3,638	3	0	0	1	2	40	12	28
	Eagle Pass	27,581	58	0	0	8	50	1,086	296	762
	Early	2,707	10	0	2	2	6	69	19	47
	Eastland	3,831	6	0	0	0	6	111	19	84
	East Mountain	635	0	0	0	0	0	10	1	9
	Edcouch	4,754	17	1	0	4	12	87	42	43
	Edgewood	1,429	10	0	0	1	9	39	12	24
	Edinburg	75,091	232	2	23	44	163	4,599	1,011	3,294
	Edna	5,816	14	1	2	3	8	126	34	89
	El Campo	10,729	39	0	2	7	30	331	79	232
	Electra	2,864	6	0	0	0	6	72	21	50
	Elgin	10,437	25	0	0	5	20	246	45	187
	El Paso	624,322	2,861	5	179	479	2,198	17,404	1,953	13,899
	Elsa	6,751	23	0	0	4	19	314	73	228
	Ennis	20,103	65	0	2	19	44	893	173	682
	Euless	53,950	141	1	22	50	68	2,008	486	1,385
	Everman	5,828	27	0	4	8	15	214	66	140

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Fairfield	3,755	8	0	0	1	7	40	18	22
	Fair Oaks Ranch	6,595	2	0	1	0	1	41	25	15
	Falfurrias	4,763	11	1	0	3	7	185	76	108
	Farmers Branch	26,585	51	0	2	24	25	1,160	236	789
	Farmersville	3,576	11	0	4	4	3	85	36	45
	Farwell	1,238	3	0	0	0	3	18	0	18
	Ferris	2,616	7	2	1	2	2	69	17	50
	Flatonia	1,443	0	0	0	0	0	19	7	12
	Florence	1,160	2	0	0	0	2	18	6	12
	Floresville	7,818	14	0	3	1	10	246	49	194
	Flower Mound	72,157	43	0	4	6	33	572	106	420
	Floydada	3,003	19	1	1	2	15	81	32	46
	Forest Hill	14,082	93	0	6	26	61	550	183	341
	Forney	17,264	25	0	6	9	10	416	106	288
	Fort Stockton	7,625	61	0	13	0	48	317	70	234
	Fort Worth	746,433	4,293	63	318	1,330	2,582	35,090	9,352	23,274
	Frankston	1,251	0	0	0	0	0	53	16	37
	Fredericksburg	11,512	1	0	0	0	1	241	33	202
	Freeport	12,570	35	0	5	4	26	388	102	266
	Freer	2,902	7	0	0	0	7	109	27	77
	Friendswood	34,530	25	0	4	10	11	390	87	286
	Friona	3,499	19	0	0	1	18	40	16	20
	Frisco	113,686	129	0	13	23	93	2,647	429	2,095
	Gainesville	16,558	54	0	2	12	40	738	192	511
	Galena Park	10,086	19	0	3	8	8	281	58	195
	Galveston	55,835	373	1	77	128	167	3,181	787	2,144
	Ganado	1,834	2	0	0	0	2	3	0	3
	Garland	221,921	492	7	39	209	237	8,626	2,159	5,764
	Gatesville	15,028	22	2	5	3	12	221	52	154
	Georgetown	53,756	55	0	14	4	37	860	142	680
	Giddings	5,373	40	0	4	5	31	171	40	127
	Gilmer	5,148	18	2	1	0	15	197	29	156
	Gladewater	6,316	22	0	2	3	17	291	62	210
	Glenn Heights	11,808	49	0	3	6	40	256	115	122
	Godley	1,040	3	0	1	0	2	16	2	14
	Gonzales	7,471	83	0	6	7	70	276	66	207
	Gorman	1,228	4	0	0	0	4	3	2	0
	Graham	8,531	22	0	11	1	10	277	50	216
	Granbury	9,153	12	0	1	0	11	464	58	399
	Grand Prairie	166,866	599	4	66	193	336	7,483	1,967	4,596
	Grand Saline	3,177	8	0	0	0	8	74	22	48
	Granger	1,382	3	0	0	0	3	31	17	14
	Granite Shoals	2,904	19	0	1	2	16	50	23	24
	Grapeland	1,368	8	0	0	1	7	28	17	10
	Grapevine	51,869	75	2	10	16	47	1,642	217	1,276
	Greenville	25,629	210	0	19	41	150	1,283	277	939
	Gregory	2,157	13	0	0	2	11	19	6	13
	Groesbeck	4,295	15	0	3	2	10	75	32	40
	Groves	14,122	52	0	2	12	38	503	148	333

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Gruver	1,148	0	0	0	0	0	12	3	7
	Gun Barrel City	6,073	30	0	1	1	28	298	67	227
	Hale Center	2,140	0	0	0	0	0	32	13	16
	Hallettsville	2,441	7	0	2	0	5	75	10	64
	Hallsville	3,202	0	0	0	0	0	27	4	19
	Haltom City	40,855	170	5	8	49	108	1,841	481	1,205
	Hamlin	1,822	27	0	1	2	24	55	19	34
	Harker Heights	26,971	45	1	9	8	27	880	248	607
	Harlingen	65,765	399	3	34	87	275	4,405	850	3,375
	Haskell	2,438	4	0	0	0	4	39	23	16
	Hawk Cove	621	1	0	0	0	1	8	2	5
	Hawkins	1,533	4	0	0	0	4	49	9	35
	Hawley	559	0	0	0	0	0	5	4	1
	Hearne	4,522	29	0	0	3	26	139	54	81
	Heath	8,527	9	0	3	0	6	81	17	61
	Hedwig Village	2,348	6	0	0	5	1	214	19	186
	Helotes	8,263	4	0	1	1	2	91	10	79
	Hemphill	1,027	4	0	1	0	3	34	7	26
	Hempstead	7,974	18	0	0	7	11	249	92	149
	Henderson	11,652	85	0	4	15	66	500	77	394
	Hereford	14,304	62	0	2	3	57	400	101	273
	Hewitt	13,810	34	0	2	2	30	123	33	78
	Hickory Creek	4,110	6	0	2	1	3	104	9	89
	Hidalgo	12,786	16	0	3	6	7	142	48	66
	Highland Park	9,357	5	0	1	0	4	217	33	174
	Highland Village	17,496	3	0	0	0	3	94	16	75
	Hill Country Village	1,140	0	0	0	0	0	32	4	27
	Hillsboro	8,968	23	0	2	7	14	262	52	203
	Hitchcock	7,204	26	1	4	10	11	229	66	137
	Holliday	1,768	0	0	0	0	0	15	7	8
	Hollywood Park	3,335	3	0	1	2	0	114	9	102
	Hondo	9,113	37	0	7	3	27	285	58	220
	Hooks	3,012	3	0	0	2	1	23	9	14
	Horizon City	15,025	18	0	0	1	17	200	91	86
	Horseshoe Bay	2,492	12	0	2	0	10	67	16	48
	Houston	2,280,859	22,491	269	712	9,449	12,061	115,323	27,924	74,582
	Howe	2,731	4	0	0	1	3	29	6	19
	Hubbard	1,759	3	0	0	1	2	10	1	8
	Hudson	4,422	11	1	2	0	8	108	49	54
	Hudson Oaks	2,230	2	0	0	2	0	88	15	70
	Humble	14,843	153	0	26	74	53	2,027	184	1,691
	Huntington	2,128	3	0	0	0	3	50	17	33
	Huntsville	38,275	159	2	13	47	97	1,174	283	845
	Hurst	39,147	167	0	10	44	113	2,125	276	1,770
	Hutchins	3,192	14	0	0	2	12	206	28	150
	Hutto	17,962	28	0	2	0	26	132	36	92
	Idalou	2,128	3	0	0	0	3	24	5	17
	Ingleside	8,927	18	0	5	6	7	230	81	136
	Ingram	1,921	11	1	3	3	4	76	19	54

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Iowa Park	6,295	3	0	0	0	3	61	16	41
	Irving	206,308	529	6	36	170	317	7,744	1,632	5,488
	Italy	2,177	8	0	0	0	8	45	10	33
	Itasca	1,715	1	0	0	0	1	33	10	23
	Jacinto City	9,797	25	0	0	10	15	389	70	285
	Jacksboro	4,309	11	0	0	2	9	66	36	28
	Jacksonville	14,447	95	0	11	25	59	858	302	520
	Jamaica Beach	1,086	0	0	0	0	0	9	3	6
	Jarrell	1,486	4	0	0	1	3	11	1	10
	Jasper	7,269	26	0	1	1	24	339	55	276
	Jefferson	1,849	6	0	0	0	6	55	11	42
	Jersey Village	7,268	33	0	1	7	25	288	59	202
	Johnson City	1,712	1	0	1	0	0	16	2	13
	Jones Creek	2,128	2	0	0	0	2	5	1	3
	Jonestown	2,654	10	0	1	2	7	50	17	30
	Joshua	6,118	2	0	0	1	1	47	17	26
	Jourdanton	4,445	8	0	0	1	7	38	13	23
	Junction	2,606	16	0	2	0	14	98	13	84
	Karnes City	3,294	9	0	0	1	8	68	14	54
	Katy	14,070	36	0	1	23	12	605	72	512
	Kaufman	9,186	19	0	0	4	15	163	45	112
	Keene	6,516	2	0	0	1	1	94	26	64
	Keller	41,396	18	0	5	0	13	506	94	406
	Kemah	2,527	11	0	3	5	3	140	7	127
	Kemp	1,380	5	0	1	0	4	28	4	21
	Kenedy	3,262	11	0	0	0	11	192	78	114
	Kennedale	7,403	25	0	0	7	18	230	76	146
	Kerens	1,827	10	0	1	2	7	24	11	11
	Kermit	5,251	7	0	1	0	6	46	13	33
	Kerrville	22,998	44	0	0	8	36	629	67	541
	Kilgore	12,229	51	0	9	7	35	688	78	574
	Killeen	122,557	993	11	91	259	632	5,837	2,062	3,536
	Kingsville	24,421	266	1	19	15	231	1,232	403	791
	Kirby	8,669	18	0	1	3	14	169	52	100
	Kirbyville	1,922	4	0	0	0	4	24	7	15
	Kountze	2,227	5	0	1	2	2	42	15	21
	Kress	735	0	0	0	0	0	4	3	1
	Kyle	33,362	51	1	6	2	42	426	94	315
	Lacy-Lakeview	5,947	42	1	8	6	27	244	73	145
	La Feria	7,139	2	0	1	1	0	324	75	247
	Lago Vista	6,637	9	0	1	2	6	101	20	80
	La Grange	4,751	6	0	0	5	1	57	11	44
	La Grulla	1,868	2	0	0	0	2	14	5	8
	Laguna Vista	4,275	6	0	1	0	5	69	15	51
	La Joya	4,977	1	0	0	1	0	38	14	22
	Lake Dallas	8,333	13	0	4	1	8	190	35	136
	Lake Jackson	29,037	49	2	7	13	27	685	120	547
	Lakeside	1,377	1	0	1	0	0	25	8	16
	Lakeview, Harris County	6,433	8	0	0	2	6	87	20	65

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lakeway	11,829	20	0	3	2	15	196	38	150
	Lake Worth	4,901	18	0	0	7	11	619	148	459
	La Marque	14,199	138	2	15	35	86	704	202	475
	Lamesa	8,684	27	1	1	2	23	214	59	146
	Lampasas	7,897	20	0	9	0	11	190	33	152
	La Porte	34,304	47	0	6	14	27	706	165	487
	Laredo	230,674	1,142	9	78	209	846	11,464	1,821	8,740
	La Vernia	1,259	3	0	0	0	3	42	7	34
	La Villa	1,450	12	0	0	0	12	63	12	48
	Lavon	437	5	0	0	0	5	35	9	26
	League City	74,776	69	1	18	21	29	2,021	340	1,604
	Leander	29,325	29	0	4	2	23	291	35	249
	Leon Valley	11,181	38	0	3	19	16	857	129	667
	Levelland	12,389	92	0	13	3	76	486	148	324
	Lewisville	107,968	238	3	24	80	131	3,513	659	2,472
	Lexington	1,225	3	0	0	0	3	4	0	4
	Liberty	8,307	19	0	0	6	13	516	78	408
	Lindale	5,028	12	0	1	4	7	182	28	146
	Linden	2,076	7	0	0	1	6	39	16	21
	Little Elm	30,854	11	0	0	2	9	309	46	254
	Littlefield	5,654	35	0	1	1	33	258	95	151
	Live Oak	15,079	21	0	6	7	8	590	67	501
	Livingston	6,199	29	0	5	8	16	292	40	245
	Llano	3,151	3	0	1	0	2	79	32	46
	Lockhart	14,468	77	0	4	5	68	377	68	291
	Lockney	1,634	1	0	0	0	1	51	23	24
	Lone Star	1,537	6	0	0	1	5	79	42	37
	Longview	78,319	581	10	41	134	396	4,290	857	3,073
	Lorena	1,704	3	0	1	0	2	42	6	34
	Lorenzo	1,149	1	0	0	0	1	9	8	1
	Los Fresnos	5,704	17	0	0	0	17	119	49	66
	Lott	660	2	0	0	1	1	13	8	5
	Lubbock	227,867	2,001	10	91	328	1,572	12,391	3,083	8,802
	Lufkin	34,611	183	3	12	52	116	2,272	577	1,622
	Luling	5,526	34	0	3	7	24	225	64	149
	Lumberton	10,832	11	0	1	2	8	225	47	173
	Lyford	2,509	2	0	0	1	1	49	27	21
	Lytle	2,941	8	0	0	4	4	89	14	73
	Madisonville	4,343	21	0	3	7	11	193	33	150
	Magnolia	1,298	4	0	0	0	4	54	9	42
	Malakoff	2,328	10	0	0	1	9	79	14	52
	Manor	4,107	21	0	0	3	18	170	46	116
	Mansfield	49,677	79	0	13	19	47	991	214	711
	Manvel	6,874	7	0	0	1	6	93	27	57
	Marble Falls	7,765	7	0	3	0	4	314	37	262
	Marlin	5,650	17	0	2	2	13	127	66	58
	Marshall	24,038	150	2	10	28	110	1,102	308	729
	Mart	2,507	8	0	1	0	7	35	10	25
	Martindale	1,201	3	0	0	0	3	12	4	8

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Mathis	5,216	22	0	1	7	14	186	59	121
	McAllen	134,623	299	5	14	115	165	7,398	711	6,283
	McGregor	4,912	19	0	2	1	16	93	39	54
	McKinney	138,306	222	1	31	40	150	3,103	643	2,322
	Meadows Place	6,529	7	0	0	4	3	144	31	107
	Melissa	5,122	4	0	0	0	4	70	25	41
	Memorial Villages	12,016	3	0	0	2	1	112	25	82
	Memphis	2,115	12	0	1	0	11	53	27	22
	Mercedes	15,488	88	0	5	7	76	808	191	567
	Meridian	1,429	1	0	0	0	1	13	6	6
	Merkel	2,619	4	0	0	0	4	48	10	36
	Mesquite	133,964	482	7	8	165	302	6,516	1,457	4,345
	Mexia	6,509	37	2	1	4	30	378	86	281
	Midland[5]	109,791	407	2	44	65	296	3,599	893	2,558
	Midlothian	19,220	35	0	3	3	29	363	53	296
	Miles	746	4	0	0	0	4	31	8	22
	Milford	767	6	0	1	0	5	7	2	5
	Mineola	5,274	6	0	0	1	5	140	27	110
	Mineral Wells	16,799	94	2	23	11	58	762	160	558
	Mission	71,556	92	2	7	37	46	3,243	482	2,454
	Missouri City	77,181	186	5	13	41	127	1,186	297	820
	Monahans	6,442	52	0	1	2	49	171	64	99
	Mont Belvieu	2,968	14	0	4	6	4	143	30	94
	Montgomery	613	4	0	0	0	4	21	12	8
	Morgans Point Resort	4,536	1	0	0	0	1	44	10	31
	Mount Pleasant	15,309	50	0	0	8	42	674	204	452
	Muleshoe	4,208	17	2	4	0	11	127	58	63
	Munday	1,154	1	0	1	0	0	17	4	13
	Murphy	17,848	8	0	2	0	6	138	23	110
	Mustang Ridge	973	1	0	0	0	1	2	2	0
	Nacogdoches	33,402	329	2	9	44	274	1,406	330	1,035
	Naples	1,365	12	0	1	1	10	59	39	19
	Nash	2,474	3	0	0	2	1	66	27	38
	Nassau Bay	3,988	7	1	2	2	2	108	21	81
	Navasota	7,662	69	0	2	3	64	221	44	170
	Nederland	15,875	63	0	15	14	34	513	124	361
	Needville	3,554	4	0	1	0	3	37	8	25
	New Boston	4,765	15	0	0	2	13	208	54	143
	New Braunfels	57,796	121	0	10	25	86	1,966	373	1,530
	New Deal	794	2	0	1	0	1	4	1	3
	Nixon	2,277	2	0	0	0	2	5	1	3
	Nocona	3,197	3	0	0	0	3	26	10	14
	Nolanville	3,062	7	0	0	3	4	65	24	41
	Northlake	2,328	6	0	0	0	6	48	1	40
	North Richland Hills	66,897	226	0	31	40	155	2,111	411	1,611
	Oak Ridge	268	0	0	0	0	0	2	0	1
	Oak Ridge North	3,517	3	0	1	2	0	89	11	73
	Odessa	101,580	726	3	36	96	591	3,523	824	2,508
	O'Donnell	882	0	0	0	0	0	0	0	0

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Olmos Park	2,338	1	0	0	1	0	72	9	62
	Olney	3,234	3	0	0	0	3	84	33	47
	Olton	2,066	5	0	0	0	5	21	7	12
	Onalaska	1,462	0	0	0	0	0	0	0	0
	Orange	19,452	146	1	3	49	93	1,017	417	551
	Orange Grove	1,402	1	0	0	0	1	19	12	7
	Overton	2,379	9	0	2	0	7	48	20	26
	Ovilla	4,047	4	0	1	0	3	30	10	20
	Oyster Creek	1,273	14	0	0	1	13	57	24	30
	Paducah	1,188	0	0	0	0	0	21	19	2
	Palacios	5,005	7	0	0	0	7	147	42	99
	Palestine	18,485	72	1	19	14	38	729	190	517
	Palmer	2,135	1	0	0	1	0	33	13	19
	Palmhurst	2,732	8	0	0	4	4	315	37	267
	Palm Valley	1,252	3	0	0	0	3	38	12	23
	Palmview	5,658	3	0	0	3	0	328	24	284
	Pampa	17,108	111	0	0	10	101	805	161	597
	Panhandle	2,402	5	0	0	0	5	28	5	20
	Pantego	2,416	15	0	1	3	11	129	25	97
	Paris	25,671	146	1	6	27	112	1,607	390	1,171
	Parker	3,197	0	0	0	0	0	17	7	8
	Pasadena	145,713	611	7	68	149	387	5,551	1,113	4,066
	Pearland	91,679	128	3	16	29	80	1,734	327	1,324
	Pearsall	7,588	23	1	0	0	22	188	65	119
	Pecos	7,611	24	0	3	1	20	222	54	164
	Pelican Bay	1,695	2	0	0	1	1	23	6	15
	Penitas	1,192	4	0	1	0	3	61	16	38
	Perryton	8,494	18	0	2	0	16	122	38	78
	Pflugerville	45,108	68	1	7	12	48	898	143	706
	Pharr	68,274	251	6	13	55	177	3,692	698	2,697
	Pilot Point	4,550	4	0	1	0	3	21	9	9
	Pinehurst	2,082	4	0	0	2	2	107	39	63
	Pittsburg	4,716	16	0	3	0	13	154	36	114
	Plainview	21,231	72	1	9	12	50	926	193	705
	Plano	278,244	503	4	53	152	294	6,716	1,237	5,093
	Pleasanton	9,904	37	0	9	2	26	414	84	305
	Point Comfort	702	0	0	0	0	0	6	3	3
	Ponder	1,440	3	0	0	0	3	10	4	6
	Port Aransas	3,947	23	1	0	3	19	366	66	286
	Port Arthur	56,424	419	6	26	169	218	2,752	1,020	1,567
	Port Isabel	5,333	24	0	2	4	18	387	100	276
	Portland	16,559	18	0	2	4	12	480	62	407
	Port Lavaca	11,405	119	0	13	4	102	351	72	266
	Port Neches	12,385	34	1	3	3	27	345	102	227
	Poteet	3,714	10	0	0	0	10	126	38	86
	Poth	2,420	7	0	1	0	6	21	13	8
	Pottsboro	2,181	7	0	0	2	5	39	10	24
	Premont	2,768	6	1	2	0	3	50	29	19
	Presidio	4,736	0	0	0	0	0	16	11	4

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Primera	4,339	6	0	1	0	5	27	15	12
	Princeton	6,916	12	0	4	0	8	158	48	104
	Progreso	5,702	25	0	4	2	19	134	31	89
	Prosper	11,081	5	0	0	1	4	126	22	102
	Queen City	1,529	18	0	7	1	10	51	15	32
	Quinlan	1,429	8	0	0	5	3	111	19	81
	Quitman	2,228	4	0	0	0	4	66	25	34
	Ralls	1,906	2	0	0	0	2	23	12	9
	Rancho Viejo	1,848	2	0	1	0	1	20	18	1
	Ranger	2,556	9	0	0	2	7	64	31	32
	Ransom Canyon	1,148	1	0	1	0	0	4	0	4
	Raymondville	9,331	191	0	8	9	174	541	173	365
	Red Oak	10,785	14	0	1	5	8	221	64	154
	Refugio	2,627	5	0	0	0	5	36	18	17
	Reno	3,108	5	0	1	1	3	75	19	54
	Richardson	104,051	193	0	13	90	90	2,999	608	2,192
	Richland Hills	8,196	8	0	1	2	5	336	78	220
	Richmond	13,688	54	0	8	11	35	226	60	158
	Richwood	3,644	0	0	0	0	0	46	11	34
	Riesel	1,024	3	0	0	0	3	15	5	10
	Rio Grande City	14,215	39	0	1	7	31	473	118	322
	Rio Hondo	2,141	7	0	0	2	5	55	11	41
	Rising Star	819	0	0	0	0	0	3	1	2
	River Oaks	7,033	9	0	4	3	2	216	65	140
	Roanoke	5,269	10	0	1	2	7	129	27	100
	Robinson	10,796	8	0	0	2	6	200	28	162
	Robstown	12,063	66	0	2	14	50	481	171	295
	Rockdale	5,913	10	0	1	2	7	176	41	127
	Rockport	10,012	14	0	2	1	11	373	93	269
	Rockwall	39,232	25	0	7	3	15	971	139	758
	Roma	11,470	25	1	4	3	17	199	39	140
	Roman Forest	4,323	4	0	0	0	4	47	18	27
	Ropesville	506	1	0	0	0	1	5	1	4
	Roscoe	1,230	0	0	0	0	0	9	0	9
	Rosebud	1,299	7	0	1	1	5	36	12	24
	Rose City	487	1	0	0	1	0	8	3	5
	Rosenberg	35,025	91	5	16	33	37	655	176	448
	Round Rock	111,099	116	0	26	35	55	3,016	464	2,452
	Rowlett	57,852	76	2	9	16	49	923	210	677
	Royse City	10,734	30	0	9	2	19	146	20	119
	Runaway Bay	1,485	2	0	1	0	1	3	1	2
	Rusk	5,293	19	0	1	1	17	123	25	89
	Sabinal	1,645	5	0	0	1	4	34	13	20
	Sachse	20,548	12	0	5	1	6	233	62	166
	Saginaw	21,770	45	0	5	5	35	575	86	450
	Salado	2,042	0	0	0	0	0	30	7	21
	San Angelo	92,234	276	1	48	50	177	4,169	1,035	2,976
	San Antonio	1,392,198	8,434	79	467	2,360	5,528	88,353	17,301	65,395
	San Augustine	2,306	6	0	0	0	6	18	3	14

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	San Benito	25,400	78	0	11	18	49	1,153	249	836
	San Diego	4,357	38	1	0	0	37	108	41	65
	San Felipe	995	1	0	1	0	0	9	6	2
	Sanger	8,350	13	0	8	0	5	129	30	93
	San Juan	35,326	223	3	31	31	158	1,680	309	1,257
	San Marcos	55,100	152	1	13	34	104	1,726	263	1,390
	San Saba	2,458	13	0	0	0	13	46	13	32
	Sansom Park Village	4,242	11	1	0	3	7	112	43	63
	Santa Anna	993	0	0	0	0	0	7	4	1
	Santa Fe	11,915	21	0	4	3	14	255	97	144
	Santa Rosa	3,155	11	0	1	2	8	82	15	66
	Schertz	33,451	71	0	17	9	45	608	120	462
	Schulenburg	2,743	16	0	4	0	12	141	32	106
	Seabrook	11,663	20	0	4	5	11	230	37	181
	Seagoville	12,436	13	0	0	5	8	539	158	327
	Seagraves	2,375	3	0	1	0	2	11	3	6
	Sealy	6,461	28	0	0	3	25	150	37	104
	Seguin	27,087	110	2	17	37	54	1,219	235	956
	Selma	6,049	10	0	3	1	6	257	24	227
	Seminole	6,269	5	0	1	0	4	79	9	65
	Seven Points	1,336	8	0	0	1	7	43	15	23
	Seymour	2,533	21	0	0	0	21	31	8	23
	Shallowater	2,384	1	0	0	0	1	20	4	16
	Shamrock	1,805	2	0	0	2	0	22	7	12
	Shavano Park	3,372	0	0	0	0	0	44	11	32
	Shenandoah	2,160	7	0	2	2	3	260	4	250
	Sherman	38,623	180	5	4	34	137	1,456	311	1,109
	Silsbee	7,128	20	0	0	5	15	183	50	127
	Sinton	5,250	26	0	0	0	26	184	53	128
	Slaton	5,881	51	0	12	1	38	160	53	103
	Smithville	4,603	8	0	0	1	7	129	23	99
	Snyder	10,519	132	0	11	4	117	362	107	232
	Socorro	32,790	91	0	6	16	69	604	143	400
	Somerset	1,896	10	0	1	3	6	51	17	30
	Somerville	1,671	4	0	0	2	2	26	8	17
	Sonora	3,046	7	0	2	0	5	27	3	23
	Sour Lake	1,777	3	0	0	0	3	55	6	45
	South Houston	16,345	113	0	5	46	62	808	223	482
	Southlake	27,811	16	0	1	3	12	541	139	390
	South Padre Island	2,911	54	0	11	6	37	585	97	473
	Southside Place	1,664	1	0	0	1	0	3	3	0
	Spearman	3,002	3	0	0	0	3	22	4	18
	Springtown	3,350	11	0	0	2	9	58	21	33
	Spring Valley	3,982	5	0	0	3	2	122	15	103
	Spur	910	2	0	0	0	2	3	1	1
	Stafford	19,829	82	2	6	33	41	868	163	643
	Stagecoach	520	0	0	0	0	0	7	3	2
	Stamford	2,991	17	0	2	1	14	102	29	69
	Stanton	2,192	5	0	1	1	3	42	17	21

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Stephenville	17,646	44	0	8	4	32	512	89	419
	Stratford	1,887	0	0	0	0	0	18	4	13
	Sugar Land	83,368	142	0	7	60	75	1,879	235	1,556
	Sullivan City	4,530	4	0	0	0	4	39	13	17
	Sulphur Springs	15,798	43	0	1	7	35	289	70	203
	Sunray	1,946	6	0	0	0	6	15	7	8
	Sunrise Beach Village	740	0	0	0	0	0	13	6	6
	Sunset Valley	938	1	0	0	1	0	141	4	135
	Surfside Beach	912	2	0	0	0	2	29	9	14
	Sweeny	3,651	4	0	1	1	2	106	29	75
	Sweetwater	10,607	141	0	18	3	120	435	84	339
	Taft	3,282	23	0	3	1	19	74	23	49
	Tahoka	2,419	3	0	1	0	2	36	10	26
	Tatum	1,220	3	0	0	0	3	17	11	6
	Taylor	16,383	17	0	2	7	8	425	107	307
	Teague	4,853	20	0	1	3	16	101	41	50
	Temple	60,444	209	1	23	71	114	2,079	537	1,462
	Terrell	20,241	121	0	16	25	80	783	266	466
	Terrell Hills	5,298	3	0	1	1	1	96	24	72
	Texarkana	37,220	527	3	26	98	400	2,350	647	1,592
	Texas City	44,053	195	8	0	83	104	1,752	367	1,291
	The Colony	46,873	53	2	11	9	31	617	165	418
	Thorndale	1,308	3	0	0	0	3	9	4	5
	Thrall	943	0	0	0	0	0	18	4	14
	Three Rivers	1,568	5	0	0	0	5	24	9	15
	Tioga	956	2	0	0	1	1	16	7	8
	Tolar	706	0	0	0	0	0	2	0	2
	Tomball	10,272	32	0	8	8	16	435	92	322
	Tom Bean	1,038	7	0	1	0	6	10	4	6
	Tool	2,434	3	0	1	0	2	67	20	46
	Trenton	716	1	0	1	0	0	29	2	25
	Trinity	2,641	15	0	1	0	14	117	22	88
	Trophy Club	8,574	5	0	0	0	5	122	19	101
	Troy	1,429	8	0	0	1	7	28	9	19
	Tulia	4,362	22	0	6	1	15	116	34	80
	Tye	1,165	2	0	2	0	0	26	6	18
	Tyler	100,125	644	6	44	99	495	5,091	1,040	3,828
	Universal City	18,511	70	0	3	18	49	475	121	320
	University Park	25,389	12	0	0	8	4	430	68	344
	Uvalde	16,318	39	1	0	7	31	575	215	360
	Valley Mills	1,102	3	0	1	0	2	25	3	20
	Valley View	831	0	0	0	0	0	3	2	0
	Van	2,518	4	0	1	0	3	45	17	26
	Van Alstyne	3,018	6	0	1	1	4	52	20	32
	Vernon	10,686	61	0	6	5	50	361	78	270
	Victoria	63,215	388	7	37	75	269	3,320	788	2,426
	Vidor	10,611	42	0	0	6	36	570	112	431
	Waco	127,039	838	5	51	195	587	6,439	1,856	4,373
	Waelder	1,025	10	0	1	1	8	14	8	6

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wake Village	5,672	1	0	0	1	0	81	39	34
	Waller	2,205	8	0	1	1	6	90	24	60
	Wallis	1,363	1	0	0	0	1	14	9	5
	Watauga	24,494	60	0	1	7	52	550	132	388
	Waxahachie	30,368	82	0	2	13	67	962	171	744
	Weatherford	28,325	63	0	7	14	42	686	123	533
	Webster	10,754	41	1	11	16	13	725	136	536
	Weimar	2,001	4	0	1	1	2	23	10	11
	Weslaco	35,244	196	1	20	40	135	2,725	505	1,998
	West	2,710	1	0	1	0	0	42	13	28
	West Columbia	4,185	20	0	1	2	17	77	15	55
	West Lake Hills	3,224	3	0	0	2	1	89	18	70
	West Orange	3,667	13	0	1	5	7	306	43	254
	Westover Hills	739	0	0	0	0	0	13	5	8
	West Tawakoni	1,621	5	0	0	0	5	61	30	26
	West University Place	15,703	4	0	0	4	0	187	58	120
	Westworth	3,167	4	0	0	3	1	118	38	77
	Wharton	9,127	78	0	2	27	49	386	63	312
	Whitehouse	8,183	9	0	1	2	6	103	32	70
	White Oak	6,553	3	0	0	1	2	125	30	76
	Whitesboro	4,061	4	0	3	0	1	63	14	48
	White Settlement	16,670	41	0	0	10	31	694	153	508
	Whitewright	1,705	5	0	0	0	5	55	10	40
	Whitney	2,098	5	0	2	0	3	71	23	47
	Wichita Falls	100,716	463	7	44	133	279	5,314	1,317	3,710
	Willis	4,557	22	1	2	3	16	123	36	78
	Willow Park	4,913	2	0	0	1	1	58	14	41
	Wills Point	3,910	2	0	0	0	2	30	13	13
	Wilmer	3,656	2	0	1	1	0	100	35	59
	Windcrest	5,463	15	0	0	11	4	355	43	300
	Winnsboro	3,907	16	0	1	0	15	42	17	25
	Winters	2,498	3	0	1	0	2	32	15	16
	Wolfe City	1,634	0	0	0	0	0	34	22	9
	Wolfforth	3,701	1	0	1	0	0	49	18	27
	Woodville	2,262	2	0	1	0	1	24	2	22
	Woodway	8,824	16	0	4	1	11	167	18	144
	Wortham	1,106	10	0	2	1	7	22	10	12
	Wylie	43,508	35	1	11	5	18	703	141	527
	Yoakum	5,398	4	0	0	1	3	149	69	78
	Yorktown	2,145	2	0	0	0	2	40	15	23
UTAH	American Fork/Cedar Hills	38,741	41	1	7	15	18	1,008	186	795
	Big Water	400	0	0	0	0	0	1	0	1
	Blanding	3,201	4	0	1	0	3	75	19	53
	Bountiful	43,485	61	2	28	12	19	898	94	741
	Brian Head	124	0	0	0	0	0	26	3	23
	Brigham City	18,491	37	0	10	3	24	427	54	349
	Cedar City	29,290	45	2	14	5	24	816	161	622
	Centerville	15,862	8	0	2	1	5	374	54	311

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Clearfield	27,788	41	0	12	14	15	846	125	685
	Clinton	20,471	20	0	7	3	10	378	50	317
	Cottonwood Heights	34,381	53	0	17	15	21	999	239	718
	Draper	44,259	62	0	6	12	44	787	166	566
	Enoch	5,275	1	0	0	0	1	44	15	29
	Fairview	1,198	1	0	0	0	1	19	5	12
	Farmington	17,977	5	0	1	1	3	171	27	137
	Grantsville	9,358	8	0	2	1	5	160	32	114
	Harrisville	6,356	9	0	0	5	4	361	29	316
	Heber	10,101	2	0	0	0	2	115	26	82
	Helper	1,840	1	0	0	0	1	64	20	41
	Hildale	1,904	5	0	0	0	5	5	4	1
	Hurricane[5]	13,587	17	0	3	0	14	295	78	205
	Ivins	8,061	3	0	1	0	2	88	26	61
	Kamas	1,535	1	0	0	1	0	34	6	27
	Kaysville	26,200	14	0	10	0	4	567	193	357
	La Verkin	4,342	18	0	1	0	17	62	15	43
	Layton	65,610	103	3	24	12	64	2,317	398	1,859
	Lehi	52,162	17	0	9	1	7	735	161	545
	Lindon	11,047	5	0	3	0	2	265	45	210
	Logan	48,819	22	0	5	2	15	616	111	486
	Lone Peak	27,692	5	0	3	1	1	259	72	181
	Mapleton	8,495	2	0	2	0	0	96	6	90
	Midvale	28,739	133	3	27	27	76	1,644	360	1,150
	Moab	5,032	20	1	4	2	13	281	31	235
	Monticello	1,975	0	0	0	0	0	24	5	19
	Moroni	1,312	2	0	2	0	0	6	4	1
	Murray	45,305	216	0	37	47	132	3,112	514	2,361
	Naples	1,750	0	0	0	0	0	63	3	58
	Nephi	5,438	2	0	1	0	1	165	60	98
	North Ogden	17,721	14	0	5	1	8	273	51	215
	North Park	12,554	19	0	9	0	10	230	21	200
	North Salt Lake	14,475	22	0	1	4	17	460	63	350
	Ogden	81,431	327	1	24	110	192	4,655	867	3,479
	Orem	93,580	68	1	19	17	31	2,553	240	2,204
	Park City	7,957	14	0	1	3	10	351	34	299
	Payson	18,200	9	0	0	3	6	632	94	523
	Perry	4,029	5	0	1	1	3	62	16	44
	Pleasant Grove	35,589	24	0	9	6	9	521	75	419
	Pleasant View	7,182	4	0	0	0	4	103	16	84
	Price	7,979	23	0	5	1	17	376	80	292
	Provo	117,734	194	2	46	27	119	2,739	370	2,266
	Richfield	7,109	10	1	2	0	7	272	30	236
	Riverdale	8,108	9	0	0	4	5	645	43	588
	Roy	35,502	39	1	17	9	12	1,008	150	819
	Salem	6,906	0	0	0	0	0	86	14	71
	Salina	2,324	10	0	7	0	3	91	24	63
	Salt Lake City	177,873	1,289	8	146	359	776	13,839	2,177	10,173
	Sandy	95,173	160	1	20	34	105	2,839	551	2,146

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Santaquin/Genola	9,895	4	0	0	0	4	149	31	111
	Saratoga Springs	20,490	10	1	4	0	5	221	32	183
	Smithfield	9,750	5	0	2	0	3	59	15	43
	South Jordan	56,502	27	0	6	7	14	1,050	212	802
	South Ogden	15,831	28	0	8	5	15	450	105	326
	South Salt Lake	21,107	211	5	32	62	112	1,662	239	1,176
	Spanish Fork	33,162	11	0	7	2	2	626	119	492
	Springdale	621	2	0	0	0	2	26	3	21
	Springville	29,784	39	0	10	6	23	888	131	736
	St. George	73,086	68	0	12	10	46	1,616	315	1,224
	Stockton	583	0	0	0	0	0	9	2	6
	Sunset	4,844	3	0	1	1	1	135	11	118
	Syracuse	23,780	15	0	4	0	11	347	62	278
	Taylorsville City	57,376	222	2	24	66	130	2,518	355	1,938
	Tooele	30,663	77	0	8	13	56	1,267	182	1,016
	Tremonton	6,943	9	0	2	0	7	172	38	129
	Vernal	9,121	27	1	4	2	20	403	66	326
	Washington	18,755	23	0	3	4	16	384	72	301
	Wellington	1,548	4	0	0	1	3	31	7	24
	West Bountiful	5,354	7	0	3	1	3	198	11	173
	West Jordan	104,783	257	1	37	54	165	3,103	469	2,410
	West Valley	123,089	599	6	70	131	392	5,769	1,029	4,127
	Woods Cross	8,899	8	0	4	1	3	238	38	181
VERMONT	Barre	8,781	32	0	10	1	21	326	40	282
	Barre Town	8,039	2	0	0	0	2	152	29	118
	Bellows Falls	2,905	1	0	0	1	0	18	7	11
	Bennington	15,086	47	0	5	2	40	400	67	309
	Berlin	2,833	4	0	1	0	3	65	2	63
	Bradford	832	0	0	0	0	0	29	4	24
	Brandon	3,873	1	0	0	0	1	83	19	61
	Brattleboro	11,573	48	0	1	16	31	477	83	374
	Bristol	3,783	4	0	0	0	4	47	5	42
	Castleton	4,649	4	0	0	0	4	39	29	9
	Chester	3,005	3	0	0	1	2	37	16	21
	Colchester	17,434	29	0	5	3	21	580	93	476
	Dover	1,444	0	0	0	0	0	152	19	127
	Essex	19,810	12	0	5	1	6	414	47	353
	Fair Haven	2,921	1	0	0	0	1	100	33	65
	Hardwick	3,195	11	0	0	0	11	87	31	53
	Hartford	10,753	11	0	4	0	7	144	28	112
	Hinesburg	4,660	0	0	0	0	0	49	12	37
	Manchester	4,293	3	0	0	1	2	126	23	100
	Middlebury	8,340	14	0	4	0	10	300	31	267
	Milton	10,984	5	0	0	2	3	221	59	153
	Montpelier	7,708	14	0	2	1	11	339	54	279
	Morristown	5,892	4	0	0	0	4	72	12	59
	Newport	5,159	10	0	4	1	5	102	34	68
	Northfield	5,751	8	0	2	1	5	108	25	81

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Randolph	5,080	1	0	0	0	1	33	9	22
	Richmond	4,169	4	0	1	0	3	9	5	2
	Shelburne	7,149	5	0	0	1	4	99	22	77
	South Burlington	17,915	13	0	4	3	6	827	67	746
	Springfield	8,577	34	0	4	2	28	189	40	142
	St. Albans	7,235	22	0	4	4	14	280	46	230
	St. Johnsbury	7,367	11	0	2	0	9	106	27	75
	Stowe	5,238	4	0	1	1	2	143	34	109
	Swanton	6,493	6	0	0	1	5	63	8	53
	Thetford	2,812	0	0	0	0	0	14	1	13
	Vergennes	2,675	3	0	1	1	1	45	5	39
	Waterbury	5,416	3	0	0	0	3	31	3	28
	Weathersfield	2,875	0	0	0	0	0	30	8	22
	Williston	8,521	3	0	0	0	3	221	24	190
	Wilmington	2,368	1	0	0	0	1	33	18	15
	Windsor	3,596	3	0	0	0	3	45	8	36
	Winooski	6,259	19	0	4	3	12	350	49	297
	Woodstock	3,134	1	0	0	0	1	27	6	21
VIRGINIA	Abingdon	8,059	15	1	1	5	8	286	28	250
	Alexandria	152,801	276	2	21	125	128	3,242	317	2,639
	Altavista	3,340	11	0	0	4	7	154	13	138
	Amherst	2,207	1	0	0	0	1	14	0	14
	Appalachia	1,719	3	0	2	0	1	69	6	62
	Ashland	7,188	26	0	3	4	19	198	22	165
	Bedford	6,377	15	0	0	4	11	219	22	194
	Berryville	3,215	5	0	1	0	4	43	6	36
	Big Stone Gap	5,653	12	0	3	1	8	159	19	137
	Blacksburg	43,355	38	0	14	9	15	687	117	547
	Blackstone	3,564	10	1	1	2	6	106	15	80
	Bluefield	5,164	12	2	2	1	7	203	24	174
	Bowling Green	1,036	0	0	0	0	0	0	0	0
	Boykins	590	0	0	0	0	0	8	0	8
	Bridgewater	5,464	0	0	0	0	0	36	6	29
	Bristol	17,794	60	1	11	10	38	601	90	490
	Broadway	3,343	1	0	0	0	1	6	1	2
	Brookneal	1,242	2	0	0	1	1	21	3	18
	Burkeville	472	0	0	0	0	0	11	0	11
	Cape Charles	1,517	2	0	0	0	2	14	7	6
	Cedar Bluff	1,046	0	0	0	0	0	19	3	15
	Charlottesville	42,590	195	3	29	51	112	1,693	163	1,443
	Chase City	2,287	7	0	2	0	5	84	14	69
	Chatham	2,381	0	0	0	0	0	12	0	12
	Chesapeake	225,627	866	9	26	276	555	7,494	1,180	5,922
	Chilhowie	1,732	1	0	0	1	0	32	2	29
	Chincoteague	4,331	6	0	1	0	5	77	10	62
	Christiansburg	19,997	38	1	9	9	19	677	76	581
	Clarksville	1,238	3	0	0	1	2	29	2	26
	Clifton Forge	3,907	7	0	2	1	4	94	18	71

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Clintwood	1,493	1	0	0	1	0	34	6	28
	Colonial Beach	3,880	8	0	0	1	7	54	8	43
	Colonial Heights	17,983	44	0	1	20	23	793	71	695
	Covington	6,157	11	1	0	2	8	201	28	163
	Crewe	2,268	6	0	0	2	4	58	9	48
	Culpeper	14,633	68	0	4	21	43	386	22	347
	Damascus	1,079	4	0	2	0	2	16	1	15
	Danville	44,192	168	8	20	60	80	2,182	540	1,577
	Dayton	1,366	2	0	0	0	2	6	1	4
	Dublin	2,141	2	0	0	0	2	58	6	52
	Dumfries	4,974	10	0	2	4	4	80	9	68
	Edinburg	910	0	0	0	0	0	23	2	20
	Elkton	2,650	0	0	0	0	0	41	11	26
	Emporia	5,653	31	1	2	8	20	332	65	254
	Exmore	1,350	2	0	0	1	1	34	8	25
	Fairfax City	25,082	35	0	6	12	17	559	27	497
	Falls Church	12,171	13	0	1	6	6	305	19	263
	Farmville	7,778	22	0	2	9	11	208	45	159
	Franklin	8,902	37	1	7	11	18	527	131	383
	Fredericksburg	23,704	102	0	11	20	71	1,080	116	933
	Fries	537	0	0	0	0	0	0	0	0
	Front Royal	14,725	31	0	6	9	16	509	39	450
	Galax	6,908	25	0	3	2	20	296	41	244
	Gate City	2,009	7	0	2	1	4	37	10	25
	Glasgow	991	0	0	0	0	0	7	1	6
	Glen Lyn	165	0	0	0	0	0	2	1	1
	Gordonsville	1,745	0	0	0	0	0	20	1	19
	Gretna	1,203	1	0	1	0	0	17	5	11
	Grottoes	2,212	3	0	0	1	2	66	47	18
	Halifax	1,238	0	0	0	0	0	21	4	16
	Hampton	144,545	395	14	29	175	177	5,334	759	4,230
	Harrisonburg	45,804	91	1	11	13	66	1,072	135	901
	Haymarket	1,298	1	0	0	1	0	12	0	12
	Haysi	301	0	0	0	0	0	4	2	2
	Herndon	22,751	49	0	3	10	36	413	39	361
	Hillsville	2,610	5	0	0	1	4	68	7	57
	Honaker	1,470	1	0	0	0	1	19	6	13
	Hopewell	23,292	206	2	9	55	140	1,037	272	661
	Hurt	1,206	1	0	1	0	0	21	4	12
	Independence	876	1	0	0	0	1	6	0	6
	Jonesville	961	2	0	0	0	2	7	1	6
	Kenbridge	1,253	7	0	1	2	4	11	3	7
	Kilmarnock	1,266	0	0	0	0	0	25	4	20
	La Crosse	583	1	0	0	0	1	14	2	10
	Lawrenceville	1,343	5	0	2	2	1	59	27	30
	Lebanon	3,219	2	0	0	0	2	147	17	130
	Leesburg	42,561	57	0	13	10	34	753	42	679
	Lexington	6,934	3	0	0	1	2	44	7	35
	Louisa	1,591	4	0	0	2	2	53	4	49

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Luray	4,812	7	0	2	0	5	153	33	119
	Lynchburg	75,137	323	4	26	75	218	2,594	433	2,067
	Manassas	36,822	134	1	14	53	66	1,005	123	806
	Manassas Park	12,275	18	0	7	6	5	202	14	175
	Marion	5,907	35	0	6	5	24	241	33	202
	Martinsville	14,618	39	3	6	13	17	448	71	364
	Middleburg	1,017	0	0	0	0	0	13	2	10
	Middletown	1,169	3	0	1	1	1	19	3	15
	Mount Jackson	2,036	2	0	1	0	1	42	3	38
	Narrows	2,160	0	0	0	0	0	28	12	16
	New Market	1,878	2	0	0	0	2	22	4	17
	Newport News	195,225	953	20	83	366	484	6,558	1,247	4,877
	Norfolk	234,100	1,445	34	90	596	725	13,159	2,158	10,079
	Norton	3,710	5	0	0	0	5	240	9	226
	Occoquan	846	0	0	0	0	0	0	0	0
	Onancock	1,378	0	0	0	0	0	23	8	14
	Onley	472	1	0	0	1	0	10	1	9
	Orange	4,749	8	0	2	1	5	141	11	126
	Parksley	788	1	0	0	1	0	13	6	7
	Pearisburg	2,773	2	0	0	0	2	58	4	54
	Pembroke	1,176	0	0	0	0	0	17	4	13
	Petersburg	33,048	189	12	6	63	108	1,500	434	930
	Pocahontas	418	1	0	0	0	1	1	1	0
	Poquoson	11,859	7	0	0	0	7	135	20	106
	Portsmouth	99,576	609	14	17	265	313	5,474	1,318	3,885
	Pound	1,076	1	0	0	0	1	35	10	25
	Pulaski	8,918	21	0	3	7	11	320	59	253
	Purcellville	5,533	2	0	0	0	2	62	5	55
	Radford	16,277	64	1	6	6	51	458	103	340
	Remington	694	0	0	0	0	0	2	0	2
	Rich Creek	684	0	0	0	0	0	9	1	7
	Richlands	5,647	10	0	1	2	7	251	32	213
	Richmond	205,883	1,506	41	40	735	690	8,567	1,783	5,918
	Roanoke	94,795	677	9	27	176	465	4,735	883	3,608
	Rocky Mount	4,541	16	0	2	2	12	132	20	106
	Rural Retreat	1,346	0	0	0	0	0	5	4	1
	Salem	25,623	34	1	6	6	21	677	89	559
	Saltville	2,192	3	0	1	1	1	36	2	34
	Shenandoah	2,274	4	0	2	0	2	39	6	30
	Smithfield	7,173	9	0	2	4	3	185	26	145
	South Boston	7,770	35	1	6	12	16	352	66	280
	South Hill	4,528	19	0	2	5	12	151	10	134
	Stanley	1,560	1	0	0	1	0	42	3	39
	Staunton	23,979	32	0	4	4	24	532	57	465
	Stephens City	1,526	0	0	0	0	0	30	6	22
	St. Paul	974	1	0	1	0	0	22	2	20
	Strasburg	4,426	1	0	1	0	0	115	4	111
	Suffolk	86,226	265	3	18	80	164	2,058	389	1,567
	Tappahannock	2,219	6	1	2	2	1	108	12	89

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Tazewell	4,282	9	1	1	1	6	127	23	103
	Timberville	2,022	1	0	0	0	1	10	4	5
	Victoria	1,693	5	0	0	0	5	16	1	15
	Vienna	15,343	25	0	1	9	15	273	35	224
	Vinton	7,851	31	1	2	2	26	288	35	250
	Virginia Beach	435,873	820	14	55	422	329	13,232	2,151	10,431
	Warrenton	9,367	27	0	4	4	19	270	46	216
	Warsaw	1,321	0	0	0	0	0	8	0	8
	Waverly	2,128	9	0	0	1	8	31	9	21
	Waynesboro	22,606	71	2	8	19	42	651	104	523
	Weber City	1,305	2	0	0	0	2	23	7	15
	West Point	3,198	2	0	0	1	1	50	10	39
	White Stone	327	0	0	0	0	0	5	1	4
	Williamsburg	12,854	18	1	1	6	10	267	35	222
	Winchester	26,698	56	0	8	20	28	1,125	146	956
	Wise	3,235	2	0	0	0	2	90	11	77
	Woodstock	4,340	3	0	0	3	0	123	11	107
	Wytheville	8,298	12	0	1	3	8	254	19	227
WASHINGTON	Aberdeen	15,917	52	0	6	15	31	1,143	185	898
	Airway Heights	5,618	6	0	2	1	3	147	36	98
	Algona	2,838	4	0	0	0	4	52	11	33
	Anacortes	17,132	14	0	3	1	10	561	81	461
	Arlington	17,749	26	0	4	6	16	731	94	542
	Asotin	1,129	5	0	0	0	5	18	4	12
	Auburn	64,139	235	3	15	79	138	3,828	725	2,533
	Bainbridge Island	22,075	27	0	1	0	26	292	64	222
	Battle Ground	18,076	34	0	10	7	17	485	86	367
	Bellevue	127,735	138	0	10	59	69	3,769	657	2,905
	Bellingham	81,139	282	2	37	73	170	3,653	589	2,931
	Bingen	677	0	0	0	0	0	28	6	19
	Black Diamond	4,090	1	1	0	0	0	52	18	32
	Bonney Lake	17,760	30	0	3	9	18	468	85	349
	Bothell	33,094	32	0	10	10	12	888	172	642
	Bremerton	34,897	263	0	52	50	161	1,786	414	1,263
	Brewster	2,123	6	0	0	4	2	99	29	63
	Brier	6,393	6	0	1	0	5	141	36	100
	Buckley	5,562	8	0	2	0	6	120	23	91
	Burien	31,831	229	0	52	95	82	2,107	561	1,171
	Burlington	8,883	13	0	3	7	3	1,135	105	992
	Camas	18,850	18	0	9	1	8	337	48	274
	Carnation	1,833	1	0	0	1	0	22	2	20
	Castle Rock	2,114	2	0	0	0	2	62	14	44
	Centralia	15,736	93	0	11	13	69	1,119	212	842
	Chehalis	7,409	25	0	6	3	16	715	97	579
	Cheney	11,030	35	0	7	6	22	349	73	256
	Chewelah	2,314	3	0	0	1	2	101	31	65
	Clarkston	7,135	18	0	8	2	8	383	50	326
	Cle Elum	3,516	8	0	3	0	5	209	58	143

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Clyde Hill	2,767	2	0	0	1	1	33	7	25
	Colfax	2,804	2	0	1	0	1	15	3	10
	College Place	9,186	4	0	2	1	1	195	29	160
	Colton	403	0	0	0	0	0	0	0	0
	Colville	4,889	5	0	0	3	2	163	13	142
	Connell	3,484	10	0	2	1	7	33	6	22
	Cosmopolis	1,660	1	0	0	1	0	19	7	11
	Coulee Dam	1,048	3	0	1	1	1	20	6	13
	Coupeville	1,878	6	0	0	2	4	53	15	36
	Covington	18,933	47	0	11	21	15	653	139	460
	Des Moines	29,134	83	1	9	47	26	979	192	615
	Dupont	8,142	7	0	0	0	7	51	13	35
	Duvall	6,349	3	0	2	1	0	38	8	30
	East Wenatchee	12,620	29	0	5	8	16	536	63	446
	Eatonville	2,608	1	0	0	1	0	40	12	27
	Edgewood	9,885	12	1	1	4	6	223	79	122
	Edmonds	40,769	68	0	9	23	36	847	183	616
	Ellensburg	17,553	31	0	14	7	10	894	153	703
	Elma	3,103	14	0	1	4	9	153	44	104
	Enumclaw	10,787	6	0	2	2	2	297	49	224
	Ephrata	7,620	19	0	1	5	13	539	120	399
	Everett	99,387	535	5	76	181	273	7,672	994	5,536
	Everson	2,254	3	0	2	0	1	72	16	50
	Federal Way	85,623	325	5	50	152	118	4,710	828	3,141
	Ferndale	11,962	16	0	3	5	8	393	72	312
	Fife	8,607	45	0	3	8	34	593	112	398
	Fircrest	6,299	10	0	1	2	7	130	29	90
	Forks	3,345	15	1	3	0	11	92	15	75
	Garfield	628	0	0	0	0	0	2	0	2
	Gig Harbor	7,289	26	0	2	10	14	440	76	338
	Goldendale	3,723	13	0	1	0	12	165	27	127
	Grand Coulee	1,969	10	0	1	1	8	61	26	34
	Grandview	9,614	20	0	4	2	14	366	104	220
	Granger	3,148	16	1	1	4	10	145	35	89
	Granite Falls	3,277	8	0	0	1	7	83	21	55
	Hoquiam	8,749	18	0	2	5	11	439	90	324
	Ilwaco	994	0	0	0	0	0	26	8	17
	Issaquah	25,784	30	0	6	6	18	735	101	583
	Kalama	2,292	2	0	0	0	2	52	14	35
	Kelso	12,141	65	0	24	18	23	778	139	600
	Kenmore	20,935	28	0	8	2	18	367	112	213
	Kennewick	68,501	239	0	25	39	175	2,517	388	2,003
	Kent	85,768	501	2	67	157	275	4,464	1,018	2,665
	Kettle Falls	1,421	1	0	0	0	1	61	12	46
	Kirkland	48,708	62	0	11	23	28	1,361	207	1,053
	Kittitas	1,129	1	0	1	0	0	24	6	16
	La Center	2,676	1	0	1	0	0	52	3	47
	Lacey	43,130	81	0	5	18	58	1,560	278	1,195
	Lake Forest Park	12,551	5	0	0	2	3	231	44	169

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Lake Stevens	14,666	47	0	3	8	36	637	148	404
	Lakewood	57,459	493	0	40	137	316	2,737	584	1,880
	Langley	1,094	3	0	1	1	1	49	23	24
	Liberty Lake	8,300	2	0	0	0	2	110	20	82
	Long Beach	1,361	4	0	1	0	3	85	26	58
	Longview	36,550	132	2	22	22	86	1,944	414	1,372
	Lynden	12,377	10	0	2	0	8	219	33	185
	Lynnwood	33,929	83	1	7	36	39	2,118	219	1,740
	Maple Valley	21,797	38	0	19	7	12	292	96	181
	Marysville	35,810	130	0	27	41	62	1,797	283	1,264
	McCleary	1,628	0	0	0	0	0	28	5	18
	Medina	3,704	0	0	0	0	0	42	7	34
	Mercer Island	24,715	14	0	1	4	9	324	50	264
	Mill Creek	17,697	39	0	6	16	17	505	91	369
	Milton	6,086	24	1	1	12	10	307	64	219
	Monroe	17,612	50	1	9	5	35	544	79	391
	Montesano	3,643	2	0	1	1	0	95	21	68
	Morton	1,084	2	0	1	0	1	43	10	31
	Moses Lake	20,559	83	0	13	18	52	1,512	297	1,130
	Mossyrock	712	3	0	1	0	2	15	4	10
	Mountlake Terrace	19,978	49	0	5	17	27	543	114	378
	Mount Vernon	32,630	89	0	15	23	51	2,109	290	1,756
	Moxee	2,698	6	0	2	0	4	33	8	21
	Mukilteo	21,177	18	0	3	2	13	571	137	382
	Napavine	1,957	0	0	0	0	0	49	16	26
	Newcastle	10,240	12	0	1	4	7	221	44	158
	Normandy Park	6,342	3	0	0	1	2	182	43	130
	North Bend	4,683	13	0	3	2	8	226	44	167
	Oak Harbor	22,873	51	0	11	2	38	509	107	389
	Oakville	733	2	0	0	0	2	28	10	14
	Ocean Shores	5,257	10	0	3	2	5	189	94	92
	Odessa	895	1	0	0	1	0	15	5	10
	Olympia	46,264	150	0	37	29	84	2,562	425	1,987
	Omak	4,734	19	0	4	4	11	134	22	104
	Oroville	1,662	0	0	0	0	0	80	19	56
	Orting	6,610	6	0	0	2	4	172	36	127
	Othello	6,807	29	1	3	5	20	477	87	354
	Pacific	6,072	14	0	3	2	9	159	49	79
	Palouse	944	0	0	0	0	0	6	3	2
	Pasco	61,747	183	3	22	38	120	1,448	324	1,006
	Port Angeles	18,901	93	0	16	20	57	1,000	230	725
	Port Orchard	8,013	50	0	14	3	33	590	102	450
	Port Townsend	9,188	17	0	0	1	16	332	76	239
	Poulsbo	8,386	31	0	2	3	26	285	41	241
	Prosser	5,303	5	1	2	0	2	161	36	112
	Pullman	27,806	42	0	10	9	23	608	198	393
	Puyallup	37,964	117	1	17	53	46	2,517	398	1,836
	Quincy	6,255	29	1	5	3	20	421	129	245
	Rainier	1,713	2	0	0	0	2	26	5	20

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Raymond	2,831	6	0	1	0	5	75	26	45
	Reardan	586	0	0	0	0	0	9	3	6
	Redmond	52,972	63	0	20	18	25	1,561	198	1,296
	Renton	62,968	280	0	38	112	130	4,114	847	2,673
	Republic	955	0	0	0	0	0	10	3	7
	Richland	48,335	66	0	12	8	46	956	146	751
	Ridgefield	4,739	3	0	0	2	1	61	17	39
	Ritzville	1,759	4	0	0	1	3	67	12	51
	Rosalia	593	1	0	0	0	1	5	1	4
	Roy	802	3	0	0	0	3	16	5	10
	Royal City	2,038	10	0	0	1	9	44	19	19
	Ruston	747	2	0	0	1	1	33	11	20
	Sammamish	43,048	17	0	6	4	7	381	95	275
	SeaTac	26,667	118	2	18	49	49	1,317	294	724
	Seattle	620,195	3,515	19	96	1,429	1,971	33,186	6,449	23,284
	Sedro Woolley	11,221	15	0	3	8	4	568	152	399
	Selah	7,361	6	0	3	0	3	263	74	165
	Sequim	5,978	21	0	1	4	16	340	41	293
	Shelton	9,309	79	0	15	19	45	849	148	603
	Shoreline	52,567	108	1	21	43	43	1,405	311	994
	Snohomish	9,223	19	0	4	10	5	396	50	306
	Snoqualmie	10,246	7	0	0	2	5	188	10	171
	Soap Lake	1,880	0	0	0	0	0	22	9	13
	South Bend	1,799	2	0	0	0	2	22	2	19
	Spokane	203,272	1,270	6	80	432	752	15,042	2,859	10,174
	Spokane Valley	87,780	165	3	44	57	61	4,226	837	2,976
	Stanwood	5,519	8	0	2	1	5	245	33	206
	Steilacoom	6,115	13	0	3	1	9	88	19	65
	Sultan	4,378	13	0	1	2	10	116	34	73
	Sumas	1,295	2	1	0	0	1	39	7	31
	Sumner	9,940	29	0	2	7	20	553	124	389
	Sunnyside	15,297	52	6	7	12	27	724	188	450
	Tacoma	199,595	1,700	14	141	535	1,010	12,670	2,893	7,741
	Tenino	2,309	1	0	0	0	1	59	10	48
	Tieton	1,175	4	1	1	0	2	17	8	8
	Toledo	688	2	0	0	1	1	18	6	11
	Tonasket	941	4	0	0	0	4	53	3	50
	Toppenish	9,253	60	0	10	27	23	500	125	322
	Tukwila	17,337	154	0	13	90	51	2,927	377	2,096
	Tumwater	16,375	50	0	14	8	28	617	147	440
	Twisp	900	0	0	0	0	0	45	12	32
	Union Gap	5,782	7	0	2	2	3	735	92	611
	University Place	30,655	111	0	14	31	66	914	226	617
	Vancouver	167,264	671	0	112	173	386	6,544	939	4,682
	Walla Walla	31,265	117	0	19	23	75	1,291	229	1,005
	Wapato	4,570	23	0	2	11	10	271	96	140
	Warden	2,651	3	0	0	0	3	65	9	49
	Washougal	14,405	23	0	3	3	17	331	56	262
	Wenatchee	30,287	80	1	16	10	53	1,181	150	971

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Westport	2,668	1	0	0	0	1	98	43	50
	West Richland	11,840	14	0	4	2	8	162	22	134
	White Salmon	2,420	0	0	0	0	0	55	11	38
	Wilbur	859	0	0	0	0	0	13	4	9
	Winlock	1,235	2	0	0	0	2	34	13	21
	Winthrop	397	0	0	0	0	0	12	5	5
	Woodinville	11,558	18	0	1	9	8	369	66	283
	Woodland	5,476	18	0	7	1	10	162	24	124
	Woodway	1,163	2	0	2	0	0	14	5	9
	Yakima	85,802	490	12	46	144	288	5,555	1,464	3,501
	Yarrow Point	953	0	0	0	0	0	4	3	1
	Yelm	6,642	10	0	5	4	1	234	45	172
	Zillah	2,852	7	0	1	1	5	103	23	69
WEST VIRGINIA	Barboursville	3,652	4	0	0	0	4	390	24	365
	Beckley	16,990	188	1	12	38	137	1,472	335	1,093
	Belington	1,843	16	0	0	1	15	17	6	11
	Benwood	1,424	1	0	0	1	0	7	0	7
	Bluefield	11,222	46	3	1	8	34	286	82	192
	Bridgeport	8,121	26	1	3	3	19	320	21	297
	Buckhannon	5,601	3	0	1	0	2	80	25	50
	Ceredo	1,608	0	0	0	0	0	24	2	21
	Clarksburg	16,652	88	1	7	15	65	753	115	619
	Dunbar	7,718	38	0	3	5	30	199	49	139
	Eleanor	1,581	0	0	0	0	0	2	0	2
	Elkins	7,114	66	1	1	7	57	224	58	159
	Fairmont[2]	19,332	48	0	7	10	31		111	
	Follansbee	2,861	3	0	1	0	2	33	12	15
	Glen Dale	1,389	2	0	0	0	2	35	9	25
	Hurricane[2]	6,463	11	0	3	1	7		20	
	Kenova	3,297	12	0	0	6	6	149	30	111
	Logan	1,500	16	0	0	2	14	251	34	209
	Martinsburg	17,654	65	0	2	17	46	969	115	815
	Matoaka	308	0	0	0	0	0	0	0	0
	Moorefield	2,508	10	0	0	0	10	61	14	45
	Morgantown[2]	31,247	100	1	9	22	68		187	
	Nitro	6,836	13	0	2	4	7	229	39	174
	Nutter Fort	1,648	3	0	0	0	3	45	13	29
	Oceana	1,401	30	0	1	2	27	118	9	107
	Point Pleasant	4,445	24	0	0	9	15	180	39	131
	Princeton	6,354	33	1	1	10	21	335	61	263
	Ravenswood	3,958	8	0	0	1	7	31	7	24
	Ripley	3,264	2	1	1	0	0	59	7	48
	Shinnston	2,273	11	0	0	0	11	55	9	43
	South Charleston	12,691	76	1	3	7	65	548	120	397
	Summersville[3]	3,351		0	0	0		127	19	106
	Vienna[2]	10,715	12	0	1	1	10		10	
	Weirton	18,717	18	1	1	5	11	196	46	143
	Wellsburg	2,585	3	2	0	0	1	35	13	22

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Weston	4,362	2	0	0	0	2	12	2	8
	Williamson	3,039	7	0	0	3	4	33	11	18
WISCONSIN	Albany	1,105	3	0	1	0	2	21	1	20
	Algoma	3,130	3	0	2	0	1	100	2	95
	Altoona	6,658	16	1	4	2	9	150	23	122
	Amery	2,744	9	0	0	1	8	85	13	71
	Antigo	7,846	31	0	0	1	30	501	64	430
	Appleton	70,975	202	0	17	13	172	1,716	305	1,379
	Arcadia	2,325	3	0	0	0	3	28	4	21
	Ashwaubenon	17,601	17	0	11	0	6	618	53	550
	Athens	1,047	1	0	1	0	0	8	0	8
	Bangor	1,392	1	0	0	0	1	31	9	20
	Baraboo	11,205	59	0	9	3	47	508	48	454
	Bayside	4,455	3	0	0	2	1	25	5	20
	Beaver Dam	15,258	7	0	0	5	2	487	84	398
	Belleville	2,378	3	0	0	1	2	21	3	15
	Beloit	36,651	151	3	14	60	74	1,398	296	1,028
	Beloit Town	7,509	16	0	4	3	9	134	52	79
	Berlin	4,932	5	0	0	1	4	174	18	153
	Big Bend	1,326	1	0	0	0	1	33	8	25
	Black River Falls	3,382	2	0	0	0	2	143	14	128
	Blair	1,226	1	0	1	0	0	32	9	21
	Bloomfield	6,382	12	0	4	4	4	121	8	112
	Boscobel	3,148	36	0	0	0	36	111	58	53
	Brillion	2,804	2	0	0	0	2	29	3	24
	Brodhead	3,092	1	0	0	0	1	61	2	58
	Brookfield	39,262	30	0	2	11	17	1,174	103	1,055
	Brookfield Township	6,202	12	0	0	2	10	147	9	133
	Brown Deer	12,111	18	0	1	5	12	361	23	328
	Burlington	10,628	0	0	0	0	0	250	24	219
	Burlington Town	6,616	4	0	1	1	2	49	6	41
	Butler	1,777	6	0	0	2	4	61	9	44
	Caledonia	26,154	59	0	5	8	46	359	73	273
	Campbellsport	1,947	0	0	0	0	0	22	5	16
	Campbell Township	4,575	9	0	0	1	8	67	12	52
	Cedarburg	11,079	1	0	0	0	1	159	7	150
	Chenequa	595	1	0	0	0	1	2	0	2
	Chetek	2,144	2	0	0	0	2	32	5	26
	Chilton	3,678	4	0	3	0	1	75	4	63
	Chippewa Falls	12,862	18	1	1	0	16	225	47	158
	Cleveland	1,374	1	0	0	0	1	13	1	12
	Clinton	2,238	0	0	0	0	0	54	4	50
	Clintonville	4,289	4	0	3	0	1	232	28	198
	Colby-Abbotsford	3,606	3	0	0	1	2	72	16	55
	Columbus	4,967	3	0	0	0	3	131	21	110
	Combined Locks	3,327	3	0	1	0	2	6	1	4
	Cornell	1,398	0	0	0	0	0	26	2	24
	Cottage Grove	6,223	0	0	0	0	0	122	21	99

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Crandon	1,806	4	0	0	0	4	68	15	49
	Cross Plains	3,664	0	0	0	0	0	30	1	29
	Cuba City	1,967	0	0	0	0	0	25	6	19
	Cudahy	19,048	47	1	2	10	34	517	96	396
	Dane	1,026	0	0	0	0	0	0	0	0
	Darien	1,615	0	0	0	0	0	31	3	28
	Darlington	2,229	1	0	1	0	0	34	3	30
	Deforest	9,260	6	0	2	0	4	122	20	101
	Delafield	6,970	5	0	0	4	1	170	11	157
	Delavan	8,309	11	0	0	2	9	330	36	287
	Delavan Town	4,754	6	0	3	0	3	96	16	77
	Denmark	2,237	0	0	0	0	0	7	1	5
	Dodgeville	4,511	0	0	0	0	0	57	4	49
	Durand	1,829	0	0	0	0	0	1	0	1
	Eagle River	1,644	1	0	0	0	1	140	12	127
	Eagle Village	1,875	5	0	0	0	5	6	0	4
	East Troy	4,506	6	0	3	1	2	128	10	115
	Eau Claire	66,737	139	2	21	23	93	1,906	406	1,446
	Edgerton	5,384	2	0	0	2	0	64	29	31
	Elkhart Lake	1,248	1	0	0	1	0	18	2	16
	Elk Mound	806	0	0	0	0	0	17	3	14
	Ellsworth	3,116	0	0	0	0	0	86	24	61
	Elm Grove	6,016	0	0	0	0	0	86	16	70
	Everest	16,425	26	0	1	3	22	340	83	247
	Fall Creek	1,317	1	0	0	0	1	20	3	17
	Fennimore	2,181	0	0	0	0	0	61	13	48
	Fitchburg	24,537	85	1	3	31	50	851	66	735
	Fond du Lac	42,369	131	0	21	13	97	1,130	194	908
	Fontana	1,837	5	0	0	0	5	36	1	35
	Fort Atkinson	11,961	27	0	1	1	25	231	26	200
	Fox Lake	1,453	0	0	0	0	0	19	5	14
	Fox Point	6,861	4	0	1	3	0	78	9	68
	Fox Valley Metro	17,757	9	0	1	1	7	347	49	292
	Franklin	37,832	12	0	0	4	8	554	84	454
	Frederic	1,181	2	0	0	0	2	18	2	16
	Freedom	5,896	2	0	1	0	1	31	6	23
	Geneva Town	4,692	4	0	0	2	2	116	22	92
	Germantown	19,787	3	0	0	1	2	393	37	348
	Gillett	1,176	1	0	0	0	1	52	11	36
	Glendale	13,029	27	0	1	21	5	812	42	745
	Grafton	11,666	3	0	3	0	0	207	16	189
	Grand Chute	21,194	42	0	6	10	26	1,192	119	1,052
	Grantsburg	1,384	0	0	0	0	0	49	5	44
	Green Bay[5]	101,320	370	2	54	67	247	2,595	568	1,917
	Greendale	14,102	8	0	0	2	6	657	16	632
	Greenfield	36,580	52	0	3	28	21	1,334	197	1,099
	Hales Corners	7,775	5	0	1	2	2	163	13	144
	Hartford	14,507	11	0	0	1	10	300	39	246
	Hartland	8,772	11	0	1	0	10	80	13	66

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Hayward	2,260	7	0	0	0	7	160	12	138
	Hazel Green	1,097	0	0	0	0	0	9	6	3
	Highland	817	0	0	0	0	0	5	0	5
	Hobart-Lawrence	10,975	0	0	0	0	0	60	13	46
	Holmen	8,644	9	0	0	0	9	177	50	123
	Hortonville	2,833	2	0	1	0	1	148	18	129
	Hudson	12,832	11	0	0	0	11	621	73	534
	Hurley	1,507	4	0	0	1	3	74	7	58
	Independence	1,222	1	0	0	0	1	24	2	17
	Iron Ridge	992	1	0	0	0	1	14	0	14
	Jackson	6,686	7	0	1	0	6	45	11	32
	Janesville	63,651	170	1	30	39	100	2,411	383	1,980
	Jefferson	7,950	12	0	4	4	4	230	11	214
	Juneau	2,646	0	0	0	0	0	65	6	59
	Kaukauna	15,948	17	0	1	2	14	193	18	168
	Kenosha	98,961	270	2	41	89	138	2,968	602	2,239
	Kewaskum	4,268	0	0	0	0	0	57	12	45
	Kewaunee	2,740	1	0	0	0	1	30	0	28
	Kiel	3,516	3	0	0	0	3	61	5	54
	Kohler	1,949	0	0	0	0	0	49	0	48
	La Crosse	51,184	155	1	23	34	97	1,723	336	1,309
	Ladysmith	3,209	1	0	1	0	0	127	16	111
	Lake Delton	2,923	22	0	6	5	11	557	29	524
	Lake Hallie	6,190	7	0	0	0	7	186	27	150
	Lake Mills	5,589	18	0	0	1	17	64	13	51
	Lancaster	3,770	0	0	0	0	0	41	4	37
	Lodi	2,909	2	0	0	0	2	67	6	60
	Lomira	2,422	3	0	1	2	0	42	5	34
	Luxemburg	2,269	3	0	0	0	3	21	2	18
	Madison[5]	238,224	933	2	87	326	518	8,037	1,647	6,025
	Manitowoc	32,640	44	0	0	6	38	662	76	570
	Marathon City	1,539	6	0	0	0	6	25	6	19
	Marinette	10,395	7	0	2	2	3	436	66	361
	Marion	1,165	2	0	1	0	1	31	11	19
	Markesan	1,261	0	0	0	0	0	31	3	28
	Marshall Village	3,800	8	0	0	2	6	73	15	55
	Marshfield	18,819	7	0	1	1	5	497	78	412
	Mauston	4,233	24	0	1	1	22	128	35	87
	Mayville	5,302	3	0	1	0	2	148	15	133
	McFarland	8,040	2	0	0	0	2	190	21	167
	Medford	3,995	7	0	0	0	7	197	18	175
	Menasha	17,052	41	0	8	2	31	389	72	308
	Menomonee Falls	34,836	13	0	1	4	8	419	35	361
	Menomonie	15,846	10	0	1	0	9	333	52	274
	Mequon	23,569	7	0	1	2	4	140	25	111
	Merrill	9,433	37	0	4	0	33	367	50	313
	Middleton	17,444	18	0	3	10	5	415	58	346
	Milton	5,809	11	0	0	4	7	78	10	63
	Milwaukee	605,921	6,329	94	197	2,932	3,106	31,720	6,181	21,212

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Mineral Point	2,512	1	0	1	0	0	36	2	34
	Minocqua	4,914	2	0	0	0	2	261	22	236
	Mishicot	1,367	0	0	0	0	0	0	0	0
	Mondovi	2,518	7	0	0	0	7	47	9	38
	Monona	8,588	11	0	0	7	4	509	24	481
	Monroe	10,482	31	0	3	1	27	313	35	271
	Montello	1,411	4	0	1	1	2	46	8	38
	Mount Horeb	7,120	5	0	0	0	5	137	29	108
	Mount Pleasant	26,991	37	0	3	10	24	658	79	558
	Mukwonago	7,209	1	0	0	1	0	184	14	164
	Muskego	23,324	9	0	3	1	5	254	38	208
	Neillsville	2,517	1	0	0	0	1	82	11	70
	Neshkoro	427	0	0	0	0	0	10	1	9
	New Glarus	2,057	1	0	0	0	1	58	7	48
	New Holstein	3,082	2	0	0	0	2	106	14	90
	New Lisbon	2,462	4	0	0	0	4	16	0	16
	New London	6,837	13	0	1	0	12	186	16	167
	New Richmond	8,541	0	0	0	0	0	246	15	226
	Niagara	1,683	1	0	0	0	1	29	11	18
	North Fond du Lac	5,108	3	0	0	0	3	85	11	72
	North Hudson	3,840	1	0	1	0	0	33	3	30
	North Prairie	2,098	0	0	0	0	0	3	1	2
	Oak Creek	34,572	40	0	7	10	23	1,124	110	966
	Oconomowoc	14,984	3	0	0	0	3	132	19	109
	Oconto	4,512	13	0	2	3	8	136	22	108
	Oconto Falls	2,755	1	0	1	0	0	62	7	52
	Omro	3,441	7	0	0	0	7	7	6	0
	Onalaska	17,367	14	0	2	2	10	438	37	395
	Oregon	9,715	6	0	0	1	5	184	36	146
	Osceola	2,712	13	0	0	1	12	38	5	33
	Oshkosh	64,428	206	1	10	24	171	1,715	313	1,360
	Osseo	1,579	5	0	0	0	5	67	8	59
	Oxford	538	1	0	1	0	0	6	1	5
	Park Falls	2,238	0	0	0	0	0	37	1	35
	Pepin	903	1	0	1	0	0	23	2	20
	Peshtigo	3,248	2	0	0	1	1	46	13	33
	Pewaukee Village	8,998	8	0	0	2	6	146	10	135
	Phillips	1,465	6	0	0	0	6	65	0	63
	Plainfield	836	0	0	0	0	0	19	6	13
	Pleasant Prairie	20,314	5	0	0	2	3	309	33	271
	Plover	12,429	7	0	0	1	6	216	23	192
	Plymouth	8,344	8	0	1	2	5	202	23	178
	Portage[2]	9,815	27	0	2	2	23		23	
	Port Washington	11,242	5	0	1	3	1	110	13	93
	Poynette	2,504	1	0	0	0	1	28	1	27
	Prescott	3,933	3	0	0	0	3	122	17	104
	Pulaski	3,554	5	1	1	0	3	48	6	41
	Racine	82,059	387	8	19	201	159	3,406	971	2,279
	Reedsburg	8,761	12	0	5	1	6	169	2	165

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Rhinelander	7,471	17	0	1	0	16	373	40	329
	Rice Lake	8,356	34	0	16	0	18	332	31	293
	Richland Center	4,969	2	0	1	0	1	102	11	91
	Ripon	7,481	9	0	1	0	8	124	25	96
	River Falls	14,745	36	0	5	0	31	407	37	361
	River Hills	1,684	1	0	0	0	1	6	1	5
	Rome Town	2,972	3	0	0	0	3	40	16	23
	Rothschild	5,330	6	0	0	1	5	141	5	132
	Sauk Prairie	4,190	7	1	0	2	4	264	33	231
	Saukville	4,386	5	0	0	0	5	88	1	83
	Seymour	3,396	8	0	3	0	5	33	6	27
	Shawano	8,875	22	0	6	1	15	237	23	200
	Sheboygan Falls	7,911	0	0	0	0	0	70	3	67
	Shorewood	13,285	15	0	1	9	5	399	33	358
	Shorewood Hills	1,675	1	0	0	0	1	54	6	47
	Silver Lake	2,526	2	0	0	0	2	21	3	17
	Slinger	4,913	0	0	0	0	0	77	6	68
	Sparta	9,107	24	0	3	2	19	345	71	264
	Spencer	1,812	0	0	0	0	0	26	2	24
	Spooner	726	1	0	0	0	1	82	8	71
	Stanley	3,575	4	0	0	0	4	94	8	86
	St. Croix Falls	2,111	0	0	0	0	0	52	6	45
	Stevens Point	25,235	37	0	2	5	30	694	99	584
	St. Francis	9,985	9	0	1	4	4	284	32	240
	Strum	1,001	0	0	0	0	0	17	5	12
	Sturgeon Bay	8,916	4	0	0	0	4	120	18	99
	Sturtevant	7,132	9	0	0	0	9	73	14	48
	Sun Prairie	30,122	36	0	2	9	25	725	93	616
	Superior	26,726	74	2	14	18	40	1,668	297	1,301
	Theresa	1,284	0	0	0	0	0	61	11	50
	Thiensville	3,187	3	0	0	0	3	12	2	9
	Three Lakes	2,229	3	0	0	0	3	26	3	23
	Tomah	8,908	36	1	4	2	29	451	41	397
	Tomahawk	3,580	5	0	0	0	5	110	14	86
	Town of East Troy	3,872	1	0	0	0	1	45	14	31
	Town of Madison	6,048	43	0	10	21	12	286	65	204
	Town of Menasha	17,512	21	0	3	0	18	250	57	182
	Twin Lakes	5,726	6	0	1	0	5	132	21	111
	Two Rivers	11,597	17	0	0	1	16	149	22	124
	Valders	966	0	0	0	0	0	3	0	3
	Verona	11,715	7	0	1	1	5	227	29	197
	Viroqua	4,288	1	0	0	1	0	66	8	55
	Washburn	2,051	3	0	0	0	3	27	3	24
	Waterloo	3,226	3	0	0	0	3	43	4	38
	Watertown	23,069	112	0	16	9	87	539	127	400
	Waukesha	68,680	93	1	16	18	58	1,075	176	854
	Waunakee	11,920	9	0	0	2	7	116	18	95
	Waupaca	5,868	18	0	0	1	17	229	15	207
	Waupun	10,564	17	0	8	0	9	225	69	150

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Wausau	38,429	102	0	19	14	69	1,187	267	894
	Wautoma	2,047	5	0	0	0	5	68	9	59
	Wauwatosa	45,229	76	1	6	42	27	1,840	263	1,526
	West Allis	60,502	190	1	13	90	86	2,975	481	2,319
	West Bend	30,362	37	0	0	7	30	816	40	769
	Westfield	1,158	0	0	0	0	0	21	1	18
	West Milwaukee	4,038	18	0	0	6	12	304	34	250
	West Salem	4,889	0	0	0	0	0	85	20	62
	Whitefish Bay	13,695	4	0	0	4	0	237	28	202
	Whitehall	1,575	1	0	0	0	1	48	5	43
	Whitewater	14,211	19	0	2	3	14	339	42	293
	Williams Bay	2,630	1	0	1	0	0	29	3	26
	Winneconne	2,520	3	0	0	0	3	17	5	12
	Wisconsin Dells	2,432	31	0	4	2	25	287	24	260
	Wisconsin Rapids	17,396	10	0	3	3	4	828	143	665
	Woodruff	2,000	1	0	0	0	1	38	7	31
WYOMING	Afton	1,960	3	0	0	0	3	25	6	19
	Alpine	882	3	0	0	0	3	18	4	14
	Basin	1,328	1	0	0	0	1	28	0	26
	Buffalo	5,123	15	0	0	0	15	92	24	62
	Casper	56,813	108	2	6	20	80	2,405	382	1,934
	Cheyenne	59,361	131	0	27	21	83	2,269	236	1,948
	Cody	9,730	14	0	1	1	12	271	30	239
	Diamondville	693	3	1	0	0	2	4	2	2
	Douglas	6,468	17	0	3	0	14	183	15	158
	Evanston	12,311	7	0	3	1	3	387	30	334
	Evansville	2,594	5	0	0	2	3	65	3	58
	Gillette	30,473	29	0	6	2	21	893	127	747
	Glenrock	2,552	3	0	0	0	3	41	8	33
	Green River	12,793	89	0	6	1	82	246	36	202
	Greybull	1,816	8	0	0	0	8	34	7	26
	Guernsey	1,084	1	0	0	0	1	17	2	13
	Hanna	893	1	0	1	0	0	4	4	0
	Hulett	538	3	0	0	0	3	1	0	1
	Jackson	10,301	41	0	13	1	27	235	23	204
	Kemmerer	2,563	1	0	0	0	1	29	1	28
	Lander	7,622	13	0	3	2	8	254	23	221
	Laramie	29,742	42	0	10	1	31	667	113	521
	Lovell	2,381	3	0	0	1	2	42	7	35
	Lusk	1,465	7	0	2	0	5	12	2	9
	Mills	3,707	17	0	0	0	17	99	32	61
	Moorcroft	961	0	0	0	0	0	22	5	17
	Newcastle	3,505	3	0	2	0	1	115	23	92
	Pine Bluffs	1,198	5	0	0	0	5	27	8	19
	Powell	5,953	10	0	0	0	10	204	22	179
	Rawlins	8,993	25	0	3	0	22	267	31	229
	Riverton	10,613	43	2	5	7	29	535	58	462
	Rock Springs	21,689	100	0	20	3	77	590	91	473

State	City	Population	**Violent crime**	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	**Property crime**	Burglary	Larceny-theft
	Saratoga	1,829	0	0	0	0	0	23	5	17
	Sheridan	18,070	24	1	4	0	19	459	84	360
	Sundance	1,387	0	0	0	0	0	14	3	9
	Thermopolis	3,002	1	0	0	0	1	53	5	48
	Torrington	5,816	18	0	1	0	17	161	28	127
	Wheatland	3,290	4	0	2	0	2	161	51	106
	Worland	5,157	9	0	0	0	9	30	6	23

[1] The FBI does not publish arson data unless it receives data from either the agency or the state for all 12 months of the calendar year.

[2] The FBI determined that the agency's data were underreported. Consequently, those data are not included in this table.

[3] The FBI determined that the agency's data were overreported. Consequently, those data are not included in this table.

[4] The population for the city of Mobile, Alabama, includes 55,995 inhabitants from the jurisdiction of the Mobile County Sheriff's Department.

[5] Because of changes in the state/local agency's reporting practices, figures are not comparable to previous years' data.

[6] The FBI determined that the agency did not follow national Uniform Crime Reporting Program guidelines for reporting an offense. Consequently, this figure is not included in this table.

[7] The data collection methodology for the offense of forcible rape used by Chicago, Illinois, and the Minnesota state UCR Program (with the exception of Minneapolis and St. Paul, Minnesota) does not comply with national UCR Program guide
its figures for forcible rape and violent crime (of which forcible rape is a part) are not published in this table.

Motor vehicle theft	Arson[1]
3	
23	
4	
35	
56	
11	
6	
11	
0	
100	
7	
3	
0	
2	
8	
2	
0	
24	
21	
6	0
53	
20	
1	
163	
4	
24	
0	
4	
5	
8	
3	
1	
2	
3	
6	
3	
0	
4	
2	
21	
10	
4	
2	
22	

Motor vehicle theft	Arson[1]
8	
11	
2	
0	
0	
1	
0	
6	
1	
2	
2	
1	
1	
6	
4	
26	
13	
15	
8	
2	
149	
12	
3	
91	
3	
0	
11	
8	
46	
8	
4	3
4	
0	
87	
5	
8	
1	
7	
30	11
30	
5	
11	
142	22
0	
20	
1	
5	
3	
0	

Motor vehicle theft	Arson[1]
3	
0	
18	
2	
5	
13	
29	1
1	
5	
10	
9	
0	
8	
1	
5	0
23	
4	
5	
0	
0	
1	
2	
0	
86	
105	2
24	
861	21
0	
70	
1	
79	
11	
2	
0	
1	
6	
4	
26	
30	
3	
0	
1	0
0	
29	
4	
0	
12	
0	
5	

Motor vehicle theft	Arson[1]
1	
0	
4	
1	
47	
6	
2	
0	
27	
9	
3	
0	
1,027	77
22	
11	
781	50
28	
5	
1	
5	
8	
5	
20	
1	
2	
0	
0	
48	
3	
0	
12	
2	
8	0
18	
8	
4	
4	
58	
21	
1	
18	
22	
123	
1	
12	
3	
0	
8	
0	

Motor vehicle theft	Arson[1]
48	
5	
4	
6	
10	
1	
4	
0	
3	
0	
5	
5	
7	
0	
4	
1	
22	
6	
0	
10	
0	
0	
0	
2	
6	
1	
5	
1	
1	0
0	
3	
5	
12	
1	
21	1
0	
70	
39	1
0	
12	
1	
2	
0	
4	
	3
178	6
21	
0	

Motor vehicle theft	Arson[1]
3	0
1	
39	
2	
1	0
0	
1	
1	
9	
11	
4	
813	86
32	7
20	0
1	0
1	0
8	0
101	4
1	0
6	1
8	0
63	6
16	0
24	1
19	6
29	3
10	2
7	1
22	1
12	4
1	1
1	0
21	1
1	0
6	0
0	0
14	0
6	2
31	3
0	0
80	3
371	
86	11
97	6
14	2
173	12
377	50

Motor vehicle theft	Arson[1]
11	2
3	0
2	0
2	0
30	7
7	3
3	0
81	6
64	9
63	21
15	4
1	1
154	38
1,329	
5	2
201	11
15	3
4	0
1	0
74	2
2	0
70	3
1,007	59
2	14
96	0
26	4
17	1
8	0
7	2
14	1
383	14
7,724	320
2	1
51	8
13	3
13	0
22	7
268	12
5	1
54	7
16	2
24	1
46	1
1	0
99	27
644	42
0	0
48	2
3	0

Motor vehicle theft	Arson[1]
3,433	153
0	0
8	5
0	0
12	2
187	27
5	0
13	2
5	0
6	1
7	0
11	1
4	0
63	3
26	4
4	1
74	8
3	2
2	2
31	1
0	0
20	1
17	5
1	0
0	1
0	0
1	0
1	0
3	3
10	0
5	0
91	9
6	1
0	0
9	3
0	0
11	1
5	1
6	1
0	1
38	2
2	0
1	0
2	1
113	9
0	0
8	0
31	4

Motor vehicle theft	Arson[1]
212	14
0	0
0	1
0	0
2	0
0	0
0	0
3	0
0	0
3	1
2	0
0	1
1	0
4	0
18	1
0	0
6	0
23	7
0	0
28	2
0	0
170	4
66	5
69	9
2	0
5	1
0	0
1	0
0	0
1	0
1,115	100
1	1
9	0
0	0
16	2
0	4
19	1
0	1
0	0
11	0
0	0
11	1
5	1
0	0
0	0
15	0
13	1
7	1
1	0

Motor vehicle theft	Arson[1]
0	0
2	0
14	0
334	21
0	0
18	5
4	1
64	5
4	2
1	0
1	0
303	38
0	0
1	1
5	0
1	0
1	0
5	1
0	0
0	0
44	7
2	0
82	11
0	0
32	5
3	2
52	6
18	4
125	7
0	0
16	3
121	3
6	1
8	1
2	0
5	1
2	0
9	0
2	0
147	17
5	0
5	1
94	13
8	0
215	10
95	4
270	18
28	3

Motor vehicle theft	Arson[1]
5	1
40	1
1,010	47
26	2
960	36
190	14
106	3
32	15
17	2
44	1
82	14
33	5
1	0
106	14
42	5
16	0
14	10
129	1
2,455	103
506	11
63	0
143	13
3	0
65	6
140	0
457	7
399	4
30	1
3	0
67	4
615	25
45	3
5	0
2	0
3	0
17	28
0	0
126	11
74	4
107	21
8	0
9	0
3	0
382	10
276	8
74	1
18	2
327	5
34	0

Motor vehicle theft	Arson[1]
20	2
0	0
4	0
42	13
115	18
32	1
22	3
108	9
1	0
9	0
464	12
289	9
452	9
228	6
221	33
216	14
82	7
23	5
1,109	24
500	17
5	0
51	5
8	2
86	2
12	5
386	22
405	11
23	6
17	0
283	4
10	0
332	5
714	41
749	6
35	1
23	8
433	14
37	1
282	10
3	0
194	6
10	0
118	2
124	2
37	9
82	5
320	17
28	4
34	3

Motor vehicle theft	Arson[1]
103	15
432	59
5	0
1	0
177	5
78	2
122	8
52	7
1	2
8	6
928	4
76	2
72	2
2	0
234	0
536	12
190	13
149	4
343	15
797	13
40	2
91	0
92	5
15	0
830	19
0	0
154	24
26	3
14	3
469	17
24	1
0	0
20	4
35	1
63	22
747	13
11	2
0	1
27	7
40	1
75	9
34	0
490	22
4,553	147
342	22
36	6
340	9
462	13
192	21

Motor vehicle theft	Arson[1]
328	12
75	9
9	1
16	0
38	2
19	3
30	7
19	1
22	5
4	1
21	1
10	0
200	5
53	4
435	21
1,007	55
7	0
330	13
81	4
23	1
268	13
0	0
250	15
0	0
94	4
11	1
285	28
644	12
16	4
19	0
131	1
5	0
515	10
213	8
703	16
4	0
121	23
22	4
1	2
7	2
12	0
138	1
23	3
77	3
13	4
38	1
13	1
28	4
30	1

Motor vehicle theft	Arson[1]
8	0
132	1
7	0
214	2
62	5
9	0
0	0
320	2
270	12
111	4
439	44
12	2
141	2
64	12
36	3
138	2
120	5
67	0
57	7
60	4
151	19
32	6
199	8
83	1
36	3
51	16
2,189	79
26	1
3	6
0	0
17,046	1,341
90	3
28	12
494	20
307	0
17	0
6	2
50	1
235	9
26	4
130	0
67	2
63	20
60	8
216	4
39	5
241	23
28	3
10	0

Motor vehicle theft	Arson[1]
256	15
50	9
1,426	56
125	0
1	1
347	16
480	15
59	5
226	0
0	0
21	10
10	1
784	10
66	16
14	0
102	7
2	0
126	6
127	11
506	3
39	5
8	0
127	9
46	0
134	12
75	4
594	13
109	11
74	2
4,644	163
56	4
345	25
4	1
898	32
221	13
9	0
44	2
88	16
473	21
66	6
8	2
485	35
123	3
178	18
49	22
3	2
32	2
487	7
106	4

Motor vehicle theft	Arson[1]
378	13
50	10
149	6
358	3
57	13
329	9
26	0
141	1
5	0
508	2
72	5
14	0
116	13
82	6
1,231	16
249	0
43	4
40	4
287	7
319	13
26	1
18	0
9	3
30	5
242	11
243	18
103	2
192	3
110	3
506	10
1,596	51
53	21
10	1
9	0
20	3
78	4
1,461	49
67	19
54	10
0	0
6	0
202	2
231	6
0	0
3,994	202
853	23
11	1
1,721	61
141	2

Motor vehicle theft	Arson[1]
57	4
2	0
6,389	155
63	4
87	3
3,903	156
60	1
169	4
212	0
5,411	181
39	5
592	15
54	22
238	5
2	0
199	19
513	6
261	12
67	7
1,275	139
102	12
325	16
243	18
179	20
178	2
317	8
166	26
41	2
298	9
159	7
9	6
11	0
6	4
28	5
51	8
10	0
327	13
86	16
2	0
67	0
134	6
21	0
35	1
2	0
5	5
13	5
137	5
824	14
16	5

Motor vehicle theft	Arson[1]
54	1
213	30
5	0
87	4
7	0
2,041	62
81	0
246	51
17	0
8	1
37	2
16	0
174	5
36	0
72	9
5	1
335	21
245	15
8	1
441	8
0	0
465	37
144	14
45	12
65	1
19	6
261	11
354	2
174	30
1,177	35
152	7
82	7
436	26
1	0
600	8
387	22
40	2
153	5
40	0
177	14
10	0
594	2
133	8
3	0
272	10
2	0
178	19
5	0
286	9

Motor vehicle theft	Arson[1]
150	2
13	2
20	4
6	0
14	1
12	0
16	1
168	19
33	2
1	1
18	2
152	11
108	9
65	6
10	2
207	14
6	1
4	0
888	68
3	0
3	0
2	0
2	0
89	56
85	16
48	14
2	0
0	0
1	1
13	2
20	1
3	0
60	9
0	0
0	0
4	0
1,288	100
155	7
11	1
6	2
0	0
2	0
5	0
1	0
14	5
3,226	128
36	1
6	3

Motor vehicle theft	Arson[1]
24	1
2	0
0	0
194	8
4	0
2	0
31	11
4	1
36	7
17	0
3	0
202	36
10	1
9	1
5	1
5	0
8	9
37	2
5	2
11	4
0	0
100	9
148	36
31	4
6	3
0	1
0	0
8	1
0	0
11	2
2	0
0	1
2	0
9	6
0	0
521	18
2	0
2	0
0	0
96	3
7	0
140	54
7	1
68	13
1	2
6	1
1	1
1	0
1	0

Motor vehicle theft	Arson[1]
17	15
4	1
0	0
1	0
0	0
112	6
1	0
4	0
2	0
23	3
4	0
451	51
0	0
2	0
4	1
48	2
5	0
3	2
2	1
2	0
13	1
19	2
4	0
304	18
2	0
3	0
326	12
133	6
6	4
0	0
1	1
39	2
1	1
11	3
6	1
20	2
50	1
858	20
71	0
1	0
2	0
11	1
6	4
11	1
16	1
80	5
6	0
31	0

Motor vehicle theft	Arson[1]
9	0
158	10
81	1
0	0
21	8
77	0
24	4
6	0
4	2
38	4
6	0
0	0
11	3
13	0
837	95
3	1
84	5
132	6
2	0
59	3
80	4
6	1
45	2
404	2
2	0
1,013	17
42	0
70	8
13	3
2	0
23	0
16	0
176	12
49	19
2	0
25	0
15	1
11	0
5	6
1	0
1	0
17	2
19	2
40	2
6	0
51	6
15	0
192	10
4	0

Motor vehicle theft	Arson[1]
120	8
5	0
5	1
19	2
35	0
18	12
29	2
424	3
4	3
15	0
64	0
197	9
3	1
16	0
20	7
46	0
0	0
13	2
25	6
8	1
15	0
2	0
1	0
3	0
6	0
0	0
1	0
0	0
3	1
0	0
3	0
113	11
0	0
17	0
0	0
0	0
0	0
5	0
0	0
6	0
6	2
1	0
14	2
16	0
6	0
3	0
29	11
6	0

Motor vehicle theft	Arson[1]
3	0
0	0
2	0
10	0
2	1
5	0
0	0
543	2
2	0
4,864	49
9	0
76	5
0	0
1	0
76	4
14	3
0	0
20	0
1	0
23	0
45	0
9	3
4	0
36	1
6	0
2	0
1	0
1	0
60	7
17	0
5	0
5	0
2	0
108	1
1	1
1	0
107	5
99	14
1	0
13	0
33	0
2	0
109	9
5	0
33	1
1	0
0	0

Motor vehicle theft	Arson[1]
2	0
41	0
6	0
201	12
41	4
14	1
65	4
23	2
112	0
16	7
65	1
175	4
5	0
29	3
1	0
4	0
101	0
8	2
127	3
9	0
258	17
463	16
18	0
176	5
6	1
59	9
193	7
161	0
37	6
0	0
11	0
35	4
5	0
22	0
28	2
16	0
4	1
7	0
52	0
636	44
194	7
92	15
62	1
9	0
332	22
3	0
3	0
64	2
17	0

Motor vehicle theft	Arson[1]
1	0
17	0
3	0
33	6
0	0
33	2
125	2
1	0
1	0
1,067	14
78	4
1	0
5	2
1	0
91	1
635	8
1	0
133	11
1	0
0	0
0	0
0	0
8	2
0	0
4	0
2	0
1	0
6	0
1,973	99
50	3
0	0
2	0
6	0
47	1
0	0
0	0
11	0
13	0
1	0
122	2
170	17
30	1
4	0
21	2
7	0
7	1
3	0
241	6
8	0

Motor vehicle theft	Arson[1]
30	0
2	0
16	0
119	7
15	1
152	14
9	0
95	6
193	10
0	0
32	2
12	1
12	0
1	0
10	0
13	1
4	4
4	0
27	0
0	0
24	1
5	0
79	4
16	1
5	0
46	0
132	13
1	0
0	0
1	0
2,449	104
594	9
574	12
61	0
31	0
46	1
5	0
9	1
290	13
1	0
36	2
9	0
12	1
37	3
40	3
15	0
19	0
75	2
330	18

Motor vehicle theft	Arson[1]
177	7
22	0
31	9
0	0
7	1
5	0
123	2
87	4
0	0
69	7
10	0
21	0
145	3
17	0
11	0
1,193	42
58	1
20	2
6	2
10	6
98	10
3	0
63	5
5	0
22	2
55	0
61	1
130	6
2	4
17	0
17	5
46	1
305	5
87	4
1	3
142	10
244	5
140	8
367	10
0	0
77	1
2	0
1	0
79	9
2	2
8	3
3	0
163	7
30	0

Motor vehicle theft	Arson[1]
62	4
7	2
210	2
1	1
134	8
2	0
0	0
12	0
10	3
15	1
0	0
0	0
1	3
3	2
52	0
26	1
0	0
8	0
14	1
19	1
5	0
27	1
7	0
24	5
16	3
1,236	90
19	1
26	0
183	4
4	0
27	4
349	21
95	0
838	107
27	0
22	0
31	3
0	0
95	7
4	0
5	0
1	0
14	1
24	1
19	0
6	0
9	1
2	0
0	0

Motor vehicle theft	Arson[1]
98	5
20	1
11	0
36	1
391	17
53	1
4	0
6	0
6	2
34	0
0	0
56	8
85	6
42	4
22	1
23	0
25	0
3	0
6	0
1	0
300	15
4	1
25	1
1	0
39	
0	0
0	0
298	15
5,043	95
0	0
13	
24	
8	0
14	
2	0
13	0
6	1
0	0
10	0
0	0
2	
4	
0	0
3	0
13	0
0	0
52	8
3	0

Motor vehicle theft	Arson[1]
2	0
3	0
17	
23	9
4	0
26	1
40	10
51	2
5	
21	0
4	2
57	
3	1
6	0
0	0
1	0
7	
5	0
0	0
2	1
297	6
1	0
1,007	65
8	1
58	2
4	0
33	1
5	0
8	0
1	
29	0
59	4
1	0
0	0
46	0
0	0
2	0
23	0
89	4
40	2
34	0
117	
2	0
1	0
8	0
461	6
2	
8	
0	

Motor vehicle theft	Arson[1]
0	0
3	1
0	0
0	0
0	0
54	0
1	0
24	
0	
6	0
98	7
9	0
0	0
7	0
13	0
2	
0	0
62	3
66	4
4	0
1	0
9	
6	
2	0
62	6
12	0
4	1
3	0
8	0
66	0
0	0
0	0
14	0
1	0
2	0
0	
14	0
0	0
64	5
5	0
1	0
6	0
3	0
0	0
6	0
0	0
6	
15	1
36	1

Motor vehicle theft	Arson[1]
14	0
15	
22	0
0	0
13	3
4	13
76	
27	3
3	
81	5
0	0
5	0
28	0
12	0
24	0
0	0
2	
0	0
3	2
625	72
14	0
14	1
166	6
0	0
1	0
66	0
3	0
5	0
0	0
0	0
3	0
33	3
9	0
35	1
10	0
66	1
64	3
0	0
0	0
4	0
0	
5	4
0	0
55	
0	0
0	0
32	2
13	
0	0

Motor vehicle theft	Arson[1]
1	0
10	0
1	0
0	0
66	8
3	
0	0
2	0
0	0
41	
4	1
15	0
0	
27	0
18	
4	2
0	0
6	
5	
5	0
73	
9	0
104	7
18	1
99	5
0	0
9	
192	
624	43
0	1
3	0
0	0
0	0
22	0
5	
0	0
5	0
51	1
7	0
9	
17	1
4	1
13	0
14	1
0	0
6	0
1	0
23	1
9	0

Motor vehicle theft	Arson[1]
41	4
0	0
0	0
6	1
4	0
1	0
9	0
196	
4	0
112	9
51	3
46	2
176	23
2	
1	1
0	0
27	5
27	0
20	2
0	0
16	2
0	0
4	0
9	
6	0
2	
3,901	349
0	0
0	1
1	0
9	1
159	50
1	0
1	5
56	7
0	0
19	1
51	17
0	0
1	0
1	0
5	0
20	3
2	0
2	0
0	0
6	2

Motor vehicle theft	Arson[1]
1	0
61	8
7	1
0	0
4	1
3	0
4	4
63	4
3	0
36	6
2	0
19	5
9	13
128	23
1	1
0	0
1	0
2	2
2	0
70	5
2	0
25	4
0	0
1	0
6	0
5	1
4	0
3	1
3	0
9	2
1	0
0	0
2	0
2	0
1	0
0	0
48	6
6	1
3	1
0	0
56	12
1	0
5	0
3	2
60	12
6	1
0	0
23	4

Motor vehicle theft	Arson[1]
2	0
1	1
0	0
0	0
138	31
0	0
0	0
5	0
0	5
11	10
7	1
6	8
0	0
0	1
0	0
54	3
19	6
9	0
1	0
107	11
1	0
0	0
5	1
53	11
0	0
8	0
8	2
3	0
33	1
22	1
18	10
0	0
5	2
0	0
0	0
36	0
1	0
3	0
0	4
10	2
318	4
0	0
1	0
6	4
32	14
2	1
7	0
26	13
3	4

Motor vehicle theft	Arson[1]
0	0
1	0
0	0
5	2
0	0
4	0
24	1
0	0
9	2
5	1
10	0
19,078	
1	0
0	0
0	0
0	0
0	0
0	0
25	2
1	0
5	2
0	2
16	6
9	0
53	0
8	4
13	9
57	9
16	2
126	27
0	0
1	0
20	15
2	0
0	0
0	0
37	4
0	0
6	0
18	16
4	1
0	0
2	0
16	0
3	0
4	0
32	4
1	0
37	7

Motor vehicle theft	Arson[1]
644	58
1	0
10	1
7	3
108	7
1	0
60	2
25	0
0	0
28	1
0	1
0	0
1	0
66	14
21	0
1	1
4	0
0	0
0	0
30	9
0	0
5	0
2	0
42	2
13	0
9	2
1	1
7	1
0	0
9	6
3	0
1	0
3	1
4	0
2	0
0	0
1	0
0	0
1	0
3	1
0	0
1	0
0	0
17	4
6	5
43	0
1	0
0	3
2	0

Motor vehicle theft	Arson[1]
6	13
1	0
0	0
0	0
9	4
2	1
1	0
23	0
1	0
0	0
19	0
1	0
258	9
8	0
5	0
47	2
0	0
1	0
19	4
14	0
3	0
8	1
2	0
0	0
1	0
2	1
6	1
21	4
0	0
1	0
21	0
7	0
3	1
0	0
0	0
3	0
6	11
9	0
2	0
175	25
47	12
0	0
7	2
0	0
1	8
0	0
3	0
1	0
6	0

Motor vehicle theft	Arson[1]
3	0
1	0
8	5
1	0
3	0
5	3
4	1
6	3
1	0
4	2
1	3
8	0
15	6
0	1
15	1
0	0
16	1
3	0
0	0
6	3
24	1
39	4
8	4
19	1
5	0
2	0
0	0
0	0
2	2
1	0
0	0
0	0
22	10
103	3
12	0
7	3
0	0
96	2
1	0
0	0
2	4
15	5
9	0
0	8
1	1
0	0
10	5
45	3
0	0

Motor vehicle theft	Arson[1]
15	4
6	2
2	1
8	6
0	0
8	1
15	0
7	2
2	0
1	0
27	0
0	0
1	1
0	0
6	2
0	0
4	2
38	2
10	2
2	0
8	2
2	0
13	2
15	0
5	0
2	0
15	5
66	5
71	2
0	0
0	0
0	1
18	1
0	0
2	2
0	0
14	3
10	1
0	0
15	3
3	11
14	3
0	0
1	1
7	1
1	0
5	1
12	0
11	1

Motor vehicle theft	Arson[1]
7	4
13	6
1	0
39	4
267	61
0	0
4	0
1	1
0	0
9	4
8	1
0	0
3	0
4	0
19	0
0	0
0	0
11	2
37	5
0	0
14	3
0	0
1	0
3	0
45	0
0	0
3	0
21	0
4	0
0	0
1	0
6	0
438	89
78	6
16	5
0	0
5	1
13	1
4	3
7	7
1	1
5	1
0	0
0	0
1	0
4	3
5	0
65	4
15	2

Motor vehicle theft	Arson[1]
0	0
1	0
11	1
3	2
0	0
7	1
76	13
0	0
1	0
0	0
10	0
5	1
2	0
38	2
0	0
2	0
0	1
240	57
0	0
0	6
3	0
20	2
11	3
2	0
4	0
20	2
4	0
66	2
10	0
7	1
5	0
1	5
22	1
0	0
3	1
0	2
23	8
0	0
3	0
26	4
0	0
7	3
0	1
0	0
3	0
1	0
2	0
14	1
12	4

Motor vehicle theft	Arson[1]
0	0
2	2
1	2
16	6
17	2
4	0
13	164
26	1
0	0
4	0
2	0
13	1
1	0
1	1
2	2
5	2
0	0
14	0
21	3
20	3
5	2
9	1
2	3
0	0
7	0
224	21
3	2
7	1
9	0
0	0
12	1
14	0
1	0
1	0
27	0
37	1
2	0
125	17
1	0
11	
8	0
3	0
9	2
3	0
35	5
19	1
4	0
5	0

Motor vehicle theft	Arson[1]
9	2
82	0
10	0
153	9
2	0
16	1
26	1
3	0
5	0
2	0
3	0
36	0
276	11
114	25
2	0
8	1
210	68
1	0
25	1
287	50
2	0
31	3
8	3
5	0
34	10
0	0
17	0
57	8
58	1
1	0
494	36
7	0
57	1
84	11
5	0
13	7
8	0
115	2
43	0
180	25
28	4
30	5
4	0
8	0
1	0
52	8
1	0
4	1
88	14

Motor vehicle theft	Arson[1]
35	2
125	0
135	16
156	15
8	1
19	0
9	2
176	28
10	0
5	0
140	19
14	1
16	0
6	0
33	7
1	1
14	0
0	1
14	4
27	1
18	2
67	4
4	1
5	1
1	0
1	0
115	48
8	0
47	0
8	0
51	3
22	0
302	51
0	0
39	1
5	0
6	1
356	47
1	0
31	3
66	0
3	1
13	3
34	0
2	0
8	2
25	1
2	1
5	0

Motor vehicle theft	Arson[1]
15	0
1	1
3	0
1	3
4	1
1	0
3	2
15	0
50	3
2	1
21	4
1	1
0	0
15	1
8	2
36	5
4	0
0	0
12	0
19	3
239	11
14	7
8	3
2	0
4	1
10	0
4	2
45	13
16	7
14	1
433	31
4	3
14	1
225	24
6	0
3	0
739	43
6	0
51	24
1	0
4	0
4	1
1	0
0	0
10	1
8	4
2	1
55	17

Motor vehicle theft	Arson[1]
25	1
5	1
2	1
0	0
1	0
3	2
2	0
4	2
21	2
74	8
5	1
2	0
11	0
29	0
18	2
0	0
3	1
10	1
31	7
50	4
48	6
4	1
7	1
2	0
20	6
6	3
2	1
18	0
3	1
4	0
13	0
0	1
6	0
1	0
4	1
8	2
34	19
8	3
4	1
15	3
1	0
7	1
0	0
1	2
3	0
5	1
152	16
1	0
0	0

Motor vehicle theft	Arson[1]
0	0
8	8
1	0
1	0
20	3
2	1
8	0
111	33
4	0
11	2
5	0
47	26
2	0
1	1
1	0
2	0
6	0
3	0
6	2
12	0
5	1
18	6
1	0
12	3
1	0
0	0
8	3
2	0
6	1
4	3
2	1
1	0
23	2
0	0
0	0
0	0
1	0
15	4
0	0
4	0
6	0
2	0
13	4
4	1
4	1
9	3
3	1
21	1

Motor vehicle theft	Arson[1]
60	2
0	0
11	0
33	1
2	0
2	0
4	0
3	0
23	5
0	0
7	1
1	0
16	3
4	0
10	2
35	6
8	7
5	0
0	0
2	0
3	0
0	0
38	5
15	6
11	7
0	0
1	0
2	0
2	0
1	0
2	1
5	1
0	0
4	1
1	0
0	0
1	0
105	22
13	0
11	4
1,129	
6	0
3	0
156	21
72	10
24	0
0	0
84	4
16	3

Motor vehicle theft	Arson[1]
2	0
1	0
0	0
0	0
0	0
3	0
1	0
0	0
1	0
11	1
0	0
3	1
65	0
0	0
0	0
3	0
0	1
18	5
2	0
0	0
0	1
142	19
2	0
3	0
15	4
305	38
6	1
10	1
17	4
47	15
17	5
3	2
18	0
2	0
6	0
3	0
89	39
8	0
124	11
3	0
4	0
0	0
1	1
3	4
504	14
3	0
7	0
1	0
0	0

Motor vehicle theft	Arson[1]
3	0
3	0
15	2
1	1
2	0
1,528	129
0	0
17	0
3	0
0	0
47	1
1	0
4	0
3	0
16	0
0	0
0	0
2	0
0	0
10	1
0	0
6	1
25	2
128	2
1	0
2	1
1	1
3	0
0	0
5	0
7	0
5	0
2	1
8	0
2	0
0	0
0	0
0	0
0	0
11	0
2	1
10	4
181	12
2	0
10	0
16	1
4	0
8	1

Motor vehicle theft	Arson[1]
2	0
1	0
2	0
3	0
1	0
33	8
4	0
11	0
2	1
29	2
1	0
0	0
5	1
0	0
63	3
15	0
7	0
9	1
18	3
17	1
10	2
36	
18	3
3	0
6	0
0	0
1	0
0	0
1	0
2	0
5	2
2	0
12	0
43	0
6	0
9	0
0	0
50	10
0	0
13	2
1	0
2	0
3	0
0	0
2	1
1	1
47	0
0	0
0	0

Motor vehicle theft	Arson[1]
2	1
3	0
3	0
6	0
6	1
10	0
0	0
641	39
1	0
25	0
1	0
1,975	223
0	0
9	0
0	0
2	0
2	0
10	2
11	1
2	0
13	1
3	4
11	1
0	0
1	0
17	0
4	1
11	1
2	0
13	0
65	4
44	6
1	0
21	4
1	0
84	12
1	0
0	0
44	7
10	1
15	0
2	0
9	1
2	0
0	0
6	1
9	7
0	0
1	0

Motor vehicle theft	Arson[1]
25	4
57	4
0	0
1	0
15	3
0	0
0	0
0	0
8	0
14	1
85	1
1	0
1	0
16	1
0	0
0	0
0	0
1	0
1	0
25	0
1	0
0	1
3	1
0	0
0	0
1	0
0	1
21	2
1	0
7	0
3	0
4	0
0	1
1	0
3	0
5	2
7	1
1	1
19	6
0	0
9	0
0	0
130	
12	3
24	1
0	0
63	5
2	0

Motor vehicle theft	Arson[1]
2	0
51	8
147	3
0	0
0	0
12	0
3	
0	0
2	1
0	0
10	2
15	0
0	0
17	0
1	
0	0
0	0
14	1
7	0
3	0
15	0
7	0
1	0
0	0
0	0
17	0
2	
8	0
4	0
58	2
109	0
4	0
87	
0	0
1	0
7	0
1	0
5	0
5	0
157	31
3	0
2	
290	26
1	0
133	0
0	2
4	
1	1
4	0

Motor vehicle theft	Arson[1]
3	1
8	0
2	2
0	
13	2
116	
1	
18	
0	0
8	1
2,410	
0	0
6	0
1	0
1	0
63	
5	0
22	
12	0
0	0
15	0
15	0
2	0
8	0
25	1
11	
526	99
77	0
0	0
0	0
0	
26	3
5	0
24	1
2	0
1	0
6	0
6	3
35	
13	1
15	1
8	0
0	
0	0
19	6
21	12
3	0
47	9

Motor vehicle theft	Arson[1]
1	2
6	0
9	3
4	2
22	16
1	0
4	1
1	0
0	0
12	3
3	1
8	0
1	6
2	0
1	1
1	1
1	0
2	0
0	0
0	0
2	1
0	0
6	0
2	0
0	0
0	0
8	0
8	3
4	1
2	1
2	0
0	0
1	0
1	0
3	2
13	2
0	1
0	1
2	1
3	0
0	0
0	0
2	1
1	1
1	0
4	2
15	16
3	1
6	1

Motor vehicle theft	Arson[1]
0	1
3	0
3	1
0	0
2	0
3	2
0	1
0	0
0	0
4	0
3	1
0	0
0	0
5	0
2	1
3	1
2	0
0	0
15	0
4	0
2	2
2	2
2	0
2	0
4	0
76	7
3	3
0	1
4	0
6	5
0	0
5	1
4	0
21	2
38	3
9	1
1	0
9	1
0	5
22	1
1	0
0	0
1	0
8	2
1	0
2	0
5	0
1	0
14	2

Motor vehicle theft	Arson[1]
4	0
21	9
2	1
15	1
6	1
0	0
2	1
0	0
3	4
5	1
31	3
104	9
4,409	321
0	0
12	3
0	1
9	0
127	0
1	0
117	2
2	0
0	0
17	4
22	0
1	0
9	1
20	
1	0
5	0
12	0
0	1
23	6
3	1
10	1
45	0
13	2
7	0
65	12
0	0
3	0
8	0
87	8
4	1
6	3
15	0
133	0
3	1
120	27

Motor vehicle theft	Arson[1]
3	2
1	0
21	2
7	1
97	0
3	1
10	0
153	1
0	0
0	0
5	1
9	0
64	2
65	0
11	2
0	0
14	6
3	0
0	0
7	4
10	3
1	0
0	0
3	0
3	1
0	0
61	0
0	1
65	11
30	0
0	0
2	0
1	1
3	2
64	2
1	1
2	4
1	0
2	
5	0
11	5
21	3
7	0
10	0
9	2
30	7
13	2
29	1

Motor vehicle theft	Arson[1]
17	3
21	8
4	1
0	0
12	0
4	3
56	7
26	3
7	0
13	4
64	12
9	3
2	0
2	0
8	1
10	2
11	1
3	1
3	0
24	2
25	3
3	0
2	0
2,037	
37	7
7	0
48	2
5	1
445	21
23	2
18	2
180	8
13	0
10	2
9	2
5	0
19	3
178	6
1	
140	2
1	0
11	0
4	0
1	1
0	0
8	3
34	1
34	2
14	0

Motor vehicle theft	Arson[1]
5	0
13	2
2	0
4	0
0	0
20	0
1	4
3	1
6	3
4	1
0	1
8	5
14	2
15	0
6	1
0	0
2	0
0	0
109	2
13	0
351	35
30	1
80	4
10	0
71	
4	0
15	1
29	3
1	0
0	1
4	3
1	0
9	0
6	2
0	0
1	3
12	3
3	0
2	0
4	1
6	0
2	0
3	0
5	0
8	0
0	2
1	0
5	0
0	0

Motor vehicle theft	Arson[1]
121	17
8	0
0	0
20	0
7	2
5	2
211	17
1	1
1	0
4	0
14	0
11	0
7	4
10	3
5	1
4	1
769	
2	0
11	2
2	0
71	7
5	0
0	0
5	2
6	0
406	27
28	0
8	0
306	3
7	0
121	1
1	0
17	3
13	0
4	0
35	3
8	6
10	0
6	1
1	0
3	2
15	1
4	1
91	3
31	4
0	0
30	2
5	2
15	

Motor vehicle theft	Arson[1]
4	1
7	7
0	0
3	0
13	1
25	1
5	0
388	29
5	0
9	2
26	1
1	0
21	4
43	2
13	0
13	0
5	0
14	4
2	0
0	1
3	0
4	0
4	0
37	4
5	0
7	0
25	2
16	2
0	1
55	1
0	0
11	2
9	1
59	10
3	1
22	2
5	1
1	1
0	0
125	8
37	1
9	2
10	0
14	4
190	3
0	3
19	
1	0
4	0

Motor vehicle theft	Arson[1]
4	0
73	
12	2
7	3
63	1
16	0
16	2
2	0
3	0
8	0
16	0
14	2
165	5
1	3
13	4
17	4
11	3
7	1
872	66
4	2
2	0
20	1
34	1
0	0
10	2
1	0
7	3
9	1
12	1
43	5
32	5
10	1
4	0
1	0
8	3
3	0
7	2
16	4
10	0
73	2
6	3
40	6
8	0
29	0
0	0
26	7
6	3
1	0
3	0

Motor vehicle theft	Arson[1]
12	1
8	1
39	4
4	5
0	0
4	0
2	0
2	1
17	2
121	9
3	0
8	1
57	3
2	0
10	3
24	3
3	1
16	1
16	1
10	0
47	1
593	10
4	0
15	5
0	4
1	0
3	1
71	3
1	0
2	0
4	3
129	22
1	0
46	3
0	1
1	0
4	0
1	0
5	1
149	19
35	9
0	1
4	1
1	0
4	0
1	0
8	1
5	4

Motor vehicle theft	Arson[1]
12	2
5	0
9	5
25	1
0	0
21	2
1	1
0	0
18	1
3	0
0	0
50	2
22	5
1	1
12	0
2	0
100	7
0	0
3	2
1	5
4	0
0	0
2	0
1	2
55	0
0	0
1	1
7	2
0	1
5	0
2	0
59	10
1	1
0	0
7	0
10	0
3	2
205	9
5	0
6	1
0	0
2	0
2	2
4	1
5	0
1	0
471	34
186	5
1	0

Motor vehicle theft	Arson[1]
8	0
12,602	1,082
3	0
5	1
2	1
2	0
1	1
46	22
219	9
0	1
2	0
87	8
1	2
0	0
5	0
22	0
2	0
1	2
17	2
130	8
19	0
94	5
653	343
116	14
4	0
1	2
3	0
0	0
1	0
18	2
14	0
93	3
11	0
63	8
4	0
5	1
2	0
2	0
14	0
44	7
5	1
5	3
380	100
9	4
0	0
1	0
13	0
11	0
4	0

Motor vehicle theft	Arson[1]
7	1
11	0
37	0
0	0
24	0
2	1
4	0
300	20
0	1
0	0
171	3
1	0
5	0
6	0
134	4
9	2
24	6
1	0
8	4
2	0
20	1
2	0
105	22
8	0
4	0
12	2
0	0
53	14
4	0
175	36
32	1
4	0
0	0
88	10
0	0
1	0
0	0
0	0
1	0
0	0
239	34
11	2
1	0
7	1
4	0
0	0
0	1
202	5
0	0

Motor vehicle theft	Arson[1]
5	0
221	10
3	0
2	0
1	0
0	0
112	6
2	0
2	0
3	3
1	2
8	0
1	1
3	2
1	0
0	3
43	3
0	0
14	9
1	1
2	10
9	1
6	0
93	7
0	0
7	2
6	0
93	17
13	3
18	0
0	0
97	23
20	3
4	0
1	0
4	1
0	0
9	0
0	0
17	2
0	1
11	1
1	0
4	0
17	1
18	3
48	0
134	5
2	0

Motor vehicle theft	Arson[1]
1	0
1	0
4	2
4	0
0	0
0	0
7	4
1	0
2	2
2	0
0	0
2	2
2	4
1	0
94	1
1	3
1	0
15	3
27	1
216	31
46	10
66	13
0	0
0	0
0	0
0	0
289	21
1	0
7	0
1	0
0	1
0	0
3	1
86	11
43	0
2	3
6	1
2	0
1	0
120	6
223	7
0	0
91	7
122	23
24	1
10	1
0	1
32	1
72	2

Motor vehicle theft	Arson[1]
1	0
410	11
117	7
3	2
1	0
1	0
1	0
0	0
3	1
2	0
1	0
0	0
0	1
4	1
87	6
120	9
6	0
3	1
3	0
1	0
11	1
16	4
9	2
1	0
231	27
1	0
10	1
14	2
4	0
13	1
23	1
109	1
8	0
3	1
2	0
14	1
99	4
1	0
1	0
8	1
715	35
79	7
1	0
1	0
50	7
28	8
0	0
319	16
1	0

Motor vehicle theft	Arson[1]
0	0
22	1
0	0
16	0
2	0
23	0
78	3
160	8
84	2
3	0
0	0
2	0
23	1
9	3
1	0
23	0
2	0
31	4
11	0
0	0
42	1
0	0
0	0
3	0
1	0
3	0
0	0
4	1
28	3
3	0
6	1
1	0
42	6
89	15
1	0
17	2
3	0
122	5
0	0
0	0
13	2
0	0
10	0
6	1
5	0
10	1
12	2
5	0

Motor vehicle theft	Arson[1]
9	1
1	1
56	11
0	0
12	12
0	2
2	0
25	2
0	0
5	0
0	0
14	0
2	0
	9
53	13
1	0
5	0
19	6
19	0
19	6
1	0
3	0
6	0
0	1
7	0
33	8
8	1
6	2
1	0
39	0
73	0
0	0
3	0
1	0
29	3
9	1
6	0
1	0
0	0
26	2
11	1
5	0
3	0
0	0
21	4
0	0
0	0
6	3
13	0

Motor vehicle theft	Arson[1]
2	1
0	0
1	0
0	0
2	0
6	0
1	3
0	0
7	0
19	7
3	0
0	0
1	0
5	0
4	2
42	0
5	0
1	0
1	0
48	8
22	2
0	0
164	11
2	0
0	0
6	0
1	0
1,903	116
27	2
2	0
1	0
2	0
26	5
1	1
4	0
7	3
23	4
0	0
0	0
40	6
25	3
10	1
1	0
0	0
7	0
8	0
10	4
3	1
0	0

Motor vehicle theft	Arson[1]
19	0
57	16
8	0
2	0
1	0
0	1
1	0
20	3
13	1
2	0
24	6
5	0
11	3
8	0
13	2
5	0
52	12
15	1
105	24
0	0
0	0
6	4
106	5
3	2
4	0
24	7
32	1
15	3
0	0
2	0
1	0
0	0
7	1
0	0
0	0
24	0
16	2
4	0
2	0
93	18
5	1
15	4
2	1
58	6
2,053	131
5	0
5	3
8	1
0	0

Motor vehicle theft	Arson[1]
2	0
41	1
17	4
1	0
4	0
6	1
0	0
10	0
7	0
0	0
1	0
1	0
59	6
20	5
7	0
2	1
25	2
1	0
50	3
17	0
7	0
12	0
2	0
11	0
19	0
0	0
131	5
2	0
9	2
8	0
4	0
5	0
0	0
56	5
24	2
11	0
2	1
23	2
5	0
2	1
32	2
0	0
1	0
0	0
11	1
1	0
45	2
0	0

Motor vehicle theft	Arson[1]
105	85
22	0
153	14
74	6
1	0
20	1
26	1
29	4
13	0
2	0
4	0
1,555	83
0	1
34	3
1	0
14	2
5	0
4	0
0	
3	0
1	0
26	0
147	16
70	0
21	10
7	0
1	0
15	1
10	0
59	7
12	0
21	5
7	0
12	2
19	2
0	0
0	0
26	2
4	0
0	3
0	0
93	8
27	1
0	0
98	1
59	15
10	0
0	1
0	0

Motor vehicle theft	Arson[1]
0	0
35	2
1	2
0	0
0	0
1	0
1	0
0	0
1	0
20	1
1	0
13	1
0	0
4	0
9	0
1	0
2	0
1	0
91	2
0	0
0	0
2	0
10	2
41	1
42	11
2	0
3	0
0	0
2	0
0	0
0	0
3	0
2	1
161	3
11	1
5	1
3	0
1	0
23	0
0	0
0	0
10	1
10	1
54	5
2	0
0	0
0	0
5	0

Motor vehicle theft	Arson[1]
0	3
4	1
0	0
0	0
3	0
5	1
5	0
0	0
1	0
5	2
3	0
0	0
64	7
0	0
9	0
4	1
2	0
16	3
7	3
4	0
5	0
5	0
3	0
3	1
21	3
9	6
2	1
1	0
14	1
0	0
0	0
21	2
0	0
135	7
1	0
1	0
10	2
0	0
0	0
0	0
7	1
2	0
2	1
0	0
4	0
12	0
0	0
3	1
6	0

Motor vehicle theft	Arson[1]
0	0
15	0
0	0
4	1
12	1
3	0
11	1
0	0
2	0
4	0
0	0
1	0
3	1
1	0
0	1
0	0
6	0
6	0
8	3
0	0
3	0
2	0
8	0
0	0
17	1
0	0
3	0
0	0
0	0
11	0
0	0
117	1
0	0
7	2
0	0
5	0
169	2
0	0
2	0
2	0
2	0
0	0
3	0
0	0
0	0
32	1
3	0
1	0
1	0

Motor vehicle theft	Arson[1]
0	0
0	0
0	0
0	0
0	1
34	1
1	0
102	9
0	0
1	0
0	0
3	0
0	0
3	0
53	3
0	0
17	1
0	0
0	0
6	1
69	2
0	0
3	0
1	1
5	0
0	0
0	0
5	0
3	1
0	0
6	1
9	3
1	0
3	0
0	0
3	0
0	1
1	0
1	0
0	0
1	0
735	22
0	0
0	0
10	0
3	0
36	19
150	11
234	29

Motor vehicle theft	Arson[1]
1	0
3,170	343
1	0
24	4
1	0
0	0
0	0
0	7
10	0
34	2
0	0
1	2
1	0
3	0
0	0
0	0
4	1
0	0
0	0
0	0
1	1
0	0
0	0
1	0
4	0
0	0
1	0
4	0
2	0
28	4
122	5
0	0
8	1
0	0
45	9
1	1
2	0
1	0
1	0
0	0
0	0
7	0
5	1
3	1
0	0
17	0
3	0
8	1
2	0

Motor vehicle theft	Arson[1]
6	0
6	0
0	0
0	0
23	3
14	0
0	0
0	0
1	0
9	1
2	0
2	0
12	2
5	2
21	2
4	0
1	0
0	0
0	0
1	2
2	0
2	0
10	1
0	0
1	0
19	0
21	2
0	0
0	1
0	0
1	0
2	1
0	0
0	0
0	0
0	0
4	0
5	0
0	0
13	0
29	0
5	0
23	1
1	0
21	2
0	2
0	0
9	1
37	0

Motor vehicle theft	Arson[1]
13	1
2	0
2	1
2	0
11	1
27	1
1	0
18	1
6	0
16	1
0	
4	0
0	3
2	0
3	0
9	0
6	0
1	1
2	0
2	1
32	0
4	0
2	0
0	0
8	1
0	0
5	0
1	0
52	8
0	0
0	0
0	0
0	0
3	0
1	0
14	2
108	5
0	0
19	1
1	0
1	1
5	4
28	0
22	0
43	1
0	0
4	0
0	0
5	0

Motor vehicle theft	Arson[1]
30	3
6	0
1	0
3	2
2	0
3	2
53	7
0	0
3	1
0	0
0	0
7	1
28	7
1	0
3	0
2	0
0	0
1,004	59
23	0
51	16
18	1
2	0
4	0
0	0
10	1
10	0
188	16
4,263	250
0	0
0	0
30	7
7	7
0	0
6	0
18	0
23	0
0	1
7	1
1	0
0	0
1	0
0	0
0	0
5	0
1	0
8	0
0	0
12	1
0	0

Motor vehicle theft	Arson[1]
12	2
0	0
2	0
0	0
0	0
6	0
6	0
1	0
4	0
0	1
1	0
6	0
1	0
0	0
11	7
11	5
8	0
0	0
0	0
15	2
0	0
4	1
30	0
16	0
0	0
0	0
8	1
1	0
28	0
1	1
2	0
3	0
3	0
4	0
0	0
30	0
7	0
1	0
9	1
362	14
1	0
74	3
0	0
2	1
4	0
0	0
2	0
3	1

Motor vehicle theft	Arson[1]
4	0
1	0
0	0
0	0
1	0
1	0
5	0
125	6
10	1
30	0
36	13
0	0
3	0
39	2
6	0
2	1
10	3
2	0
15	1
2	1
11	0
1	2
1	0
9	0
2	1
1	0
2	0
1	0
2	0
1	0
6	3
7	1
9	0
0	1
2	0
6	0
0	0
11	2
122	7
0	0
5	4
0	0
2	0
1	1
10	2
20	0
4	1
4	1

Motor vehicle theft	Arson[1]
3	0
26	6
7	2
1	0
95	12
31	4
1	1
1	0
26	13
19	5
16	1
348	
1	0
3	0
5	0
0	1
0	2
6	0
31	4
51	10
6	0
2,197	119
0	0
16	0
0	0
3	1
9	1
17	2
2	0
0	1
14	0
0	0
5	0
3	0
0	0
2	0
0	0
1	0
7	0
18	2
0	1
48	4
4	2
510	43
7,164	240
18	0
729	29
233	17

Motor vehicle theft	Arson[1]
3	1
12	1
1	0
0	0
3	0
2	2
4	1
5	1
2	0
1	0
5	1
4	4
0	0
6	3
10	2
2	0
0	3
3	0
4	0
1	1
1	1
4	0
9	0
1	1
3	1
1	0
2	0
1	0
1	0
1	2
15	1
1	0
19	12
19	4
0	1
4	1
4	0
0	1
39	24
9	2
2	0
2	0
5	2
0	3
1	2
2	0
1	1
11	1

Motor vehicle theft	Arson[1]
4	1
0	0
0	0
3	1
8	0
3	1
5	3
0	0
0	0
3	0
3	0
16	2
0	0
1	4
4	1
1	3
0	0
6	3
6	0
9	2
1	0
30	9
3	2
14	6
6	1
12	4
5	1
10	10
2	1
1	1
0	0
1	1
4	1
14	6
7	0
1	0
160	59
1	1
7	1
10	1
0	0
14	6
6	1
2	0
2	0
67	29
3	0
1	0
2	1

Motor vehicle theft	Arson[1]
0	0
1	0
0	1
5	1
0	0
1	1
1	2
1	1
3	0
1	1
1	1
5	0
2	0
0	0
9	1
14	2
2	0
2	0
10	0
21	0
4	6
24	6
9	0
4	1
21	10
1	1
0	0
3	0
2	0
9	3
5	6
0	0
1	0
2	1
1	0
1	0
8	1
1	0
10	0
4	0
0	0
0	0
0	0
7	1
0	0
2	2
10	1
8	0
1	0

Motor vehicle theft	Arson[1]
0	1
8	1
10	1
1	1
0	0
0	0
0	0
0	0
1	0
59	2
133	13
0	0
5	0
0	0
2	2
1	1
0	0
4	5
8	0
0	0
93	0
1	0
9	1
2	0
130	1
18	1
6	0
0	0
2	1
3	0
21	10
8	2
3	2
8	1
0	1
1	1
2	0
131	2
0	0
3	0
3	1
1	0
4	0
5	0
10	2
3	0
4	1
39	16

Motor vehicle theft	Arson[1]
50	4
17	1
1	0
7	1
10	1
4	1
12	0
16	2
4	0
1	0
0	0
0	1
519	91
0	0
0	0
34	0
12	1
31	0
1	2
1	0
0	0
70	0
5	1
0	0
1	0
0	0
18	2
9	0
5	4
9	0
5	0
0	1
1	0
0	0
27	2
0	1
2	0
6	1
4	0
3	1
1	0
3	0
8	1
0	0
4	2
51	2
22	0
0	0
2	1

Motor vehicle theft	Arson[1]
5	0
23	4
6	2
6	0
1	0
360	19
19	2
13	4
18	0
18	1
13	0
155	11
5	0
32	14
1,145	12
5	1
0	0
17	2
0	2
0	0
39	1
2	0
0	2
1	0
17	12
62	4
15	1
0	0
13	9
7	0
3	0
0	0
0	0
2	0
5	0
2	0
16	1
2	0
1	0
16	1
1	0
56	5
14	0
19	3
2	0
38	1
43	2
0	0
2	0

Motor vehicle theft	Arson[1]
12	8
8	2
0	0
16	3
93	15
3	0
2	0
0	0
5	3
74	4
6	0
4	2
4	1
11	0
16	0
0	0
32	7
96	9
7	1
7	1
0	1
2	0
0	0
38	0
2	1
0	0
1	0
0	0
15	0
6	1
1	0
1	0
2	0
7	0
2	0
6	6
0	0
140	0
4	0
87	1
1	0
1	0
7	2
0	0
1	0
1	0
24	3
0	1
0	0

Motor vehicle theft	Arson[1]
682	9
0	0
27	20
4	1
3	2
807	51
11	6
113	8
7	0
3	0
0	0
16	0
2	0
1	0
55	6
2	0
1	0
0	0
2	0
15	9
3	0
2	0
1	0
145	2
32	5
4	2
10	11
15	1
13	0
0	0
11	0
0	0
24	0
5	0
0	0
31	1
2	1
0	0
1	0
1	0
15	0
3	9
15	1
0	0
9	0
12	0
12	1
0	2
9	7

Motor vehicle theft	Arson[1]
1	1
1	1
0	0
1	2
28	1
35	2
37	2
1	2
13	4
4	0
4	0
0	0
3	0
0	0
0	0
1	0
7	0
9	0
26	3
23	0
0	0
12	2
3	0
32	6
1	2
2	1
26	4
13	3
23	3
2	0
1	0
4	1
8	0
8	3
0	0
14	1
4	0
0	0
5	0
0	0
14	0
8	0
22	1
4	5
4	0
3	1
9	0
59	6
0	1

Motor vehicle theft	Arson[1]
3,620	51
120	10
2	0
1	1
5	0
0	0
1	0
20	2
121	5
63	1
1	1
1	0
3	0
1	3
33	2
0	0
1	0
1	0
16	0
1	1
2	4
5	1
0	0
1	3
20	7
3	0
0	0
61	3
0	0
0	0
240	1
0	0
2	2
9	1
46	4
1	0
27	0
143	0
701	15
11	0
2	0
5	0
30	4
0	0
87	4
8	1
17	3
3	0
110	0

Motor vehicle theft	Arson[1]
12	4
0	0
4	9
0	0
53	2
4	1
130	9
5	1
33	5
2	0
1	0
5	0
5	0
0	0
5	5
2	0
11	1
38	2
7	2
4	0
2	1
8	0
3	1
8	1
11	0
9	1
0	1
1	1
3	0
1	0
7	0
0	0
0	0
4	1
6	0
4	0
7	1
0	0
2	0
48	7
6	0
6	0
0	2
19	1
14	1
11	0
2	0
5	7
52	1

Motor vehicle theft	Arson[1]
7	0
0	0
0	0
3	3
15	1
2	0
22	0
0	0
3	0
11	0
3	1
12	0
7	1
0	0
24	0
10	0
0	0
31	1
30	2
6	2
5	1
1	0
1	2
15	2
4	0
1	0
0	0
8	0
1	0
2	0
6	2
4	0
1	0
2	0
0	1
24	9
6	0
4	0
1	1
15	0
28	7
31	0
362	45
4	1
3	1
152	3
116	3
4	0
3	1

Motor vehicle theft	Arson[1]
6	0
8	0
76	7
22	3
0	0
6	2
14	0
3	2
0	0
1	0
0	0
44	10
3	2
2	0
3	0
4	1
61	0
29	1
2	1
4	0
2	0
3	1
2	0
25	2
9	0
3	0
8	9
85	7
48	3
10	1
0	0
9	0
12	0
3	0
6	0
1	0
35	7
1	0
49	7
125	3
19	3
1	1
1	0
13	0
11	1
10	0
2	0
2	0

Motor vehicle theft	Arson[1]
2	1
35	5
2,773	121
0	0
5	7
1	0
42	2
18	0
11	4
6	1
58	10
1	0
1	0
62	25
0	0
27	0
2	0
27	13
0	0
1	0
89	20
118	6
25	0
60	7
0	0
4	4
190	11
27	7
2	0
0	0
5	3
59	1
17	0
6	0
9	0
10	0
15	1
109	12
70	13
6	1
5	0
4	0
176	9
3	0
30	4
14	2
25	1
12	0

Motor vehicle theft	Arson[1]
0	0
1	0
0	0
6	1
4	0
0	0
0	0
0	0
0	0
229	16
0	0
0	0
0	0
0	0
47	7
0	0
7	0
12	7
1	0
1	0
0	0
0	0
14	4
0	0
6	0
2	0
9	3
3	3
15	3
3	0
9	1
18	2
0	1
0	0
0	0
0	0
1	0
0	0
24	0
5	0
3	0
0	0
1	0
1,430	90
0	0
2	0
5	0
5	3

Motor vehicle theft	Arson[1]
7	1
0	0
1	0
0	0
6	2
0	0
2	0
0	1
0	0
0	0
2	0
0	0
4	0
96	7
1	0
1	0
3	0
12	3
32	2
0	0
0	0
3	0
2	1
15	1
0	0
43	9
0	0
0	0
2	2
0	0
17	2
5	0
2	0
0	0
1	0
2	0
9	3
0	0
19	6
0	0
2	0
1	0
0	0
9	1
0	0
7	0
6	0
5	3
12	1

Motor vehicle theft	Arson[1]
4	0
3	0
8	1
0	0
3	0
4	0
0	0
25	3
2	0
0	0
10	1
12	0
11	4
2	0
9	1
3	1
1	0
11	1
1	0
2	1
0	0
4	0
101	4
0	0
7	2
10	0
21	1
1	1
0	2
8	1
0	0
6	0
0	0
3	0
4	0
25	1
3	0
1	0
1	1
0	1
0	0
60	3
17	2
0	0
5	0
1	0
1	0
0	0
9	0

Motor vehicle theft	Arson[1]
30	8
5	2
0	0
0	0
0	0
10	1
3	0
20	3
134	8
0	1
0	0
4	0
0	0
3	0
6	0
6	0
5	1
0	0
0	0
6	0
6	1
0	0
0	0
50	1
0	0
28	0
44	9
7	1
3	1
0	0
11	0
0	0
6	0
1	0
18	4
34	0
2	0
3	0
5	0
4	5
2	0
0	0
1	0
19	3
4	1
1	3
0	0
1	0
2	1

Motor vehicle theft	Arson[1]
23	6
3	0
7	1
3	0
0	0
5	0
0	0
2	0
4	0
0	0
8	0
0	0
3	0
5	3
6	0
8	0
1	1
0	0
28	3
8	0
0	0
5	1
2	0
0	0
2	0
5	4
2	0
2	0
178	5
2	0
1	3
1	0
66	14
32	1
3	0
7	0
6	0
55	2
15	1
10,319	
0	1
134	18
6	0
0	0
2	0
4	0
11	0
0	0
5	1

Motor vehicle theft	Arson[1]
14	2
0	0
7	0
2	0
0	0
14	1
7	1
2	0
0	0
4	1
4	2
10	4
18	0
10	0
0	0
1	0
3	1
13	2
0	0
0	0
5	0
3	1
2	0
1	0
2	1
0	0
0	0
0	0
5	1
12	6
0	0
0	0
28	0
0	0
5	3
0	0
3	0
53	4
8	3
0	0
0	0
3	0
16	0
0	0
19	0
0	0
28	0
752	176
14	0

Motor vehicle theft	Arson[1]
26	5
0	0
17	2
0	0
2	0
0	0
6	1
1	0
5	0
9	0
4	5
5	0
184	35
3	0
0	0
6	3
0	1
3	0
2	1
3	0
0	0
0	0
0	0
3	1
0	1
0	0
2	10
0	0
1	0
10	1
55	3
4	0
0	2
0	1
2	1
26	0
0	0
0	0
1	0
3	0
6	0
367	54
2	1
5	2
9	0
54	0
145	10
0	0
1	1

Motor vehicle theft	Arson[1]
0	0
0	0
10	0
81	10
0	0
5	2
2	0
13	2
2	0
1	0
0	0
3	0
6	0
1	1
23	10
17	1
1	0
0	0
0	0
11	0
0	0
2	1
0	0
1	0
1	0
28	1
0	4
29	0
0	0
5	0
1	0
3	0
3	0
244	27
1	1
0	0
0	0
8	2
4	1
48	6
21	4
64	2
290	8
2	0
10	1
0	1
0	0
5	0

Motor vehicle theft	Arson[1]
0	1
20	2
19	0
3	0
2	0
12	0
2	0
9	1
6	1
4	0
126	9
10	0
0	0
13	0
16	1
1	3
64	2
2	0
2	0
50	4
2,665	247
9	0
4	1
3	0
11	4
1	0
13	0
1	0
1	1
167	22
18	4
3	0
3	0
3	0
1	0
0	0
718	28
46	0
10	2
20	3
6	0
6	0
3	1
4	1
6	2
3	0
5	4
722	53
6	0

Motor vehicle theft	Arson[1]
5	1
5	0
32	1
1	0
6	0
128	5
24	2
8	0
800	87
15	15
4	0
44	7
57	3
0	0
121	13
0	0
220	36
9	0
0	0
4	0
6	1
35	7
5	0
19	7
0	0
4	0
70	8
1	0
30	8
7	0
45	12
2	0
15	3
1	0
3	1
41	10
13	0
45	2
30	5
2	0
8	0
18	1
7	0
175	12
2	1
2	0
1	1
8	1
1	0

Motor vehicle theft	Arson[1]
17	4
6	1
40	9
7	2
3	0
0	0
0	0
25	12
6	0
46	9
11	1
18	4
14	1
27	4
18	1
13	3
3	0
3	1
3	4
54	1
2	1
8	0
5	0
28	5
0	0
5	0
1	0
65	1
2	0
3	2
27	0
870	63
2	0
5	0
23	1
26	5
1	0
21	4
0	0
19	2
1	0
170	13
0	0
2	0
15	4
5	0
96	7
1	0
22	0

Motor vehicle theft	Arson[1]
15	3
3	2
42	7
14	2
17	13
10	2
3	0
4	5
4	0
4	0
7	0
0	2
1	0
0	1
1	0
1	0
3	0
8	3
11	0
2	1
35	6
0	0
0	1
6	0
1	0
2	0
5	1
0	0
4	0
11	2
4	1
11	3
0	1
2	0
1	0
1	0
7	1
15	2
478	13
96	4
2	1
642	105
3	1
2	1
2	0
0	0
1	0
1	0

Motor vehicle theft	Arson[1]
76	5
0	0
0	0
2	0
2	0
20	1
21	5
0	2
167	14
0	0
9	0
77	5
1	0
28	4
0	0
0	0
1	0
3	0
18	1
0	0
47	1
0	0
1	0
0	0
1	0
2	0
0	0
0	0
0	0
6	0
6	0
7	0
26	6
30	3
0	0
749	106
24	22
0	0
0	0
4	0
0	0
2	0
10	2
3	0
12	1
5	1
75	0
4	1

Motor vehicle theft	Arson[1]
29	9
1	1
2	0
32	3
3	0
29	1
52	0
0	1
19	0
1	0
1	0
5	2
2	0
0	0
16	2
2	1
6	0
0	0
80	11
17	2
0	0
1	0
10	0
1	0
11	0
38	0
3	0
13	0
0	2
2	0
0	0
16	0
2	0
23	0
2	2
1	1
269	46
0	0
2	0
10	5
21	2
3	1
0	0
9	0
42	8
1,615	199
17	7
14	3
1	0

Motor vehicle theft	Arson[1]
1	0
3,503	378
87	0
0	0
28	1
0	0
0	0
4,150	403
26	1
1	0
1	1
0	0
2	0
0	0
48	4
2	1
671	203
5	1
5	3
23	8
9	1
3	0
2	0
5	1
19	8
7	2
7	0
0	0
103	13
12	0
5	0
25	5
53	2
10	0
5	3
29	3
1	0
13	3
0	1
0	0
5	0
26	1
26	7
5	2
0	0
1	0
1	0
1	1
2	0

Motor vehicle theft	Arson[1]
0	0
20	3
2	1
2	0
11	3
3	2
2	1
0	1
0	0
23	6
46	10
3	0
205	52
3	0
1	0
14	6
2	0
1	0
2	0
1	0
27	7
1	2
2	0
7	1
5	0
2	1
3	0
0	0
2	1
5	0
1	1
2	0
37	2
3	0
2	1
24	19
6	2
51	11
0	0
1	0
3	2
26	1
54	7
8	0
7	3
2	0
102	32
0	0
3	0

Motor vehicle theft	Arson[1]
15	2
10	0
8	0
115	44
1	0
1	0
3	2
3	1
12	1
24	2
62	15
2	0
5	2
48	7
11	3
5	0
22	6
15	1
2	2
3	0
65	5
2	0
29	3
9	5
45	4
0	1
0	0
145	6
2	0
2	0
1	1
3	0
7	1
5	0
3	2
14	3
1	0
1	0
14	0
0	0
6	1
1	0
6	1
0	0
70	23
11	0
3	1
2	0
2	0

Motor vehicle theft	Arson[1]
0	0
1	2
2	0
0	1
0	0
81	1
6	3
21	1
1	0
10	1
10	2
8	1
16	1
39	0
3	3
3	1
4	0
1	0
26	5
3	1
5	1
16	9
12	9
29	5
1	1
9	0
0	1
1	1
3	0
4	0
1	3
26	3
0	0
1	1
1	0
3	0
3	0
56	2
0	0
0	0
19	1
0	0
43	5
5	1
5	0
0	0
2	1
40	12
1	0

Motor vehicle theft	Arson[1]
0	0
1	0
3	1
3	3
1	1
4	0
43	0
17	0
5	0
2	1
9	2
23	10
9	2
5	2
1	1
10	0
0	0
2	0
1	0
29	2
0	0
0	0
1	0
10	0
31	3
270	28
37	3
1	1
18	6
4	0
0	0
36	3
9	1
0	0
2	1
0	0
21	1
21	3
6	1
5	1
0	0
17	2
10	2
3	0
1,197	492
98	11
8	2
8	1
6	5

Motor vehicle theft	Arson[1]
22	13
9	2
11	2
0	0
7	0
26	3
8	4
11	3
0	1
9	1
0	0
0	1
3	0
1	0
146	4
53	4
2	0
8	1
2	4
0	0
1	0
0	1
35	3
26	11
10	7
4	0
1	0
1	0
0	0
2	0
69	0
18	4
2	1
11	0
6	1
4	1
6	1
2	0
17	12
8	4
1	0
24	0
4	0
524	242
53	26
0	0
28	1
0	0

Motor vehicle theft	Arson[1]
15	4
3	1
18	2
7	0
1	0
46	6
1	0
2	2
59	13
4	0
58	0
25	1
4	4
22	1
1	0
0	0
3	0
124	16
21	4
0	0
0	0
0	1
1	0
28	1
1	0
14	0
0	0
1	0
24	5
7	1
4	0
28	2
1	0
9	2
11	3
2	1
2	0
23	4
0	0
13	1
5	0
97	5
0	0
1	0
5	0
48	4
30	3
45	3
1	6

Motor vehicle theft	Arson[1]
15	7
65	7
5	0
4	0
4	0
0	0
5	2
3	1
5	0
16	1
0	0
8	0
14	1
13	1
1	0
15	1
10	2
4	1
18	1
3	0
2	0
7	2
0	1
4	0
0	0
1	0
2	0
4	0
9	0
1	0
16	0
3	0
1	1
3	0
4	0
218	42
3	2
4	0
3	1
8	1
1	0
4	0
3	0
3	0
3	0
0	0
26	0
0	0
14	0

Motor vehicle theft	Arson[1]
0	0
1	0
17	4
168	19
1	0
144	1
1	0
2	0
0	1
3	1
85	29
16	3
27	0
0	0
6	0
3	0
2	0
112	6
0	1
0	1
8	0
3,602	119
25	9
2	0
38	5
11	1
5	0
2	0
2	0
6	0
2	0
2	1
35	26
0	1
33	3
5	0
15	1
7	0
1	0
4	0
13	0
57	1
51	3
2	0
0	0
33	1
138	0
17	1
0	0

Motor vehicle theft	Arson[1]
0	0
11	3
2	0
2	0
88	11
3	0
3	0
5	1
0	0
14	2
2	2
15	0
19	2
1	0
4	0
0	0
2,352	203
9	3
0	0
0	0
1	0
12	3
15	4
0	0
4	0
42	2
2	1
5	0
0	0
8	0
2	0
4	2
2	0
10	0
1	1
4	1
16	1
1	0
2	0
3	0
16	2
1	0
60	25
1	0
24	9
29	5
3	1
1	0

Motor vehicle theft	Arson[1]
9	1
3	0
136	24
72	19
0	0
0	1
2	0
11	4
0	2
1	0
15	2
0	0
5	0
0	0
24	3
22	9
36	23
40	7
32	3
6	4
4	1
1	1
3	1
599	98
11	5
23	6
0	0
12	0
30	8
0	0
667	33
21	2
1	1
1	1
13	7
0	0
2	2
1	1
43	6
1	0
58	4
10	3
16	12
1	0
9	2
12	4
29	1
0	0
54	9

Motor vehicle theft	Arson[1]
162	36
29	1
10	0
3	2
2	3
1	1
31	13
16	1
3	0
24	3
66	0
35	3
2	0
8	0
1	0
3,245	214
0	0
4	0
53	30
2	0
0	0
5	0
39	16
427	36
22	1
8	0
4	1
16	4
25	4
14	14
0	0
9	0
9	1
3	0
31	2
68	4
10	0
4	1
40	4
1	3
7	0
8	4
9	1
22	0
6	4
70	11
2	0
32	6

Motor vehicle theft	Arson[1]
0	0
2	0
3	0
2	0
0	0
0	1
0	0
16	0
0	0
417	29
37	10
5	0
8	5
0	2
0	0
0	0
16	1
2	1
1	0
0	0
8	0
0	0
1	0
2	0
1	0
0	0
0	0
3	0
11	0
1	0
0	0
2	1
1	0
4	0
18	1
0	0
0	1
0	0
0	0
0	0
11	1
0	0
0	0
0	0
0	0
124	47
13	3
1	0
5	0

Motor vehicle theft	Arson[1]
0	0
12	2
0	0
5	2
0	0
1	0
4	0
102	12
16	4
0	0
5	1
0	0
0	0
1	1
6	0
4	0
1	0
10	2
0	0
0	0
5	0
0	0
1	0
0	0
12	4
4	2
1	0
12	0
1	0
14	2
2	0
2	0
0	0
21	2
125	14
1	0
6	4
2	0
2	0
2	1
5	0
1	1
4	0
10	2
7	1
8	2
0	0
3	0
1	0

Motor vehicle theft	Arson[1]
10	0
4	0
0	1
1	0
0	0
1	0
9	2
3	4
0	0
10	0
1	0
4	0
4	2
0	0
4	1
3	1
4	0
1	0
0	0
2	0
1	0
20	1
1	0
8	1
1	0
47	3
0	0
148	33
11	3
4	0
0	0
0	0
8	0
0	0
2	0
3	1
0	0
2	0
0	0
9	2
36	0
0	0
4	0
1	0
3	0
18	1
9	2
8	1
0	0

Motor vehicle theft	Arson[1]
0	0
0	0
0	1
0	0
12	0
1	2
5	0
0	0
0	0
0	0
1	0
5	1
0	0
6	2
0	0
4	0
0	0
2	1
0	0
0	1
0	0
0	0
3	1
12	0
0	1
0	3
0	0
0	1
0	0
2	2
52	0
13	0
0	0
4	0
0	0
0	0
1	1
0	0
25	2
4	1
0	0
4	4
6	1
2	0
4	1
12	0
4	0
6	0
0	0

Motor vehicle theft	Arson[1]
12	1
0	0
1	0
0	0
8	1
0	0
26	21
9	0
1	0
0	0
0	0
3	0
0	0
2	0
10	1
0	0
0	0
2	0
8	0
1	0
5	0
0	0
6	3
17	1
2	1
2	0
18	0
0	0
44	6
5	0
2	0
1	2
1	0
2	0
1	0
3	1
0	0
1	0
0	0
2	0
2	0
2	0
5	1
3	0
0	0
0	0
6	1
5	0
4	0

Motor vehicle theft	Arson[1]
3	3
0	0
3	1
0	0
5	2
4	1
139	46
6	0
0	0
0	0
6	0
14	1
2	0
0	0
0	0
7	1
2	0
40	3
3	0
0	0
5	0
0	0
1	0
8	0
19	1
0	0
1	0
2	0
2	0
1	0
0	0
0	0
4	1
0	0
2	0
1	2
3	3
2	1
2	0
4	0
1	0
1	0
0	0
0	0
0	0
0	0
1	3
0	0
0	0

Motor vehicle theft	Arson[1]
3	1
9	0
3	0
4	1
0	1
7	4
0	0
2	2
0	0
3	1
0	0
5	0
0	0
6	0
3	0
11	10
11	5
2	0
0	0
7	1
7	0
192	28
0	0
3	0
2	2
4	0
9	6
2	2
0	0
54	0
0	0
0	0
3	1
2	0
4	1
6	4
0	0
4	4
6	2
2	1
0	0
23	0
2	2
0	0
0	0
0	0
11	1
16	2
0	0

Motor vehicle theft	Arson[1]
2	0
0	0
4	0
5	0
1	0
7	3
2	0
0	0
1	1
0	0
0	0
1	0
0	0
0	0
0	1
4	0
0	0
6	1
0	0
0	0
2	0
5	0
0	1
28	15
0	0
7	2
3	1
0	0
12	0
3	2
2	0
3	1
0	0
0	0
0	0
5	0
0	0
0	0
0	0
114	35
16	2
0	0
0	0
10	1
13	0
1	1
7	1
1	0
4	1

Motor vehicle theft	Arson[1]
4	0
0	0
8	2
0	0
36	3
2	0
9	2
5	1
0	0
1	0
9	0
0	1
1	0
6	0
0	0
0	0
1	2
0	0
1	4
0	0
5	1
0	0
3	3
8	0
1	0
5	0
0	0
6	0
23	2
1	1
7	1
31	6
4	1
19	2
0	0
2	1
10	6
4	4
10	0
2	0
0	0
1	0
8	0
0	0
0	0
3	1
0	0
1	0
2	0

Motor vehicle theft	Arson[1]
12	2
3	0
0	0
8	2
0	0
1	5
0	1
0	0
0	0
2	0
8	0
1	1
0	0
8	1
0	0
1	1
2	0
40	16
21	1
1	0
0	2
5	4
3	0
0	1
1	0
2	1
3	0
10	0
2	1
56	2
6	1
0	0
0	0
0	2
29	1
0	0
1	0
0	0
17	2
1	1
1	5
1	1
0	0
0	0
0	2
4	5
0	0
5	0
6	3

Motor vehicle theft	Arson[1]
4	1
19	1
0	0
11	2
0	0
2	1
10	0
0	0
6	2
1	0
22	0
0	0
0	0
3	2
1	0
0	0
0	0
0	0
0	2
11	0
29	0
1	0
1	0
5	1
3	0
37	1
0	0
10	0
2	0
2	0
22	2
2	0
1	0
2	2
0	0
2	0
8	1
2	0
0	0
0	0
11	1
4	1
1	0
6	0
59	27
0	0
2	0
0	0
12	0

Motor vehicle theft	Arson[1]
5	3
5	0
0	0
20	0
1	0
0	0
4	0
0	0
1	2
5	3
7	0
1	0
131	8
5	1
4	0
2	0
3	1
9	0
4	1
1	0
7	2
4	2
5	0
3	0
55	6
2	0
5	1
10	1
0	0
7	1
1	0
3	0
1	1
5	0
2	0
0	0
6	4
4	0
1	0
2	0
1	0
6	0
3	0
1	0
2	0
5	0
9	3
5	0
5	0

Motor vehicle theft	Arson[1]
0	0
0	0
0	0
0	0
3	0
0	1
4	0
15	2
4	0
0	1
7	0
0	0
0	0
4	1
3	0
3	0
1	1
49	4
6	1
2	1
18	0
1	0
2	1
6	1
3	1
3	0
2	0
1	0
7,068	
3	2
0	0
5	0
657	154
10	1
4	0
7	1
2	0
0	0
8	0
29	1
29	7
11	0
0	0
0	2
0	0
0	0
0	0
0	0
4	1

Motor vehicle theft	Arson[1]
56	10
6	0
0	0
1	3
6	0
3	8
0	0
0	0
8	0
1	0
0	0
655	29
0	0
1	0
1	0
0	0
6	1
3	1
5	1
4	0
31	2
0	0
0	0
0	1
4	0
11	1
7	1
1	0
4	0
2	1
0	0
14	0
10	0
0	0
2	1
1	0
0	0
0	0
0	0
8	0
0	0
0	0
13	2
0	0
0	0
7	0
0	0
0	0
116	26

Motor vehicle theft	Arson[1]
9	2
0	0
0	0
0	0
3	2
1	1
0	0
15	9
10	0
10	0
1	0
4	1
10	0
9	0
5	0
0	0
0	0
2	0
2	0
6	1
3	0
0	0
1	0
0	0
0	0
0	0
4	0
7	0
3	0
2	0
0	0
0	1
2	1
5	0
0	0
0	0
2	7
0	1
0	0
0	0
1	1
0	0
0	0
1	0
2	0
6	0
2	1
0	0
16	4

Motor vehicle theft	Arson[1]
0	0
5	1
0	0
0	0
0	0
15	1
16	1
5	2
12	0
14	2
2	0
0	0
12	18
0	0
0	0
17	1
2	1
4	0
0	0
1	0
0	0
1	3
38	3
2	0
0	0
0	0
1	0
0	0
0	0
13	8
1	0
2	1
9	1
0	0
1	0
14	6
0	0
13	1
4	0
0	0
7	2
3	0
0	0
3	1
2	2
5	0
7	0
0	0
3	0

Motor vehicle theft	Arson[1]
0	0
23	0
3	0
4	1
1	0
0	0
0	0
3	0
0	0
1	0
4	1
3	0
1	1
1	0
0	1
0	0
35	0
1	2
0	0
6	0
6	1
0	0
18	2
130	8
3	1
2	1
4	0
1	0
44	1
14	1
4	3
0	0
3	0
8	0
1	0
6	0
1	0
0	0
0	0
3	1
1	0
0	0
0	0
1	0
2	0
0	0
0	0
1	0
20	8

Motor vehicle theft	Arson[1]
5	1
3	0
1	1
4	1
50	1
0	1
14	1
2	0
1	0
0	0
0	1
5	0
1	0
1	0
3	1
2	0
8	1
0	0
0	0
2	0
26	0
1	3
2	0
1	0
5	0
5	0
2	0
0	0
0	0
12	0
2	0
6	0
7	2
2	3
3	0
6	1
0	0
1	0
16	1
1	1
1	0
0	0
15	0
1	0
15	1
0	0
1	0
1	0
1	1

Motor vehicle theft	Arson[1]
4	2
12	1
1	0
1	0
6	0
12	1
7	0
2	0
14	1
1	0
6	0
1	0
0	1
29	6
1	0
8	0
3	0
1	0
13	0
0	0
89	8
6	2
63	11
4	0
0	0
34	19
1	0
10	2
6	1
5	0
0	0
0	0
0	0
0	0
0	0
1	0
8	1
0	0
35	1
186	3
41	4
0	0
1	0
0	3
7	3
8	0
10	2
70	7

Motor vehicle theft	Arson[1]
3	2
33	14
180	12
27	3
6	1
57	14
2	0
4	1
5	1
1	2
50	5
22	2
1	0
6	3
9	0
43	18
1	0
13	6
44	4
6	0
229	31
11	7
1,117	36
2	1
5	2
18	4
12	3
21	1
7	2
110	21
15	1
4	0
40	14
90	9
12	1
45	0
8	0
116	5
8	1
5	2
3	1
9	0
20	2
12	0
13	3
9	0
5	0
7	0

Motor vehicle theft	Arson[1]
21	4
1	0
6	0
1	0
21	1
59	2
8	1
2	0
229	3
12	0
4	0
13	3
1	0
26	0
10	3
1	0
7	0
671	11
46	2
0	0
0	0
7	1
22	1
11	0
16	4
0	0
11	0
47	3
2	0
0	1
1	0
2	0
0	0
4	1
1	0
0	1
130	5
6	1
26	0
2	2
24	2
16	0
46	3
20	4
7	1
2	0
169	7
77	4
64	4

Motor vehicle theft	Arson[1]
3	0
29	3
16	2
6	0
30	4
0	0
4	0
19	0
6	1
13	0
4	0
11	0
0	0
0	0
4	0
11	1
14	4
1	0
3	0
25	7
4	2
6	3
19	0
19	0
7	0
12	0
4	0
7	0
21	6
37	2
0	1
2	1
1	0
35	0
45	0
9	3
301	5
8	0
2	0
0	0
6	0
1	0
63	2
525	20
154	3
38	6
4	2
4	1
1	0

Motor vehicle theft	Arson[1]
0	0
10	2
1	0
16	1
0	0
6	1
145	9
3	0
4	0
0	0
5	5
23	2
8	0
201	14
6	0
2	0
1	1
2	0
2	1
80	4
108	10
42	1
2	0
2	0
19	0
4	0
0	0
17	4
4	1
8	1
28	2
6	0
5	3
61	1
3	0
0	0
0	0
12	3
4	1
9	3
5	1
10	0
15	2
38	5
0	0
1	0
6	0
4	0

Motor vehicle theft	Arson[1]
2	0
0	0
4	0
0	0
1	0
3	0
0	0
0	0
0	0
0	0
6	0
0	0
0	0
0	0
1	0
0	0
0	0
0	0
0	0
0	0
2	0
1	0
0	0
0	0
2	0
0	0
0	0
0	0
0	0
19	0
1	0
0	0
23	1
127	8
0	0
0	0
0	0
228	25
6	0
16	1
0	0
5	1
4	0
0	0
0	0
0	0
0	0
2	0
36	1

Motor vehicle theft	Arson[1]
0	0
0	0
2	0
14	0
2	0
0	0
3	2
1	0
9	0
45	1
7	0
4	0
0	0
53	1
4	0
5	0
0	1
3	1
1	0
0	0
2	0
0	2
2	0
0	0
1	0
14	2
1	0
43	5
21	1
2	0
1	0
0	0
7	1
4	0
10	1
0	0
6	0
1	0
2	0
825	7
7	1
0	0
204	24
74	5
1	0
20	1
7	0
39	0

Motor vehicle theft	Arson[1]
0	0
49	7
68	5
2	0
0	0
1	0
12	0
0	2
1	0
63	2
0	0
0	0
0	0
2	1
10	1
1	0
0	0
5	2
27	0
3	0
2	0
12	1
4	0
48	3
0	0
62	2
14	1
1	0
1	0
1	0
3	0
2	0
0	0
4	0
2	1
14	2
30	8
0	0
1	0
0	0
14	2
0	0
3	0
10	5
12	1
2	0
2	0
45	2
3	0

Motor vehicle theft	Arson[1]
0	0
1	0
8	2
33	0
2	0
2	0
16	5
5	0
45	11
0	0
0	0
4	2
1	0
0	0
17	2
2	0
1	0
3	0
244	11
2	1
4	0
16	2
8	2
90	15
4	0
2	0
3	0
98	15
4	0
0	0
810	51
4	0
37	2
3	2
8	1
44	2
38	4
61	4
20	6
12	2
17	6
3	0
0	1
3	0
6	0
0	0
16	2
16	0
5	0

Motor vehicle theft	Arson[1]
31	0
1	0
1	0
5	0
0	1
3	0
33	0
1	1
3,930	328
0	0
11	0
3	1
24	0
0	0
3	0
3	1
83	7
1	0
4	0
3	0
12	1
12	0
5	0
156	15
1,905	80
3	1
1	0
1	0
0	0
31	0
0	0
1	0
2	0
0	0
0	0
42	4
3	0
8	0
7	0
6	0
0	0
1	0
38	3
3	0
1	0
0	0
4	0
2	0
10	1

Motor vehicle theft	Arson[1]
0	0
11	1
2	1
29	8
0	0
0	0
3	0
13	0
14	2
11	2
0	0
0	0
2	0
0	0
28	1
0	0
3	0
69	0
1	1
1	0
32	4
0	0
9	2
32	10
0	0
40	0
4	0
0	0
5	0
4	0
16	2
1	0
0	0
33	8
5	0
2	1
1	0
19	0
9	0
0	0
0	0
0	0
2	0
1	0
6	3
1	0
0	0
1	0
21	3

Motor vehicle theft	Arson[1]
1	0
17	7
3	0
0	0
0	0
0	0
1	1
2	0
1	0
4	0
2	0
11	1
4	0
3	0
5	1
8	2
1	2
6	0
3	0
182	26
106	0
145	9
5	0
37	14
64	0
0	1
1	0
42	4
6	0
26	2
647	55
8	2
16	1
8	1
4	1
2	2
13	3
0	1
5	1
3	0
1,245	48
0	0
36	3
15	0
2,250	122
20	2
1	0
135	2

Motor vehicle theft	Arson[1]
22	1
4	0
2	0
11	2
6	1
0	0
320	7
289	48
98	4
2	0
8	3
15	0
32	4
4	0
9	4
24	4
0	0
3	0
0	0
47	1
1	0
1	0
0	0
5	0
4	1
2	0
10	1
34	0
0	1
18	0
0	1
1	0
5	0
0	3
0	0
22	1
6	0
4	0
6	1
1	0
11	0
246	26
11	2
4	0
125	59
1	1
1	0
2	0
43	1

Motor vehicle theft	Arson[1]
9	1
2	0
3	0
1	0
1	1
1	1
8	0
2	0
357	13
4	0
9	0
0	0
99	4
27	4
2	0
14	2
2	0
3	0
5	1
2	0
0	0
58	3
27	1
0	0
1	0
10	3
6	0
13	2
0	0
20	4
89	0
7	0
1	0
1	2
3	4
3	1
5	2
13	1
135	0
16	3
49	1
14	14
21	3
448	105
1	0
67	3
3	0
4	0
1	5

Motor vehicle theft	Arson[1]
8	0
0	0
0	0
10	1
0	1
7	0
3	1
7	1
8,384	642
4	0
1	0
17	0
10	1
35	1
0	0
0	0
25	6
36	3
157	21
3	1
125	6
5	0
1	0
32	1
4	0
4	0
67	12
0	0
1	0
1	0
14	2
126	2
0	0
28	6
3	0
8	1
0	1
2	0
3	1
294	19
3	1
20	4
1	0
14	0
1,552	101
13	1
38	3
137	2
8	1

Motor vehicle theft	Arson[1]
0	1
1	0
1	9
135	4
4	0
0	0
2	1
0	0
0	0
3	0
46	1
3	1
26	0
22	0
13	0
2,464	138
0	0
6	0
20	2
5	0
17	2
4	1
123	12
35	1
28	0
250	291
0	0
703	48
15	4
38	6
4	1
12	0
19	2
19	3
0	0
3	0
1	0
11	0
7	1
920	30
4	0
0	0
3	1
1	0
149	0
67	1
0	1
3	0
22	0

Motor vehicle theft	Arson[1]
2	1
4	0
3	0
1	0
4	0
155	10
2	2
25	3
180	32
0	0
1	2
5	2
0	1
4	2
3	0
9	0
2	0
1	2
8	3
29	8
26	2
12	1
6	0
28	2
10	0
3	0
1	0
7	0
26	2
0	0
3	0
7	2
0	0
23	0
3	0
12,817	865
4	0
1	0
5	0
3	0
152	2
0	1
46	0
79	0
28	0
4	1
2	0
13	1
3	0

Motor vehicle theft	Arson[1]
4	0
624	28
2	0
0	1
34	4
2	0
36	5
0	0
0	0
8	0
2	0
27	0
1	0
1	0
3	0
4	0
2	1
1	0
0	3
21	1
6	0
4	0
6	1
6	0
3	0
0	0
8	0
2	0
0	0
21	7
36	1
239	36
38	4
17	0
2	1
6	0
0	0
17	4
26	0
2	1
1	0
2	0
1	0
3	1
2	0
19	1
18	3
1	0
2	2

Motor vehicle theft	Arson[1]
8	0
12	0
27	3
9	3
5	0
54	7
903	72
1	0
3	0
0	0
77	0
7	0
61	0
14	3
382	2
0	0
30	0
8	0
2	0
9	0
12	2
22	0
7	3
1	1
18	4
4	1
0	0
360	30
2	1
0	2
4	3
0	0
506	54
73	5
12	3
5	0
1	1
2	0
10	1
3	0
13	0
8	0
66	5
9	3
15	1
3	3
65	8
0	1
0	0

Motor vehicle theft	Arson[1]
6	3
404	9
0	0
138	22
6	1
4	0
5	0
4	0
50	6
1	0
2	0
714	20
11	0
148	13
14	0
1	0
0	0
3	1
44	4
307	6
69	3
8	0
19	2
1	0
3	0
18	2
6	2
0	1
5	0
0	0
41	2
1	1
1	0
6	0
7	2
28	0
4	1
11	1
63	6
0	0
1	0
2	0
0	0
7	0
89	0
1	0
5	0
191	16
0	1

Motor vehicle theft	Arson[1]
1	0
4	1
2	1
0	0
49	15
0	1
2	0
0	0
3	0
0	0
6	2
22	5
1	0
11	1
3	0
20	0
47	0
3	0
7	0
46	0
2	0
372	15
83	2
4	0
4	0
2	0
7	0
6	3
49	4
297	14
3	0
5	0
4	0
28	4
386	10
25	1
0	0
0	0
14	0
165	56
11	1
11	1
13	3
16	1
2	4
0	2
5	0
2	0
1	0

Motor vehicle theft	Arson[1]
0	0
6	1
14	1
2	0
4	0
11	0
7	0
2	0
1	0
1	0
0	0
3	5
3	1
1	0
2	1
199	4
38	0
8	1
1	0
0	0
33	6
3	1
0	0
11	0
2	0
10	1
15	3
8	0
11	0
74	0
20	2
2	1
0	0
0	0
0	0
0	0
31	2
100	4
36	1
7	1
0	0
9	0
1	1
5	0
39	1
2	0
158	16
5,657	327
1	0

Motor vehicle theft	Arson[1]
68	8
2	2
1	0
6	0
114	1
73	1
1	1
6	1
2	1
14	1
1	0
26	6
3	1
12	0
54	0
2	0
9	0
28	4
6	0
5	0
5	0
0	0
0	0
3	0
1	0
6	0
36	13
6	1
3	0
4	0
7	0
23	0
61	8
4	0
1	0
1	1
4	0
103	0
12	2
15	0
0	0
0	0
4	1
4	0
1	1
62	0
2	0
4	0
4	0

Motor vehicle theft	Arson[1]
4	3
1	0
88	1
9	0
16	2
0	0
1	0
2	0
6	1
2	0
12	3
2	2
0	0
0	0
11	2
10	0
80	3
51	4
0	0
111	21
94	2
34	7
0	0
0	0
0	0
1	2
0	0
21	1
0	0
1	0
2	0
7	0
2	0
0	0
2	0
2	0
223	12
34	3
18	0
0	0
2	0
1	0
2	0
0	0
13	2
106	21
27	0
210	26
0	0

Motor vehicle theft	Arson[1]
8	1
6	1
0	0
30	0
47	3
30	1
53	1
2	0
222	6
1	0
7	2
1	0
9	0
0	0
5	0
9	0
3	0
11	3
1	1
19	0
1	0
33	1
5	0
1	0
287	29
9	3
3	0
4	0
6	1
12	0
0	0
1	0
3	0
4	0
0	0
5	0
0	0
35	1
2	0
2	0
27	2
0	0
3	0
63	1
0	0
24	0
33	3
9	0

Motor vehicle theft	Arson[1]
36	1
11	1
42	1
55	6
0	0
2	0
7	0
14	1
16	0
7	0
3	1
0	0
12	3
1	0
1	0
17	0
4	0
60	2
29	0
10	1
19	0
6	0
0	0
134	2
15	0
0	0
1	0
237	8
2	0
7	0
7	2
9	1
47	1
309	16
109	3
18	0
15	0
2	0
27	2
3	0
4	2
103	17
6	0
14	3
39	4
1	0
4	0
1,489	52
142	7

Motor vehicle theft	Arson[1]
7	0
6	0
1	0
36	1
19	3
247	4
15	5
2	0
21	1
77	5
1	0
6	0
7	0
225	10
69	13
5	0
11	2
11	0
0	0
14	0
224	14
613	13
19	1
4	1
5	0
0	0
24	5
0	0
1	0
3	1
20	0
0	0
1	0
0	0
11	4
6	0
14	0
2	0
3	0
4	0
0	0
3	1
2	1
9	0
6	2
1	0
0	0
2	0

Motor vehicle theft	Arson[1]
2	0
2	0
0	0
14	0
7	2
4	2
4	0
0	0
2	0
0	0
1	2
0	0
0	0
7	1
0	0
1	0
4	2
0	0
8	0
286	7
3	0
0	0
1	1
11	4
3	1
1	0
3	0
23	5
11	2
5	0
0	0
0	0
1	0
21	5
3	0
0	0
0	0
1	1
1	0
87	5
1	0
0	0
392	23
1	0
5	1
20	9
1	0
5	0

Motor vehicle theft	Arson[1]
0	0
3	0
27	7
10	1
1	0
17	3
0	0
65	13
1	0
0	0
3	1
1	0
4	0
13	2
1	0
35	2
23	0
4	1
13	6
31	1
0	0
20	5
11	0
2	0
0	0
0	0
0	0
1	1
1	0
1	1
345	24
36	11
0	0
0	0
13	0
4	0
0	1
104	7
5	0
0	0
0	0
1	0
1	0
2	1
2	2
0	0
32	3
2	0
0	0

Motor vehicle theft	Arson[1]
1	1
94	16
76	6
13	0
6	0
13	4
1	0
1	0
1	0
0	0
1	0
434	93
922	50
5	3
0	0
1	1
0	0
4	1
0	0
0	0
0	0
136	6
0	0
9	1
271	24
0	0
8	7
2	1
15	5
0	0
1	0
6	2
866	43
244	33
6	2
0	0
29	3
0	0
3	1
14	1
6	0
7	0
0	0
10	12
2	0
0	0
0	1
102	21
7	0

Motor vehicle theft	Arson[1]
1	0
1	0
0	0
14	1
3	6
650	133
8	1
0	0
1	0
24	8
1	0
1	0
0	0
10	0
23	1
2	2
5	2
8	1
60	7
13	0
8	1
19	5
95	0
2	0
570	23
6	3
32	3
207	31
133	6
3	0
2	0
34	5
74	10
109	15
7	0
5	2
6	1
375	14
38	2
15	4
0	0
4	0
65	8
39	2
20	1
5	0
7	4
8	0

Motor vehicle theft	Arson[1]
1	0
2	0
6	0
0	0
8	0
5	1
1	0
1	0
2	1
54	0
172	2
3	0
0	0
27	2
1	0
22	0
48	14
38	3
5	0
24	1
20	0
1,142	29
6	0
741	11
9	0
83	2
11	2
2	2
0	0
26	2
11	0
1	0
42	2
21	2
7	1
25	5
1	0
51	6
3	0
39	1
42	7
126	27
781	23
3	0
101	5
2	0
2	0
87	3
18	1

Motor vehicle theft	Arson[1]
85	8
273	10
2	0
8	0
1	0
158	17
1	0
159	1
15	8
250	9
5	0
1	0
10	3
45	0
24	2
74	0
6	6
2	0
85	4
1	0
51	8
63	8
4	0
52	2
7	0
19	1
9	1
15	3
13	4
4	0
3	3
0	0
150	5
8	1
5	0
9	6
36	0
31	0
1	0
118	27
45	3
38	2
17	2
3	1
13	0
17	1
283	11
47	0
1	1

Motor vehicle theft	Arson[1]
4	0
0	0
67	0
594	7
0	0
59	5
5	0
4	0
0	0
1	0
6	0
2	0
11	0
299	8
3,453	126
17	3
24	0
6	3
98	5
100	8
40	5
7	2
0	0
1	0
2,009	45
413	7
6	0
4	0
9	1
1	0
40	6
86	2
2,036	64
1	1
1	0
1	0
0	0
53	8
454	9
30	4
1	0
32	1
71	8
923	48
57	6
35	1
7	0
13	5
60	2

Motor vehicle theft	Arson[1]
5	1
6	1
6	0
0	0
0	0
2	0
20	2
14	1
0	0
590	37
0	0
17	0
11	1
1	1
44	10
0	0
0	0
12	4
2	1
5	3
1	0
19	8
11	2
0	0
7	1
17	6
6	0
1	0
4	0
8	2
8	1
39	7
0	0
2	0
22	3
16	2
3	0
2	0
10	0
11	0
0	0
4	0
3	3
31	1
2	0
3	0
7	4
0	0

Motor vehicle theft	Arson[1]
2	0
4	0
0	1
3	0
5	0
1	0
7	0
32	15
3	
15	
0	0
2	2
6	0
0	0
5	0
3	0
74	11
3	0
3	0
0	0
1	1
2	0
1	1
0	0
2	0
1	
16	
5	
10	1
7	0
2	0
8	
13	2
1	0
3	0
2	0
0	
1	
8	0
20	
0	0
0	0
6	0
1	
0	
1	0
0	
2	0

Motor vehicle theft	Arson[1]
4	0
0	
0	3
25	5
0	
0	0
1	
1	
2	
7	0
3	
1	
4	0
0	0
1	
2	0
3	5
54	8
4	
0	0
0	
1	0
0	
10	2
0	0
0	0
50	
28	1
0	0
5	3
0	0
1	1
6	1
16	
0	
2	0
2	0
8	
5	0
25	0
2	1
21	1
0	0
110	6
9	0
38	0
6	1
15	1
1	

Motor vehicle theft	Arson[1]
10	0
0	0
0	0
1	
4	1
1	
14	1
9	0
5	0
0	
2	0
48	12
5	2
0	0
7	0
127	9
0	0
2	0
2	0
1	0
78	5
0	0
4	
9	
0	1
0	
1	
3	0
1	0
365	30
16	2
0	0
9	0
1	0
0	0
3	
7	11
6	0
0	0
2	
4	0
9	4
23	1
7	1
4	1
4	4
11	1
5	
4,327	248

Motor vehicle theft	Arson[1]
0	0
3	1
0	0
0	
4	
7	0
0	0
0	
21	2
6	
8	0
1	1
0	0
3	0
2	0
0	0
3	0
5	0
0	0
2	0
0	0
0	
48	3
4	
6	
3	
1	0
6	0
2	0
0	0
42	6
0	
0	0
1	0
1	0
0	0
1	
2	0
0	0
5	0
1	0
1	0
6	
4	0
0	
1	
1	
156	
2	0

Motor vehicle theft	Arson[1]
4	0
8	1
0	0
3	0
9	5
0	0
1	
4	0
0	0
4	
0	0
14	0
0	0
8	
1	
1	2
3	0
10	5
0	
3	0
0	
1	0
11	5
12	0
0	0
3	0
11	
16	2
70	8
0	0
1	0
0	0
13	0
10	0
0	0
17	
11	0
0	0
3	0
0	0
1	1
3	1
0	
1	0
12	6
45	1
3	0
7	1
6	0

Motor vehicle theft	Arson[1]
26	6
0	0
51	
175	22
7	1
2	0
20	0
3	1
7	
0	0
4	1
0	0
0	0
3	0
20	2
0	0
0	0
0	0
2	0
6	1
89	22
85	15
2	2
0	0
10	0
23	1
4	0
19	6
0	0
8	1
1	0
2	0
0	0
0	0
8	0
0	0
10	1
33	4
0	1
1	0
6	0
0	1
0	0
0	1
3	0
7	0
15	0
26	1

Motor vehicle theft	Arson[1]
1	0
15	1
2	0
0	0
6	0
4	0
1	0

elines. Consequently,

Law Enforcement Officers Feloniously Killed

This page provides information about duly sworn law enforcement officers (who met certain other criteria such as having full arrest powers, ordinarily carrying a badge and gun, etc.) who were killed in the line of duty during 2009. These officers came from city, university and college, county, state, tribal, and federal agencies.

Overview

- In 2009, 48 law enforcement officers were feloniously killed in the line of duty.
- Thirty-two of the slain officers were employed by city police departments. Of these, nearly half (15) were with law enforcement agencies in cities with 250,000 or more inhabitants.
- Line-of-duty deaths occurred in 18 states and Puerto Rico. Twenty-one officers lost their lives in the South. Thirteen of the officers died in the West, 7 died in the Northeast, and 5 officers who were feloniously slain were employed in the Midwest.
- More information about these topics (including annual totals from 2000 to 2009) is provided in Tables 1, 2, 15, 16, 21, 22, 28, 29, and 30.

Victim profile

- The average age of the officers who were feloniously killed in 2009 was 38 years.
- The slain officers' average length of law enforcement service was 12 years.
- Of the 48 officers slain in 2009, 47 were male and 1 was female.
- Forty-two of the victim officers were white, 3 were black, 2 were American Indian/Alaskan Native, and 1 officer was Asian/Pacific Islander.

More information about this topic is provided in Tables 6, 7, 8, 9, 10, and 11.

Circumstances

- 15 officers died in ambush situations.
- 8 officers died from felonious attacks during arrest situations.
- 8 officers died during traffic pursuits/stops.
- 6 officers died answering disturbance calls.
- 5 officers died during tactical situations (barricaded offender, hostage taking, etc.).
- 4 officers died while investigating suspicious persons/circumstances.
- 2 officers were killed while transporting or maintaining custody of prisoners.

More information about this topic (including a breakdown of the types of circumstances in which officers were feloniously killed) is provided in Tables 19, 20, 21, 22, 23, 24, 25, 26, 31, 32, and 33.

Assignments

- 35 officers who were slain in 2009 were assigned to vehicle patrol.
- 2 of the slain officers were off duty but were acting in an official capacity.
- 11 officers were assigned to other duties, such as special assignments or undercover, when they were murdered.

More information about this topic is provided in Tables 15, 16, 17, 18, 23, 24, 25, and 26.

Weapons

- Most officers slain in 2009 (45 of the 48) were killed with firearms. Of those killed with firearms, 28 were killed with handguns. (A breakdown of the types of weapons used in these slayings is provided in Table 27.)
- 2 officers were killed with their own weapons.

- 9 officers attempted to use their weapons; 12 officers fired their weapons.
- 19 officers were slain with firearms when they were 0-5 feet from the offenders.

More information about this topic is provided in Tables 12, 13, 14, 27, 28, 29, 30, 31, 32, 33, 34, 35, and 36.

Body armor

- Most of the officers feloniously killed in 2009 (36 of the 48 officers) were wearing body armor at the time of their murders.
- Of the 33 officers who were wearing body armor and killed with firearms:

  12 suffered wounds to the front of the head.

  7 were wounded in the front upper torso.

  6 were shot in the neck/throat.

  5 were shot in the side of the head.

  2 were shot in the rear of the head.

  1 officer was shot in the back.

More information about this topic (including annual totals from 2000 to 2009) is provided in Tables 37, 38, 39, 40, and 41.

Months, days, and times of incidents

- More officers (8) died from felonious assaults that occurred in April than in any other month.
- 13 officers were involved in fatal assaults that occurred on Saturday, more than on any other day of the week.
- More officers (13) were fatally injured in assaults that happened from 8:01 p.m. to midnight than at any other time period.

More information about these topics (including annual totals from 2000 to 2009) is provided in Tables 3, 4, 5, 17, and 18.

Profile of alleged known assailants

In 2009, 41 alleged offenders were identified in connection with the 48 law enforcement officers feloniously killed. Of those offenders, the following characteristics are known:

- The average age of the alleged offenders was 32 years old.
- The average height was 5 feet 10 inches tall, and the average weight was 181 pounds.
- 39 of the alleged offenders were male; 2 were female.
- 24 of the alleged offenders were white and 17 were black.
- 33 of the 41 offenders had prior criminal arrests.
- 13 of the alleged offenders were under judicial supervision at the time of the incidents.
- 2 of the alleged offenders were intoxicated or under the influence of alcohol at the time of the fatal incidents.

More information about these topics is provided in Tables 42, 43, 44, 45, 46, and 47.

Summaries of Officers Feloniously Killed

Note: Occasionally, the Law Enforcement Officers Killed and Assaulted Program is unable to publish summaries concerning some officers who are feloniously killed in the line of duty. These situations may stem from insufficient information, gag orders that are issued by the courts, or other unusual circumstances that may exist. Although written summaries of the deaths of three officers who were killed in 2009 are not included in this publication, all available information is included where applicable in the data tables.

Alabama

At 5:45 p.m. on April 24, a chief investigator with the Headland Police Department was killed and a deputy sheriff with the Henry County Sheriff's Office was injured during a disturbance call that turned into an ambush. Earlier in the day, a woman had pulled her vehicle into a store's parking lot to get a signal to make a telephone call on her mobile phone. While she was sitting in her car, a man approached the automobile from the rear and fired a shot into the air from a shotgun he was carrying. The man told the woman to "keep her family close," that "bad things" were going to happen, and that she needed to leave his property. The woman called her husband, and when he got off work around 4 p.m., the pair returned to the store's parking lot and called police. A 38-year-old deputy sheriff, who had 14 years of law enforcement experience, and a reserve deputy were dispatched to the scene shortly before 5 p.m. When the deputy sheriff and reserve deputy arrived at the scene, the officers parked their police car near the home and exited the vehicle. The deputy sheriff went to the front of the home, and the reserve deputy went toward the rear of the vehicle. As the deputy sheriff approached the front door of the residence, the reserve deputy saw a man with a weapon come around the corner of the house. The reserve deputy yelled "gun," and the deputy sheriff tried to turn toward the vehicle for cover. The armed man fired three rounds from a 12-gauge semiautomatic shotgun at the deputy sheriff, striking him in the head, neck, chest, back, and hands. The reserve deputy radioed that an officer was down and that he needed assistance. A 38-year-old chief investigator with the Headland Police Department and his partner responded to the call and stopped in the parking lot of a nearby store. The chief investigator, who had more than 16 years of law enforcement experience, exited the vehicle, retrieved his service weapon, and attempted to verbally engage the suspect. However, before the chief investigator could issue any commands to the suspect, the man fired an unknown number of rounds from a .280-caliber semiautomatic rifle at the chief investigator, who was wearing body armor. The rounds struck the chief investigator in the front of the head. He was pronounced dead at the scene. His partner and responding officers from the Quitman County Sheriff's Office in Georgia and the Abbeville Police Department in Alabama engaged the 53-year-old suspect in a firefight, killing him. The suspect, who had a prior criminal record, may have had a mental disorder and had possibly stopped taking his medications. At the time of the publication, the injured deputy sheriff had not returned to duty.

‡

On September 24, just before 1 p.m., a 39-year-old deputy sheriff with the Lee County Sheriff's Office died from wounds incurred while performing a traffic stop. The deputy, with nearly 3 years of law enforcement experience, and his partner were on patrol when they spotted a vehicle with the driver behaving suspiciously. The deputies ran a check on the license plate and found that the license plate and vehicle information did not match. The deputy and a trainee partner, who was driving, pulled over the vehicle. The driver of the vehicle, the sole occupant, turned into the driveway of a residence, and the officers followed. Suddenly, the driver made a u-turn in the yard and attempted to pass the patrol car on the passenger side in order to flee. The deputy was stepping from the passenger side of the cruiser, and the suspect accelerated his vehicle, striking the victim deputy and pinning him under the vehicle. The victim deputy's partner drew her sidearm and fired two rounds, after which the man surrendered. The 37-year-old assailant, who had a prior criminal record and was on parole at the time of the incident, was taken into custody by the victim's partner and later charged with Capital Murder. The victim deputy was taken to a local hospital where he subsequently died.

‡

A 26-year-old police officer with the Mobile Police Department died from a gunshot wound sustained while investigating a disturbance call around 11:30 p.m. on June 2. The officer, with nearly 2 years of law enforcement experience, was off duty but encountered the disturbance at the apartment complex where he lived and where he also served as courtesy officer. In his official capacity, the officer investigated the dispute and initially dispersed the parties involved in the altercation. Shortly after the incident, one of the parties involved returned to the location of the dispute armed with a .380-caliber semiautomatic handgun. Witnesses reported that the individual seemed extremely agitated. The officer approached a vehicle in which one of the original parties involved in the dispute was sitting to ask them to leave the premises. As the officer approached the passenger side of the vehicle, the armed man, who was concealed on the other side of the vehicle, stood up and shot through the open windows of the vehicle, striking the officer in the upper torso/chest area. The 18-year-old alleged assailant then fled the scene in the vehicle. He was pursued by responding officers and was apprehended about 1 hour after the incident. The victim officer was rushed to a nearby hospital by emergency personnel where he succumbed to his injuries a few minutes after midnight on June 3. The alleged assailant was charged with Capital Murder, Altering the Identity of a Firearm, Third-Degree Receiving Stolen Property, and Second-Degree Possession of Marijuana.

‡

A 33-year-old police officer with the Pelham Police Department was fatally wounded during a traffic stop at 11:50 p.m. on December 3. The veteran officer, who had more than 10 years of law enforcement experience, stopped a driver for speeding in a construction zone. Approximately 10 minutes later, dispatch received a call reporting that an officer was lying on the road in that area. Dispatch attempted to contact the officer by his radio, but they were unable to reach him. Several back-up officers arrived on the scene and found the victim officer with a gunshot wound to the front of his head. The back-up officers immediately called for emergency medical personnel, who arrived shortly thereafter and transported the victim officer to a local hospital, where in the early morning hours of December 4, he was pronounced dead from a wound inflicted by a .40-caliber semiautomatic handgun. Investigating officers identified a suspect in the slaying of the victim officer from information that was obtained from the officer's ticket book found at the scene of the shooting. The partially completed speeding ticket contained the man's name, birth date, and a description of the suspect's vehicle. A region-wide announcement was broadcast to be on the lookout for the suspect and his vehicle. Officers from the Alabama Bureau of Investigation arrived on the scene and reviewed footage from the victim officer's dash-mounted camera that showed the victim officer approaching the driver's side of the suspect's car, speaking to the driver, and returning to the patrol car. The officer approached the suspect's vehicle a second time and engaged in another conversation with the driver. As the officer looked down at his ticket book, the man produced a handgun. The white flash of an apparent gunshot appeared on the video, and the victim officer fell to the ground. Police from nearby Trussville, who had heard the description of the murder suspect and the vehicle he was driving, recognized the description of the car as one belonging to the brother of a Trussville police officer. Meanwhile, in Birmingham, the Birmingham Police Department received a telephone call about a man who was trying to break into vehicles and subsequently was seen getting into a truck driven by an unidentified individual. Birmingham officers issued an alert for the truck, and an officer in Trussville reported seeing a truck matching this description speeding through Trussville approximately 1 hour after the shooting incident in Pelham. Officers from Birmingham subsequently located an abandoned car matching the description of the shooting suspect's vehicle. It appeared to have blood on the driver's side doors and roof. Shortly thereafter, the suspect, in a truck driven by his brother, approached cruisers from the Hoover Police Department parked at an exit by the side of the highway. As police officers apprehended the man, he stated, "I'm the guy you're looking for." After a tip from the suspect's brother, police found the weapon used in the murder of the victim officer in the glove compartment of the truck. The 29-year-old suspect, who had no previous criminal history, was charged with Capital Murder of a Law Enforcement Officer.

Arkansas

The 50-year-old assistant chief of the Plumerville Police Department was shot and killed around 6:20 a.m. on June 19 while attempting a traffic stop of a reported stolen vehicle. The assistant chief, who had 27 years of law enforcement experience, had stopped a truck along a local portion of a national highway. He was approaching the vehicle when the suspect fired a single shot from a .22-caliber revolver, fatally wounding the assistant chief in the upper left chest. The assistant chief returned fire, striking the tailgate of the truck before the suspect fled. The victim officer succumbed to his wounds at the scene shortly thereafter. The 22-year-old alleged assailant, who had a prior criminal record and was on probation at the time of the incident, was arrested approximately 15 miles from the shooting. He was charged with Capital Felony Murder, Felon in Possession, and Theft by Receiving.

California

Four officers from the Oakland Police Department were killed and another of its officers was injured during a traffic stop and related tactical situation on March 21. Shortly after 1 p.m., a 40-year-old sergeant, who had 18 years of law enforcement experience, advised that he was making a traffic stop. A 41-year-old officer, who had 10 years of law enforcement experience, had just cleared a traffic stop one block away and drove to the sergeant's location. The lone occupant of the vehicle that the sergeant had stopped presented false identification. The sergeant and the officer were walking toward the vehicle on the driver's side when the occupant of the vehicle opened fire with a .40-caliber semiautomatic handgun through the open window on the driver's side. Both officers, though wearing protective body armor, were each fatally struck in the neck. The victim officers were transported to a local hospital where they succumbed to their injuries. A SWAT team was assembled to search for the suspect, who had fled from the scene. At 3:02 p.m., the tactical team entered the apartment of the suspect's sister, where they had tracked him. As a 43-year-old sergeant with 13 years of law enforcement experience and a 35-year-old sergeant with 9 years of law enforcement experience entered the apartment, they were shot by the suspect with a 7.62x39 mm semiautomatic rifle. Both victim sergeants were wearing body armor, and both were shot fatally in the fronts of their heads. The suspect retreated to a rear bedroom. As a 33-year-old sergeant, who had 11 years of law enforcement experience, entered that room, he was shot in the front upper torso/chest above his protective vest. He was transported to a local hospital where he was treated and released. The other sergeants were transported to the hospital where they were pronounced dead. The 26-year-old suspect, who had an extensive criminal history and had a parolee-at-large warrant against him, was shot and killed during the incident.

‡

At 9 p.m. on July 23, a 30-year-old agent with the U.S. Border Patrol, Campo Station, was shot and killed while investigating suspicious persons or circumstances in Campo. The agent, who had 11 years of law enforcement experience, was patrolling alone and had radioed that he had spotted multiple individuals traveling north in Mexico toward the United States border. Other agents working in the vicinity lost radio contact with the agent and subsequently heard gunshots. Responding agents went to the last known location of the agent and found his vehicle, its lights on and the motor still running.

They found the victim agent a short distance away in the brush. He had been shot multiple times in the head and torso from both the front and rear. The victim agent's service handgun, radio, handcuffs, and personal mobile phone were all missing. On August 14, a 16-year-old male was arrested for the murder and charged with Murder of a Federal Officer Committed in Perpetration of a Robbery and Aiding and Abetting. That individual subsequently pled guilty and was sentenced to 40 years in federal prison.

Colorado

A sergeant with the Montrose Police Department was killed and two officers were wounded at 9:40 p.m., July 25, when they were responding to a domestic incident. The 41-year-old sergeant, who had 19 years of law enforcement experience, was called to a home at 8:30 p.m. to assist two officers who were dealing with a person under the influence of alcohol. The person had barricaded himself in a detached garage. The sergeant, along with the intoxicated man's family members, negotiated with the man for more than an hour. When negotiations failed, the sergeant decided to forcibly enter the garage in order to arrest the man. Family members assured the officers that though there were weapons in the garage, the man inside did not have a key to the locked container, which they called a "gun safe." Upon the police breaking through the door, however, the man began shooting at them with a 12-gauge semiautomatic shotgun. The assailant fired four times. All three law enforcement members were wearing body armor; however, the victim sergeant was fatally struck in the upper torso when a bullet entered the armhole of his protective vest. The other two officers were wounded. One, who was 53 years old and had 18 years of law enforcement experience, was shot in the left leg. The other, who was 24 years old and had 2 years of law enforcement experience, was struck in both legs. Although these two officers returned fire, the 52-year-old offender was not hit and retreated to a bathroom in the garage where he committed suicide. What had been described as a "gun safe" was a gun locker made of sheet metal. The shooter had used hand tools in the garage to peel the metal away and had gained access to the weapons inside. The shooter, who had prior mental disorders, knew the sergeant through a law enforcement relationship. He had a prior criminal record that included a violent crime conviction and was on probation at the time of the incident.

Delaware

Two officers with the Georgetown Police Department were shot around 6:40 p.m. on September 1 while investigating a complaint of shots being fired at a local fast-food restaurant. A 29-year-old patrol officer, who had nearly 6 years of law enforcement experience, was fatally shot in the incident, and a 31-year-old corporal, who had nearly 7 years of law enforcement experience, sustained minor injuries. The officers were on patrol together when they heard a broadcast providing a description of a vehicle occupied by the suspects involved in the reported shooting incident, which allegedly also involved a robbery. According to later reports, one or more of the suspects had robbed a drug dealer and then had fired rounds at the dealer before fleeing the scene with an undisclosed amount of marijuana. The patrol officer and the corporal, both of whom were wearing body armor, spotted the suspects' vehicle in front of them. The corporal, who was driving the patrol car, began to pursue the vehicle, which was occupied by three men. The pursuit ended when the suspects' vehicle came to an abrupt stop, and the corporal stopped alongside it. A passenger in the rear driver's side of the suspects' vehicle shot through his partially opened window with a 9 mm semiautomatic handgun. The round entered the officers' passenger side window and struck the patrol officer in the face, killing him. The corporal, unaware that his partner was struck, received a minor injury to his neck from shrapnel from the round. In spite of his injury, he exited the vehicle and began a foot pursuit of the driver, who had gotten out of the suspects' vehicle and was fleeing the scene. The driver managed to escape, however, and when the corporal returned to the police vehicle, it was only then that he realized that his partner had been shot, and he called for assistance. One of the suspects had remained in the car at the original location and was apprehended; one of the other suspects, the alleged shooter who had killed the officer, had also fled the scene. He was tracked to an area east of the scene, and several assisting officers converged there. The alleged assailant was found inside a residence, and when the officers entered the dwelling, they took the 22-year-old man into custody and charged him with First-Degree Murder of a Law Enforcement Officer, three counts of Possession of a Firearm during the Commission of a Felony, Burglary, Reckless Endangering, and Resisting Arrest. The man, who had in his possession the gun used in the shooting of the patrol officer, had a prior criminal record including violent crime, drugs, and weapons violations. The driver of the vehicle turned himself in approximately 3 days later.

Florida

Two deputy sheriffs, both aged 44, with the Okaloosa County Sheriff's Office were shot and killed while attempting to make an arrest in Crestview around 12:50 p.m. on April 25. About 10:20 a.m., other deputies from the same office responded to a local hospital regarding a report of domestic violence. The victim told the deputies that her husband had beaten her, and she gave the officers a description of his truck and also indicated that she believed he would be at their apartment or at a local shooting range. Around noon, the victim deputies, both of whom were wearing body armor, located the suspect's truck at the shooting range and saw the man standing behind the truck. The deputies, who were driving separate patrol cars, parked several feet behind the truck with the patrol cars facing opposite directions. Witnesses said the deputies approached the man and ordered him to get on the ground, but the man refused. As the deputies continued to give the man commands to get on the ground, one of the deputies pulled out a conducted energy device (CED). When the man continued to defy their orders, the deputy used the CED. The man fell to the ground, then immediately pulled out a 9 mm semiautomatic handgun and began shooting at the deputies. One of the deputies took cover at the front of one of the cruisers, and the assailant positioned himself at the back of the same cruiser. In an exchange of gunfire, the deputy at the front of the cruiser was hit in the shoulder. Despite the injury, the deputy (whose total years of law enforcement experience is unknown) was able to notify dispatchers that he was shot, and he continued to exchange gunfire. The shooter stepped away from the vehicle, approached the injured deputy, and shot him in the front of the head. The second deputy, who had more than 22 years of law enforcement experience, had taken cover but was out of view of any witnesses. At one point, someone at the shooting range saw the second deputy move to the back of the truck, and he attempted to take cover by jumping into the open passenger side door of the assailant's vehicle. Witnesses then heard gunshots and saw the window from the open door shatter. The assailant walked around his truck and shut the passenger side door. He then walked around to the driver's side, got in, and sped off on a local highway. A short time later, additional deputies arrived at the scene and found the two victim deputies lying on the ground. They were transported to a local hospital where they both died later that day. The first deputy succumbed to the gunshot wound to the front of his head, and the second deputy succumbed to the gunshot wound to the rear of his head. Dispatchers broadcast a description of the man's truck to local law enforcement. A sergeant from the Walton County Sheriff's Office, traveling on the same highway, spotted the truck and attempted to make a traffic stop, but the man refused to stop. The sergeant pursued the vehicle as additional officers deployed spike strips in an attempt to disable the truck in a couple of locations along the highway. However, the suspect avoided the strips and continued to flee at speeds of up to 80 mph. A police officer from the Defuniak Springs Police Department placed a set of spike strips across the road along the highway at the city limits. The suspect saw the spike strips and turned across all lanes of the highway to avoid them. He drove off of the right shoulder of the highway and headed toward the sergeant. The sergeant pulled out his gun and fired at the driver's window as the suspect sped past him going about 70 mph. At this point, five patrol units from Walton County and one unit from Okaloosa County were in pursuit. As the suspect's vehicle crossed the entrance road to a local airport, it went airborne and left the roadway. The suspect attempted to gain control of the truck and return to the road when the sergeant from Walton County performed a tactical maneuver in an attempt to end the pursuit. The maneuver forced the suspect's truck off of the right shoulder of the roadway where the truck struck a sign and some shrubs. The vehicle then flipped several times and struck the roof and windshield of a vehicle driven by a Walton County sheriff's deputy before coming to rest up against that deputy's vehicle. The remaining deputies involved in the pursuit positioned their vehicles around the suspect's truck. The suspect, still in the vehicle, shot at the deputies, who returned fire and killed the assailant to end the threat. The 28-year-old man had a prior criminal record that included violent crime.

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A 38-year-old corporal with the Tampa Police Department was shot and killed while investigating a suspicious person around 10 p.m. on August 19. When the veteran corporal, who had nearly 11 years of law enforcement experience, confronted a man pushing a shopping cart full of items in an outside commercial area, a fight ensued. The man tried to run away, and the corporal tackled him. The man then produced a .45-caliber semiautomatic handgun, hit the corporal in the head with it, and shot the corporal in the front upper torso/chest area. The round entered the corporal's ballistic vest through the armhole area, fatally wounding him. The man ran back to the shopping cart and grabbed a canvas bag as a second officer arrived. He reportedly pulled a semiautomatic rifle from the bag, aimed it at the responding officer, and then fled the scene. A police dog later tracked the suspect to the backyard of a nearby residence. The 34-year-old male was arrested and charged with First-Degree Murder of a Law Enforcement Officer, Aggravated Assault of a Law Enforcement Officer, Carrying a

Concealed Firearm, and Depriving a Law Enforcement Officer of Communications. In addition to the military-type gear and numerous ammunition magazines found in the shopping cart, police confiscated three handguns and a rifle from the offender.

Illinois

A 59-year-old lieutenant with the Centreville Police Department was shot and killed while investigating suspicious persons shortly before 2:30 a.m. on June 2. The veteran lieutenant, who had nearly 23 years of law enforcement experience, was patrolling an area near a housing complex when he noticed three or four people loitering at the complex. He stopped his vehicle and told them to leave the area. The lieutenant circled the complex and came back to where he first saw the group, and they were still there. He stopped his vehicle and exited but did not notify the dispatcher that he had left the vehicle or that he was investigating suspicious persons. The lieutenant ordered the individuals to place their hands on the patrol vehicle. As he was patting down one of the individuals, a man pulled out a .32-caliber revolver from his waistband and fired three shots, striking the victim lieutenant in the chest, back of the head, and fatally in the neck. A witness contacted dispatch via the radio in the victim lieutenant’s patrol car and informed them that the lieutenant had been shot. Tips from the public assisted the authorities in locating and arresting the suspect on June 4. The 22-year-old man, who had a prior criminal record that included violent crime, police assault, and weapons violations, was charged with First-Degree Murder.

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A 27-year-old police officer with the Chicago Police Department was shot and killed in an ambush around 12:30 a.m. on June 1. The officer, who had nearly 4 years of law enforcement experience, and his partner responded to a dispatch call of shots fired and a report that gang members were hiding guns in the garage of a nearby residence. As the officers approached the location, they saw someone walking near the residence. While the officers were questioning this person, a vehicle drove by, and a passenger fired multiple shots at them through an open window of the vehicle with a .357 Magnum revolver. The victim officer, who was wearing body armor, was shot in the thigh and the back of the head. He was taken to a local hospital where he died later that morning from the head wound. Later that day, authorities arrested a 21-year-old suspect and charged him with Murder of a Law Enforcement Officer. The suspect stated that he believed he was shooting at rival gang members. The following day, another suspect, a 20-year-old male, was arrested and charged with Murder and Attempted Murder. Both men were on probation at the time of the incident, were known drug dealers, and had prior criminal records that included violent crimes, drugs, and weapons violations.

Kansas

A 26-year-old deputy sheriff with the Sedgwick County Sheriff's Office was shot at 12 p.m. on September 28 in an ambush in Wichita. The deputy, who had more than 1 year of law enforcement experience, had been dispatched a few minutes earlier to investigate a report of larceny. At 12:01 p.m., he radioed dispatch to report that he had been shot. Apparently, the deputy arrived at the residence but was unable to get anyone to answer the front door. He asked the dispatcher to contact the complainant on the telephone, which the dispatcher did. The complainant instructed the deputy via the dispatcher to meet him behind the residence. The deputy went to the rear of the residence, and the man, who was hiding behind a tree, immediately opened fire with a .30-30 lever-action rifle, wounding the deputy in his chest, the front below his waist, and fatally in his back, where at least one of the bullets penetrated his body armor. The force of the shot knocked the victim deputy to the ground. The man approached the deputy and attempted to shoot him at close range, but the rifle malfunctioned and did not fire. After a struggle, the man took the deputy's service weapon, a 9 mm semiautomatic handgun, and pointed it at the deputy. The deputy, still lying on the ground, lifted his leg in an effort to protect himself from the bullet when the man fired the weapon, and the bullet went through the deputy's foot and lodged in his bulletproof vest. The man fled the scene, and it was then that the victim deputy radioed dispatch that he had been shot twice. Assisting deputies arrived, secured the scene, and administered emergency medical treatment to the victim deputy until an ambulance arrived. The victim deputy was transported to a local medical center where he underwent surgery, but he succumbed to his wounds later that day. In the meantime, officers from the Sedgwick County Sheriff's Office, the Wichita Police Department, the Derby Police Department, the Kansas Highway Patrol (KHP), the Kansas Bureau of Investigation, the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), and the FBI responded to the scene of the shooting. They surrounded the house where they believed the shooter was located and attempted negotiations with him, but those attempts were unsuccessful. Eventually they introduced gas into the house and then used a robot with a camera in an effort to find the man. However, the suspect had escaped into a rural area surrounding the house.

As two ATF agents and one KHP trooper drove through the field where they believed the suspect was hiding, he fired at them with the service weapon he had taken from the fallen deputy. A brief gun battle ensued, and the suspect was fatally wounded and died at the scene. Investigating officers discovered that the man had remarked earlier that he was going to “kill a cop,” and that he subsequently had called in the false report of larceny. They found a large supply of ammunition for the .30-30 rifle and outdoor clothing in a duffle bag at the scene in addition to the victim deputy’s service weapon. The offender was a 27-year-old man with a prior criminal record that included police assault and violent crime.

Minnesota

On September 7, at 8:45 a.m., a 57-year-old officer with the North St. Paul Police Department was shot and killed and a 37-year-old officer with the Maplewood Police Department was wounded while attempting an arrest. The North St. Paul officer, who had nearly 16 years of law enforcement experience, and the Maplewood officer, who had more than 10 years of law enforcement experience, responded to a call regarding a possible violation of a protection order. The woman who had called for assistance and her daughter were waiting in the parking lot outside of their apartment building when the officers arrived. The woman said that she thought her former husband, for whom she had an active protection order, might be in her apartment. He had violated the protection order previously and was on conditional release. At the woman’s request, the officers first checked the vacant apartment adjacent to the woman’s residence but found no sign of the man there. The woman then unlocked the door to her apartment, and the North St. Paul officer entered first and was immediately assaulted by the woman’s ex-husband. The officer pushed the woman and her daughter away from the attack, and he then was struck in the face with a burning rag that the man was wielding. In the altercation that ensued between the two officers and the man, the man managed to remove the North St. Paul officer’s service weapon, a .40-caliber semiautomatic handgun, from its holster and shoot the officer once in the side of his head. The victim officer, who was wearing body armor, died instantly. The man immediately turned the gun on the second officer, who was also wearing body armor. In the ensuing gunfight, she fired eight shots at the assailant, and he fired several rounds at her. During this time, the officer’s weapon malfunctioned once, but not before five of her rounds struck the assailant. She discarded that magazine and attempted to load another one, not knowing that it had been damaged by one of the rounds fired by the assailant. The rounds from that magazine spilled onto the floor, and as she was loading her last magazine, a back-up officer arrived, and she and the officer seized the firearm from the shooter and handcuffed him. The 34-year-old assailant, who had had a prior criminal record and convictions that included violent crime, drugs, and weapons violations, died at the scene a short time later. Medical personnel that arrived on the scene pronounced both the victim officer and the assailant deceased. They transported the wounded officer to a local hospital where the injuries to her arms/hands and front lower torso were treated. She was released later that day and returned to work approximately 2 weeks later.

New Jersey

On July 19, a 37-year-old detective with the Jersey City Police Department (JCPD) succumbed to gunshot wounds he received 3 days earlier while attempting to arrest a man suspected of shooting another police detective. In that incident, which occurred on July 16 around 5 a.m., a JCPD surveillance team was monitoring a vehicle that was allegedly used in an armed robbery in which an individual was shot with a 12-gauge shotgun. When the officers saw a female suspect move the vehicle to the opposite side of the street, they began to move toward the vehicle in their unmarked car. The woman exited the vehicle and was joined by a male suspect who apparently had been lurking nearby; the pair crossed the roadway. As the unmarked police car came into view, the man pulled a 12-gauge shotgun from under his robe-like garment and began firing at the unmarked car, striking the detective who was operating it. The pair then fled into an apartment complex. An entry team comprised of the JCPD and the Port Authority of New York and the New Jersey Police Department responded and attempted to elicit the suspects' surrender. Among the team members was the JCPD veteran detective, who had more than 10 years of law enforcement experience. When the attempts failed to yield a response from the suspects, the entry team began a floor-by-floor, unit-by-unit search of the complex. After clearing 14 units, the team knocked on the door of the fifteenth unit; although the knocks were unanswered, officers heard activity inside the apartment. As the officers prepared to break through the door, the male suspect began firing the same 12-gauge shotgun, striking four officers. The officers returned fire, fatally shooting both the male and female suspects. The victim detective, who was wearing body armor, suffered a shotgun blast to the head and neck. He was transported to a medical facility where he died from the wound to his head. The 32-year-old male assailant had a previous criminal record with both juvenile and adult convictions and that involved violent crime, drugs, police assault, and weapons violations.

New Mexico

A sergeant with the Sandoval County Sheriff's Office was shot and killed on July 16 while investigating a burglary in progress in La Cueva. The 45-year-old sergeant, with nearly 27 years of law enforcement experience, and a deputy were on duty working an undercover burglary operation. Around 4:30 a.m., a lone male entered the cabin where the officers were, and a struggle ensued. After the officers handcuffed the 62-year-old burglary suspect, he brandished a .357-caliber revolver and fired five rounds at the officers. The victim sergeant was shot in the arms/hands and fatally below the waist, severing his right femoral artery. Despite being shot, the sergeant was able to return fire, killing the assailant instantly. The man was under the influence of alcohol at the time of the incident and was wanted in Canada for a double homicide. The sergeant was airlifted to a hospital where he was pronounced dead upon arrival at 6:48 a.m. The deputy was not injured in the incident.

North Carolina

At 1:25 a.m. on April 8, a 29-year-old detective with the Lenoir County Sheriff's Office (LCSO), who had more than 7 years of law enforcement experience, was killed during a tactical situation in a wooded area in Grifton. A 27-year-old detective with the same agency was also wounded in the incident. At 10 p.m. on April 7, deputies responded to a report of a man who had parked his car near a wooded area, exited the vehicle, and fired a gun. Although the deputies found the vehicle, they could not locate the man. Moments later, the man fired a shot from the nearby patch of woods and continued to fire shots about once every 10 minutes; however, none of the rounds struck the officers or their vehicles. Additional officers arrived and set up a perimeter on both sides of the wooded area. Using a public address system, officers attempted to contact the man, and he responded by firing his weapon again. Meanwhile, officers processed the vehicle's license information and determined that the owner was a woman in a nearby county. Sheriff's deputies from that county went to the woman's residence in an effort to determine the identity of the shooter, but they found the woman dead, apparently murdered in her home. Police determined that the woman's boyfriend was the individual in the woods firing at the officers. Officers summoned a special response team from the LCSO and a helicopter from the North Carolina State Highway Patrol. Officers in the helicopter scanned the area using infrared technology, and after about 25 minutes, they located the man. Seven members of the special response team, wearing ballistic vests and using a thermal unit and a ballistic shield, entered the woods. The helicopter pilot radioed the team informing them when they were within 5 yards of the man. Armed with a 7 mm bolt-action rifle, the man fired a round at the officers, who were in a “stack formation.” The round went through the sleeve of the first officer’s uniform and struck the detective fatally in the left shoulder. The victim detective was wearing a protective vest, but the round exceeded the vest’s specifications. In the exchange of gunfire that followed, fragments from a shot struck the second detective in the left side of the neck, injuring him. Officers returned fire, hitting the suspect five times; he later died of his injuries. The injured detective recovered from his wounds and returned to duty several weeks later. The 43-year-old suspect had a record involving weapons violations, violent crime, and police assault. Police later found a note in the suspect’s home that indicated he was going to kill as many officers as he could. Investigators also determined that he had murdered his girlfriend.

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A corporal from the Martin County Sheriff’s Office was shot and killed on December 8 at 9:15 a.m. while responding to a disturbance call in Williamston. The 38-year-old veteran corporal, who had nearly 16 years of law enforcement service, responded to a report that a man was walking around and firing a gun in a residential area in the city. When the corporal arrived at the alleged shooter’s residence, he saw a man was inside the home. The corporal had a brief conversation with the man from the front porch and then immediately requested that all available officers report to the scene. The man appeared to walk to the rear interior of the home, and the corporal walked to the side of the house, approaching the backyard. In the backyard, the corporal encountered the man holding a 7.62x39 mm semiautomatic rifle. The corporal ordered the man to drop his weapon; instead, the man fired an unknown number of shots, striking the corporal in the front upper torso/chest. The victim corporal was wearing body armor, but one bullet entered his chest through his left armpit, circumventing the vest. The alleged assailant, a 36-year-old man with a prior criminal record including police assault, was shot and killed by assisting officers who had arrived on the scene.

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At 10:29 a.m. on October 7, two officers with the Winston-Salem Police Department were shot while responding to a warrant service request. A 50-year-old sergeant was shot and killed, and a 27-year-old officer was injured while attempting to make an arrest stemming from the warrant. The officer, who had more than 6 years of law enforcement experience, and his partner responded to the original call made from a local fast-food restaurant. While the officers were en route to the location, the call was upgraded to a hold-up alarm. The two officers arrived on the scene and made contact with the individual who had made the call. Apparently, a man had gone into the business to confront his ex-wife and had created a disturbance. It was then that personnel were prompted to activate the hold-up alarm. The officers identified the suspect and confirmed that he had outstanding warrants for his arrest regarding offenses against his ex-wife. The officers were told that the suspect had exited the building and was in an adjacent parking lot. When the officers went to the parking lot to confront the man, he ran, and the officers pursued on foot. The suspect attempted to run back into the restaurant, but the employees had locked the doors. The sergeant, a 27-year veteran of law enforcement, arrived on the scene to assist just as the suspect was rounding a nearby building. The man ran down an embankment into a thicket, and the sergeant followed him. While in the thicket, the man produced a .380-caliber semiautomatic handgun and shot the sergeant, who was wearing body armor, in the front of his head at point blank range. The 27-year-old officer caught up to them in the thicket, and the suspect shot the officer in the chest. The round was stopped by the officer's body armor. The officer was also struck by a bullet in the side of the head, near his ear. The officer returned fire with six shots, striking the man three times. The 35-year-old suspect died at the scene. He had a prior criminal record including violent crime, drugs, police assault, and weapons violations. Both the sergeant and the officer were transported to a local medical center. The officer survived his injury but did not return to duty. The sergeant did not recover from his injury and died 5 days later.

Oklahoma

Two sheriff's deputies with the Seminole County Sheriff's Department were shot and killed in the city of Seminole in an ambush around 4:30 p.m. on July 26. About 4 p.m., a woman called the department because her son, against whom she had a restraining order, had broken into her home, and she was afraid to go into the residence. The two deputies went to the home to investigate. One of the deputies knocked on the front door three times then entered the home. The man in the house opened fire on the officers with 22 shots from a 9 mm automatic rifle. The first deputy, who was 23 years old and had 1 year of law enforcement experience, was struck in the front below the waist and in the front of the head. The second deputy, who was 43 years old and had 3 years of law enforcement experience, was hit by a round in the chest. The first deputy died at the scene from the gunshot wound to his head. The second deputy was taken to a local hospital where he died later that day. The 26-year-old alleged assailant was arrested and charged with two counts of Murder. He was a known drug user and was under the influence of narcotics at the time of the incident. The man also had a prior criminal record that included violent crime, drugs, police assault, and weapons violations.

Pennsylvania

A 32-year-old patrol officer with the Penn Hills Police Department was shot and killed on December 6 around 8:25 p.m. in an ambush. The patrol officer, who was a 5½-year veteran of law enforcement, was sitting in his police cruiser waiting for backup outside the house where a 911 call around 8:20 p.m. indicated that there was a man inside with a gun. While the telephone line remained open, the dispatcher heard what sounded like a struggle, then gunshots. A second officer arrived at the scene and reported that an officer was down. Additional units were called to the scene. Approximately 8:30 p.m., a sergeant arrived and found a woman standing in the street crying and yelling, "He's been shot, the cop's shot." She told the sergeant that the victim officer was in his car. The sergeant told the woman to return to her house and remain there, and he ran to the patrol officer's vehicle, where he found the victim patrol officer slumped in the front seat with a gunshot wound to his head. Because of the initial "officer down" call, medical personnel already had been dispatched. Within minutes of the sergeant's arrival, an ambulance arrived at the scene and rushed the patrol officer to a local hospital, where he was pronounced dead a short time later of the head wound from a round from a 7.62x39 mm semiautomatic rifle. Further investigation showed that the victim patrol officer, who was wearing body armor, was also shot in the chest but had been able to fire two shots from his service weapon before he was fatally wounded. They also found the body of another man in an upstairs bathroom. Apparently, the suspect had shot and killed the man in the bathroom and was attempting to run from the scene when he saw the patrol officer in the cruiser and had shot him. Twelve hours later, officers arrested a 32-year-old suspect when they located him in his mother's residence. The suspect had a criminal record that included murder, weapons violations, and drugs, and was also on parole at the time of the incident. He was charged with two counts of Criminal Homicide, Burglary, Robbery, Illegal Possession of a Firearm, Possession of a Firearm without a License, Possession of a Firearm with an Altered Manufacturing Number, and Possession of a Prohibitive/Offensive Weapon.

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Around 8:40 p.m. on June 7, a 34-year-old state trooper with the Pennsylvania State Police, Swiftwater, who had nearly 7 years of law enforcement experience, was fatally shot following a traffic stop in Coolbaugh Township. A 35-year-old state trooper with the same detachment, who had nearly 6 years of law enforcement experience, was injured in the same incident. Approximately 7:45 p.m., officers from the Nazareth Borough Police Department (NBPD) responded to the residence of a reported protection from abuse violation. When the officers arrived at the home, they found that the suspect had left the home with his 9-year-old son. Other officers with the NBPD spotted the man driving his vehicle, and they pursued him for 40 miles to Coolbaugh Township. Assisting officers were able to stop the vehicle. The two troopers from the Swiftwater detachment approached the vehicle, and when they were within 5 feet of the driver's door, the man opened fire with a 9 mm semiautomatic handgun, striking the victim officer in the neck and wounding the other officer in his left shoulder. The troopers returned fire, striking the assailant, while another state trooper and a corporal with the Tatamy Borough Police Department pulled the boy from the vehicle unharmed. The fatally wounded state trooper, who was wearing body armor, was airlifted to a local hospital where he succumbed to his injury later that day. The second state trooper, who was also wearing body armor, was taken to another hospital where he was treated and later released. The 31-year-old assailant, who was on probation at the time of the incident and who had a prior criminal record that included drug use, was pronounced dead at the scene.

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A 25-year-old police officer with the Philadelphia Police Department was shot and killed on February 13 while investigating an attempted robbery. At 8:12 p.m., the officer and his partner responded to a call where they were met by a cab driver who identified a man who had attempted to rob him. As the officers approached the suspect, they directed him to remove his hands from his pockets. The man fired multiple shots from a .357-caliber revolver from inside his jacket pocket. The victim officer, who had nearly 6 years of law enforcement experience, was struck three times in the front upper torso/chest above his body armor. Both officers returned fire and wounded the offender. The victim officer was transported to a local medical center where he died shortly after arrival. The 33-year-old suspect, a known drug dealer and user, was on probation at the time of the incident. He was arrested and charged with Murder and Narcotics Possession.

‡

Three officers from the Pittsburgh Bureau of Police were killed and another of its officers was injured in an ambush at a residence shortly after 7 a.m. on April 4. At 7:03 a.m., dispatchers received a call of a domestic dispute at the residence, and two officers arrived at the scene at 7:11 a.m. One officer was 36 years old and had more than 1 year of law enforcement experience; the other officer was 28 years old and had nearly 2 years of law enforcement experience. Each was wearing body armor. The complainant, who had called and asked police to remove her adult son from the house, admitted the officers into the dwelling. She apparently was unaware that her son had come into the room with a .22-caliber rifle. When the officers entered about 10 feet into the house, he opened fire on them with an unknown number of rounds. The woman fled downstairs to the basement as each officer was hit in the front of the head. The 36-year-old officer was hit at point blank range and fell to the floor inside the house. The other officer apparently had moved outside of the house to the front stoop, where he fell. Witnesses said the man opened the screen door and fired two or three more shots at the fallen officer, then went back inside. Both officers died at the scene. At approximately 7:16 a.m., dispatchers received calls about the downed officers, and a 45-year-old officer, who had 26 years of law enforcement experience, responded. As he arrived at the scene, he saw that another officer, aged 41 and with more than 14 years of law enforcement experience, had responded to the call and had been shot below the waist and in the chest. The wounded officer, who was wearing body armor and was off-duty just having completed the night shift, was lying on the ground near his vehicle. As the responding officer took cover near the front of the vehicle to assess the situation, the assailant fired an unknown number of rounds from a 7.62 mm semiautomatic rifle from the residence toward the vehicle, striking the officer in the hand. The officer, despite his injury, pulled the other wounded officer to cover behind the vehicle and fired at the assailant until the SWAT team arrived. The fatally wounded officer was taken to a local hospital where he succumbed to his injuries. When the SWAT team arrived, officers took up positions around the area, and a 3-hour standoff ensued during which time the assailant exchanged gunfire with police intermittently. The man had been stockpiling weapons and had used several weapons in the incident, including a 12-gauge shotgun, a .357-caliber revolver, and a .380-caliber handgun. Several rounds from the assailant's weapons struck the SWAT team's vehicle as well as nearby residences. Police returned fire, and at one point, struck the man in the leg, wounding him. The assailant, who was 22 years old and was wearing body armor, then allowed the police to enter the home. He was taken to a local hospital where he was treated for his injuries. He was arrested and charged with Aggravated Assault and three counts of Criminal Homicide. His mother was safely removed from the home without injuries. The officer with the injured hand recovered from his injury and returned to duty on April 25.

South Dakota

A deputy sheriff with the Turner County Sheriff's Office was shot and killed around 9:15 a.m. on March 15 while responding to a call regarding a possible suicide attempt. The 32-year-old deputy sheriff, who had 5 years of law enforcement experience, arrived at the rural residence and attempted to make contact with a 19-year-old male, whose welfare was in question. The deputy entered a bathroom in the home and located the male holding a .30-06 bolt-action rifle. The man shot at the deputy, and the bullet grazed the deputy's left shoulder, hitting beyond the edge of his body armor. The deputy returned fire and retreated toward his patrol vehicle as the man shot at him two more times. One bullet struck the front door post of the patrol vehicle and the other round went through the windshield and struck the deputy fatally in the neck. The 19-year-old suspect telephoned the Mitchell Police Department from the residence, claimed he had shot the deputy in self defense, and then fled the scene. When emergency personnel arrived, they found the deputy deceased on the ground next to his patrol vehicle. Approximately 3 hours later, the suspect, who had a prior criminal record and who was a known drug user, surrendered to law enforcement officials. He was arrested and charged with First-Degree Murder.

Tennessee

A 56-year-old captain with the Henderson Police Department died December 13 from gunshot wounds sustained shortly before 8 p.m. on December 10 when he responded to a robbery in progress at a local grocery store. Minutes before the incident, one of the employees had called dispatch to report that an armed man was robbing the store. The captain, a veteran with nearly 28 years in law enforcement, and a deputy were the first to arrive at the scene. As two assisting officers were pulling into the store's parking lot, they received a call from dispatch indicating that shots had been fired in the store and that the captain had been hit. The assisting officers entered the store and found the deputy unharmed and the captain lying on the floor. The assailant had shot three rounds from a .44-caliber revolver, wounding the captain in his front lower torso/stomach. The captain had fired 13 rounds, wounding the suspect. The assisting officers found the assailant lying on the floor of the store's office with the revolver lying at his feet. They ordered the man to show his hands. When the man did not comply, the two officers and another deputy who had arrived at the scene approached the man, who was lying face down with his hands under him moving around. The officers turned him over, handcuffed him, and searched him for any additional weapons. The captain was transported to a local medical center where he succumbed to his injuries 3 days later. The 48-year-old assailant, who had a prior history of violent crime, drugs, and weapons violations, recovered from his wounds and was charged with First-Degree Murder, Attempted Murder, and Aggravated Robbery.

Texas

At 3:40 p.m. on April 2, a sergeant with the Bridgeport Police Department was killed while assisting with a traffic pursuit. A peace officer with the Wise County Attorney's Office and a deputy with the Wise County Sheriff's Office were riding in a patrol car near Decatur when they saw a speeding vehicle driven by an individual they believed they had pursued earlier that day. They followed the vehicle into Bridgeport. The 32-year-old sergeant, who had 6 years of law enforcement experience, had been clearing traffic ahead of the pursuit and was waiting in his marked cruiser on the right side of the road for the officers' and the suspect's vehicles. When they arrived, the suspect abruptly turned his vehicle to the right, crossed two lanes of traffic, and struck the parked patrol car, fatally wounding the victim sergeant, who died at the scene. The 43-year-old assailant, who was taken to a local hospital for treatment of injuries sustained in the incident, was known to use drugs and had a prior criminal record. At the hospital, he confessed to the murder to an attending ranger and was subsequently arrested and charged with Capital Murder of a Law Enforcement Officer.

‡

A 31-year-old deputy sheriff with the Chambers County Sheriff's Office was killed on July 13 in an incident at a residence in Baytown. The deputy, who had more than 6 years' law enforcement experience, responded to a mobile home a little after 9:30 a.m. with a fellow deputy and a trooper from the Texas Department of Public Safety. A meter reader assigned to turn off water service to the home had reported being shot at by a resident. When the law enforcement officers arrived, they arrested a female resident of the home who had shot with what she later described as "blanks" at the meter reader. When the deputy sheriff, who was wearing body armor, entered the home to search for other suspects or victims, he encountered a male resident in a hall near a back bedroom. The male resident looked around a corner, saw the deputy, and began firing a .223-caliber semiautomatic rifle, fatally wounding the deputy in the front head. The shooter then went into the back bedroom. The other deputy and the trooper fired at the assailant through the door and wall of the bedroom and were able to get the victim deputy out of the home. Because there was no further response from inside the home, SWAT teams were called. After an extended standoff, heavy construction equipment was used to shake the mobile home and then remove a wall. The 37-year-old shooter was found dead in the back bedroom with a self-inflicted gunshot wound. The SWAT units noticed explosives in the home and called in the bomb squad, which began clearing the residence. They requested assistance from other bomb squads, including four FBI Special Agent Bomb Technicians. The bomb squads collectively found 118 improvised devices, which took 2 days to safely remove. The shooter had prior crime convictions that included violent crime, weapons violations, and a juvenile conviction.

‡

A 47-year-old lieutenant with the Corpus Christi Police Department was fatally struck by a vehicle at 12:10 a.m. on March 11 while deploying stop sticks during a felony traffic pursuit. A few minutes earlier, a patrol officer in a neighboring community had requested an emergency backup after a driver had assaulted him in Molina. The assault had escalated into a traffic pursuit, and the lieutenant had responded to the area to assist the patrol officer. The lieutenant had placed the tire deflation devices on the road in advance of the suspect's arrival in Corpus Christi. The 20-year law enforcement veteran was waiting on the shoulder of the road to pull up the spikes once the suspect had driven over them. As the driver approached the devices, officers chasing the suspect's vehicle saw the driver swerve off the road and strike the victim officer with the vehicle. The victim officer suffered extensive and fatal internal injuries; he was taken to a local medical center where he was pronounced dead at 12:30 a.m. After striking the victim officer, the assailant sped away in his vehicle with the other officers still in pursuit. The pursuit ended when the driver was shot while attempting to assault other officers. The 21-year-old driver, who was on probation at the time of the incident, was also taken to a medical center for the treatment of his wounds. The suspect, who had a prior record for violent crime, was arrested and charged with Homicide and eight counts of Aggravated Assault on a Law Enforcement Officer. The suspect was later found guilty and sentenced to death.

‡

A 43-year-old senior corporal with the Dallas Police Department was shot and killed on January 6 while attempting to serve an arrest warrant. The corporal, who had 18 years of law enforcement experience, was with other members of a gang unit as they attempted to enter an apartment at 6:14 p.m. An individual from inside the residence fired five shots through the door from a .38-caliber revolver. The victim corporal, who was wearing body armor, was struck in the front of his head from an unknown number of rounds, and he fell to the ground. He was transported to a local hospital where he died as a result of his injuries. The 26-year-old male suspect, a known drug dealer with a prior criminal history, was arrested and charged with Capital Murder.

‡

A 29-year-old patrol officer with the Pasadena Police Department died from a gunshot wound to the head at 7:11 a.m. on August 21 after responding to a domestic disturbance call. He was one of two patrol officers dispatched to the scene. The officer, who had nearly 5 years of law enforcement experience, was wearing body armor when he arrived at the residence at 6:25 a.m. He knocked on the door of the dwelling and made contact with the woman who had called the police for help concerning a man who was mentally ill. While the two talked on the porch, the man stepped out of the residence and shot the officer in the front of the head with a .40-caliber semiautomatic handgun. The second responding officer had just arrived, and upon seeing the shooting, he shot the male assailant. The victim officer was transported by medical helicopter to a hospital in Houston where he was pronounced dead. The 24-year-old assailant, who had a previous criminal record with both juvenile and adult convictions, was arrested and charged with Capital Murder of a Law Enforcement Officer and Aggravated Assault of a Law Enforcement Officer.

Washington

One sergeant and three officers from the Lakewood Police Department were killed in an ambush at 8:14 a.m. on November 29. Earlier that morning, the sergeant and the officers went to a local coffee shop where police often gather to share information and complete required reports. At 8:16 a.m., dispatchers received a 911 call via a mobile phone that reported a man had entered the coffee shop and had fired a gun. The witness with the mobile phone reported that a man had walked into the business as if he were going to purchase coffee, but instead, had drawn a 9 mm semiautomatic handgun and had fired on the four officers at close range. The 39-year-old sergeant, who had more than 13 years of law enforcement experience, was shot in the rear of his head and fatally in the side of his head. The 37-year-old officer, who had more than 12 years of law enforcement experience, was shot in the front and side of his head, in his front upper torso/chest, and fatally in his neck/throat area. The 40-year-old officer, who had nearly 15 years of law enforcement experience, was struck in the rear of her head and fatally in the side of her head. The fourth officer, a 42-year-old with more than 8 years of law enforcement experience, was able to shoot the assailant twice in the chest/abdomen even though the officer was shot in the front, rear, and side of his head; in the front below his waist; in his arms/hands; and in the front of his head, which was the fatal wound. After killing the four officers, all of whom were wearing body armor, the assailant took the 42-year-old officer's weapon and left the coffee shop. Witnesses reported that the alleged assailant went to a nearby car wash where he got into the passenger side of a truck that was being washed by another man. That man reportedly drove away in the vehicle with the alleged assailant. Two days later, at 2:30 a.m., a police officer in Seattle discovered a stolen vehicle apparently abandoned in the middle of a street. As the officer approached the vehicle, he heard a noise by his patrol car, turned, and saw a man whom he recognized as the suspect from the Lakewood shootings. The officer ordered the man to show his hands, and when the man refused to comply, the officer shot and killed him. The gun that was taken from the victim officer during the ambush in the coffee shop was found in the man's waistband. The 37-year-old alleged assailant was a known drug dealer with previous charges against him for violent crime, murder, and weapons violations. He was on conditional release at the time of the shootings and was known to have mental disorders.

‡

Two officers with the Pierce County Sheriff's Department were shot at 8:48 p.m. on December 21 when they responded to a domestic incident in Eatonville. The 44-year-old deputy sheriff, who had 10 years of law enforcement experience, was fatally wounded, and the 43-year-old sergeant, who had nearly 21 years of law enforcement experience, was seriously wounded but survived the attack. The officers were called to a residence to investigate an argument between two brothers. The officers were invited into the home by the caller, who was one of the brothers. The other brother apparently had armed himself and began firing shots at both officers with a .45-caliber semiautomatic handgun. The deputy sheriff was wounded in the neck/throat and fatally in the front upper torso/chest when the bullet entered between the side panels of his protective body armor. Even though he was severely wounded, the deputy sheriff returned fire, killing the assailant. The veteran sergeant, who was wearing body armor, was wounded on the side of his head. The victim deputy sheriff was airlifted to a hospital where he died on December 28. The victim sergeant was taken to a hospital where he was treated and released days later for an extended recovery. The 35-year-old assailant, who had a prior mental disorder, had a criminal history including police assault and was on conditional release at the time of the incident.

‡

On October 31, just after 11 p.m., two officers from the Seattle Police Department were ambushed while sitting in their patrol car. The attack left a 39-year-old officer dead and a 34-year-old officer injured. The 39-year-old officer, who had nearly 9 years of law enforcement experience, and a trainee officer, who had 7 months of law enforcement experience, were parked on a public street discussing training points following a routine traffic stop. The veteran officer was seated in the passenger side when a car pulled up on the driver's side of their police vehicle, blocking the trainee officer's door. The trainee officer noticed that the driver had something in his hand, and she yelled a warning and ducked. The driver of the car shot several rounds from a .223-caliber semiautomatic rifle into the police vehicle. The trainee officer received an injury to her upper back when a bullet entered the left sleeve of her shirt, traveled along her back tearing her protective vest, and exited through her right sleeve. The veteran officer, who was wearing body armor, was shot in the neck and arm, and received a fatal wound to the side of his head. The shooter backed up his vehicle and made a three-point turn and fled the scene. The injured trainee officer was able to exit the patrol car and fire several rounds into the assailant's vehicle before he sped away. She used the radio to call for help, reporting that shots had been fired and that her partner had been killed. When assistance arrived, the injured officer was transported to the hospital where she was treated and released. The 41-year-old male suspect, who had no prior record, was arrested 6 days later and charged with Murder, two counts of Attempted Murder, and Arson.

Law Enforcement Officers Accidentally Killed

This page provides information regarding accidental line-of-duty deaths of duly sworn city, university and college, county, state, tribal, and federal law enforcement officers who met the same criteria as officers feloniously killed.

Overview

- In 2009, 47 law enforcement officers died as the result of accidents that occurred in the line of duty.
- Law enforcement agencies in 29 states reported that officers from their jurisdictions died in the line of duty as a result of accidents in 2009.
- Of the 47 officers accidentally killed, 15 were employed by city police departments, 21 were employed by county agencies, 10 were employed by state agencies, and 1 was employed by a federal agency.

More information about these topics (including annual totals from 2000 through 2009) is provided in Tables 48, 49, 59, 60, and 64.

Victim profile

- The average age of the officers who were accidentally killed in 2009 was 35 years.
- In 2009, the average length of law enforcement service of the 47 officers accidentally killed in the line of duty was 9 years.
- Of the 47 officers who were accidentally killed, 44 were white and 3 were black.
- All 47 officers were male.

More information about these topics is provided in Tables 53, 54, 55, 56, 57, and 58.

Circumstances

- Thirty-four of the 47 officers who were accidentally killed in the line of duty in 2009 died as a result of automobile accidents. Six officers were struck by vehicles, 3 officers died in motorcycle accidents, and 4 officers died during other types of accidents.

- Of the 6 officers struck by vehicles, 3 were executing a traffic stop or roadblock, and 3 officers were directing traffic or assisting motorists.

- Two officers were accidentally shot as a result of crossfire or other firearm mishap.

More information about this topic (including a complete breakdown of the types of circumstances in which officers accidentally died) is provided in Tables 61, 62, 63, and 64.

Regional and outlying area breakdowns

Of the 47 officers accidentally killed in the line of duty in 2009:

- 21 officers were employed by law enforcement agencies in the South.

- 12 officers were employed by law enforcement agencies in the West.

- 8 officers were employed by law enforcement agencies in the Midwest.

- 6 officers were employed by law enforcement agencies in the Northeast.

More information about this topic (including annual totals from 2000 through 2009) is provided in Table 48.

Months, days, and times of incidents

Months

- In 2009, agencies reported the most accidental deaths (9) in January.

Days

- More officers (10) were fatally injured in accidents on Thursday in 2009 than on any other day of the week.

Times

- Twenty-five officers were fatally injured in accidents that occurred between the hours of 12:01 p.m. and midnight, and 22 officers were killed in accidents between 12:01 a.m. and noon.

More information about these topics (including annual totals from 2000 through 2009) is provided in Tables 50, 51, and 52.

Law Enforcement Officers Assaulted

The following information concerns duly sworn city, university and college, county, state, and tribal law enforcement officers who were assaulted in the line of duty in 2009 and met certain other criteria.

Overview

- The FBI collected assault data from 11,451 law enforcement agencies that employed 556,155 officers in 2009. These officers provided service to more than 243 million persons (79.4 percent of the Nation's population). (Based on Table 65.)
- Law enforcement agencies reported that 57,268 officers were assaulted while performing their duties.
- The rate of officer assaults in 2009 was 10.3 assaults per 100 sworn officers.

More information about these topics is provided in Tables 65, 66, 70, and 71.

Injuries

- Of the officers assaulted, 26.2 percent sustained injuries.
- 27.6 percent of the officers who were attacked by persons using personal weapons (e.g., hands, fists, or feet) suffered injuries.
- 13.3 percent of the officers who were assaulted by persons with knives or other cutting instruments were injured.
- 8.8 percent of officers who were attacked by persons with firearms suffered injuries.
- 23.5 percent of officers who were attacked by persons with other dangerous weapons were injured.

More information about this topic is provided in Tables 65, 66, and 70.

Times of incidents

- The largest percentage of assaults on officers (16.0 percent) happened from 12:01 a.m. to 2 a.m.

- The smallest percentage of assaults on officers (2.4 percent) occurred from 6:01 a.m. to 8 a.m.

More information about this topic is provided in Table 67.

Circumstances

- Of all officers who were assaulted in 2009, the largest percentage (32.6 percent) were responding to disturbance calls (family quarrels, bar fights, etc.).

- 15.4 percent of the officers assaulted were attempting other arrests.

- 12.7 percent of the officers assaulted were handling or transporting prisoners.

More information about this topic is provided in Tables 68, 69, and 73.

Clearances

Law enforcement agencies can clear offenses by arrests or exceptional means (i.e., when law enforcement can identify the perpetrator but are unable to make an arrest due to circumstances beyond their control, such as the death or suicide of the subject).

- In 2009, law enforcement agencies cleared 89.2 percent of the 57,268 reported assaults on law enforcement officers.

- By type of circumstance, agencies cleared the greatest percentage (91.1) of assaults on officers attempting other arrests.

More information about this topic is provided in Table 68.

Assignments

- 61.9 percent of the officers who were assaulted were assigned to 1-officer vehicle patrols.
- 18.9 percent of the officers who were assaulted were assigned to 2-officer vehicle patrols.
- 4.8 percent of officers who were assaulted were assigned to detective duties or special assignments.
- 14.5 percent of officers were assigned to other duties when they were assaulted in the line of duty.

(Based on Table 69.)

Weapons

- In 2009, the majority of officers who were assaulted in the line of duty (81.4 percent) were attacked by persons using personal weapons.
- 3.5 percent of the officers were assaulted by persons with firearms.
- 1.5 percent of the officers were assaulted by persons with knives or other cutting instruments.
- 13.6 percent of the officers were assaulted by persons with other dangerous weapons.

More information about this topic is provided in Tables 70, 71, 72, and 73.

Property Crime

Definition

In the FBI's Uniform Crime Reporting (UCR) Program, property crime includes the offenses of burglary, larceny-theft, motor vehicle theft, and arson. The object of the theft-type offenses is the taking of money or property, but there is no force or threat of force against the victims. The property crime category includes arson because the offense involves the destruction of property; however, arson victims may be subjected to force. Because of limited participation and varying collection procedures by local law enforcement agencies, only limited data are available for arson. Arson statistics are included in trend, clearance, and arrest tables throughout *Crime in the United States*, but they are not included in any estimated volume data. The arson section in this report provides more information on that offense.

Data collection

The data presented in *Crime in the United States* reflect the Hierarchy Rule, which requires that only the most serious offense in a multiple-offense criminal incident be counted. In descending order of severity, the violent crimes are murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault, followed by the property crimes of burglary, larceny-theft, and motor vehicle theft. Although arson is also a property crime, the Hierarchy Rule does not apply to the offense of arson. In cases in which an arson occurs in conjunction with another violent or property crime, both crimes are reported, the arson and the additional crime.

Overview

- In 2010, there were an estimated 9,082,887 property crime offenses in the Nation.

- The 2-year trend showed that property crime decreased 2.7 percent in 2010 compared with the 2009 estimate. The 5-year trend, comparing 2010 data with that of 2006, showed a 9.3 percent drop in property crime.

- In 2010, the rate of property crime was estimated at 2,941.9 per 100,000 inhabitants, a 3.3 percent decrease when compared with the rate in 2009. The 2010 property crime rate was 12.1 percent lower than the 2006 rate and 19.6 percent below the 2001 rate. (See Tables 1 and 1A.)

- Larceny-theft accounted for 68.1 percent of all property crimes in 2010. Burglary accounted for 23.8 percent and motor vehicle theft for 8.1 percent. (Based on Table 1.)

- Property crimes in 2010 resulted in losses estimated at 15.7 billion dollars. (Based on Tables 1 and 23.)

What you won't find on this page

Clearance and arrest data for property crimes.

Violent Crime

Definition

In the FBI's Uniform Crime Reporting (UCR) Program, violent crime is composed of four offenses: murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault. Violent crimes are defined in the UCR Program as those offenses which involve force or threat of force.

Data collection

The data presented in *Crime in the United States* reflect the Hierarchy Rule, which requires that only the most serious offense in a multiple-offense criminal incident be counted. The descending order of UCR violent crimes are murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault, followed by the property crimes of burglary, larceny-theft, and motor vehicle theft. Although arson is also a property crime, the Hierarchy Rule does not apply to the offense of arson. In cases in which an arson occurs in conjunction with another violent or property crime, both crimes are reported, the arson and the additional crime.

Overview

- In 2010, an estimated 1,246,248 violent crimes occurred nationwide, a decrease of 6.0 percent from the 2009 estimate.

- When considering 5- and 10-year trends, the 2010 estimated violent crime total was 13.2 percent below the 2006 level and 13.4 percent below the 2001 level.

- There were an estimated 403.6 violent crimes per 100,000 inhabitants in 2010.

- Aggravated assaults accounted for the highest number of violent crimes reported to law enforcement at 62.5 percent. Robbery comprised 29.5 percent of violent crimes, forcible rape accounted for 6.8 percent, and murder accounted for 1.2 percent of estimated violent crimes in 2010.

- Information collected regarding type of weapon showed that firearms were used in 67.5 percent of the Nation's murders, 41.4 percent of robberies, and

20.6 percent of aggravated assaults. (Weapons data are not collected for forcible rape.) (See Expanded Homicide Data Table 7, Robbery Table 3, and the Aggravated Assault Table.)

What you won't find on this page

Clearance and arrest data for violent crime.

Arrests

Definition

The FBI's Uniform Crime Reporting (UCR) Program counts one arrest for each separate instance in which a person is arrested, cited, or summoned for an offense. The UCR Program collects arrest data on 28 offenses, as described in Offense Definitions. (Please note that, beginning in 2010, the UCR Program no longer collected data on runaways.) Because a person may be arrested multiple times during a year, the UCR arrest figures do not reflect the number of individuals who have been arrested; rather, the arrest data show the number of times that persons are arrested, as reported by law enforcement agencies to the UCR Program.

Data collection-juveniles

The UCR Program considers a juvenile to be an individual under 18 years of age regardless of state definition. The program does not collect data regarding police contact with a juvenile who has not committed an offense, nor does it collect data on situations in which police take a juvenile into custody for his or her protection, e.g., neglect cases.

Overview

- Nationwide, law enforcement made an estimated 13,120,947 arrests (except traffic violations) in 2010. Of these arrests, 552,077 were for violent crimes and 1,643,962 were for property crimes.

- The highest number of arrests were for drug abuse violations (estimated at 1,638,846 arrests), driving under the influence (estimated at 1,412,223), and larceny-theft (estimated at 1,271,410).

- The estimated arrest rate for the United States in 2010 was 4,257.6 arrests per 100,000 inhabitants. The arrest rate for violent crime (including murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault) was 179.2 per 100,000 inhabitants, and the arrest rate for property crime (burglary, larceny-theft, motor vehicle theft, and arson) was 538.5 per 100,000 inhabitants.

- Two-year arrest trends show violent crime arrests declined 5.3 percent in 2010 when compared with 2009 arrests, and property crime arrests decreased 4.7 percent when compared with the 2009 arrests.

- Arrests of juveniles for all offenses decreased 9.7 percent in 2010 when compared with the 2009 number; arrests of adults declined 3.7 percent.

- Nearly three-quarters (74.5 percent) of the persons arrested in the Nation during 2010 were males. They accounted for 80.5 percent of persons arrested for violent crime and 62.4 percent of persons arrested for property crime.

- In 2010, 69.4 percent of all persons arrested were white, 28.0 percent were black, and the remaining 2.6 percent were of other races.

Expanded arrest data

Expanded data about arrests include information about the age, gender, and race of the arrestees. These data are available in the following tables:

Age: Tables 32, 34, 36, 38, 39, 40, 41, 44, 46, 47, 50, 52, 53, 56, 58, 59, 62, 64, and 65

Gender: Tables 33, 35, 37, 39, 40, 42, 45, 48, 51, 54, 57, 60, 63, and 66

Race: Tables 43, 49, 55, 61, and 67

What you won't find on this page

- Clearance data for violent crimes and property crimes.

- The number of persons who were convicted, prosecuted, and/or imprisoned. The UCR Program does not collect this information.

FIRE LOSS IN THE UNITED STATES DURING 2010

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September 2011

National Fire Protection Association
Fire Analysis and Research Division

Abstract
U.S. fire departments responded to an estimated 1,331,500 fires. These fires resulted in 3,120 civilian fire fatalities, 17,720 civilian fire injuries and an estimated $11,593,000,000 in direct property loss. There was a civilian fire death every 169 minutes and a civilian fire injury every 30 minutes in 2010. Home fires caused 2,640, or 85%, of the civilian fire deaths. Fires accounted for five percent of the 28,205,000 total calls. Eight percent of the calls were false alarms; sixty-six percent of the calls were for aid such as EMS.

Keywords: fire fatalities, fire injuries, fire losses, fire statistics, intentional fires, region fire department calls, intentional fires.

Acknowledgements
The NFPA gratefully thanks the many fire departments that responded to the 2010 National Fire Experience Survey for their continuing efforts for providing us in a timely manner the data so necessary to make national projections.

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For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

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Overview of 2010 U.S. Fire Experience

Number of Fires

- 1,331,500 fires were attended by public fire departments, a slight decrease of 1.3% from the year before.

- 482,000 fires occurred in structures, a very slight increase of 0.3%.

- 384,000 fires or 80% of all structure fires occurred in residential properties.

- 215,500 fires occurred in vehicles, a decrease of 1.6% from the year before.

- 634,000 fires occurred in outside properties, a decrease of 2.3%.

- What do these fire frequencies above mean? Every 24 seconds, a fire department responds to a fire somewhere in the nation. A fire occurs in a structure at the rate of one every 65 seconds, and in particular a residential fire occurs every 82 seconds. Fires occur in vehicles at the rate of 1 every 146 seconds, and there's a fire in an outside property every 50 seconds.

Civilian Fire Deaths

- 3,120 civilian fire deaths occurred in 2010, an increase of 3.7%.
- About 85% of all fire deaths occurred in the home.
- 2,640 civilian fire deaths occurred in the home (1-and-2 family dwelling homes and apartments), an increase of 2.9%.
- 285 civilians died in highway vehicle fires.
- 90 civilians died in nonresidential structure fires.
- Nationwide, there was a civilian fire death every 169 minutes.

Civilian Fire Injuries

- 17,720 civilian fire injuries occurred in 2010, an increase of 3.9%. This estimate for civilian injuries is on the low side, because many civilian injuries are not reported to the fire service.
- 13,800 of all civilian injuries occurred in residential properties, while 1,620 occurred in nonresidential structure fires.
- Nationwide, there was a civilian fire injury every 30 minutes.

Property Damage

- An estimated $11.6 billion in property damage occurred as a result of fire in 2010, a decrease of 7.5% from last year.

- $9.7 billion of property damage occurred in structure fires.

- $7.1 billion of property loss occurred in residential properties.

Intentionally Set Fires

- An estimated 27,500 intentionally set structure fires occurred in 2010, an increase of 3.8%.

- Intentionally set fires in structures resulted in 200 civilian deaths, an increase of 17.7%.

- Intentionally set structure fires also resulted in $585,000,000 in property loss, a decrease of 14.5%.

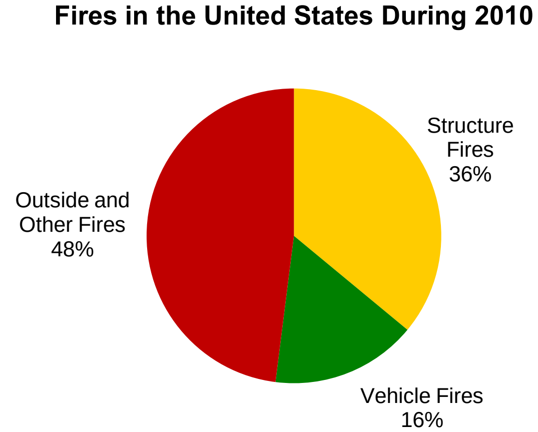
- 14,000 intentionally set vehicle fires occurred, a decrease of 6.7% from a year ago, and caused $89,000,000 in property damage, a decrease of 17.6% from a year ago.

List of Tables and Figures

Fires in the United States During 2010

1,331,500 fires were reported in the U.S. during 2010.

- down **1%** from 2009
- **3,120** civilian fire deaths
- On civilian death occurred every two hours and 49 minutes
- **17,720** civilian fire injuries
- One civilian injury occurred every 30 minutes
- **$11.6 billion** in property damage
- A fire department responded to a fire every 24 seconds



482,000 structure fires occurred in the U.S. during 2010.

- Less than 1% increase from 2009
- **2,755** civilian fire deaths
- **15,420** civilian fire injuries
- **$9.7 billion** in property damage
- One structure fire was reported every 65 seconds

215,500 vehicle fires occurred in the U.S. during 2010.

- down **1%** from 2009
- **310** civilian fire deaths
- **1,590** civilian fire injuries
- **$1.4 billion** in property damage
- One vehicle fire was reported every 146 seconds

634,000 outside and other fires occurred in the U.S. during 2010.

- down **2%** from 2009
- **55** civilian fire deaths
- **710** civilian fire injuries
- **$501 million** in property damage
- One outside fire was reported every 50 seconds

NFPA’s Fire Safety Resources

NFPA´s wealth of fire-related research includes investigations of technically significant fire incidents, fire data analysis, and the Charles S. Morgan Technical Library, one of the most comprehensive fire literature collections in the world. In addition, NFPA´s Fire Protection Research Foundation is a source of independent fire test data. Find out more at: www.nfpa.org/research

Properly installed and maintained smoke alarms are necessary to provide a warning of any fire to all occupants. You can find out more information about smoke alarms here: NFPA Smoke Alarm Information

Home fire sprinkler systems provide even greater protection. These systems respond quickly to reduce the heat, flames, and smoke from a fire until help arrives. More information about home fire sprinklers may be found at www.firesprinklerinitiative.org

Research ↔ **Advocacy**

Codes & Standards ↔ **Public Education**

NFPA also develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks. Among these are:

NFPA1: Fire Code:

NFPA 101: Life Safety Code®:

NFPA 13R: Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four

For consumers: NFPA has consumer safety information regarding causes, escape planning, fire & safety equipment, and many other topics.

For Kids: Sparky.org has important information for kids delivered via fun games, activities, and cartoons.

For public educators: Resources on fire safety education programs, educational messaging, grants & awards, and many other topics.

Number of Fires

In 2010, public fire departments responded to 1,331,500 fires in the United States, according to estimates based on data the NFPA received from fire departments responding to its 2010 National Fire Experience Survey (see Tables 1 and 2). (A fire department is a public organization that provides fire prevention, fire suppression and associated emergency and non-emergency services to a jurisdiction such as a county, municipality, or organized fire district.) This represents a slight decrease of 1.3% from last year, and is the lowest since the NFPA started using its current survey methodology in 1977-78[1].

There was an estimated 482,000 structure fires reported to fire departments in 2010, a very slight increase of 0.3%, or virtually no change from a year ago. For the 1977-2010 period, the number of structure fires were at their peak in 1977 when 1,098,000 structure fires occurred (see Figure 1). The number of structure fires then decreased quite steadily particularly in the 1980s to 688,000 by the end of 1989 for an overall decrease of 37.3% from 1977. Since 1989, structure fires again decreased steadily for an overall decrease of 24.7% to 517,500 by the end of 1998. They stayed in the 505,000 to 530,500 area from 1999 to 2008, before the decrease to 480,500 in 2009, and the slight increase in 2010.

Fire incident rates by community size were examined for the 2006-2010 period (see Figure 2). The smallest communities (populations less than 2,500) had the highest rate with 11.7 which was more than twice the average national rate.

Of the structure fires, 384,000 were residential fires, accounting for 79.7% of all structure fires, and a slight increase of 1.9% from a year ago. Of the residential structure fires, 279,000 occurred in one- and two-family homes, accounting for 57.9% of all structure fires. Another 90,500 occurred in apartments accounting for 18.8% of all structure fires.

For nonresidential structure fires, some property types showed notable changes: a decrease of 17.2% to 12,000 in public assembly properties, an increase of 9.1% to 18,000 in stores and offices, and a decrease of 11.1% to 20,000 in special structure properties.

There were an estimated 184,500 highway vehicle fires in 2010, a decrease of 3.2% and 31,000 other vehicle fires, an increase of 8.8%.

For the 1977-2009 period, the number of outside fires were at their high in 1977 when 1,658,500 outside fires occurred. The number of outside fires decreased steadily the next six years to 1,011,000 in 1983 for a considerable decrease of 39.0% from 1977. Outside fires changed little for the rest of the 1980s except for 1988 when 1,214,000 occurred. Outside fires dropped to 910,500 in 1993, and stayed near the 1,000,000 level

Table 1
Estimates of 2010 Fires, Civilian Deaths, Civilian Injuries and Property Loss in the United States

	Estimate	Range[1]	Percent Change From 2009
Number of Fires	1,331,500	1,311,500 to 1,351,500	-1.3
Number of Civilian Deaths	3,120	2,810 to 3,430	+3.7
Number of Civilian Injuries	17,720	16,820 to 18,620	+3.9
Property Loss[2]	$11,593,000,000	$11,283,000,000 to 11,903,000,000	-7.5**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2010 National Fire Experience Survey.

[1] These are 95 percent confidence intervals.

[2] This includes overall direct property loss to contents, structures, vehicles, machinery, vegetation, and anything else involved in a fire. It does not include indirect losses. No adjustment was made for inflation in the year-to-year comparison.

**Change was statistically significant at the .01 level.

Table 2
Estimates of 2010 Fires and
Property Loss by Property Use

	Number of Fires		Property Loss[1]	
Type of Fire	**Estimate**	**Percent Change from 2009**	**Estimate**	**Percent Change from 2009**
Fires in Structures	482,000	+0.3	$9,716,000,000	-10.4**
Fires in Highway Vehicles	184,500	-3.2	987,000,000	-6.4
Fires in Other Vehicles[2]	31,000	+8.8	389,000,000	+26.7*
Fires Outside of structures with value involved but no vehicle (outside storage, crops, timber, etc.)	72,500	+5.1	413,000,000	+62.6**
Fires in Brush, Grass Wildland (excluding crops and timber) with no value or loss involved	304,000	-0.7	—	—
Fires in Rubbish including dumpsters (outside of structures), with no value or loss involved	173,000	+1.2	—	—
All Other Fires	84,500	-18.0**	88,000,000	+18.9
Total	1,331,500	-1.3	$11,593,000,000	-7.5**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2010 National Fire Experience Survey.

[1] This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison.

[2] This includes trains, boats, ships. aircraft, farm vehicles and construction vehicles.

*Change was statistically significant at the .05 level.

**Change was statistically significant at the .01 level.

Table 3
Estimates of 2010 Structure Fires and
Property Loss by Property Use

	Structure Fires		Property Loss[1]	
Property Use	**Estimate**	**Percent Change from 2009**	**Estimate**	**Percent Change from 2009**
Public Assembly	12,000	-17.2**	$421,000,000	-44.4**
Educational	5,500	0	76,000,000	-8.4
Institutional	5,500	0	37,000,000	+15.6
Residential (Total)	384,000	+1.9	7,079,000,000	-9.2**
One- and Two-Family Homes[2]	279,000	+2.4	5,895,000,000	-7
Apartments	90,500	+0.6	1,033,000,000	-15
Other Residential[3]	14,500	0	151,000,000	-16
Stores and Offices	18,000	+9.1	730,000,000	+2.4
Industry, Utility, Defense[4]	9,000	-5.3	515,000,000	-10.0
Storage in Structures	28,000	-5.1	756,000,000	-4.4
Special Structures	20,000	-11.1	102,000,000	+4.1
Total	482,000	+0.3	$9,716,000,000	-10.4**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2010 National Fire Experience Survey.

[1] This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison.

[2] This includes manufactured homes.

[3] Includes hotels and motels, college dormitories, boarding houses, etc.

[4] Incidents handled only by private fire brigades or fixed suppression systems are not included in the figures shown here.

**Change was statistically significant at the .01 level.

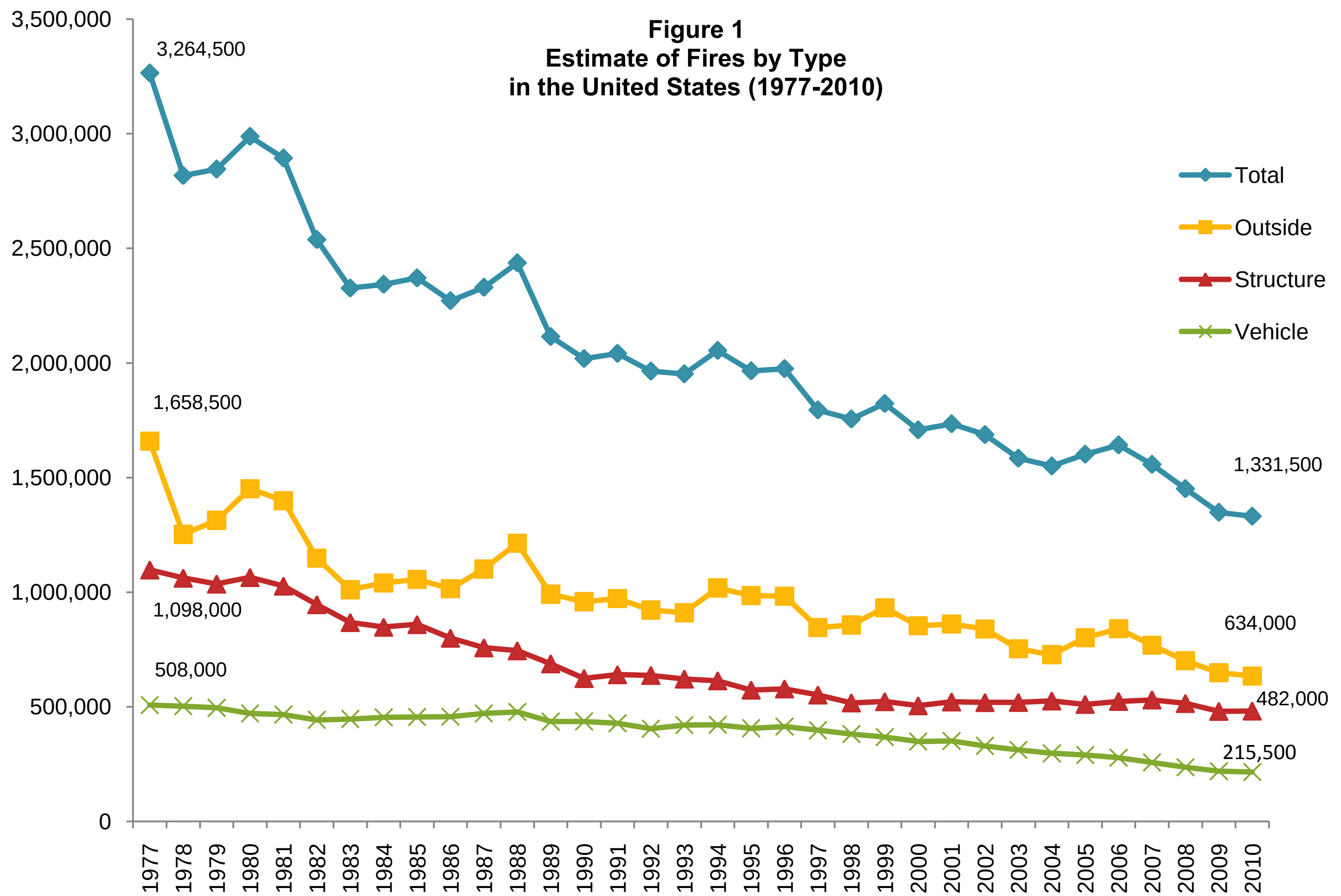


Figure 1
Estimate of Fires by Type
in the United States (1977-2010)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
3,264,500
1,658,500
1,098,000
508,000
1,331,500
634,000
482,000
215,500
Total
Outside
Structure
Vehicle
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
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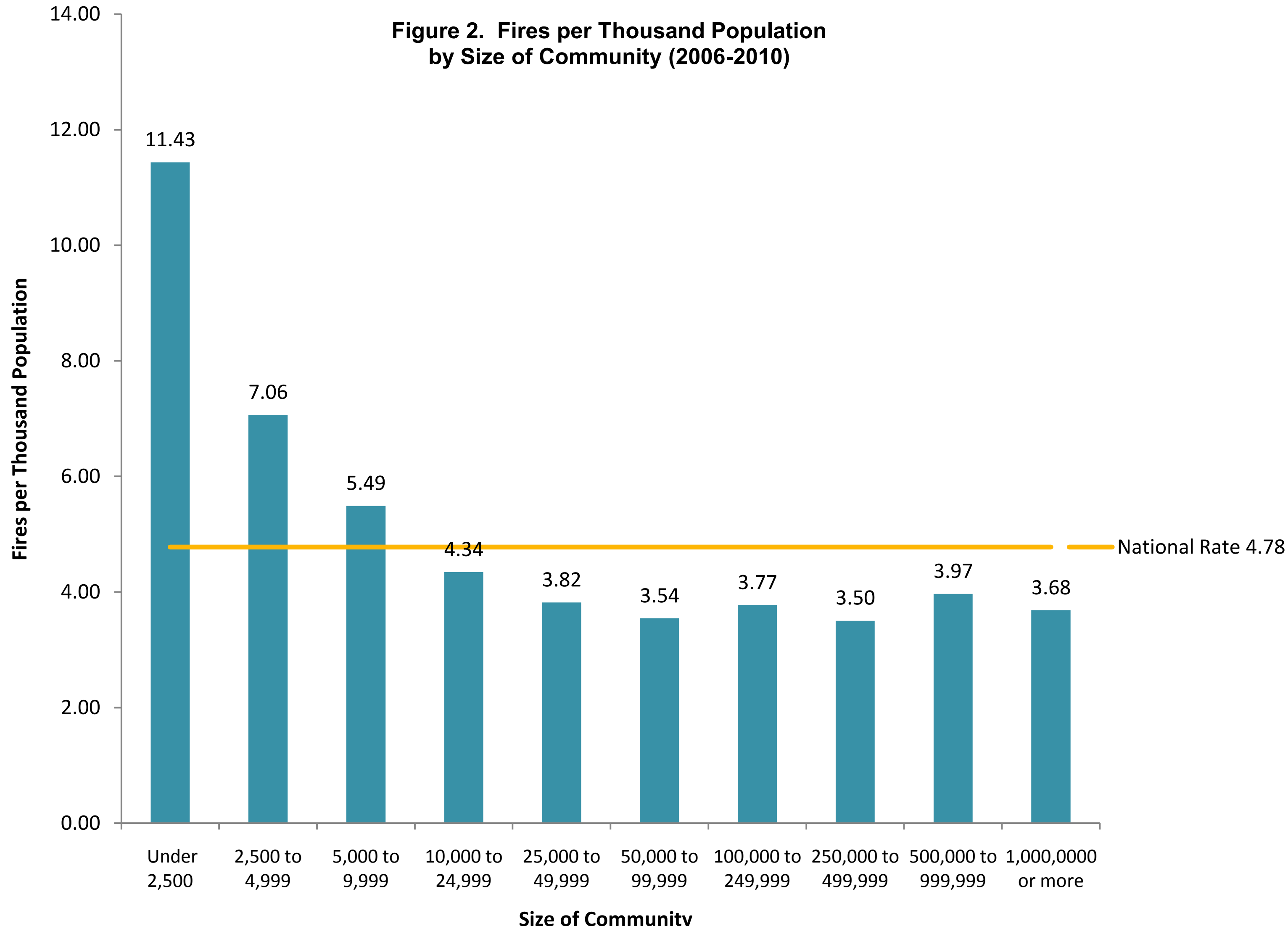


Source: NFPA Survey of Fire Departments (2006-2010)

the next three years. From 1997 to 2002, the number of outside fires stayed in the 839,000 to 861,500 level except for 1999, then rose in 2005 and 2006, before declining during 2007-2010 to 634,000 at the end of 2010.

Of the outside fires, there were an estimated 304,000 brush, grass and wildland fires in 2010, a very slight decrease of 0.7%, while an estimated 173,000 rubbish fires occurred, a very slight increase of 1.2%, or virtually no change from a year ago.

Civilian Fire Deaths

The 1,331,500 fires reported by fire departments in the U.S. in 2010, resulted in an estimated 3,120 civilian deaths based on data reported to the NFPA. This is an increase of 3.7% from a year ago. The nature of the increase is better understood when results are examined by property type.

An estimated 2,665 civilians died in residential fires in 2010, an increase of 2.9%. Of these deaths, 440 occurred in apartment fires. Another 2,200 died in one- and two-family homes, an increase of 4.8%.

In all, fires in the home (one- and two-family homes including manufactured homes and apartments) resulted in 2,640 civilian deaths, an increase of 2.9% from a year ago. Looking at trends in civilian deaths since 1977-78[1], several observations are worth noting (see Figure 3). Home fire deaths were at their peak in 1978 when 6,015 fire deaths occurred. Home fire deaths then decreased steadily during the 1979-82 period except for 1981, and decreased a substantial 20% during the period to 4,820 by the end of 1982. From 1982 to 1988, the number of home fire deaths stayed quite level in the 4,650 to 4,950 area except for 1984 when 4,075 fire deaths occurred. From 1989 to 1996 home fire deaths continued to decline and stayed in the 3,420 to 4,340 area. From 1997 onward home fire deaths have generally continued to decline with the number of deaths staying in the 2,550 to 3,200 area since 2001.

Overall for the 1977-2010 period, the number of home fire deaths decreased from 5,865 in 1977 to 2,640 in 2010 for a decrease of 55%. The number of home fire incidents also declined steadily for an overall decrease of 49% for the same period. When the death rate per 1,000 home fire incidents is looked at (Figure 3), there is no steady decline, but rather the rate fluctuates considerably up and down[2]. In fact, the death rate per 1,000 home fires was 8.1 in 1977 and 7.1 in 2010 for a decrease of 12%. These results suggest that even though the number of home fires and home fire deaths declined similarly during the period, the death rate did not, and that given there is a home fire, the fire death rate risk has not changed much for the period.

With home fire deaths still accounting for 2,640 fire deaths or 85% of all civilian deaths, fire safety initiatives targeted at the home remain the key to any reductions in the overall fire death toll. Five major strategies are: First, more widespread public fire safety education is needed on how to prevent fires and how to avoid serious injury or death if fire occurs. Information on the common causes of fatal home fires should continue to be used in the design of fire safety education messages. Second, more people must use and maintain smoke detectors and develop and practice escape plans. Third, wider use of residential sprinklers must be aggressively pursued. Fourth, additional ways must be sought to make home products more fire safe. The regulations requiring more child-resistant lighters are a good example, as are requirements for cigarettes, with reduced ignition strength (generally called “fire-safe” cigarettes). The wider use of upholstered furniture and mattresses that are more resistant to cigarette ignitions is an example of change that has already accomplished much and will continue to do more. Fifth, the special fire safety needs of high-risk groups, e.g., the young, older adults, and the poor need to be addressed.[3,4]

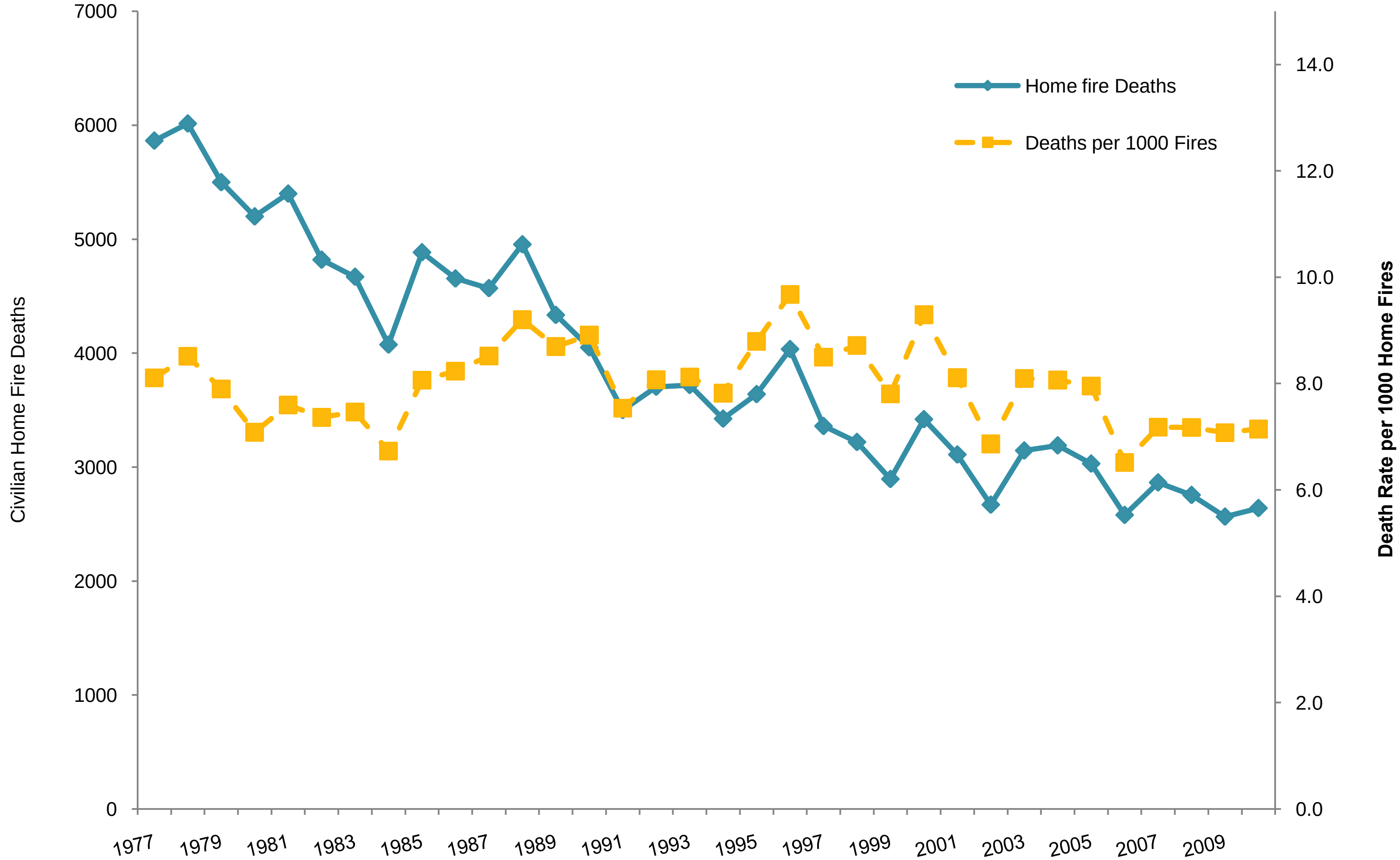
Also in 2010, 90 civilians that died in nonresidential structure fires, a decrease of 14.3%.

Civilian fire death rates per million people by community size were examined (Figure 4). The smallest communities (populations less than 2,500) had the highest rate with 10.8, which was almost twice the national average rate.

Of the 2,755 civilians that died in structure fires, 200 or 7.3% died in fires that were intentionally set.

Also in 2010, an estimated 285 civilians died in highway vehicle fires, an increase of 9.6%.

Figure 3. Civilian Home Fire Deaths and Rates per 1000 Fires, 1977-2010



Source: NFPA Surve of Fire Departments (1977-2010)

Table 4
Estimates of 2010 Civilian Fire Deaths and
Injuries by Property Use

Property Use	Civilian Deaths: Estimate	Civilian Deaths: Percent Change From 2009	Civilian Deaths: Percent of all Civilian Deaths	Civilian Injuries: Estimate	Civilian Injuries: Percent Change From 2009	Civilian Injuries: Percent of all Civilian Injuries
Residential (total)	2,665	+2.9	85.4	13,800	+5.8	77.9
One-and-Two-Family Homes[1]	2,200	+4.8	70.5	9,400	+1.1	53.1
Apartments	440	-5.4	14.1	3,950	+17.9*	22.3
Other Residential[2]	25	0	0.8	450	+12.5	2.5
Non-residential Structures[3]	90	-14.3	2.9	1,620	-4.1	9.1
Highway Vehicles	285	+9.6	9.1	1,440	-1.0	8.1
Other Vehicles[4]	25	+25.0	0.8	150	-3.2	0.9
All Other[5]	55	+57.1	1.8	710	+1.4	4.0
Total	3,120	+3.7		17,720	+3.9	

Estimates are based on data reported to the NFPA by fire departments that responded to the 2010 National Fire Experience Survey. Note that most changes were not statistically significant; considerable year-to-year fluctuation is to be expected for many of these totals because of their small size.

[1] This includes manufactured homes.

[2] Includes hotels and motels, college dormitories, boarding houses, etc.

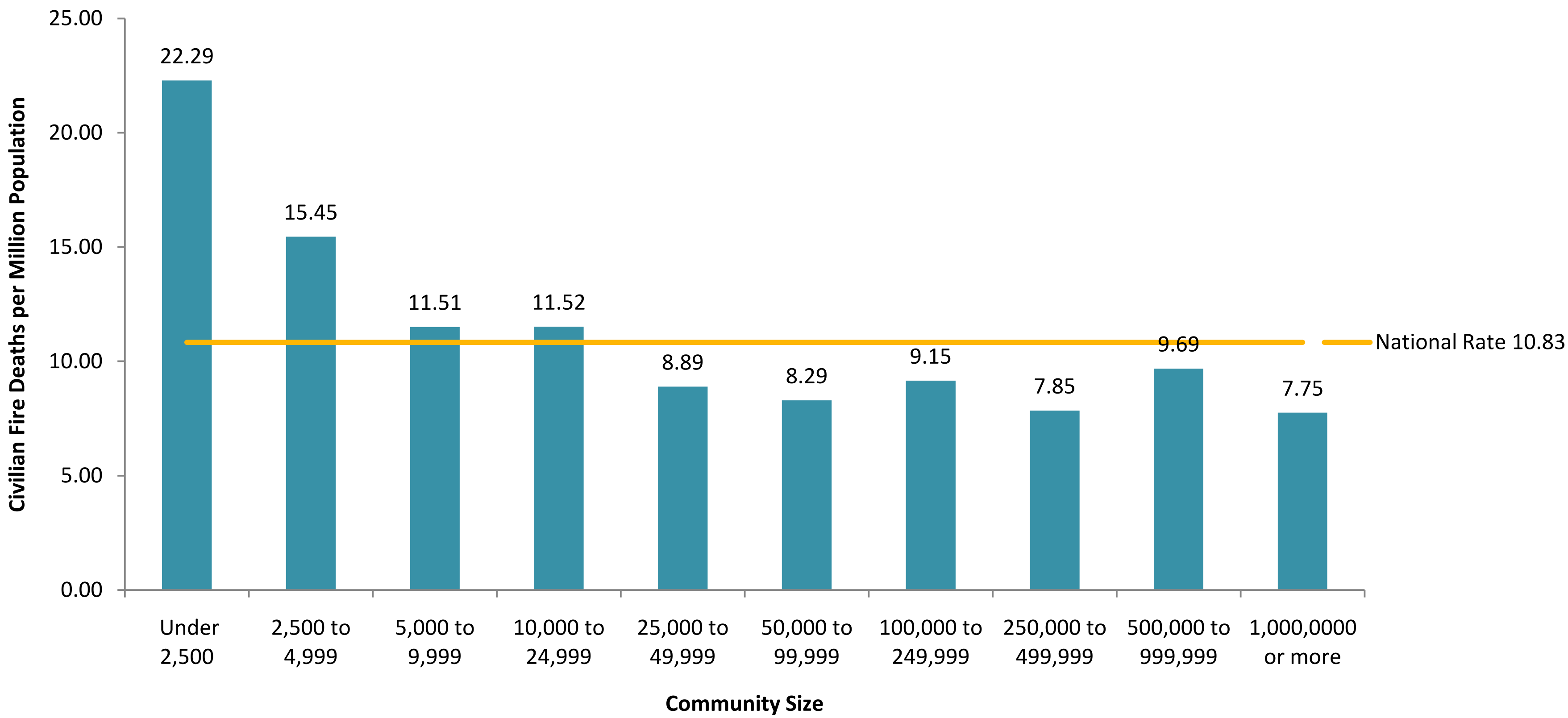
[3] This includes public assembly, educational, institutional, store and office, industry, utility, storage, and special structure properties.

[4] This includes trains, boats, ships, farm vehicles and construction vehicles.

[5] This includes outside properties with value, as well as brush, rubbish, and other outside locations.

*Change was statistically significant at the .05 level.

Figure 4. Civilian Fire Deaths per Million Population by Community Size (2006-2010)



Source: NFPA Survey of Fire Departments (2006-2010)

Civilian Fire Injuries

Results based on data reported to the NFPA indicate that in addition to 3,120 civilian fire deaths, there were an estimated 17,720 civilian fire injuries in 2010. This represents an increase of 3.9% from a year ago, and is the highest since 2005 when 17,925 injuries occurred.

Estimates of civilian fire injuries are on the low side, because many civilian injuries are not reported to the fire service. For example, many injuries occur at small fires that fire departments do not respond to, and sometime when departments do respond they may be unaware of injured persons that they did not transport to medical facilities.

The NFPA estimates that there were 13,800 civilians injured in residential properties, an increase of 5.8%. Of these injuries 9,400 occurred in one- and two-family homes, and 3,950 occurred in apartments. There were also 1,620 civilians injured in nonresidential structures in 2010.

For the 1977-2010 period, the number of civilian injuries has ranged from a high of 31, 275 in 1983 to a low of 16,400 in 2006 for an overall decrease of 48%. There was no consistent pattern going up or down until 1995, when injuries fell roughtly 5,000 in 1994-95 to 25,775. From 1996 to 2002, injuries declined 28% to 18,425 by the end of 2002. Since 2002, civilian injuries have been in the range of 16,400 to 18,425.

Property Loss

The NFPA estimates that the 1,331,500 fires responded to by the fire service caused $11,593,000,000 in property damage in 2010. This is a highly significant decrease of 7.5%.

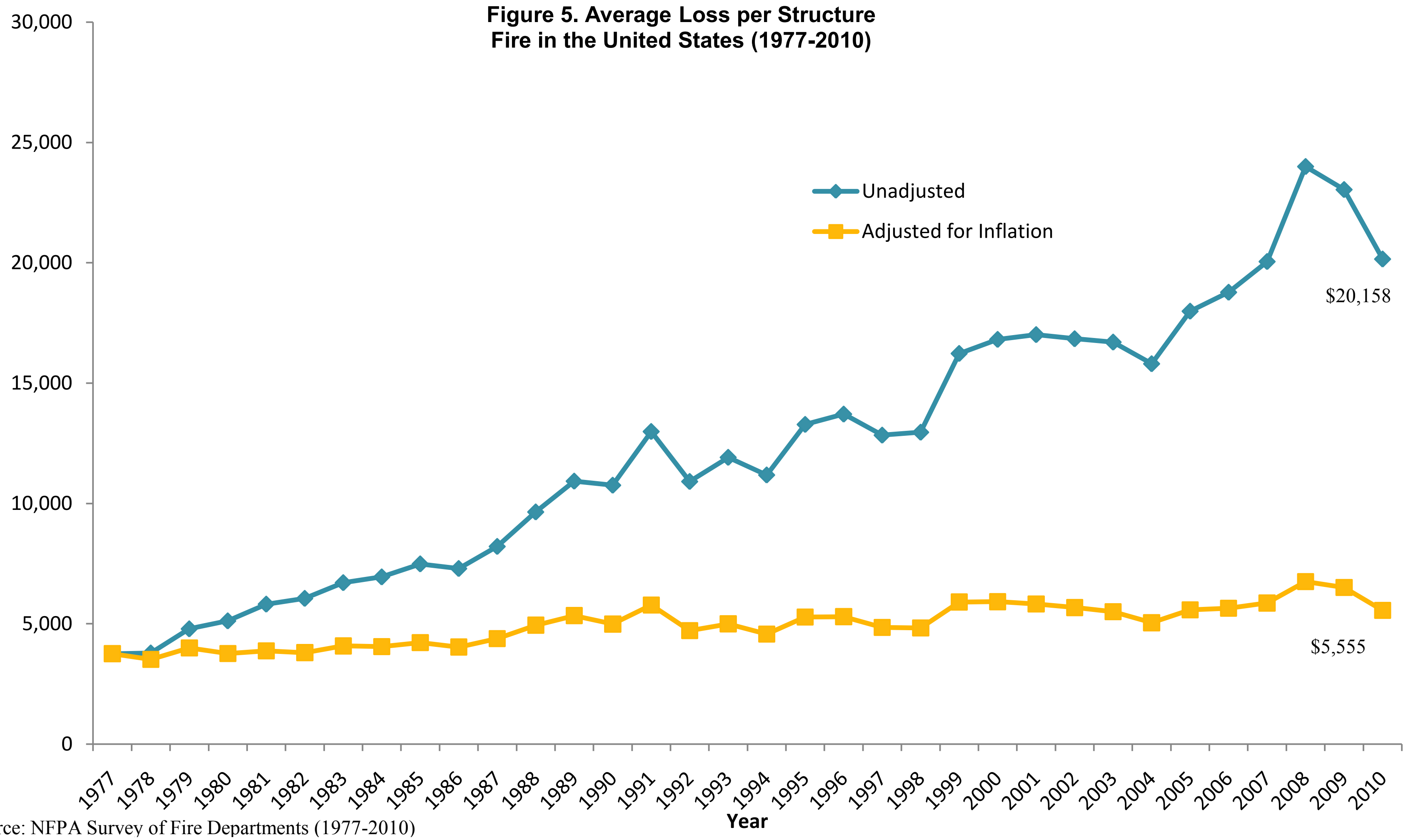
Fires in structures resulted in $9,716,000,000, in property damage, a significant decrease of 10.4%. Average loss per structure fire was $20,158, a significant decrease of 10.6%.

Over the 1977-2010 period, and excluding the events of 9/11/01, the average loss per structure fire was $3,757 in 1977 and $20,158 in 2010 for an overall increase of 436%. When property loss is adjusted for inflation, the increase in the average structure fire loss between 1977 and 2010 is 48%.

Of the property loss in structures, $7,079,000,000 occurred in residential properties, a decrease of 9.2%. An estimated $5,895,000,000 occurred in one- and two-family homes, a decrease of 7.8%. An estimated $1,033,000,000 also occurred in apartments.

Other property damage figures worth noting for 2010 include: $421,000,000 in public assembly properties, a significant decrease of 44.4% (this decrease reflects a s009 casino fire that resulted in $340,000,000 in property loss); $515,000,000 in industrial properties, a decrease of 10.0%; $389,000,000 in fires outside of a structure with value involved, a significant increase of 27.6% (this increase reflects the Fourmile Canyon Wildfire in Colorado with an estimated property loss of $217,000,000).

It should be kept in mind that property loss totals can change dramatically from year to year because of the impact of occasional large loss fires. The NFPA provides an analysis of these large loss fires in the November/December issue of *NFPA Journal* every year.



Source: NFPA Survey of Fire Departments (1977-2010)

Intentionally Set Fires

Based on data reported by fire departments in the survey, the NFPA estimates there were 27,500 intentionally set structure fires in 2010, an increase of 3.8% from a year ago (see Table 5). (Note the NFPA survey is based on the NFIRS 5.0 system. This system has an intentionally set category which is equivalent to the old incendiary category. There is no new equivalent to the old suspicious category, which has been eliminated.)

These intentionally set structure fires resulted in an estimated 200 civilian deaths, an increase of 17.7%. These set structure fires also resulted in $585,000,000 in property loss, a decrease of 14.5%.

Also in 2010, there were an estimated 14,000 intentionally set vehicle fires, a decrease of 6.7% from a year ago. These set vehicle fires resulted in $89,000,000 in property loss, a decrease of 17.6% from a year ago.

Table 5
Estimate of 2010 Losses in
Intentionally Set Structure Fires

Intentionally[2] Set Structure Fires	Estimate	Percent change from 2008
Number of Structure Fires	27,500	+3.8
Civilian Deaths	200	+17.7
Property Loss[1]	$585,000,000	-14.5

The estimates are based on data reported to the NFPA by fire departments that responded to the 2010 National Fire Experience Survey.

[1] This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation, or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison.

[2]The NFPA Survey is based on the NFIRS 5.0 system. This system has an intentionally set category which is equivalent to the old incendiary category. There is no new equivalent to the old suspicious category, which has been eliminated.

Region

Fire loss rates nationwide and by region can be seen in Table 6. The Midwest and the South with 4.9 fires per thousand people had the highest fire incident rates..

The South (13.0) and the Midwest (12.6) had the highest civilian death rate per million population. In recent years, the Midwest and the South have had the highest fire incident and civilian death rates.

The Northeast (76.6) and the Midwest (71.1) had the highest civilian injury rates per million population.

The Midwest with $46.0 property loss per capita had the highest property loss rate.

Fire incident rates by region and community size are shown in Table 8. The Northeast had the highest rate for communities of 500,000 or more, the Midwest had the highest rate for communities of 250,000 to 499,999, and the South had the highest rates for communities of 10,000 to 99,999, and smaller communities (population of less than 10,000)..

Civilian fire deaths per million population by region and community size are shown in Table 9. The Midwest had the highest rate for communities of 100,000 to 499,999 and the smallest communities (population of less then 5,000 population), the West had the highest rate for communities of 5,000 to 9,999, and the South had the highest rates for communities of 10,000 to 99,999.

Civilian fire injuries per million population by region and community size are shown in Table 9. The West had the highest rates for communities of 500,000 or more (though only the South and the West had sufficient data for this community size), and the South had the highest rate for communities of 100,000 to 249,999. The Midwest had the highest rates for communities of 250,000 to 499,999, communities of 10,000 to 24,999, and communities less than 2,500 population, and the Northeast had the highest rates for communities of 25,000 to 99,999, and communities of 2,500 to 9,999.

Property loss per capita by region and community size are shown in Table 10. The South had the highest rates for most community sizes, and the West had the highest rate for communities of 25,000 to 49,999.

Table 6
Fire Loss Rates Nationwide and by Region, 2010

Region	Number of Fires per Thousand Population	Civilian Deaths per Million Population	Civilian Injuries per Million Population	Property Loss per Capita
Nationwide	4.3	10.1	57.3	$37.5
Northeast	4.4	6.8	76.6	31.2
Midwest	4.9	12.6	71.1	46.0
South	4.9	13.0	51.6	38.7
West	2.7	5.7	38.8	32.5

Source: NFPA's; Survey of Fire Departments for 2010 U.S. Fire Experience.

Table 7
2010 Fires per Thousand Population

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	3.4	5.4	*	3.4	2.2
250,000 to 499,999	3.1	*	4.3	3.2	2.0
100,000 to 249,999	3.4	5.4	3.6	4.1	2.1
50,000 to 99,999	3.3	3.8	2.8	4.3	2.3
25,000 to 49,999	3.4	3.9	2.8	4.4	3.0
10,000 to 24,999	4.0	3.7	3.4	5.8	3.2
5,000 to 9,999	5.0	4.3	4.3	7.0	4.6
2,500 to 4,999	6.6	5.6	5.8	9.5	5.8
under 2,500	10.3	7.6	8.9	15.6	9.8

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience.

*Insufficient data

Table 8
2010 Civilian Fire Deaths per Million Population
by Region and Size of Community

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	8.1	8.8	*	10.5	4.3
250,000 to 499,999	5.8	*	13.3	4.4	2.8
100,000 to 249,999	8.5	5.7	14.7	9.5	4.4
50,000 to 99,999	7.2	5.9	8.1	9.9	2.8
25,000 to 49,999	7.9	8.2	8.5	11.5	7.7
10,000 to 24,999	10.8	8.3	9.7	17.3	4.4
5,000 to 9,999	9.4	11.1	4.5	13.9	14.5
2,500 to 4,999	13.5	5.2	17.9	11.9	9.5
under 2,500	14.6	*	18.4	17.4	12.8

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience

*Insufficient data

Table 9
2010 Civilian Fire Injuries per Million Population
by Region and Size of Community

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	51.5	*	*	40.6	44.8
250,000 to 499,999	46.2	*	82.7	46.6	31.2
100,000 to 249,999	63.5	*	72.0	81.6	34.3
50,000 to 99,999	64.1	119.8	62.2	69.9	37.7
25,000 to 49,999	65.0	78.1	65.1	70.5	43.8
10,000 to 24,999	61.7	57.9	65.5	59.9	55.0
5,000 to 9,999	36.9	43.0	39.0	31.8	29.1
2,500 to 4,999	40.5	57.6	34.4	34.6	56.7
under 2,500	52.1	25.0	76.5	40.8	*

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience.

*Insufficient data

Table 10
2010 Property Loss per Person
by Region and Size of Community

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	$25.9	*	*	$29.6	$21.6
250,000 to 499,999	29.6	*	$26.5	34.1	24.8
100,000 to 249,999	30.0	*	29.3	34.2	24.8
50,000 to 99,999	28.0	24.4	26.3	31.4	26.2
25,000 to 49,999	33.0	28.0	31.5	34.7	37.5
10,000 to 24,999	42.4	43.3	38.2	51.2	38.6
5,000 to 9,999	51.7	41.7	50.5	63.5	48.4
2,500 to 4,999	70.4	69.7	71.5	75.9	53.4
under 2,500	100.0	86.1	107.6	114.6	73.8

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience.

*Insufficient data

Average Fire Experience

Average fire experience by community size for all fires and residential properties can be seen in Tables 11 and 12.

Table 11
Average 2010 Fire Experience by Size of Community

Population of Community	Total Fires	Structure Fires	Civilian Deaths	Civilian Injuries	Property Loss
1,000,000 or more	4,585	1,657	13.71	128.43	$41,168,300
500,000 to 999,999	2,579	1,121	6.83	33.21	22,627,200
250,000 to 499,999	1,053	395	1.97	15.90	12,097,100
100,000 to 249,999	503	192	1.26	9.81	4,600,000
50,000 to 99,999	222	85	0.49	4.34	1,922,500
25,000 to 49,999	119	46	0.28	2.26	1,160,700
10,000 to 24,999	63	24	0.17	0.96	662,000
5,000 to 9,999	36	13	0.09	0.27	396,500
2,500 to 4,999	22	7	0.06	0.14	285,000
under 2,500	11	3	0.02	0.07	108,400

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience

Table 12
Average 2010 Residential Fire Experience by Size of Community

Population of Community	Number of Fires	Civilian Deaths	Civilian Injuries	Property Loss
1,000,000 or more	1,257	10.57	90.71	$22,788,600
500,000 to 999,999	890	5.23	26.52	14,221,400
250,000 to 499,999	320	1.67	13.24	6,460,800
100,000 to 249,999	158	1.11	7.94	2,903,100
50,000 to 99,999	69	0.41	3.45	1,159,500
25,000 to 49,999	38	0.26	1.90	686,200
10,000 to 24,999	19	0.15	0.80	394,800
5,000 to 9,999	11	0.08	0.23	239,100
2,500 to 4,999	5	0.05	0.08	142,400
under 2,500	2	0.02	0.04	54,200

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience

Table 13
Fire Department Responses by Type of Call, 2010

	Number	Percent Change From 2009
Fire Incidents	1,331,500	-1.3
Medical Aid Responses (Ambulance, EMS, Rescue)	18,522,000	+8.3
False Alarms	2,187,000	+0.5
Mutual Aid or Assistance Calls	1,189,500	-8.2
Hazardous Material Responses (Spills, Leaks, etc.)	402,000	+1.3
Other Hazardous Responses (arcing wires, bomb removal etc.)	660,000	+5.5
All Other Responses (smoke scares, lock-outs, (etc.)	3,913,000	+9.1
Total Incidents	28,205,000	+6.3

The percent of fires and nonfire incidents by community size is shown in Table 14.

A further breakdown on false responses was collected on the 2010 surveys and the results can be seen in Table 15.

Table 14
Percent of Fires and Nonfire Incidents by Community size, 2009-2010

	Community Size									
	1,000,000 or more	500,000 to 999,999	250,000 to 499,999	100,000 to 249,999	50,000 to 99,999	25,000 to 49,999	10,000 to 24,999	5,000 to 9,999	2,500 to 4,999	less than 2,500
Fire Incidents	2.4%	3.1%	3.1%	3.3%	3.5%	4.0%	5.0%	7.0%	10.7%	15.5%
Medical Aid Responses	73.8%	70.4%	70.1%	67.7%	67.7%	64.0%	61.1%	55.6%	54.2%	52.6%
False Alarms	9.9%	6.7%	6.8%	7.4%	8.5%	9.6%	9.1%	9.6%	6.6%	7.1%
Mutual Aid Responses	1.0%	1.7%	2.1%	2.3%	2.2%	4.1%	6.3%	10.4%	13.3%	13.9%
Hazardous Material Responses	0.5%	0.9%	1.0%	1.2%	1.4%	1.8%	1.9%	2.0%	1.3%	1.0%
Other Hazardous Responses	1.1%	1.4%	2.1%	1.8%	2.3%	2.6%	3.0%	3.2%	3.3%	2.8%
All Other Responses	11.1%	15.6%	16.4%	16.4%	15.0%	13.6%	13.1%	12.7%	9.6%	7.3%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience, 2009-2010.

Table 15
Estimates of False Alarms by Type, 2010

	Estimate	Percent Change From 2009	Percent of All False Alarms
Malicious, Mischievous False Call	163,000	-10.9	7.5
System Malfunction	708,500	+1.5	32.4
Unintentional Call	992,000	+1.3	45.3
Other False Alarms (Bomb Scares, etc.)	323,500	+2.2	14.8
Total	2,187,000	+0.4	

Source: NFPA's Survey of Fire Departments for 2010 U.S. Fire Experience

SURVEY METHODOLOGY

Each year, based on a sample survey of fire departments across the country, the NFPA estimates the national fire problem as measured by the number of fires that public fire departments attend, and the resulting deaths, injuries and property losses that occur. This report summarizes key findings based on the NFPA Survey for 2010 Fire Experience. This section explains the major steps in conducting the 2010 survey.

Sample Selection

The NFPA currently has 30,170 public fire departments listed in the US in its Fire Service Inventory (FSI) file. Based on desired levels of statistical precision for the survey results and the staff available to process, edit, and follow up on the individual questionnaires the NFPA determined that 3,000 fire departments were a reasonable number for the 2010 sample.

Because of the variation in fire loss results by community size, fire departments were placed in one of the following 10 strata by size of community protected:

1,000,000 and up
500,000 to 999,999
250, 0000 to 499,999
100,000 to 249,999
50,000 to 99,999
25,000 to 49,999
10,000 to 24,999
5,000 to 9,999
2,500 to 4,999
Under 2,500

Sample sizes for the individual strata were chosen to ensure the best estimate of civilian deaths in one-and two-family dwellings, the statistic that most aptly reflects the overall severity of the fire problem. All departments that protect 50,000 people or more were included. These 800 departments in the five highest strata protect 147,989,000.

For the remaining five population strata, assuming response rates similar to the past two years for the five highest strata, a total sample of 2,640 was indicated. Sample sizes for individual strata were calculated using a methodology that assured optimum sample allocations[6]. Based on the average variation in civilian deaths in one- and two-family dwellings by stratum for the last two years and on the estimated number of fire departments, appropriate relative sample weights were determined. Then the corresponding sample sizes by stratum were calculated. The sample size by stratum was then adjusted based on the response rates from the last two years' returns. A sample size of 18,861 was found to be necessary to obtain the desired total response of 3,000 fire departments. For all strata, were a sample was necessary, departments were randomly selected.

Data Collection

The fire departments selected for the survey were sent the 2010 NFPA Fire Experience Questionnaire during the 2nd week of January 2011. A second mailing was sent in mid-March to fire departments that had not responded to the first mailing. A total of 2,650 departments responded to the questionnaire 2,182 to the first mailing and 468 to the second.

Table 14 shows the number of departments that responded by region and size of community. The overall response rate was 14%, although response rates were considerably higher for departments protecting larger communities than they were for departments protecting smaller communities. The 2,650 departments that did respond protect 112,153,200 people or 36% of the total U.S. population.

After the NFPA received the surveys, technical staff members of the Fire Analysis and Research Division reviewed them for completeness and consistency. When appropriate, they followed up on questions with a telephone call.

After the edit, procedures were completed, the survey data were keyed to a computer file, where additional checks were made. The file was then ready for data analysis and estimation procedures.

Estimation Methodology

The estimation method used for the survey was ratio estimation[7], with stratification by community size. For each fire statistic a sample loss rate was computed for each stratum. This rate consisted of the total for that particular statistic from all fire departments reporting it, divided by the total population protected by the departments reporting the statistic. Note that this means that the departments used in calculating each statistic could be different, reflecting differences in unreported statistics The sample fire loss rates by stratum were then multiplied by population weighing factors to determine the estimates were combined to provide the overall national estimate.

If this method of estimation is to be effective, estimates of the total number of fire departments and the total population protected in each stratum must be accurate. The NFPA makes every effort to ensure that this is the case. The population weights used for

Table 16
Number of Fire Departments Responding to 2010 NFPA Survey, by Region and Community Size

Population of Community	All Regions	Northeast	Midwest	South	West
1,000,000 or more	9	2	0	4	3
500,000 to 999,999	30	1	2	15	12
250,000 to 499,999	35	1	6	18	10
100,000 to 249,999	111	4	19	54	34
50,000 to 99,999	203	19	67	68	49
25,000 49,999	305	38	133	88	46
10,000 to 24,999	534	90	256	128	60
5,000 to 9,999	361	76	153	94	38
2,500 to 4,999	335	57	170	76	32
Under 2,500	727	99	369	154	105
Total	2,650	387	1,175	699	389

the national estimates were developed using the NFPA FSI (Fire Service Inventory) File and U.S. Census population figures.

For each estimate, a corresponding standard error was also calculated[6]. The standard error is a measure of the error caused by the fact that estimates are based on a sampling of fire losses rather than on a complete census of the fire problem. Due to the fact that the survey is based on a random sample, we can be very confident that the actual value falls within the percentage noted in parentheses for the overall national fire loss statistics: number of fires (1.5%), number of civilian deaths (10.0%), number of civilian injuries (5.1%), and property loss (2.7%).

The standard error helps in determining whether year-to-year differences are statistically significant. Differences that were found to be statistically significant were so noted in tables. Property loss estimates are particularly prone to large standard errors because they are sensitive to unusually high losses, and, as a result, large percentage differences from year to year may not always be statistically significant. In 2010, for instance, property damage in industrial properties was estimated to be $515,000,000. This represented a decrease of 10.0% from the year before, but was found not to be statistically significant.

In addition to sampling errors, there are nonsampling errors. These include biases of the survey methodology, incomplete or inaccurate reporting of data to the NFPA, differences in data collection methods by the fire departments responding. As an example of a nonsampling error, most of the fires included in the survey took place in highly populated residential areas, because the fire departments selected for the surveys are primarily public fire departments that protect sizable residential populations. Fires that occur in sparsely populated areas protected primarily by State and Federal Departments of Forestry are not likely to be included in the survey results.

The NFPA Fire Incident Data Organization (FIDO) data base was also used in conjunction with the annual survey to help identify any large loss fires or deaths that the survey might have missed.

The editors of survey data attempted to verify all reported civilian deaths in vehicle fires. They contacted most of the fire departments that reported fire-related deaths in vehicles and found that many of the deaths were indeed the results of fire. In some instances, however, impact was found to have been the cause of death. This effort can have a considerable impact on the estimates.

The results presented in this report are based on fire incidents attended by public fire departments. No adjustments were made for unreported fires and losses (e.g., fires extinguished by the occupant). Also, no adjustments were made for fires attended solely by private fire brigades (e.g., industry and military installations), or for fires extinguished by fixed suppression systems with no fire department response.

Fire Experience of Nonrespondents

A telephone follow-up was made to a sample of nonrespondents to determine whether fire departments that did not respond to the survey experienced fire loss rates similar to those that did respond. This would help the NFPA determine whether we received questionnaires only from departments that had experienced unusually high or low fire losses.

The sample of nonrespondents selected was proportional by state and population of community to the original sample selected for the survey. As a result of these efforts, 157 fire departments were successfully contacted and answered some of the questions about their fire experience.

Table 17 compares fire loss rates for both respondents and nonrespondents. For communities of 100,000 to 249,999, the rates were similar for fires, the respondent rate was 49% higher for civilian deaths, and the nonrespondent rate was 37% higher for property loss (None of these results were statistically significant).

For communities of 50,000 to 99,999, the respondent rate was 10% higher for fires, while the nonrespondent rate was 18% higher for civilian deaths, and 34% higher for property loss. (None of these results were statistically significant).

For communities of 25,000 to 49,999, the nonrespondent rate was 21% higher for fires, and 58% higher for civilian deaths while the respondent rate was 22% higher for property loss. (None of these results were statistically significant).

For communities of 10,000 to 24,999, the nonrespondent rate was 19% higher for fires, while the respondent rate was 122% higher for civilian deaths, and 10% higher for property loss. (Only the civilian death result was statistically significant).

For communities of 5,000 to 9,999, the nonrespondent rate was 26% higher for fires, 48% higher for civilian deaths, and 9% higher for property loss. (None of these results were statistically significant).

Table 17
A Comparison of Respondents and Nonrespondents*
to the 2010 NFPA Survey by Community Size

Population of Community	Number of Fires (Per Thousand Population)				Civilian Deaths (Per Million Population)				Property Loss (Per Capita)			
	Respondents		Nonrespondents		Respondents		Nonrespondents		Respondents		Nonrespondents	
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
100,000 to 249,999	109	3.4	18	3.6	109	8.5	18	5.7	81	30.0	16	41.2
50,000 to 99,999	195	3.3	29	3.0	197	7.2	28	8.5	124	28.0	20	37.5
25,000 to 49,999	281	3.4	40	4.1	300	7.9	40	12.5	165	33.0	29	26.9
10,000 to 24,999	503	4.0	39	4.8	531	10.8	35	4.9	272	42.4	29	38.6
5,000 to 9,999	343	5.0	18	6.3	359	12.0	16	17.7	168	51.7	8	56.5

*Some departments did not return the questionnaire. A sample of these nonrespondents was contacted by telephone and questioned about their 2010 fire experience.

Note: ―n‖ refers to the number of departments reporting the statistic.

ns – Data not sufficient.

Definition of Terms

Civilian: The term ―civilian” includes anyone other than a firefighter, and covers public service personnel such as police officers, civil defense staff, non-fire service medical personnel, and utility company employees.

Death: An injury that occurred as a direct result of a fire that is fatal or becomes fatal within one year.

Fire: Any instance of uncontrolled burning. Includes combustion explosions and fires out on arrival. Excludes controlled burning (whether authorized or not), over pressure rupture without combustion, mutual aid responses, smoke scares, and hazardous responses (e.g., oil spill without fire).

Injury: Physical damage that is suffered by a person as a direct result of fire and that requires (or should require) treatment by a practitioner of medicine (physician, nurse, paramedic, EMT) within one year of the incident (regardless of whether treatment was actually received), or results in at least one day of restricted activity immediately following the incident. Examples of injuries resulting from fire are smoke inhalation, burns, wounds and punctures, fractures, heart attacks (resulting from stress under fire condition), strains and sprains.

Property Damage: Includes all forms of direct loss to contents, structure, machinery, a vehicle, vegetation or anything else involved in the fire but not indirect losses, such as business interruption or temporary shelter provisions.

Structure: An assembly of materials forming a construction for occupancy or use in such a manner as to serve a specific purpose. A building is a form of structure. Open platforms, bridges, roof assemblies over open storage or process areas, tents, air-supported, and grandstands are other forms of structures.

Vehicles, Highway and Other: Fires in these instances may have been associated with an accident; however, reported casualties and property loss should be the direct result of the fire only. Highway vehicles include any vehicle designed to operate normally on highways, e.g., automobiles, motorcycles, buses, trucks, trailers (not mobile homes on foundations), etc. Other vehicles include trains, boats and ships, aircraft, and farm and construction vehicles.

Footnotes

1. Note that the NFPA changed its survey methodology in 1977-78, and meaningful comparisons cannot be made with fire statistics estimated before 1977.

2. The downward trend of home fire deaths for the period was examined by a Spearman's rho correlation coefficient and was found to be statistically significant at the .001 level, while for the death rate per 1,000 home fires, there was no statistically significant trend found.

3. John R. Hall, Jr., Characteristics of Home Fire Victims Including Age and Sex, July 2005, Quincy: National Fire Protection Association, Fire Analysis and Research Division.

4. Rita F. Fahy and Alison L. Miller, ―How Being Poor Affects Fire Risk", *Fire Journal*, Vol. 83, No. 1 (January 1989), p. 28.

5. As defined by the U.S. Bureau of the Census, the four regions are: Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

6. Steve K. Thompson, *Sampling,* John Wiley, New York, NY, 1992, pp. 107-111.

7. William G. Cochran, *Sampling Techniques,* John Wiley, New York, NY, 1977, pp. 150-161.

Appendix A. Fire Loss in the United States Trend Tables, 1977-2010

The U.S. Fire Problem, 1977-2010

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Billions) As Reported	In 2010 Dollars
1977	3,264,000	7,395	31,190	$4.7	$16.9
1978	2,817,500	7,710	29,825	$4.5	$15.0
1979	2,845,500	7,575	31,325	$5.8	$17.3
1980	2,988,000	6,505	30,200	$6.3	$16.6
1981	2,893,500	6,700	30,450	$6.7	$16.0
1982	2,538,000	6,020	30,525	$6.4	$14.5
1983	2,326,500	5,920	31,275	$6.6	$14.4
1984	2,343,000	5,240	28,125	$6.7	$14.0
1985	2,371,000	6,185	28,425	$7.3	$14.8
1986	2,271,500	5,850	26,825	$6.7	$13.3
1987	2,330,000	5,810	28,215	$7.2	$13.7
1988	2,436,500	6,215	30,800	$8.4	$15.4
1989	2,115,000	5,410	28,250	$8.7	$15.2
1990	2,019,000	5,195	28,600	$7.8	$13.0
1991	2,041,500	4,465	29,375	$9.5[1]	$15.1[1]
1992	1,964,500	4,730	28,700	$8.3	$12.9
1993	1,952,500	4,635	30,475	$8.5[2]	$12.9[2]
1994	2,054,500	4,275	27,250	$8.2	$12.0
1995	1,965,500	4,585	25,775	$8.9	$12.7
1996	1,975,000	4,990	25,550	$9.4	$13.1
1997	1,795,000	4,050	23,750	$8.5	$11.6
1998	1,755,500	4,035	23,100	$8.6	$11.5
1999	1,823,000	3,570	21,875	$10.0	$13.1
2000	1,708,000	4,045	22,350	$11.2	$14.2
2001	1,734,500	6,196[3]	21,100[4]	$44.0[6]	$54.2[6]
2002	1,687,500	3,380	18,425	$10.3	$12.5
2003	1,584,500	3,925	18,125	$12.3[7]	$14.6[7]
2004	1,550,500	3,900	17,875	$9.8	$11.3
2005	1,602,000	3,675	17,925	$10.7	$11.9
2006	1,642,500	3,245	16,400	$11.3	$12.2
2007	1,557,500	3,430	17,675	$14.6[8]	$15.4[8]
2008	1,451,500	3,320	16,705	$15.5[9]	$15.7[9]
2009	1,348,500	3,010	17,050	$12.5	$12.7
2010	1,331,000	3120	17,720	$11.6	$11.6

[1]This includes $1.5 billion in damage caused by the Oakland Fire Storm, most of which was lost to homes but for which no detailed breakdown by property type was available.

[2]This includes $809 million in damage caused by Southern California wildfires.

[3]This includes 2,451 civilian deaths that occurred from the events of 9/11/01.

[4]This includes 800 civilian injuries that occurred from the events of 9/11/01.

[5]This includes 340 firefighters at the World Trade Center, September 11, 2001.

[6]This includes $33.44 billion in property loss that occurred from the events of 9/11/01.

[7]This includes the Southern California Wildfires (Cedar and Old Wildfires) with an estimated total property loss of $2,040,000,000. Loss by specific property type for this fire was not available.

[8]This includes the California Fire Storm 2007 with an estimated property damage of $1.8 billion.

[9]This includes the California wildfires 2008 with an estimated property damage of $1.4 billion.

Direct property damage figures do not include indirect losses, like business interruption. Inflation adjustment to 2010 dollars is done using the consumer price index.

Source: *Fire Loss in the United States 2010*, Michael J. Karter, Jr., NFPA, August 2011 and previous reports in the series.

The U.S. Structure Fire Problem, 1977-2010

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Billions)[1] As Reported	In 2010 Dollars
1977	1,098,000	6,505	26,310	$4.1	$14.8
1978	1,062,000	6,350	24,985	$4.0	$13.4
1979	1,036,500	5,970	24,850	$5.0	$14.9
1980	1,065,000	5,675	24,725	$5.5	$14.4
1981	1,027,500	5,760	25,700	$6.0	$14.3
1982	946,500	5,200	25,575	$5.7	$12.9
1983	868,500	5,090	26,150	$5.8	$12.7
1984	848,000	4,525	23,025	$5.9	$12.3
1985	859,500	5,265	23,350	$6.4	$13.0
1986	800,000	4,985	22,750	$5.8	$11.6
1987	758,000	4,880	23,815	$6.2	$11.9
1988	745,000	5,280	26,275	$7.2[2]	$13.2[2]
1989	688,000	4,655	24,025	$7.5[3]	$13.2[3]
1990	624,000	4,400	24,075	$6.7	$11.2
1991	640,500	3,765	24,975	$8.3[4]	$13.3[4]
1992	637,500	3,940	24,325	$7.0[5]	$10.8[5]
1993	621,500	3,980	26,550	$7.4[6]	$11.2[6]
1994	614,000	3,590	23,125	$6.9	$10.1
1995	573,500	3,985[7]	21,725	$7.6	$10.9
1996	578,500	4,220	21,875	$7.9	$11.0
1997	552,000	3,510	20,375	$7.1	$9.6
1998	517,500	3,420	19,425	$6.7	$9.0
1999	523,000	3,040	18,525	$8.5	$11.1
2000	505,500	3,535	19,600	$8.5	$10.8
2001[8]	521,500	3,220	17,225	$8.9	$10.9
2002	519,000	2,775	15,600	$8.7	$10.6
2003	519,500	3,385[9]	15,600	$8.7[10]	$10.3[10]
2004	526,000	3,305	15,525	$8.3	$9.6
2005	511,000	3,105	15,325	$9.2	$10.3
2006	524,000	2,705	14,350	$9.6	$10.4
2007	530,500	3,000	15,350	$10.6[11]	$11.2[11]
2008	515,000	2,900	14,960	$12.4[12]	$12.5[12]
2009	480,500	2,695	14,740	$10.8	$11.0
2010	482,000	2,755	15,420	$9.7	$9.7

[1] Individual incidents with large loss can affect the total for a given year.
[2] The 1988 figure includes a Norco, Louisiana petroleum refinery with a loss of $330 million.
[3] The 1989 figure includes a Pasadena, Texas polyolefin plant with a loss of $750 million.
[4] The 1991 figure includes the Oakland fire storm with a loss of $1.5 billion and the Meriden Plaza high-rise fire in Philadelphia with a loss of $325 million.
[5] The 1992 figure includes the Los Angeles Civil Disturbance with a loss of $567 million
[6] The 1993 figure includes Southern California wildfires with a loss of $809 million.
[7] Includes 168 deaths that occurred at the federal office building fire in Oklahoma City, OK.
[8] Does not include the events of 9/11/01, where there were 2,451 civilian deaths, 800 civilian injuries and $33.44 billion in property loss.
[9] Includes 100 fire deaths in the Station Night Club Fire in Rhode Island and 31 deaths in tow nursing home fires in Connecticut and Tennessee.
[10] Does not include the Southern California wildfires with an estimated property damage of $2 billion.
[11] This does not include the California Fire Storm 2007 with an estimated property damage of $1.8 million.
[12] Does not include the California wildfires 2008 with an estimated property damage of $1.4 billion.
Direct property damage figures do not include indirect losses, like business interruption
Inflation adjustment to 2010 dollars is done using the consumer price index.
Source: *Fire Loss in the United States 2010*, Michael J. Karter, Jr., NFPA, August 2011 and previous reports in the series.

The U.S. Home Structure Fire Problem, 1977-2010

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Billions) As Reported	Direct Property Damage (in Billions) In 2010 Dollars
1977	723,500	5,865	21,640	$2.7	$9.8
1978	706,500	6,015	20,400	$2.1	$6.9
1979	696,500	5,500	18,825	$2.4	$7.1
1980	734,000	5,200	19,700	$2.8	$7.5
1981	711,000	5,400	19,125	$3.1	$7.5
1982	654,500	4,820	20,450	$3.1	$7.1
1983	625,500	4,670	20,750	$3.2	$7.0
1984	605,500	4,075	18,750	$3.4	$7.0
1985	606,000	4,885	19,175	$3.7	$7.5
1986	565,500	4,655	18,575	$3.5	$6.9
1987	536,500	4,570	19,965	$3.6	$6.9
1988	538,500	4,955	22,075	$3.9	$7.2
1989	498,500	4,335	20,275	$3.9	$6.8
1990	454,500	4,050	20,225	$4.2	$6.9
1991	464,500	3,500	21,275	$5.5[1]	$8.7[1]
1992	459,000	3,705	21,100	$3.8	$5.9
1993	458,000	3,720	22,000	$4.8[2]	$7.2[2]
1994	438,000	3,425	19,475	$4.2	$6.2
1995	414,000	3,640	18,650	$4.3	$6.1
1996	417,000	4,035	18,875	$4.9	$6.8
1997	395,500	3,360	17,300	$4.5	$6.0
1998	369,500	3,220	16,800	$4.3	$5.7
1999	371,000	2,895	16,050	$5.0	$6.5
2000	368,000	3,420	16,975	$5.5	$7.0
2001	383,500	3,110	15,200	$5.5	$6.8
2002	389,000	2,670	13,650	$5.9	$7.2
2003	388,500	3,145	13,650	$5.9[3]	$7.1[3]
2004	395,500	3,190	13,700	$5.8	$6.7
2005	381,000	3,030	13,300	$6.7	$7.5
2006	396,000	2,580	12,500	$6.8	$7.4
2007	399,000	2,865	13,600	$7.4[4]	$7.8[4]
2008	386,500	2,755	13,160	$8.2[5]	$8.4[5]
2009	362,500	2,565	12,650	$7.6	$7.7
2010	384,000	2,640	13,350	$7.1	$6.9

[1]Includes $1.5 billion in damage caused by the Oakland Fire Storm, most of which was lost to homes but for which no detailed breakdown by property type was available.

[2]Includes $809 million in damage caused by Southern California wildfires

[3]This does not include the Southern California wildfires with an estimated property damage of $2 billion.

[4]Does not include the California Fire Storm 2007 with an estimated property damage of $1.8 billion

5Does not include the California wildfires 2008 with an estimated property damage of $1.4 billion.

"Homes" are dwellings, duplexes, manufactured homes (also called mobile homes), apartments, rowhouses, and townhouses. Other residential properties, such as hotels and motels, dormitories, barracks, rooming and boarding homes, and the like, are not included.

Direct property damage figures do not include indirect losses, like business interruption. Inflation adjustment to 2010 dollars is done using the consumer price index.

Source: *Fire Loss in the United States 2010*, Michael J. Karter, Jr., NFPA, August 2011 and previous reports in the series.

One– and Two-Family Home Structure Fires [1]

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Billions) As Reported	In 2010 Dollars
1977	678,000	4,835	17,465	$2.3	$8.4
1978	623,233	4,945	15,400	$1.8	$5.9
1979	550,500	4,320	14,650	$2.0	$6.1
1980	590,500	4,175	16,100	$2.4	$6.5
1981	574,000	4,430	14,875	$2.7	$6.5
1982	538,000	3,960	15,750	$2.8	$6.3
1983	523,500	3,825	16,450	$2.8	$6.1
1984	506,000	3,290	15,100	$2.9	$6.2
1985	501,500	4,020	15,250	$3.2	$6.5
1986	468,000	4,005	14,650	$3.0	$6.0
1987	433,000	3,780	15,200	$3.1	$5.9
1988	432,500	4,125	17,125	$3.3	$6.2
1989	402,500	3,545	15,225	$3.3	$5.9
1990	359,000	3,370	15,250	$3.5	$5.9
1991	363,000	2,905	15,600	$3.4[2]	$5.4[2]
1992	358,000	3,160	15,275	$3.2	$4.9
1993	358,000	3,035	15,700	$4.1[3]	$6.2[3]
1994	341,000	2,785	14,000	$3.5	$5.2
1995	320,000	3,035	13,450	$3.6	$5.2
1996	324,000	3,470	13,700	$4.1	$5.7
1997	302,500	2,700	12,300	$3.7	$5.1
1998	283,000	2,775	11,800	$3.6	$4.9
1999	282,500	2,375	11,550	$4.1	$5.4
2000	283,500	2,920	12,575	$4.6	$5.9
2001	295,500	2,650	11,400	$4.7	$5.7
2002	300,500	2,280	9,950	$5.0	$6.1
2003	297,000	2,735	10,000	$5.1[4]	$6.0[4]
2004	301,500	2,680	10,500	$4.9	$5.7
2005	287,000	2,570	10,300	$5.8	$6.4
2006	304,500	2,155	8,800	$5.9	$6.4
2007	300,500	2,350	9,650	$6.2[5]	$6.5[5]
2008	291,000	2,365	9,185	$6.9[6]	$7.0[6]
2009	272,500	2,100	9,300	$6.4	$6.5
2010	279,000	2,200	9,400	$5.9	$5.9

[1] Includes manufactured homes.

[2] Does not include $1.5 billion in damage caused by the Oakland Fire Storm most of which was lost to homes but for which not detailed breakdown by property type was available.

[3] Includes $809 million in damage caused by Southern California wildfires.

[4] This does not include the Southern California Wildfires with an estimated property damage of $2 billion.

[5] This does not include the California Fire Storm 2007 with an estimated property damage of $1.8 billion.

[6] Does not include the California wildfires 2008 with an estimated property damage of $1.4 billion.

Direct property damage figures do not include indirect losses, like business interruption. Inflation adjustment to 2010 dollars is done using the consumer price index.

Source: *Fire Loss in the United States 2010*, Michael J. Karter, Jr., NFPA, August 2011 and previous reports in the series.

U.S. Highway Vehicle Fire Problem, 1977-2010

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Billions) As Reported	In 2010 Dollars
1980	456,000	650	2,850	$0.5	$1.2
1981	453,000	770	2,900	$0.5	$1.2
1982	433,000	575	3,250	$0.5	$1.2
1983	435,500	670	3,400	$0.6	$1.3
1984	437,000	530	3,250	$0.6	$1.3
1985	437,000	770	3,250	$0.7	$1.4
1986	438,000	665	2,850	$0.7	$1.3
1987	451,000	755	2,900	$0.7	$1.4
1988	459,000	800	2,750	$0.8	$1.5
1989	415,500	560	2,750	$0.8	$1.4
1990	415,000	645	3,025	$0.8	$1.4
1991	406,500	530	2,675	$0.8	$1.3
1992	385,500	665	2,750	$0.8	$1.3
1993	402,000	540	2,400	$0.9	$1.3
1994	402,000	555	2,325	$1.0	$1.4
1995	386,000	490	2,275	$1.0	$1.4
1996	395,000	550	2,075	$1.1	$1.6
1997	377,000	450	1,950	$1.1	$1.5
1998	358,500	545	2,050	$1.1	$1.5
1999	345,000	450	1,600	$1.1	$1.5
2000	325,000	450	1,325	$1.2	$1.5
2001	327,000	470	1,750	$1.3	$1.6
2002	307,000	540	1,700	$1.2	$1.4
2003	286,000	455	1,400	$1.1	$1.3
2004	266,500	520	1,300	$1.0	$1.1
2005	259,000	500	1,450	$1.0	$1.2
2006	250,000	445	1,075	$1.0	$1.1
2007	227,500	365	1,500	$1.1	$1.1
2008	207,000	350	850	$1.2	$1.2
2009	190,500	260	1,455	$1.0	$1.1
2010	184,500	285	1,440	$1.0	$1.0

Highway vehicles include any vehicle designed to operate normally on highways, such as automobiles, motorcycles, buses, trucks, and trailers, but not manufactured homes on foundations.

Direct property damage figures do not include indirect losses, like business interruption. Inflation adjustment to 2010 dollars is done using the consumer price index.

Source: *Fire Loss in the United States 2010*, Michael J. Karter, Jr., NFPA, August 2011 and previous reports in the series.

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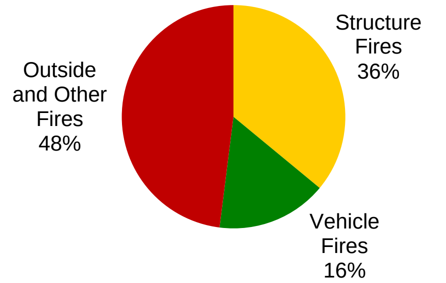
Fires in the United States During 2010

1,331,500 fires were reported in the U.S. during 2010.

- down **1%** from 2009
- **3,120** civilian fire deaths
- **17,720** civilian fire injuries
- **$11.6 billion** in property damage
- **72 firefighter deaths**
  Firefighter deaths are not restricted to fires.

Fires in the United States During 2010



482,000 structure fires occurred in the U.S. during 2010.

- Less than 1% increase from 2009
- **2,755** civilian fire deaths
- **15,420** civilian fire injuries
- **$9.7 billion** in property damage

215,500 vehicle fires occurred in the U.S. during 2010.

- down **1%** from 2009
- **310** civilian fire deaths
- **1,590** civilian fire injuries
- **$1.4 billion** in property damage

634,000 outside and other fires occurred in the U.S. during 2010.

- down **2%** from 2009
- **55** civilian fire deaths
- **710** civilian fire injuries
- **$501 million** in property damage

Source: *Fire Loss in the United States During 2010* by Michael J. Karter, Jr., NFPA, Quincy, MA
Firefighter Fatalities in the United States – 2010, by Rita F. Fahy, Paul R. LeBlanc and Joseph L. Molis, NFPA, Quincy, MA

TRENDS AND PATTERNS OF U.S. FIRE LOSSES IN 2010

Ben Evarts

September 2011

NFPA

National Fire Protection Association
Fire Analysis and Research Division

Abstract

Projections from NFPA's annual fire department experience data reported in Michael Karter's annual reports: *Fire Loss in the United States,* particularly the most recent report, are summarized in this analysis. Reported fires and fire deaths have fallen since 1977, the first year of available data. The drop in population-based rates is even sharper. In 2010, home structure fires accounted for 28% of the reported fires. However, these incidents caused 85% of all civilian fire deaths. Vehicle fires accounted for 16% of the reported fires and 10% of the civilian fire deaths. Roughly half (48%) of the reported fires were outside or other non-structure, non-vehicle fires. In 2010, only 5% of all fire department responses were to fires while 66% were medical aid responses. Since 1980, medical aid calls have more than tripled.

Keywords: fire statistics, fires, fire deaths, fire loss, fire injuries, fire department calls

Acknowledgements

The National Fire Protection Association thanks all the fire departments who participate in the annual NFPA fire experience survey. These firefighters are the original sources of the data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this analysis are available from:

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phone: 617-984-7443

NPFA No. USS47

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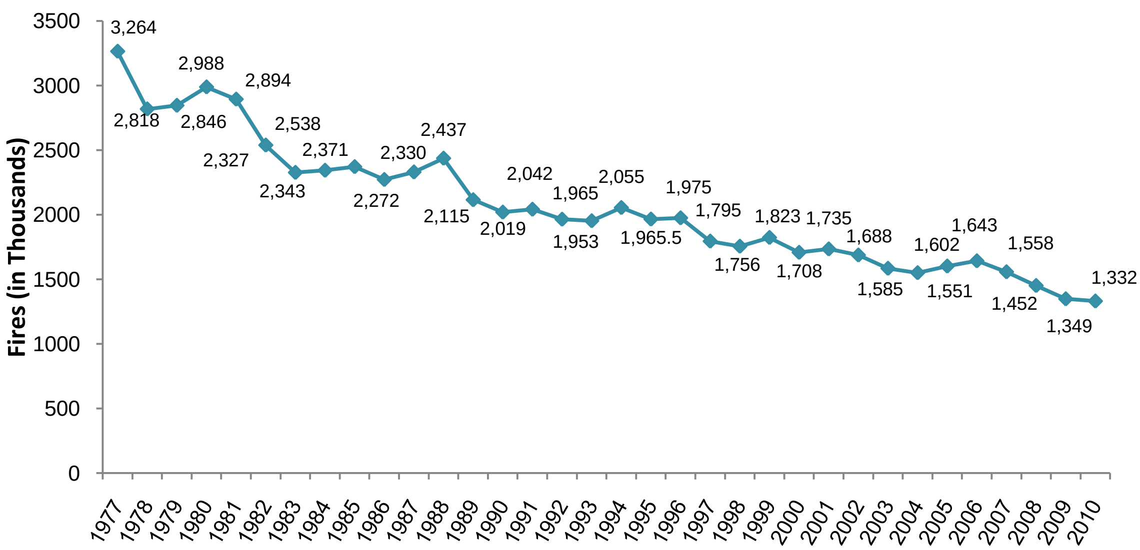
Fire Department Experience with Fires and Other Calls

Except where otherwise noted, the statistics in this report were extracted from the annual reports, Fire Loss in the United States, by Michael J. Karter, Jr. The 2010 report may be downloaded free of charge from www.nfpa.org/osds. Copies can also be obtained from NFPA's One-Stop Data Shop by calling (617) 984-7443 or emailing osds@nfpa.org. These statistics are projections based on the results of NFPA's annual fire department survey. Only fires reported to municipal fire departments are included. Fires handled without fire department involvement, by private fire brigades or by state or federal firefighting authorities are not included in these statistics.

Fire departments responded to 1,331,500 fires in 2010.
U.S. municipal fire departments responded to an estimated 1,331,500 fires in 2010. These fires killed 3,120 civilians (non-firefighters) and caused 17,720 reported civilian fire injuries. Direct property damage was estimated at $11.6 billion dollars. Seventy-two firefighters died while on duty or of injuries incurred while on duty.[1] The 482,000 structure fires accounted for 36% of all reported fires.

Figure 1 and Table 1 show that reported fires fell 59% from 3,264,000 in 1977 to 1,331,500 in 2010, the lowest point since the current data collection system began. Reported fires fell 1% from the previous record low of 1,348,500 in 2009.

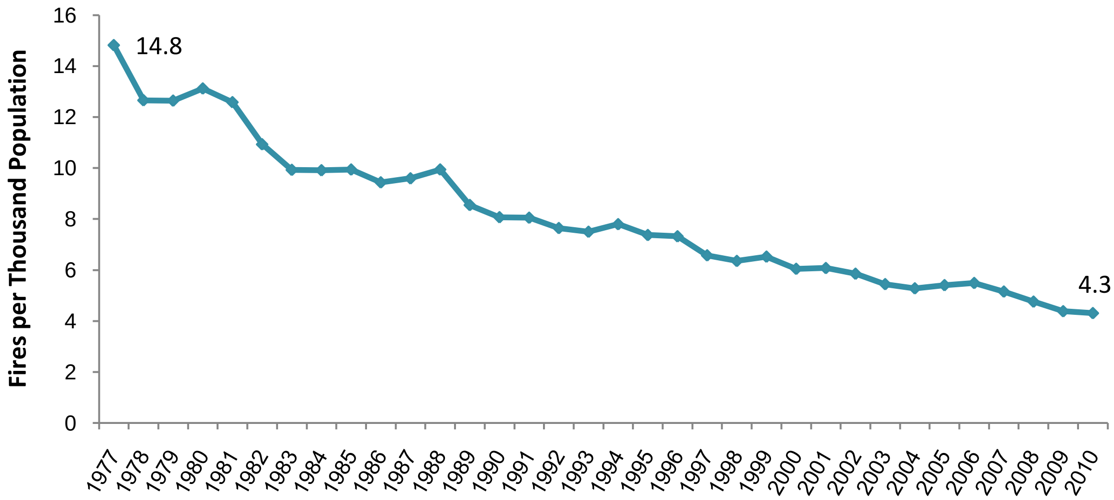
Figure 1. U.S. Fire Incident Trends (in Thousands) 1977-2010



[1] Rita F. Fahy, Paul R. LeBlanc, and Joseph L. Molis, *Firefighter Fatalities in the United States – 2010,* Quincy, MA: National Fire Protection Association, June 2011.

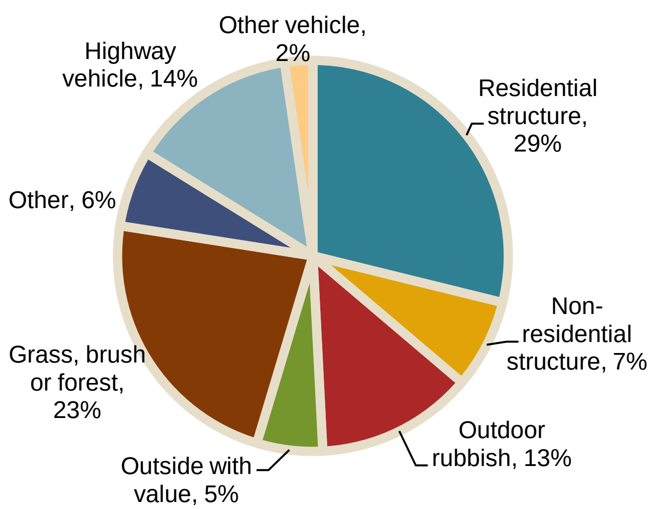
Rates of reported fires per 1,000 population fell even more sharply than total fires over the past three decades.
According to the U.S. Census, the resident population of the US grew 40% from 1977 to 2010. Figure 2 shows that the rate of reported fires per 1,000 population fell 71% from 14.8 in 1977 to 4.3 in 2010.

Figure 2. Trend in Reported Fire Rates per Thousand Population 1977-2010



Structure fires account for one-third of all reported fires but the majority of losses.
Figure 3 shows a breakdown of fires by major property class. The 482,000 reported structure fires caused 2,755 civilian fire deaths, 15,420 civilian fire injuries, and $9.7 billion in direct property damage. Structure fires accounted for 36% of the reported fires, 88% of the civilian fire deaths, 87% of the civilian fire injuries, and 84% of the direct property loss.

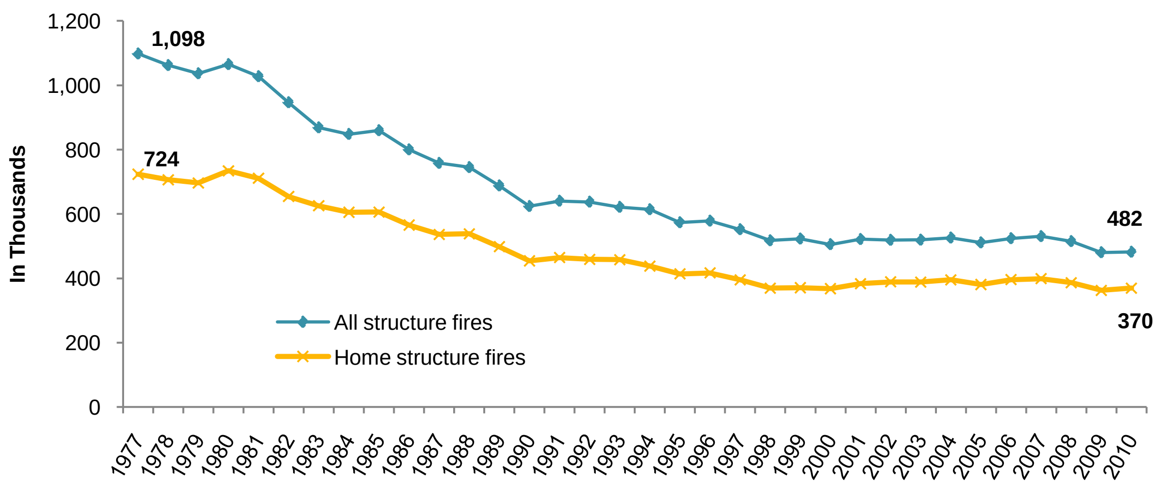
Figure 3. Reported Fire Incidents by Major Property Class 2010



Reported structure fires fell 56% from 1,098,000 in 1977. From 2009 (480,500 structure fires) to 2010, they increased 0.3%. Generally speaking, any fire in or on a structure is considered a structure fire, even if only the contents were involved and there was no structural damage.

Home fires dominate the structure fire problem.
Eighty percent (384,000) of the 482,000 structure fires occurred in residential properties, including homes, hotels, motels, rooming houses and dormitories; 77% (369,500) occurred in homes. (NFPA uses the term "home" to include one- and two-family homes, apartments and manufactured housing.) Home structure fires fell 49% from the 723,500 reported in 1977. They increased 2% from the 362,500 reported in 2009. Figure 4 shows that the trend line for structure fires overall resembles the trend for home fires. However, the percentage of all structure fires that are home fires has risen slowly but steadily through the years, from 66% in 1977 to 77% in 2010.

Figure 4. All Structure Fires and Home Structure Fires by Year 1977-2010



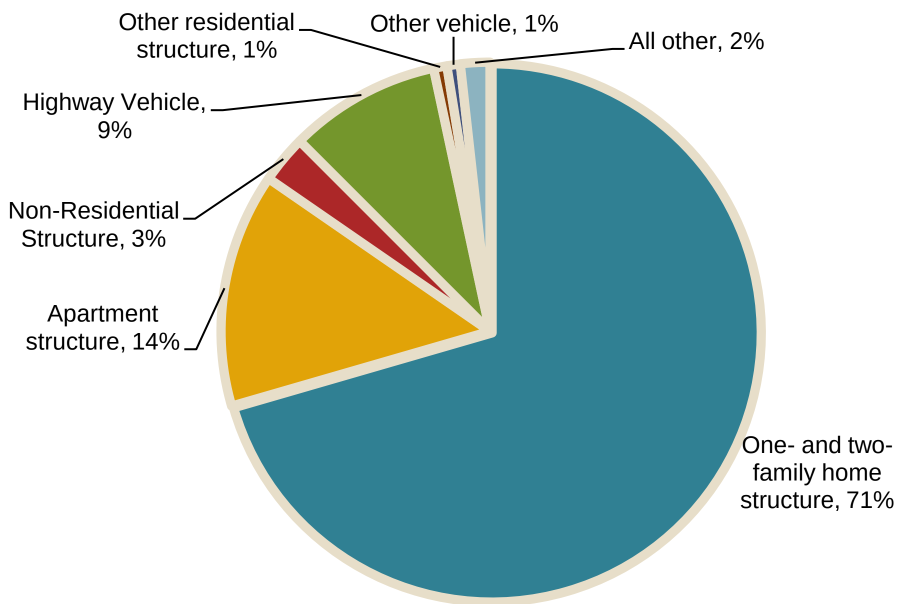
Fifty-eight percent (279,000) of all reported structure fires occurred in one- and two-family homes, including manufactured homes; 19% (90,500) occurred in apartments. NFPA produces a variety of reports about general and specific causes and circumstances of home fires. A general overview, *Home Structure Fires*, by Marty Ahrens, is available at www.nfpa.org/osdsoccupancies. The report is free to all visitors. NFPA members may download more specific reports at no cost.

Home structure fires caused 85% of the civilian fire deaths.
In 2010, 2,640, or 85%, of the 3,120 civilian fire deaths resulted from home structure fires. Only 21% of all reported fires occurred in one- or two-family homes but these fires caused 71% (2,200) of the fire deaths. Apartment fires accounted for only 7% of all reported fires but caused 14% (440) of the deaths. Figures 5-7 show breakdowns of civilian fire deaths, civilian fire injuries, and direct property damage by type of fire and property class. Homes also account for the largest share of civilian fire injuries and direct

property damage. For more information about the people killed or injured in home fires, see NFPA's 2010 report, *Characteristics of Home Fire Victims,* by Jennifer D. Flynn.

Although non-residential structure fires accounted for only 7% of all reported fires, Figure 6 shows that these incidents caused 23% of the direct property damage.

Figure 5. Civilian Fire Deaths by Major Property Class
2010



Vehicle fires caused 10% of fire deaths and civilian fire injuries
During 2010, the 215,500 reported vehicle fires caused an estimated 310 civilian deaths, 1,590 civilian injuries, and $1.4 billion in direct property loss. Vehicle fires accounted for 16% of the reported fires, 10% of the civilian fire deaths and 9% of civilian fire injuries, and 12% of the total direct property damage.

The estimate of 310 vehicle fire deaths was more than three times the 90 civilian deaths reported in non-residential structure fires. Vehicle fires fell 58% from 508,000 in 1977. From 2009 to 2010, highway vehicle[2] fires fell 3%, while non-highway vehicle fires increased 9%**.** Vehicle fires have been hitting consecutive new lows since 2002.

NFPA's 2010 report, *U.S. Vehicle Fire Trends and Patterns,* by Marty Ahrens, provides more information about highway vehicle fires and a breakdown of all vehicle fires by type of vehicle.

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[2] Highway vehicles include cars, trucks and other vehicles intended for roadway use. Non-highway vehicles include vehicles for water, air or rail transportation, as well as construction, lawn, garden and agricultural vehicles.

Figure 6. Reported Civilian Fire Injuries by Major Property Class 2010

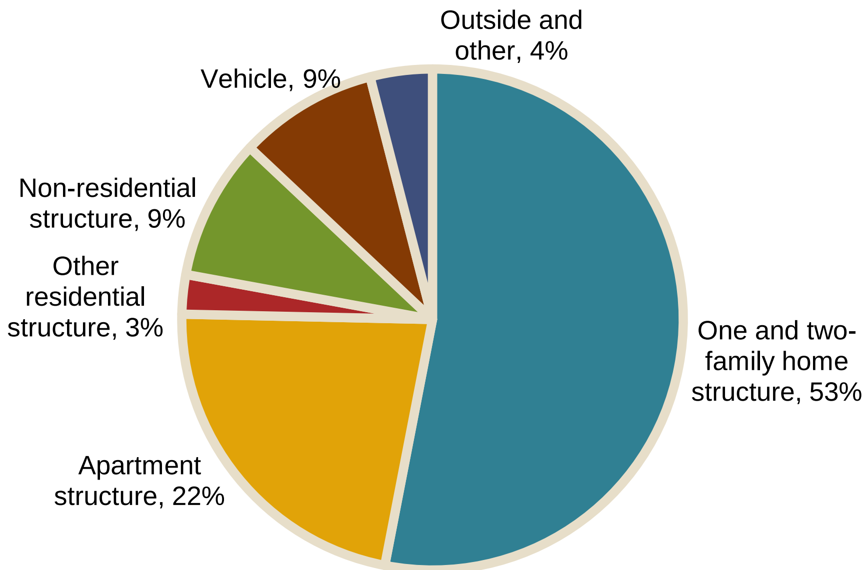
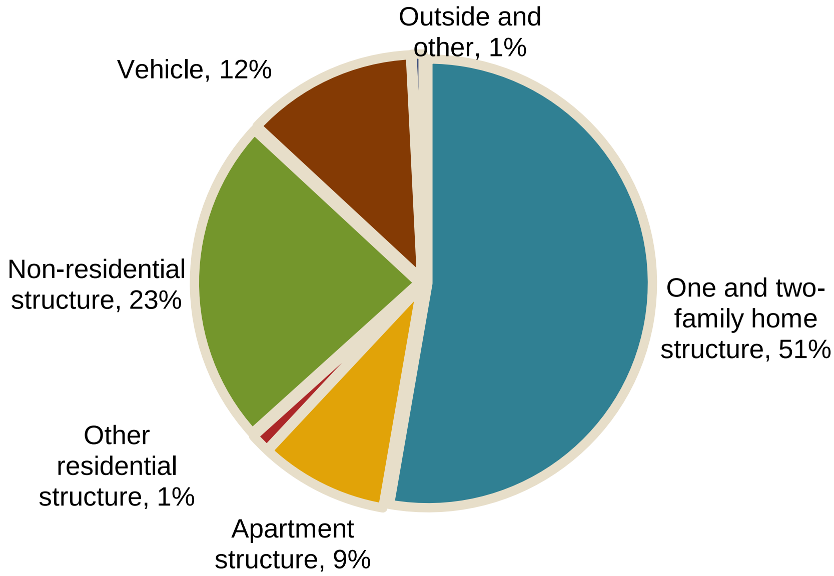


Figure 7. Direct Property Damage by Major Property Class 2010



Civilian fire deaths increased slightly from 2009.
The 2010 civilian fire death toll of 3,120 was 4% higher than the 3,010 in 2009 and 58% lower than the 7,395 reported in 1977. Figure 8 shows that the 2010 total civilian fire death toll was the second-lowest since data collection began in 1977. Home structure fire deaths increased 3% from 2,565 in 2008 and 55% from 5,865 in 1977. Because home fire deaths account for such a large share of the total fire deaths, the trend line for both home fire deaths and all home fire deaths tend to be very similar.

Figure 8. All Civilian Fire Deaths and Home Fire Deaths by Year 1977-2010

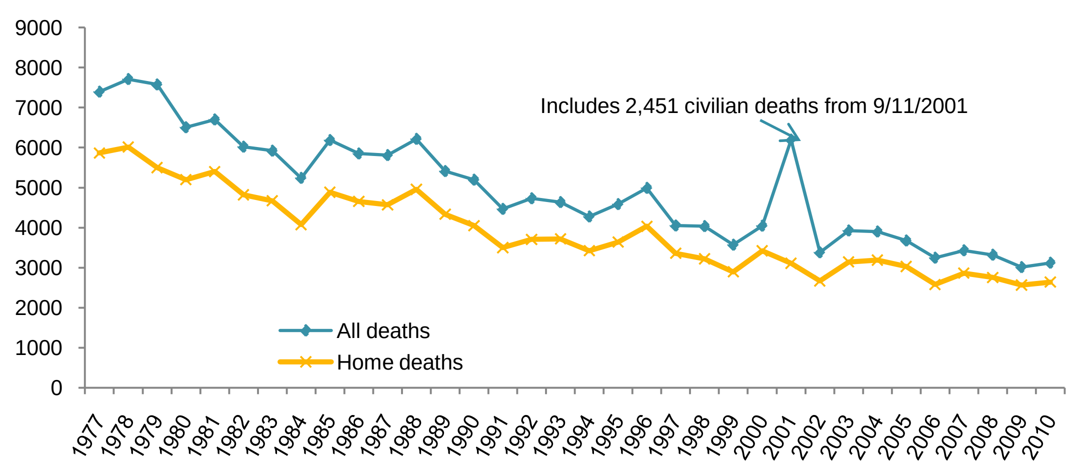
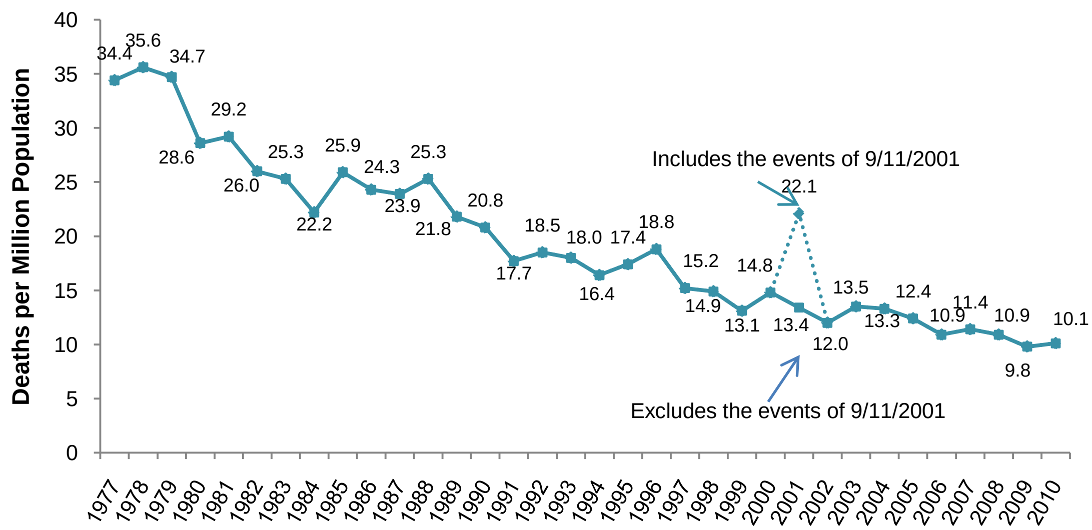


Figure 9 shows that the fire death rate per million population fell 71% from 34.4 in 1977 to 10.1 in 2010. From 2009 to 2010, the rate increased 3%.

Figure 9. Trend in Civilian Fire Death Rates per Million Population, 1977-2010



The highest fire death rates were seen in the rural South.

In 2010, the South had the highest overall fire death rate (13.0 per million population.) The Midwest had a rate of 12.6, the Northeast had a rate of 6.8 and the West had the lowest death rate of 5.7, much less than the national rate of 10.1.

Nationally, in terms of community size, rural areas with populations under 2,500 had a death rate of 14.6 per million. Southern communities with populations under 2,500 had a civilian fire death rate of 17.4 deaths per million population. The lowest rate was seen in communities with populations between 250,000 and 499,999 (5.8 deaths per million population). Larger Midwestern cities had death rates that were higher than comparably sized cities in other regions.

Half of the reported fires were reported as "outside or other."

Figure 3 showed that 48% (634,000) of the 1,331,500 total reported fires were outside fires or fires other than structure or vehicle fires. These fires caused 55, or 2%, of the civilian deaths and 710, or 4%, of the civilian injuries. These fires fell 2% from the 649,000 reported in 2009.

Outside and other fires reported in 2010 included:

- 72,500 outside fires involving property of value;
- 304,000 brush, grass, or wildland fires; (fires handled by state or federal agencies are not included)
- 173,000 outside rubbish fires; and
- 84,500 other fires including outside spills or leaks with ensuing fires, outside gas or vapor combustion explosions with no after-fire, and unclassified or unknown-type fires.

Although real property damage was lower than in 1977, the average adjusted loss per structure fire was higher.

Figure 10 shows that direct property damage from fire (excluding the events of September 11, 2001), as reported, has generally been rising despite a 26% drop from 2008 to 2010. When adjusted for inflation, however, total fire damages were 31% lower in 2010 than in 1977. Figure 11 shows that the adjusted loss per structure fire was 50% higher in 2010 than it was in 1977.

Figure 10. Direct Property Damage Trend: 1977-2010
(Excluding the Events of September 11, 2001)

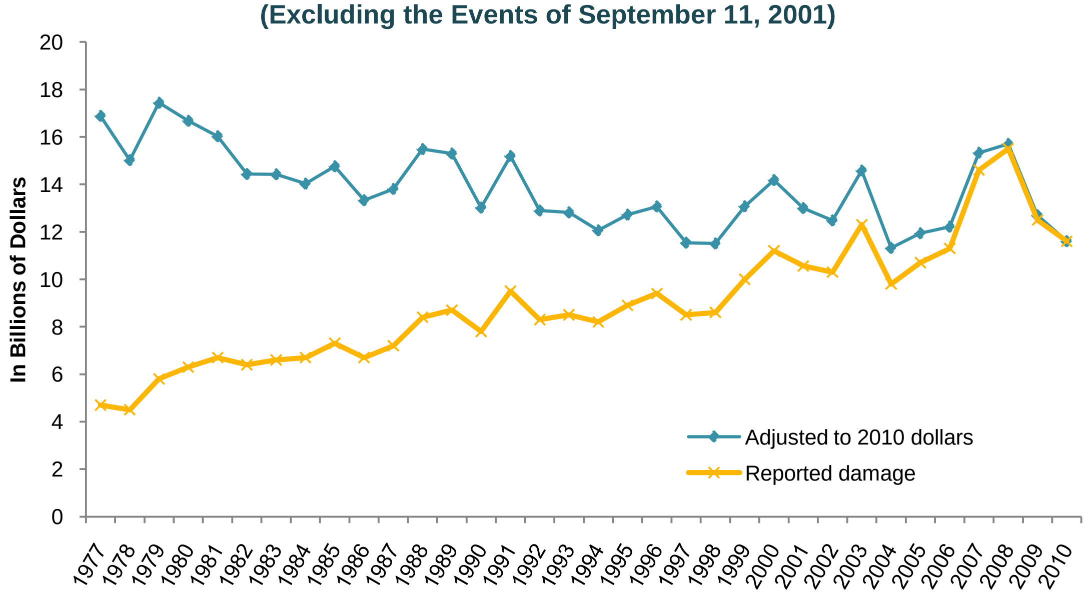
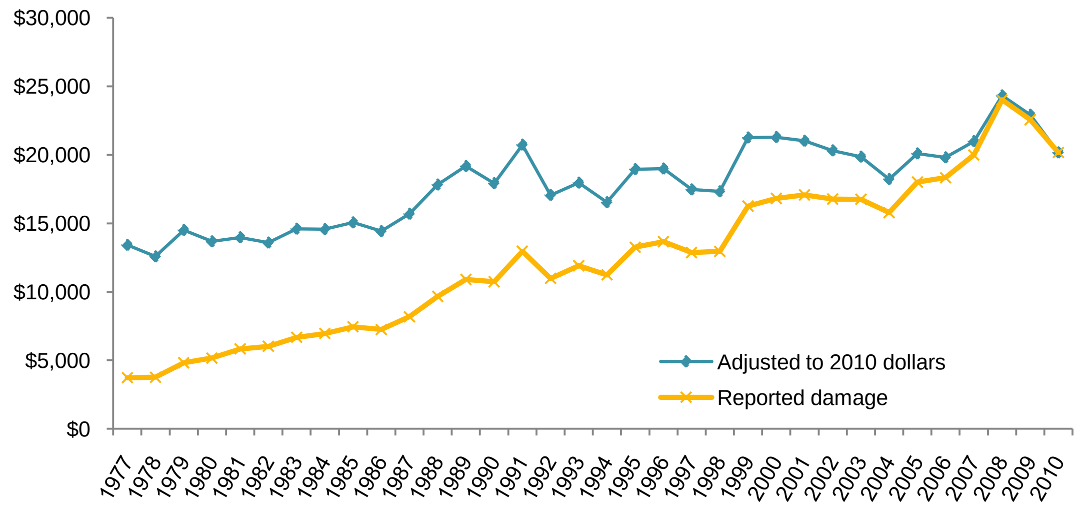


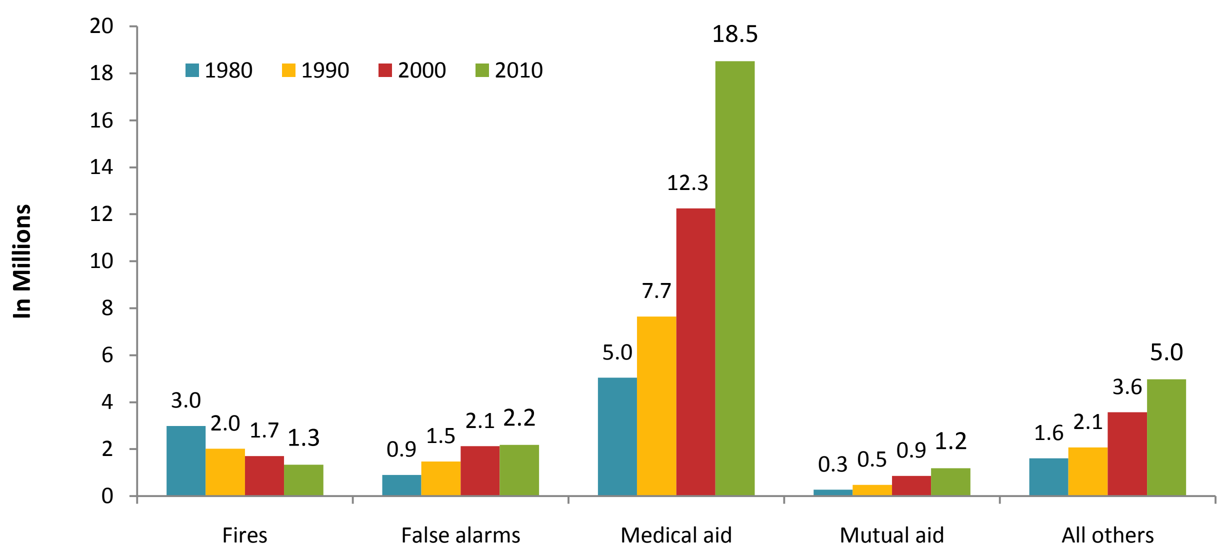
Figure 11. Average Direct Loss per Structure Fire: 1977-2010
(Excluding the Events of September 11, 2001)



U.S. Fire Department Responses by Incident Type

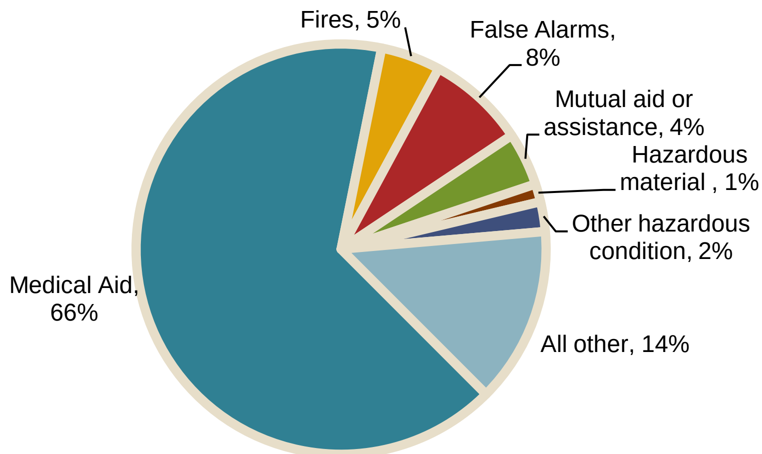
Fire department responses have more than doubled since 1980.
During 2010, U.S. fire departments responded to a total of 28,205,000 calls, 2.6 times the 10,819,000 responses in 1980. Figure 12 shows that medical aid calls have more than tripled since 1980. Mutual aid calls increased more than four times although the share of mutual aid incidents remains small, increasing from 3% in 1980 to 4% in 2010.

Figure 12. Fire Department Responses by Incident Type in 1980, 1990, 2000, and 2010



Two-thirds of fire department responses were medical aid calls.
During 2010, U.S. fire departments responded to 18,522,000 medical aid calls involving emergency medical services (EMS), medical assistance, and non-fire rescue. Figure 13 shows that these incidents accounted for 66% of fire department responses. In 2007-2009, the majority of U.S. fire departments provided at least some EMS services. Forty-four percent of the departments provided EMS only and 15% provided advanced life support (ALS) in addition. The percentage of departments providing any EMS, and more specifically both EMS and ALS, increased with the size of the population protected.[3]

Figure 13. Fire Department Responses by Incident Type 2010



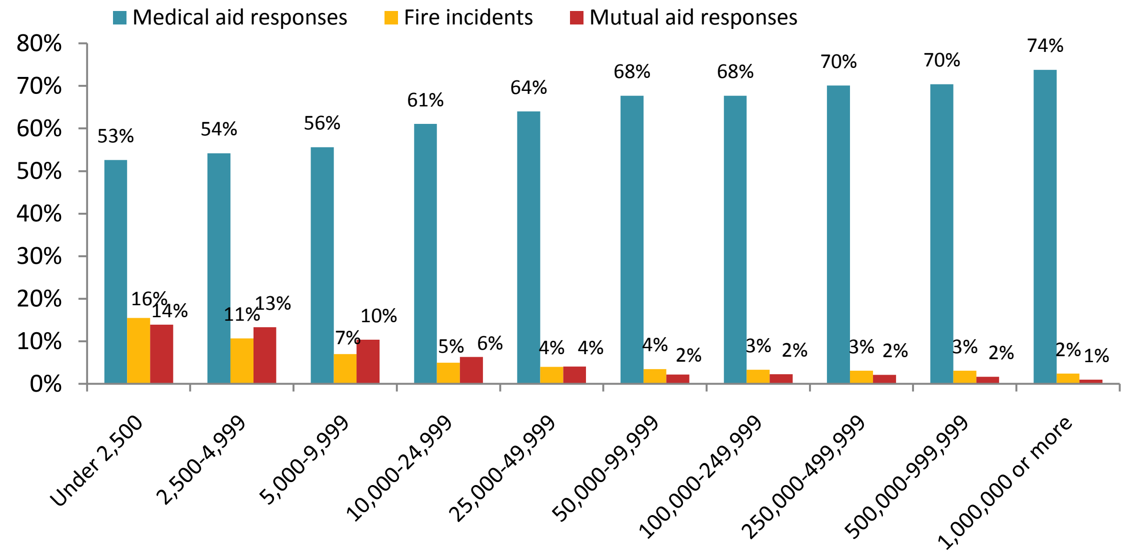
Fires account for a larger percentage of fire department responses in small communities.
Figure 14 shows fire incidents accounted for 16% of the responses by departments protecting populations under 2,500. The percentage of fire calls fell as population grew, dropping to 4% in localities with populations between 25,000 and 49,999 and to 3% for the most populated jurisdictions. These statistics are for 2009 and 2010 combined.

Even in the smallest departments, medical aid accounted for an average of half of all fire department responses. In communities with populations of at least 50,000, at least two-thirds of the responses were for medical aid.

Mutual aid responses also accounted for larger percentages of the incidents in localities with smaller populations. Fourteen percent of the responses in communities with populations under 2,500 were mutual aid. The percentage dropped to 1-2% for departments with populations of 50,000 or more.

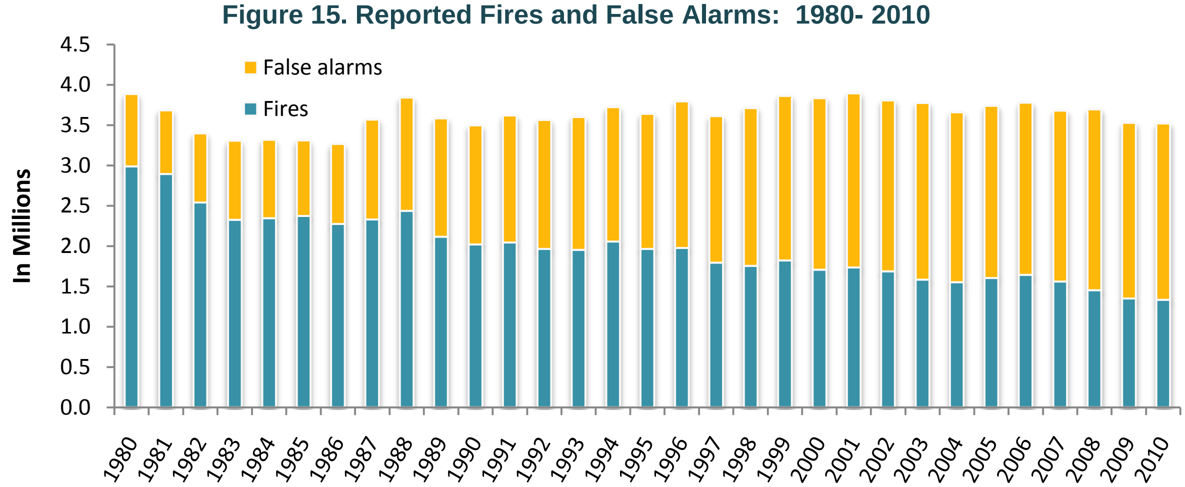
[3] Michael J. Karter, Jr. and Gary P. Stein. *U.S. Fire Department Profile Through 2009,* Quincy, MA: NFPA, 2010, p. 28.

Figure 14. Fire Incidents, Medical Aid, and Mutual Aid Responses as Percentages of Fire Department Responses by Community Size 2009-2010



Sum of false alarms and actual fires has not changed much.
Fires accounted for only 5% of all fire department responses in 2010, compared to 28% in 1980. This decrease is due in large part to the increase in medical aid calls noted earlier. However, the 2010 estimate of 2,187,000 false alarms or false calls was 2.4 times the 896,500 reported in 1980. This increase in false alarms is due to increases in system malfunctions and unintentional calls over the years. Figure 15 shows that the total of reported fires and false alarms has been remarkably stable. Fire departments cannot know the actual situation until they arrive at the scene. In terms of initial response, a false alarm is generally treated as if it were an actual fire. False alarms or false can be related to equipment for smoke, fire or carbon monoxide detection as well as malicious false alarms, bomb scares, and the like.

Figure 15. Reported Fires and False Alarms: 1980- 2010



Other comparative data is found in supporting tables.
Table 1 compares 2010 data with data from 2009, 2000, 1990, and 1980. Most measures show steady improvement over time. Table 2 provides a numeric summary of 2010 fires and associated losses by incident type. Table 3 shows a breakdown of all fire department responses by incident type for 2010 and the percent change from the 2009, 2000, 1990, and 1980. Table 4 shows the percentage breakdown of incident types for the same years as in Table 3.

These statistics were extracted from the annual reports *Fire Loss in the United States,* by Michael J. Karter, Jr. Summaries of these reports are published each year in *NFPA Journal®.* The 2010 report may be downloaded free of charge from www.nfpa.org/osds. Copies of this and other NFPA reports can be obtained from NFPA's One-Stop Data Shop by calling (617) 984-7443 or emailing osds@nfpa.org. Trend tables for all fire department calls, all fires, structure fires, home structure fires, non-home fires, and all fires by incident type are also available on the website or from the One-Stop Data Shop.

Table 1.
The U.S. Fire Problem in 2010 Compared to 2009, 2000, 1990, and 1980

		Compared To			
Reported to Fire Departments	**2010**	**2009**	**2000**	**1990**	**1980**
Fire Incidents	1,331,500	Down 1%	Down 22%	Down 34%	Down 55%
Civilian Deaths	3,120	Up 4%	Down 23%	Down 40%	Down 52%
Firefighter Deaths	72	Down 12%	Down 30%	Down 33%	Down 48%
Civilian Injuries	17,720	Up 4%	Down 21%	Down 38%	Down 41%
Direct Property Damage	$11,593,000,000	Down 7%	Up 4%	Up 49%	Up 84%
Adjusted for Inflation		Down 10%	Down 18%	Down 11%	Down 30%
Civilian Deaths per Million Population	10.1	Up 3%	Down 29%	Down 51%	Down 65%
Civilian Deaths per Thousand Reported Home Structure Fires	6.9	Down 3%	Down 26%	Down 23%	Down 3%
Property Damage per Structure Fire	$20,158	Down 11%	Up 20%	Up 88%	Up 290%
Adjusted for Inflation		Down 12%	Down 5%	Up 12%	Up 47%

Sources:
Michael J. Karter, Jr. *Fire Loss in the United States* series, (1980, 1990, 2000, 2009, and 2010), Quincy, MA: NFPA, 1981, 1991, 2001, 2010, and 2011.
Rita F. Fahy, Paul R. LeBlanc, and Joe Molis, *Firefighter Fatalities in the United States – 2010,* Quincy, MA: NFPA, 2011.
U.S. Census Bureau
Inflation calculations were made with the Bureau of Labor Statistics Inflation Consumer Price Index Purchasing Power of the Dollar.

Table 2.
U.S. Fires and Losses by Incident Type in 2010

Incident Type	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Structure fires	482,000	(36%)	2,755	(88%)	15,420	(87%)	$9,716	(84%)
Residential structure fires	384,000	(29%)	2,665	(85%)	13,800	(78%)	$7,079	(61%)
Home structure fires	369,500	(28%)	2,640	(85%)	13,350	(75%)	$6,928	(60%)
One- and two-family homes, including manufactured homes	279,000	(20%)	2,200	(71%)	9,400	(53%)	$5,895	(51%)
Apartments	90,500	(7%)	440	(14%)	3,950	(22%)	$1,033	(9%)
Other residential structure fires	14,500	(1%)	25	(1%)	450	(3%)	$151	(1%)
Non-residential structure fires	98,000	(7%)	90	(3%)	1,620	(9%)	$2,637	(23%)
Vehicle fires	215,500	(16%)	310	(10%)	1,590	(9%)	$1,376	(12%)
Highway vehicle fires	184,500	(14%)	285	(9%)	1,440	(8%)	$987	(9%)
Other vehicle fires	31,000	(2%)	25	(1%)	150	(1%)	$389	(3%)
Outside and other fires	634,000	(48%)	55	(2%)	710	(4%)	$501	(4%)
Brush, grass and wildland fires with no value or loss involved	304,000	(23%)	*	*	*	*	*	*
Outside rubbish fires	173,000	(13%)	*	*	*	*	*	*
Outside fires involving property of value	72,500	(5%)	*	*	*	*	$413	(4%)
All other fires	84,500	(6%)	55	(2%)	710	(4%)	$88	(1%)
Total	1,331,500	(100%)	3,120	(100%)	17,720	(100%)	$11,593	(100%)

* NFPA survey does not collect specific incident types for fire deaths and injuries caused by outside and other fires. Nor does it collect any dollar loss data for brush, grass, and wildland fires with no value or loss or for outside rubbish fires.

Source: Michael J. Karter, Jr. *Fire Loss in the United States during 2010,* Quincy, MA: NFPA, 2011.

Table 3.
U.S. Fire Department Responses in 2010 Compared to 2009, 2000, 1990 and 1980

		Compared To			
Reported To Fire Departments	**2010**	**2009**	**2000**	**1990**	**1980**
Total calls	28,205,000	Up 6%	Up 37%	Up 106%	Up 161%
Fire calls	1,331,500	Down 1%	Down 22%	Down 34%	Down 55%
Medical aid responses	18,522,000	Up 8%	Up 51%	Up 142%	Up 267%
False alarms	2,187,000	Up <1%	Up 3%	Up 48%	Up 144%
Mutual aid or assistance calls	1,189,500	Down 8%	Up 38%	Up 145%	Up 334%
Hazardous materials responses – spills, leaks, etc.	402,000	Up 1%	Up 26%	Up 91%	NA
Other hazard responses (arcing wires, bomb removal, etc.)	656,000	Up 5%	Up 21%	Up 56%	NA
All other responses (Smoke scares, lock-outs, etc.)	3,913,000	Up 9%	Up 44%	Up 171%	NA
All other plus hazardous material and other hazard responses	4,609,000	Up 8%	Up 39%	Up 140%	Up 208%

NA - Hazardous material and hazardous condition calls were captured under "All other" until 1986.

Source: Michael J. Karter, Jr. *Fire Loss in the United States* series, (1980, 1990, 2000, 2009 and 2010), Quincy, MA: National Fire Protection Association, 1981, 1991, 2001, 2010, and 2011.

Table 4.
U.S. Fire Department Responses by Call Type
As Percentage of Calls in 2010, 2009, 2000, 1990 and 1980

		IN			
Reported to Fire Departments	**2010**	**2009**	**2000**	**1990**	**1980**
Fire calls	5%	5%	8%	15%	28%
Medical aid responses	66%	64%	60%	56%	47%
False alarms	8%	8%	10%	11%	8%
Mutual aid or assistance calls	4%	5%	4%	4%	3%
Hazardous materials responses – spills, leaks, etc.	1%	1%	2%	2%	NA
Other hazardous condition responses (arcing wires, bomb removal, etc.)	2%	2%	3%	3%	NA
All other responses (Smoke scares, lock-outs, etc.)	14%	14%	13%	11%	NA
All other plus hazardous material and other hazardous responses	18%	17%	17%	15%	15%

NA - Hazardous material and hazardous condition calls were captured under "All other" until 1986.

Source: Michael J. Karter, Jr. *Fire Loss in the United States* series, (1980, 1990, 2000, 2009 and 2010), Quincy, MA: National Fire Protection Association, 1981, 1991, 2001, 2010, and 2011.

CATASTROPHIC MULTIPLE-DEATH FIRES IN 2010

Stephen G. Badger
September 2011

National Fire Protection Association
Fire Analysis and Research Division

Acknowledgments
NFPA wishes to thank the U.S. fire service, and the medical examiners for their contributions of data, without which this report would not be possible. The author would like to give a special thanks to Norma Candeloro and his co-workers for their guidance in the completion of this report.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

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NFPA No. MDS10

CATASTROPHIC MULTIPLE-DEATH FIRES IN 2010

Headlines from around the country during 2010 read a lot like these: "Two children survive fire that kills rest of family"; "Adult care home fire kills three"; "Motel fire kills four college students," and so on. If they sound familiar, it's because they could have been written in any previous year. When it comes to these kinds of fires, history truly repeats itself.

According to U*.S. Fire Loss for 2010*, by Michael J. Karter, Jr. of NFPA, firefighters in the United States in 2010 responded to an estimated 1,331,500 fires, 384,000 of which were in residential structures, 98,000 of which were in nonresidential structures, and 849,500 of which were outside of structures. These fires accounted for an estimated 3,120 deaths, 2,665 of which occurred in residential structures, 90 in non-residential structures, and 365 in fires outside of structures.

Twenty-nine of the fires were categorized as catastrophic multiple-death fires, defined here as fires or explosions in homes or apartments that result in five or more fire-related deaths, or as fires or explosions in all other structures, as well as outside of structures such as wildfires and vehicle fires, that claim three or more lives.

These 29 fires accounted for 175 fire deaths, including 30 children under the age of six. They accounted for 0.002 percent of the total estimated fires and 5.6 percent of the total fire deaths for 2010. By comparison, there were 21 catastrophic multiple-death fires in 2009, resulting in 103 deaths, including 26 children under age six.

The largest loss of life in a fire or explosion in the United States in 2010 was a mine explosion. At approximately 3 p.m. on April 5, 2010, a powerful explosion occurred in a coal mine almost 1,000 feet (305 meters) below the surface of the Coal River and mountains in West Virginia, killing 29 miners and seriously injuring at least one other. The Mine Safety and Health Administration (MSHA), the State of West Virginia, the Governor's Independent Investigation Panel, and the United Mine Workers of America conducted a joint investigation, and the Governor's Panel report (see nttc.edu/ubb/) identified several mining system failures that led to, and contributed to, the devastating explosion and fire. "The company's ventilation system did not adequately ventilate the mine," the report found. "As a result, explosive gases were allowed to build up. The company failed to meet federal and state safe principal standards for the application of rock dust. Therefore, coal dust provided the fuel that allowed the explosion to propagate through the mine. Also, water sprays on equipment were not properly maintained and failed to function as they should have. As a result, a small ignition could not be quickly extinguished."

The mine had been closed on April 4, which was Easter Sunday, and re-opened the following day, with 45 workers underground by 7 a.m. During what seemed to be a "normal and typical" day, several problems that arose were reported and being dealt with by the miners before the explosion occurred.

The conclusion reached by the Governor's Panel was that "the ignition point for the blast was the tail of the longwall [the machinery for shearing off coal from the wall]. As the shearer cut into the sandstone mine roof, the resulting sparks ignited a pocket of methane, creating a fireball. The fireball in turn ignited the methane that had accumulated in the gob [an area filled with rock waste] during the Easter weekend and leaked onto the longwall face. The fireball traveled into the tailgate area, where accumulations of coal dust provided fuel for a second, more deadly, force. This dust-fueled blast ricocheted in multiple directions, traveling across the longwall face, into the tailgate entry, and through more than two miles [3 kilometers] of the mine."

According to MSHA, several miners who were near the portals were able to evacuate when the explosion occurred. Those who could not ranged from 20 to 61 years old. It was several days before conditions in the mine were safe enough for the bodies to be removed, and several weeks before the conditions were safe enough for investigators to enter the mine.

Catastrophic Home Structure Fires

Two-thirds, or 65.5 percent, of the catastrophic multiple-death fires occurred in homes. Of the 19 such fires in these properties in 2010, 15 occurred in single-family homes, five of which were manufactured homes; one occurred in a duplex; three occurred in apartment buildings, one of which had six units, one of which had four units, one of which occurred in a building whose size was not reported. This is an increase of nine from 2009. There were 101 deaths in these catastrophic multiple-death home fires in 2010, up from 59 in 2009. Of the 101 fatalities, 28 were children under six, three more than 2009.

The cause or origin was reported for just five of these 19 fires. One fire was deliberately set. One each involved abandoned or improperly disposed of smoking materials, combustibles too close to a heat source, a short circuit in a damaged electric cord, and defective wiring in a ceiling. Fifteen of the fires broke out between the hours of 11 p.m. and 7 a.m., resulting in 81 deaths, including 22 children under age six.

In 14 cases, the cause and origin was listed as undetermined. In some cases, this was due to destruction of the property. In others, fire investigators were unable to determine the cause or eliminate all potential causes. In four incidents, the authorities provided no details.

The largest loss-of-life fire in a home killed seven people, including two children under age six. This arson fire was set on the first floor of a two-story apartment building of unprotected wood-frame construction. There were smoke alarms, which operated and alerted occupants. It was not reported why the occupants were unable to escape.

Four fires killed six people each. The first fire broke out on the second floor of a two-story, six-unit apartment building of unprotected ordinary construction that had a business on the ground level. This fire killed three children under age six. The building had some smoke alarms, but they did not operate for an unreported reason, and others had been removed. The victims were all found on the second story.

The second fire, which killed two children under the age of six, broke out on the first floor of a two-story, single-family home of unprotected wood-frame construction. The cause was not determined, and no information was reported on the presence or absence of smoke alarms. One child was found in a first-floor bedroom, and the other fatalities were found on the second story. Three other people in the house were injured.

The third fire, which killed two children under age six, broke out in a two-story, single-family home of unprotected wood-frame construction. No information was reported on smoke alarms. The fire was electrical in nature and broke out in the first-floor living room.

The fourth fire broke out in a one-story, single-family home, killing two children under age six. No other additional information was reported.

Fourteen fires killed five people each. Seventeen children under age six died in these fires; one fire alone killed four children. These fires occurred in 12 single-family homes, five of which were manufactured homes; one duplex; and one apartment building, with an unreported number of units. In eight of these fires, the buildings had no smoke alarms. In two fires, smoke alarms were present. In one of the two, the victims were under the influence of drugs, and in the second, the family was trying to open doors and windows and became trapped. No information on smoke alarms was reported in four fires.

Catastrophic Non-Home Structure Fires

Eight of the 29 fires occurred in non-home structures. There was one fire each at a chemical manufacturer, a refinery, a care-for-the-aged facility, a motel, a coal mine, a tool shed, a vacant building, and a building under construction. These accounted for 63 of the 175 deaths, compared to 20 in 2009. None of the victims was under age six. In 2009, there were five fires in the non-home category. Part of the large increase in deaths was due to the West Virginia coal mine explosion and fire that killed 29 people, or 46 percent of the deaths in this category.

Seven of the properties were operating to some extent, and the status of the eighth was not reported. The cause—a mechanical breakdown—was reported for just one of the fires.

The largest loss-of-life incident was the coal mine explosion and fire. Eight people were also killed in a vacant warehouse that was being used by the homeless for shelter and sleeping, but no further information was reported.

Seven people were killed at a hydrocarbon refinery when a heat exchanger ruptured, releasing hydrocarbon and naphtha vapors that ignited almost immediately. The heat exchanger, which was almost 40 years old, was being returned to service after maintenance. The rupture occurred at cracks in welds caused by the stresses that heat exchangers experience over years of operation.

Six people died in an explosion and fire in an electric power generation plant that was under construction. The explosion occurred as a large quantity of natural gas was being used in a blowout being conducted to clean out pipes.

Four people died in a two-story motel. No information was released due to ongoing civil suits.

Three people died in each of three incidents. The first, whose cause and origin were not reported, occurred at a one-story chemical manufacturing plant. The second, also of unknown cause, occurred in a one-story, 144-square-foot (13-square-meter) tool shed. The third fire broke out in the living room of a one-story, 2,100-squarefoot (195-square-meter) care-for-the-aged facility. The cause of this fire was undetermined and is still under investigation.

Catastrophic Non-Structure Fires

There were two non-structure incidents, one in a passenger vehicle crash and fire, and the other in a gas distribution system. The incidents killed 11 people, two under age six. This is four fewer incidents than occurred in this category in 2009 and 10 fewer deaths. Vehicle crashes and fires are included in this study if the fire in the vehicle caused the crash or if the local coroner or medical examiner confirms that the victims died of thermal injuries or inhalation of products of combustion, rather than from impact injuries.

One of the fires killed eight people. An explosion and fire erupted in a natural gas distribution system when a 30-inch (76.2-centimeter) gas transmission pipeline developed a leak under a street in a residential area. An unknown source ignited the explosion of approximately 47 million cubic feet (1,331,000 cubic meters) of natural gas. The fire destroyed 38 homes and damaged 63 others. The victims were at various locations in the area.

Three members of one family, including two children under age six, died in a multi-vehicle crash and fire on an interstate highway when a tractor trailer struck their passenger car from behind, pushing it into another tractor trailer. Fuel from a breach in the car's fuel system, as well as fuel from a saddle tank on the tractor trailer that hit the car, was ignited by heat from the tractor's engine. Another family member in the car died of blunt force trauma.

The Role of Smoke Detection and Suppression Equipment

In 12 of the 19 home fires, information was available on automatic smoke detection equipment. Four were equipped with smoke alarms. Two systems operated, one didn't, and it was not known if the fourth did or not. The reason the occupants failed to evacuate in one home that had operational smoke alarms was not reported. The other fire in which operational smoke alarms were present occurred in a four-unit apartment building where the fire department reported the exits were blocked by smoke and flames. Eight structures had no smoke alarms at all. In these fires, 40 people died, including three children under the age of six.

Information on detection equipment was reported for only one of the eight non-home structures. The care-for-the-aged facility was equipped with smoke alarms that operated and alerted the residents. The fire department reported that the age of the victims was a factor in preventing escape.

Smoke alarms have been proven effective in reducing the risk of death in home fires. The most effective arrangement is interconnected, multiple-station smoke alarms that are supplied by hard-wired AC power with a battery backup. These should be located outside each sleeping area, on each level, and in each bedroom. Homeowners should routinely test smoke alarms according to manufacturers' recommendations; NFPA recommends testing home smoke alarms at least monthly. Batteries should also be replaced according to manufacturer's recommendations; conventional batteries should be replaced at least yearly. If an alarm "chirps," a warning that the battery is low, the battery should be replaced right away. All smoke alarms, including alarms that use 10-year batteries and hard-wired alarms, should be replaced when they are 10 years old or sooner if they do not respond properly when tested.

Smoke alarms are only effective if occupants leave the building when they sound. Children should be familiar with the sound of a properly operating smoke alarm and follow a practiced escape plan, one that emphasizes two exits from any location, as well as a designated meeting place once they have evacuated the structure. Exit drills in the home are part of many school curricula. Practicing the plan helps families determine whether children and others readily waken to the sound of a smoke alarm if it sounds during night, and that, along with assistance for family members who require it, can be factored into the plan. Practicing escape plans, as well as basic fire prevention principles, might have prevented many of the fires and deaths included in this report.

No suppression equipment was reported to have been present in any of the fires. This is unfortunate, because sprinklers are proven lifesaving systems across many different kinds of properties, including homes. The risk of dying in a reported fire in your home decreases by about 80 percent when sprinklers are present, and sprinklers reduce the average property loss by 71 percent per fire. More information about home fire sprinklers is available at www.firesprinklerinitiative.org.

Where We Get Our Data

NFPA obtains its data by reviewing national and local news media, including fire service publications. A news clipping service reads all daily U.S. newspapers and notifies the NFPA Fire Analysis and Research Division of catastrophic fires. Once an incident has been identified, we request information from the local fire department or the agency having jurisdiction.

NFPA's annual survey of U.S. fire experience and mailings to state fire marshals are additional data sources, although not principal ones. We also contact federal agencies that have participated in the investigation of such fires. The diversity and redundancy of these sources enable us to collect the most complete data available on catastrophic fires in the United States. We understand that, in many cases, a department cannot release information due to ongoing litigation. In other cases, departments have been unable to determine the information we request.

Stephen G. Badger*, a fire data assistant with NFPA's Fire Analysis and Research Division, is retired from the Quincy, Massachusetts, Fire Department.*

TABLE 1. HOME STRUCTURE FIRES

Illinois

Date, Time of Alarm, Number of Deaths
February, 6:30 a.m., 7 (2 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was an occupied two-story, four-unit apartment building that covered 2,250 square feet (210 square meters) and was of unprotected wood-frame construction.
Smoke Alarm and Other Protection Devices
Smoke alarms were present and alerted the occupants. The fire department reported the occupants were unable to escape because exits were blocked by smoke and flames. There was no automatic suppression equipment.
Fire Origin and Path
This fire was set on the first story using available combustibles. No additional information was reported.
Contributing Factors and Victim Locations
Three firefighters were also injured. No information was reported on the victim's locations. An arrest has been made in this case.

Minnesota

Date, Time of Alarm, Number of Deaths
April, 5:59 a.m., 6 (3 under age 6)
Number of Stories, Occupancy Type, Construction Type
The two-story, six-unit apartment building with a pub on the first floor covered7,200 square feet (670 square meters). It was of unprotected, ordinary construction. The second-story apartments were occupied, and the pub was closed.
Smoke Alarm and Other Protection Devices
Smoke alarms, though present, did not operate for unreported reasons, and some had been removed. There was no automatic suppression equipment.
Fire Origin and Path
The only information reported was that the fire began on the second story.
Contributing Factors and Victim Locations
The victims were all located on the second story. An additional five people, as well as four firefighters, were injured.

New York

Date, Time of Alarm, Number of Deaths
June, 6:51 a.m., 6 (2 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was a two-story, single-family home of unprotected wood-frame construction.
The ground floor area was not reported.
Smoke Alarm and Other Protection Devices
No information was reported on smoke alarms. There was no automatic suppression equipment.

Fire Origin and Path
The only information reported was that the fire started on the first floor.
Contributing Factors and Victim Locations
Five of the victims were located on the second story, and one child was in a bedroom on the first story. In addition, three other people were injured.

Oklahoma

Date, Time of Alarm, Number of Deaths
August, 5:13 a.m., 6 (2 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was a one-story, single-family home of unprotected ordinary construction.
Smoke Alarm and Other Protection Devices
No information was reported.
Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
No information was reported.

Maryland

Date, Time of Alarm, Number of Deaths
December, 4:35 a.m., 6 (2 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was a two-story, single-family row house of unprotected wood-frame construction that covered approximately 1,000 square feet (93 square meters).
Smoke Alarm and Other Protection Devices
No information was reported on smoke detection equipment. There was no automatic suppression equipment.
Fire Origin and Path
This fire broke out in a first-story living room and was electrical in nature. No additional details were reported.
Contributing Factors and Victim Locations
No information was reported.

Missouri

Date, Time of Alarm, Number of Deaths
January, 4:59 a.m., 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was a one-story, single-family home of unprotected wood-frame construction. The ground floor area was not reported. There were seven occupants in the home at the time.
Smoke Alarm and Other Protection Devices
There were no smoke alarms or suppression equipment present.
Fire Origin and Path
The fire broke out in the finished basement near a couch. The cause was undetermined.

Contributing Factors and Victim Locations
The five victims were found in a bathroom in the basement. Two other people were injured but escaped from the first floor. Firefighters responding to the scene were slowed due to icy roads and snow drifts.

California

Date, Time of Alarm, Number of Deaths
January, 5:15 a.m., 5
Number of Stories, Occupancy Type, Construction Type
This single-family, single-wide manufactured home of unprotected wood-frame construction covered 648 square feet (60 square meters) and had an addition that contained a bedroom.
Smoke Alarm and Other Protection Devices
Neither smoke alarms nor suppression equipment were present.
Fire Origin and Path
The fire started in the bedroom in home's addition. The cause was undetermined.
Contributing Factors and Victim Locations
These were not reported.

Tennessee

Date, Time of Alarm, Number of Deaths
January, 6:46 a.m., 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
This two-story duplex of unprotected wood-frame construction covered 1,690 square feet (157 square meters). The unit of origin was occupied by seven people at the time of the fire.
Smoke Alarm and Other Protection Devices
Neither smoke alarms nor suppression equipment were present.
Fire Origin and Path
The fire broke out in a first-floor bedroom, but the cause was undetermined.
Contributing Factors and Victim Locations
No information was reported on victim location or fire spread. An eight-year-old who escaped on her own was taken to a hospital, as was another child who was in critical condition.

New York

Date, Time of Alarm, Number of Deaths
January, 2:31 a.m., 5
Number of Stories, Occupancy Type, Construction Type
This three-story apartment building of unprotected ordinary construction had businesses on the ground level and covered 4,000 square feet (372 square meters). The number of apartments in the building was not reported.
Smoke Alarm and Other Protection Devices
There were no smoke alarms or suppression equipment.
Fire Origin and Path
The fire broke in a second-story apartment. No additional information was reported.

Contributing Factors and Victim Locations
Three additional people and 14 firefighters were injured.

Arkansas

Date, Time of Alarm, Number of Deaths
February, 3:57 a.m., 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was a one-story, single-family home of unprotected wood-frame construction that covered 1,200 square feet (111.5 square meters)
Smoke Alarm and Other Protection Devices
Neither detection nor automatic suppression equipment were present.
Fire Origin and Path
The fire was caused by a short circuit in a lamp’s electrical cord, which had been damaged by a sofa resting on it. The short circuit ignited the sofa, and the fire spread throughout the house.
Contributing Factors and Victim Locations
A man and a four-year-old girl were found in a bedroom. A woman was found in a bathroom off a bedroom. Two more children were found in a hallway at the entrance to a bathroom.

Rhode Island

Date, Time of Alarm, Number of Deaths
February, 12:10 pm, 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
This two-story, single-family home of unprotected woodframe construction covered 1,224 square feet (114 square meters).
Smoke Alarm and Other Protection Devices
There were smoke alarms, but it is not known if they operated. There was no automatic suppression equipment.
Fire Origin and Path
Defective wiring in a first-story ceiling ignited wooden structure supports. Fire damage was confined to the ceiling/floor assembly and a second-floor bedroom.
Contributing Factors and Victim Locations
Two victims were found in each of two bedrooms on the second floor. The fifth victim was also found on the second floor, but the location was not reported. All four adults had drugs in their systems.

Alabama

Date, Time of Alarm, Number of Deaths
March, 12:15 a.m., 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
The ground floor area of the single-family manufactured home of unprotected wood-frame construction was not reported.
Smoke Alarm and Other Protection Devices
No information was reported.

Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
No information was reported.

Kentucky
Date, Time of Alarm, Number of Deaths
April, 2 a.m., 5 (3 under age 6)
Number of Stories, Occupancy Type, Construction Type
The ground-floor area of the single-family manufactured home of unprotected wood-frame construction was not reported.
Smoke Alarm and Other Protection Devices
No information was reported.
Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
Seven people were also injured.

Idaho
Date, Time of Alarm, Number of Deaths
June, 4:02 a.m., 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
This single-family manufactured home of unprotected wood-frame construction covered 600 square feet (55.7 square meters). It was occupied by a family of two adults and three children.
Smoke Alarm and Other Protection Devices
Neither smoke alarms nor automatic suppression equipment were present.
Fire Origin and Path
The fire began on the porch when a can of discarded cigarette butts ignited the wooden decking. The fire spread into the house and to two vehicles parked outside.
Contributing Factors and Victim Locations
All five victims were found in a rear bedroom.

Washington
Date, Time of Alarm, Number of Deaths
June, 10:04 a.m., 5 (1 under age 6)
Number of Stories, Occupancy Type, Construction Type
This two-story townhouse of unprotected woodframe construction covered 476 square feet (44 square meters). It was one unit of a three-unit building that covered 1,800 square feet (167 square meters).
Smoke Alarm and Other Protection Devices
Two smoke alarms were present. An alarm on the second floor activated. There was no suppression equipment.

Fire Origin and Path

The fire broke out in a first-floor living room closet when the closet's hot light bulb ignited one end of a foam rubber mattress that had been pushed inside. Residents pulled the mattress from the closet and left it in the living room as they opened doors and windows to help silence the alarm, but the cross ventilation caused the smoldering mattress to flare up and ignite nearby furniture. The fire then spread up the stairwell to the second story.

Contributing Factors and Victim Locations

The fire blocked the victims' means of egress. All five were found in a second-floor bathroom; three were in the bathtub. Another person was injured.

Tennessee

Date, Time of Alarm, Number of Deaths

September, 2:38 a.m., 5 (2 under age 6)

Number of Stories, Occupancy Type, Construction Type

This single-family, double-wide manufactured home covered 1,404 square feet (130 square meters).

Smoke Alarm and Other Protection Devices

Neither smoke alarms nor automatic suppression equipment were present.

Fire Origin and Path

The cause and origin of this fire is undetermined.

Contributing Factors and Victim Locations

When the fire department arrived, the house was 50 percent involved in fire. Firefighters made three attempts to rescue the trapped occupants, but they were forced into a defensive attack as conditions worsened. One other person was injured.

Ohio

Date, Time of Alarm, Number of Deaths

October, 2:12 a.m., 5 (1 under age 6)

Number of Stories, Occupancy Type, Construction Type

This two-story, eight-bedroom, single-family home of unprotected wood-frame construction covered 5,720 square feet (531 square meters).

Smoke Alarm and Other Protection Devices

Information on detection equipment was undetermined due to the destruction of the house. Investigators found no automatic suppression equipment.

Fire Origin and Path

The fire began in the living room when an electric space heater ignited an unknown wooden item. How the item was ignited was not reported. The fire spread throughout the first story and up the stairway to the second floor, destroying the home.

Contributing Factors and Victim Locations

All the victims were located in four of the bedrooms on the second story, but they were found on the first floor after the house burned to the ground. A second-story balcony had no ladder or stairs allowing for egress, and the fire blocked the main means of egress. Seven civilians and a firefighter were injured.

Pennsylvania

Date, Time of Alarm, Number of Deaths
October, 7:30 p.m., 5 (4 under age 6)
Number of Stories, Occupancy Type, Construction Type
This was a three-story, single-family row house of unprotected wood-frame construction. The ground floor area was not reported.
Smoke Alarm and Other Protection Devices
No information was reported.
Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
No information was reported.

Florida

Date, Time of Alarm, Number of Deaths
November, 10:35 p.m., 5
Number of Stories, Occupancy Type, Construction Type
This one-story, single-family home covered 1,434 square feet (133 square meters) and was of unprotected wood-frame construction.
Smoke Alarm and Other Protection Devices
Neither smoke alarms nor suppression equipment were present.
Fire Origin and Path
No information was reported on the cause and origin of the fire.
Contributing Factors and Victim Locations
Two of the victims were found in bedrooms. No information was reported as to the locations of the other three. An additional person received life-threatening smoke inhalation and burn injuries.

TABLE 2. NON-HOME STRUCTURE FIRES

West Virginia
Date, Time of Alarm, Number of Deaths
April, 3 p.m., 29
Number of Stories, Occupancy Type, Construction Type, Operating Status
This explosion and fire occurred in a coal mine consisting of approximately 2.5 miles (4 kilometers) of tunnels approximately 1,000 feet (395 meters) under the surface. It was at full operation at the time.
Detection Systems and Suppression Systems
No information reported.
Fire Origin and Path
A low volume of methane and/or methane from natural gas was the fuel for the initial ignition of the explosion. Friction or sparks from a worn bit on a mining machine contributed to the ignition. This explosion initiated a secondary coal dust explosion.
Contributing Factors and Victim Locations
Water sprayers that cooled the wall and the mining machine as it sheared away coal were missing, allowing a spark or heat from friction to ignite the gasses present. The mine's ventilation and air moving systems were not working correctly, so methane gas and coal dust accumulated over the weekend. More information can be found at the Mine Safety and Health Administration website at msha.gov. The report from the Governor's Independent Investigation Panel is available at nttc.edu/ubb/. Investigations are ongoing.

Louisiana
Date, Time of Alarm, Number of Deaths
December, 1:30 a.m., 8
Number of Stories, Occupancy Type, Construction Type, Operating Status
This one-and-a-half-story vacant warehouse of unprotected noncombustible construction was being used by homeless men and women for shelter. The floor area was not reported.
Detection Systems and Suppression Systems
No information was reported.
Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
No information was reported.

Washington
Date, Time of Alarm, Number of Deaths
April, 12:40 a.m., 7
Number of Stories, Occupancy Type, Construction Type, Operating Status
This hydrocarbon refinery was of unprotected noncombustible construction. The height and floor area were not reported. It was operating at the time of the fire.
Detection Systems and Suppression Systems
No information was reported.

Fire Origin and Path
A heat exchanger ruptured, releasing hydrocarbon and naphtha vapors that were almost immediately ignited. The heat exchanger, which was almost 40 years old, was being brought back in service after being down for maintenance and cleaning. The leak or leaks were found in cracks in welds. During operations, heat exchangers go through many changes in temperature and pressure, causing such cracks. For further information on the investigations, visit the Washington Department of Labor and Industry at lni.wa.gov/ and the Chemical Safety Board at csb.gov/.
Contributing Factors and Victim Locations
No information was reported.

Connecticut
Date, Time of Alarm, Number of Deaths
February, 11:15 a.m., 6
Number of Stories, Occupancy Type, Construction Type, Operating Status
This was an explosion at a power generating plant construction site. No information on the construction, ground floor area, or height of the plant was reported.
Detection Systems and Suppression Systems
No information was reported.
Fire Origin and Path
The explosion occurred when a large quantity of natural gas was being used in a blowout conducted to clean out pipes. It is not known what the ignition point was.

Contributing Factors and Victim Locations
Fifteen natural gas blows were completed within four hours of the explosion from an open-ended 20-foot (6-meter) pipe located between two large structures known as heat recovery steam generators. It is probable that the proximity of the buildings and the location of the vent pipe affected the dispersion of the natural gas. Up to 50 other workers were injured. Additional information can be found at the Chemical Safety Board at csb.gov/. At least five of the fatalities were located in the power generation building and were involved in the gas blow. The location of the other victim was not reported.

Alabama
Date, Time of Alarm, Number of Deaths
January, 8 p.m., 4
Number of Stories, Occupancy Type, Construction Type, Operating Status
This was a two-story motel of unprotected wood-frame construction. No further information was reported.
Detection Systems and Suppression Systems
No information was released due to ongoing civil suits.
Fire Origin and Path
No information was released due to ongoing civil suits.
Contributing Factors and Victim Locations
No information was released due to ongoing civil suits.

California

Date, Time of Alarm, Number of Deaths
September, 12:51 p.m., 3
Number of Stories, Occupancy Type, Construction Type, Operating Status
This was a one-story, 144-square-foot (13-square-meter) tool shed of unprotected wood-frame construction.
Detection Systems and Suppression Systems
No information was reported.
Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
No information was reported on the victims' locations or what they were doing at the time. One firefighter was injured during the fire.

Michigan

Date, Time of Alarm, Number of Deaths
October, 1:57 a.m., 3
Number of Stories, Occupancy Type, Construction Type, Operating Status
This one-story adult care home covered 2,100 square feet (195 square meters) and was of unprotected wood-frame construction. The facility was occupied at the time of the fire.
Detection Systems and Suppression Systems
There were smoke alarms in each room. The system operated and alerted the occupants. There was no automatic suppression equipment.
Fire Origin and Path
The cause of the fire, which broke out in the first-story living room, is undetermined and still under investigation.
Contributing Factors and Victim Locations
The age of the victims was reported as a factor in preventing their escape. An additional four people were injured.

West Virginia

Date, Time of Alarm, Number of Deaths
December, 1:23 p.m., 3
Number of Stories, Occupancy Type, Construction Type, Operating Status
This was a one-story chemical manufacturing plant of unprotected noncombustible construction.
Detection Systems and Suppression Systems
No information was reported.
Fire Origin and Path
No information was reported.
Contributing Factors and Victim Locations
No information was reported.

TABLE 3. NON-STRUCTURAL FIRES

California

Date, Time of Alarm, Number of Deaths
September, 6:12 p.m., 8
Setting
This was a 30-inch (76-centimeter) natural gas transmission pipeline that ran under the roadway in a residential neighborhood.
Climate
Winds were at 20 miles (32 kilometers) per hour, the temperature was 65° F (18°C), and humidity was at 58 percent.
Fire Origin and Path
A rupture of the gas transmission pipeline released over 47 million cubic feet (1,330,892 cubic meters) of natural gas. The release was ignited by an undetermined source and created a crater approximately 76 feet (23 meters) by 26 feet (8 meters), with a fireball reported to be 200 feet (61 meters) high.
Factors Hindering Occupant Escape
The explosion and ensuing fire destroyed 38 homes and damaged 63 others. It also damaged or destroyed 74 vehicles. Fifty people were injured. An investigation is ongoing by the National Transportation Safety Board (ntsb.gov/).

California

Date, Time of Alarm, Number of Deaths
February, 12:35 p.m., 3 deaths (2 under age 6)
Setting
This crash, which occurred on an interstate highway, involved a passenger car that was struck from behind and became partially wedged under another tractor trailer.
Climate
It was not reported.
Fire Origin and Path
The fire broke out when fuel spilled from a breach in the car's fuel system and fuel from a damaged saddle tank on the truck that struck the car was ignited by the truck's engine.
Factors Hindering Occupant Escape
A passenger vehicle with four occupants became wedged under a tractor trailer truck after it was struck from behind by another tractor trailer truck. The four occupants were trapped in the car when it caught fire. One of the four died of blunt force trauma injuries, and the other three died of burns or smoke inhalation. Passersby tried to rescue the victims, but they were driven back by the heat and flames.

California

Date, Time of Alarm, Number of Deaths

September, 12:51 p.m., 3

Number of Stories, Occupancy Type, Construction Type, Operating Status

This was a one-story, 144-square-foot (13-square-meter) tool shed of unprotected wood-frame construction.

Detection Systems and Suppression Systems

No information was reported.

Fire Origin and Path

No information was reported.

Contributing Factors and Victim Locations

No information was reported on the victims' locations or what they were doing at the time. One firefighter was injured during the fire.

Michigan

Date, Time of Alarm, Number of Deaths

October, 1:57 a.m., 3

Number of Stories, Occupancy Type, Construction Type, Operating Status

This one-story adult care home covered 2,100 square feet (195 square meters) and was of unprotected wood-frame construction. The facility was occupied at the time of the fire.

Detection Systems and Suppression Systems

There were smoke alarms in each room. The system operated and alerted the occupants. There was no automatic suppression equipment.

Fire Origin and Path

The cause of the fire, which broke out in the first-story living room, is undetermined and still under investigation.

Contributing Factors and Victim Locations

The age of the victims was reported as a factor in preventing their escape. An additional four people were injured.

West Virginia

Date, Time of Alarm, Number of Deaths

December, 1:23 p.m., 3

Number of Stories, Occupancy Type, Construction Type, Operating Status

This was a one-story chemical manufacturing plant of unprotected noncombustible construction.

Detection Systems and Suppression Systems

No information was reported.

Fire Origin and Path

No information was reported.

Contributing Factors and Victim Locations

No information was reported.

LARGE-LOSS FIRES IN THE UNITED STATES-2009

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November 2010

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For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

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NFPA No. LLS09

Introduction

Each year, the NFPA reports on large-loss fires and explosions that occurred in the United States the year before. Such fires and explosions are defined as any event that results in property damage of at least $10 million. In 2009, according to Michael J. Karter Jr., in "U.S. Fire Loss For 2009," in the September/October issue of *NFPA Journal*, U.S. fire departments responded to an estimated 1,348,500 fires—480,500 structure fires and 868,000 non-structure fires—which caused an estimated loss of $12.5 billion. Many of these fires were small or resulted in little or no reported property damage. However, 24 of them resulted in losses of $10 million or more each, for a total of roughly $940 million in direct property losses. Although these fires accounted for only 0.002 percent of the estimated number of fires in 2009, they accounted for 7.5 percent of the total estimated dollar loss.

NFPA tracks and tries to verify loss information for all large-loss fires reported in the media or by other sources. These 24 large-loss fires are those fires for which an official dollar loss was obtained.

The number of large-loss fires annually has ranged over the past 10 years from 16 to 45, with an average of approximately 25 fires per year. When adjusted for inflation to 2000 dollars, the number of fires in 2009 that could be categorized as large-loss fires—that is, fires resulting in a loss of $10 million in 2000 dollars—drops to 17, with an adjusted loss of $693 million in 2000 dollars (Figures 1 and 2).

In 2009, 14 fires resulted in more than $20 million each in property damage. These costliest 14 fires, which include 10 structure fires, 3 wildland fires, and 1 vehicle fire, resulted in a combined property loss of $813.2 million, which represents 86.5 percent of the total loss in large-loss fires and 6.5 percent of the total fire losses of 2009. Two fires alone resulted in losses of over $100 million each. The combined loss for these fires was $440 million.

The largest of the large

The largest-loss fire in 2009 occurred in the pavilion of a riverboat casino that was being renovated and caused an estimated $340 million in damage. The one- and two-story facility covered 118,000 square feet (11,000 square meters) and was of protected noncombustible construction. The one-story pavilion, which housed shops, restaurants, and a large ballroom, was connected by an above-ground walkway to a two-story casino that sits on two barges in the river. The fire destroyed the pavilion, but the casino was untouched.

While welding new duct work into an older duct work system in the kitchen, a welder saw smoke coming from an area where he had just been working. He went to get a fire extinguisher, but it was no longer where he had seen it earlier. Meanwhile, the surveillance department discovered the fire and sent someone to investigate; the method of discovery was not reported. The investigator confirmed the fire, having seen a hole burned through the duct work in the ceiling, and the premises was ordered evacuated. At the same time, the fire alarm sounded.

The fire spread to the ballroom, then to the hallway and throughout the structure. Arriving firefighters found that the fire had spread through the roof of the new construction area of the pavilion and started an interior attack. They also made trench cuts in the roof in an effort to stop the fire's spread. As conditions deteriorated, however, the incident commander ordered the firefighters inside and on the roof to evacuate, and a defensive attack was begun with master stream appliances.

During the fire, water availability became a problem; no cause was reported. Thirty extra tankers were requested from nearby communities to start a tanker shuttle of water to the scene. It was not reported if the river was used as a water supply.

Where fires occurred

Nineteen of the 24 large-loss fires of 2009 occurred in structures, resulting in a total property loss of $716.8 million. Another three were wildland fires that resulted in a total property loss of $169 million, and two more were vehicle fires that resulted in a total loss of $54.5 million. The vehicles involved were a tractor-trailer truck with TV broadcasting equipment and a cargo plane.

Six of the structure fires occurred in buildings that were under construction or being renovated, with a total loss of $429.8 million. The structures included three apartment buildings under construction. The buildings being renovated the casino pavilion mentioned above, a middle school, and a block of stores. Four fires occurred in manufacturing properties—a meat preparation plant, a machinery parts manufacturer, a truss and beam lamination plant, and a saw mill—and resulted in a total loss of just over $102.5 million. Three fires occurred in storage properties—a produce warehouse, a chemical waste facility, and a book storage warehouse—and resulted in losses of $70 million.

Two more structure fires each involved residential properties, both single-family homes, and two basic industry facilities, an 11-barn egg farm and a transformer next to an electric power generating plant, for a total loss of $40 million and $32 million, respectively. There was one fire each in a college classroom building and a furniture store, resulting in losses of $22.5 million and $20 million, respectively.

Information on operating status was reported for 17 of the 19 structure fires. Six were at full operation or occupancy, and three had some construction workers at the site. Eight properties were closed when the fires broke out.

Information on the cause of the fire was reported for 10 of the structures, all 3 wildfires, and 1 vehicle fire. Two of the structure fires and one wildland fire were incendiary. The resulting losses in these fires were $83 million, or 8.8 percent of the fire loss in large-loss fires.

Seven of the fires, five in structures and both the vehicles fires, broke out between 11 p.m. and 7 a.m.

Detection and suppression systems

Information about smoke detection equipment was reported for 16 of the 19 structure fires. Eleven of the 16 fires, or 69 percent, occurred in properties that had no automatic detection equipment. The other five structures had some type of automatic detection equipment. One had complete coverage smoke and manual alarms, and the coverage of the other four systems, which included three smoke detection systems and one unreported type of system, was not reported. Four of the five systems operated effectively, while the operation or effectiveness of the other system was not reported.

Information on automatic suppression equipment was reported for 18 of the 19 structure fires. Eleven structures had no suppression equipment, and seven had some type of system. Three had wet-pipe sprinklers; two provided partial coverage and the coverage of the other was not reported. Two had dry-pipe systems, both with unreported coverage. And two others were reported simply as suppression systems. One was still under construction, and the coverage of the other was not reported.

Three of the seven systems operated, and four did not. One of the systems that operated effectively controlled the fire, but two did not, one because the fire broke out above the covered area and the other because the water available was insufficient. Of the four systems that did not operate, one was not yet operational, the backflow device of another was turned off, and no reason was given for the final two.

Complete information on both detection and suppression equipment was reported for 15 of the 19 large-loss structure fires. In three structures, only detection equipment was present. In three more, only suppression equipment was present. In one fire, the structure had both detection and suppression systems, and eight properties, or 53 percent of all structures for which information was reported, had no coverage.

What we can learn

This study reports on the small share of fires that account for major losses. The number of fires in 2009 that resulted of losses of at least $10 million decreased by almost 31 percent from the total in 2008, and the associated property losses decreased by more than $1.4 billion. That difference in dollar loss can be accounted for by a large decrease in manufacturing property fires and wildfire losses. In 8 of the past 10 years, at least one fire has resulted in a loss of more than $100 million, and in at least four years, there was one loss of more than $1 billion. In 2009, two fires did more than $100 million in damage.

Adherence to the fire protection principles reflected in NFPA’s codes and standards is essential if we are to reduce the occurrence of large-loss fires and explosions in the United States. Proper design, maintenance, and operation of fire protection systems and features can keep a fire from becoming a large-loss fire. Proper construction, storage, and housekeeping will make fires less likely and help control or limit the fire spread should a fire occur.

Where we get our data

NFPA identifies potential large-loss incidents by reviewing national and local news media, including fire service publications. A clipping service reads all U.S. daily newspapers and notifies the NFPA's Fire Analysis and Research Division of major large-loss fires. NFPA's annual survey of the U.S. fire experience is an additional data source, although not the principal one.

Once an incident has been identified, we request information about the fire from the fire department or agency having jurisdiction. We also contact federal agencies that have participated in investigations, state fire marshal's offices, and military sources. The diversity and redundancy of these data sources enable the NFPA to collect the most complete data available on large-loss fires.

About the author

Stephen G. Badger is a fire data assistant in NFPA's Fire Analysis and Research Division and is a retired firefighter from the Quincy, Massachusetts, Fire Department.

Table 1
Large-Loss Fires that Caused $10 Million or More in Property Damage, 2000-2009

Year	Number of Fires	Number of Fires Causing $10 Million or More in 2000 Dollars	Direct Property Damage (in Millions) As Reported	Direct Property Damage (in Millions) In 2000 Dollars
2000	31	31	$1,814	$1,814
2001*	19	15	$762	$702
2002	25	22	$562	$509
2003	21	17	$2,623	$2,417
2004	16	9	$337	$242
2005	16	6	$217	$101
2006	16	13	$380	$305
2007	45	33	$3,393	$2,709
2008	35	23	$2,372	$1,794
2009	24	17	$940	$693

* Excluding the 9/11/01 World Trade center Incident from the loss totals but not the fire incident totals.

Note: Number of fires and unadjusted loss are based on data from studies that appeared in previous annual large-loss studies. Some of the information may differ from previously published material because material was updated after publication.

Note: Adjustment for inflation is based on the Consumer Price Index using 2000 as a base year. Note that adjustment for inflation not only reduces the the total dollar loss for each year but also reduces the number of fires when adjusted losses large enough to qualify as large-loss fires.

Source: NFPA's Fire Incident Data Organization (FIDO)

Table 2
Large-Loss Fires of $20 Million or More in 2009

Incident and Location	Loss in Millions
Casino pavilion under renovation, Illinois	$340.0
Wildfire, California	$100.0
Meat preparation plant, Minnesota	$50.0
TV broadcasting vehicle, Texas	$44.0
Wildfire, South Carolina	$44.0
Apartment building under construction, Indiana	$38.0
Produce warehouse, North Carolina	$30.0
Chemical waste recycling storage, Ohio	$29.7
Machinery parts manufacturing, Arkansas	$25.0
Single-family home, Michigan	$25.0
Wildfire, California	$25.0
College classrooms, Ohio	$22.5
Furniture store, Texas	$20.0
Egg farm barns, Texas	$20.0
Total Fires: 14	$813.2

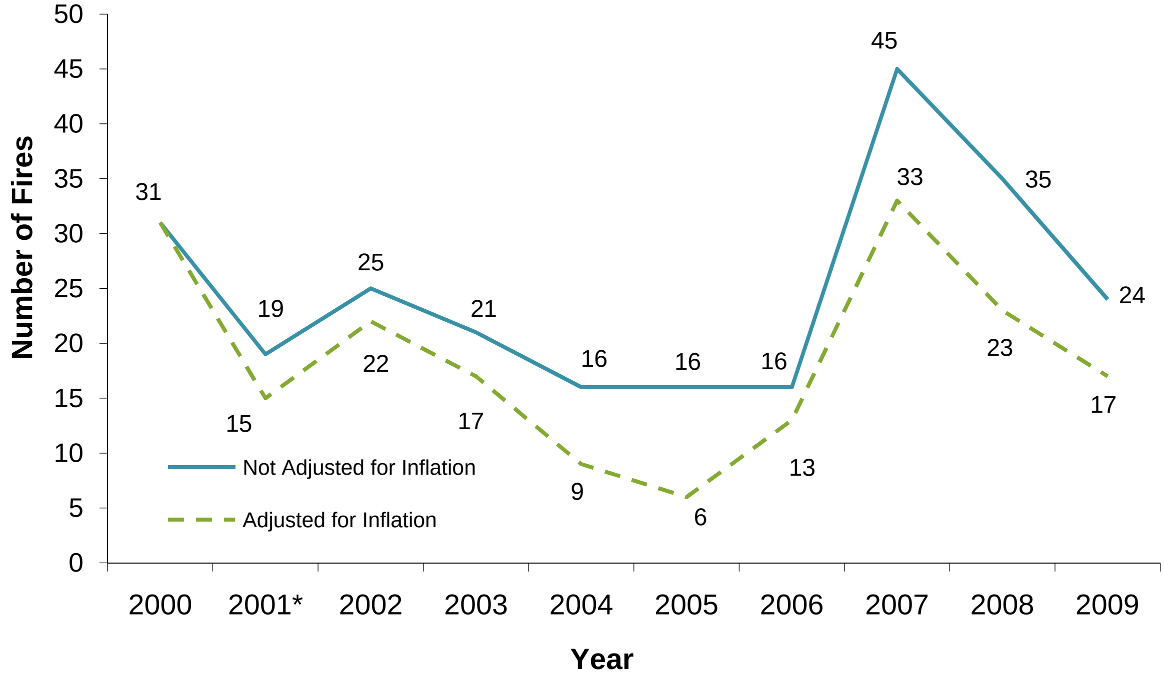
Source: NFPA's Fire Incident Data Organization (FIDO).

Table 3
2009 Large-Loss Fires by Major Property Use Classification

Property Use	Number of Fires	Percent of Fires	Total Dollar Loss	Percent of Loss
Special Properties	6	25%	$429,784,856	45.7%
Manufacturing	4	17%	$102,500,000	10.9%
Wildlands	3	13%	$169,000,000	18.0%
Storage	3	13%	$69,980,000	7.4%
Vehicle	2	8%	$54,500,000	5.8%
Residential	2	8%	$40,000,000	4.3%
Basic Industry	2	8%	$32,000,000	3.4%
Educational	1	4%	$22,500,000	2.4%
Stores and Offices	1	4%	$20,000,000	2.1%
Total	24	100%	$940,264,856	100.0%

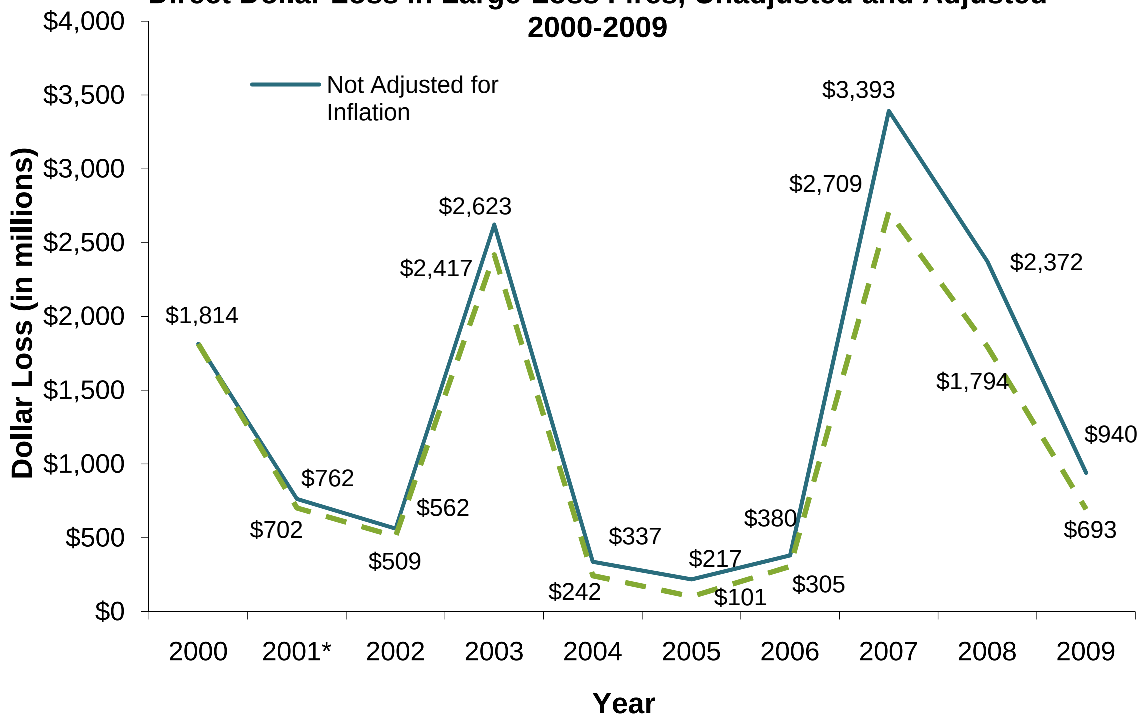
Source: NFPA's Fire Incident Data Organization (FIDO).

Figure 1
Large-Loss Fires, Unadjusted and Adjusted for Inflation, 2000 - 2009



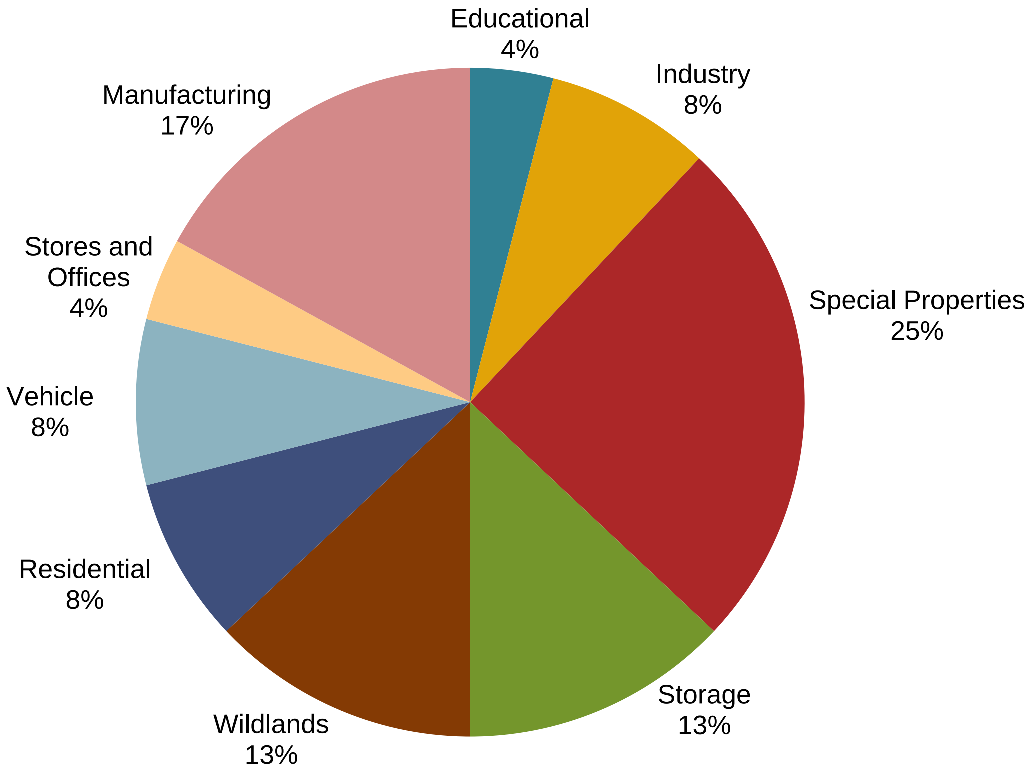
Note: The 2001 totals include the 9/11/01 World Trade Center Incident

Figure 2
Direct Dollar Loss in Large-Loss Fires, Unadjusted and Adjusted
2000-2009



Note:Losses exclude the 9/11/01 World Trade Center Incident

Figure 3
2009 Large-Loss Fires by Major Property Use



2009 Large-Loss Fire Incidents

Special Properties

Illinois
$340 million
March, 9:33 a.m.

Property Characteristics and Operating Status
This was a one- and two-story casino pavilion that covered 118,000 square feet (10,963 square meters) and was of protected noncombustible construction. An elevated walkway separated the pavilion from a two-story casino. The pavilion contained shops, restaurants, and a ballroom. At the time of the fire, the structure was undergoing major renovations, and construction workers were on site.

Fire Protection Systems
The fire alarms present operated and notified the workers, who evacuated safely. No information was reported as to the presence or absence of automatic suppression equipment.

Fire Development
A welder was adding new ductwork to existing grease ducts in the kitchen when he spotted smoke and fire. He tried to get an extinguisher but could not find it. Grease and wood structural members ignited, and the fire spread to a large ballroom, then into the hallway and throughout the building.

Contributing Factors and Other Details
The pavilion was a total loss, but the casino was untouched by the fire due to the work of the firefighters at the elevated walkway separating the two structures. The structure sustained a loss of $290 million, and its contents sustained damages of $50 million.

Indiana
$38 million
March, 3:20 a.m.

Property Characteristics and Operating Status
This six-story apartment building was under construction at the time of the fire. The building covered 345,000 square feet (32,052 square meters) and was of unprotected wood-frame construction. Construction was nearly complete. No one was on site at the time of the fire.

Fire Protection Systems
Neither automatic detection nor suppression equipment was present.

Fire Development
This incendiary fire was set on the ground level in the rear of the building. No further information was reported.

Contributing Factors and Other Details
Firefighters were dispatched to calls for smoke in the area. Upon arrival, they found heavy smoke and fire in the building. They mounted an interior attack until conditions deteriorated and they were withdrawn. At the same time, exposure protection successfully kept the fire from spreading to two adjacent structures.

Washington
$19.8 million
November, 1:06 a.m.

Property Characteristics and Operating Status
This two-story middle school of unprotected ordinary construction covered 28,000 square feet (2,601 square meters). The building was being renovated at the time. No one was on site when the fire broke out.

Fire Protection Systems
Smoke detection equipment was present throughout the school, and there were manual pull stations at the exits. The smoke alarms were not located in the area of the fire, but they activated. There was a partial-coverage wet-pipe sprinkler system, but the fire broke out above the system so, although it activated, it was ineffective.

Fire Development
The fire, the cause of which was undetermined, broke out in the ceiling-attic assembly.

Contributing Factors and Other Details
Upon finding heavy fire and smoke issuing from the school, arriving firefighters began an interior attack. Due to fire growth and deteriorating conditions, however, they were withdrawn to an exterior attack. Structural damage was reported at $19,270,487; damage to its contents was reported to be more than $500,000.

Washington
$12 million
June, 8 p.m.

Property Characteristics and Operating Status
This five-story apartment building was under construction, covered 11,250 square feet (1,045 square meters), and was of unprotected wood-frame construction. No one was at the site at the time of the fire.

Fire Protection Systems
The automatic detection system had not yet been installed. Although a sprinkler system had been installed up to the second story, it was not yet operational.

Fire Development
Roofers had been using a torch during the day. Several spot fires had occurred, but they were thought to have been extinguished. However, overlooked embers had fallen into the void between the insulation, ceiling, and roof assembly, and a breeze provided enough air for a fire to flare up nearly four hours later. The fire spread rapidly through the wooden construction.

Contributing Factors and Other Details
Sheetrock had not yet been installed to protect the wood framing, and the fire spread rapidly, completely destroying the building.

Montana
$10 million
March, 8:30 a.m.

Property Characteristics and Operating Status
This two-story block of stores was being renovated in a downtown area. The store in which the fire started was 140 feet (43 meters) by 25 feet (8 meters) and was of unprotected wood-frame construction. Construction workers were on site when the fire broke out.

Fire Protection Systems
Neither automatic detection nor suppression equipment was present.

Fire Development
This fire broke out when embers from hot work fell into a basement partition wall and ignited paper or plastic. The fire then ignited wood framing and joists, and spread to the first and second stories through the balloon construction.

Contributing Factors and Other Details
Hot work was done without a fire watch, and there were no portable extinguishers at the location. Firefighters were able to make an interior attack before conditions deteriorated and crews were withdrawn. Winds blowing at 35 miles (56 kilometers) per hour and gusting up to 50 miles (81 kilometers) per hour hindered firefighting operations.

Oklahoma
$10 million
October, 6:01 p.m.

Property Characteristics and Operating Status
This four-story, 148-unit apartment building was under construction. The building covered 179,000 square feet (16,630 square meters) and was of unprotected wood-frame construction. Construction workers were at the site when the fire broke out.

Fire Protection Systems
No information was reported as to the presence or absence of smoke alarms. A wet-pipe

sprinkler system was present, but its coverage was not reported. The system failed to operate, but the reason for this was not reported.

Fire Development
The only information reported was that the fire broke out in a storage room on the first floor.

Contributing Factors and Other Details
None reported.

Manufacturing Properties

Minnesota
$50 million
April, 10:22 a.m.

Property Characteristics and Operating Status
This two-story meat preparation plant covered 300,000 square feet (27,871 square meters) and was of unprotected ordinary construction. The plant was in full operation at the time of the fire.

Fire Protection Systems
There was no detection equipment or suppression equipment present.

Fire Development
The fire began in the ceiling near the exhaust chimney of a cooker and burned undetected for a while.

Contributing Factors and Other Details
Firefighters had trouble reaching the fire because of barriers and obstructions created by multiple ceilings and extensive piping between the ceilings. Firefighters were concerned about a potential release of anhydrous ammonia. The fire destroyed more than a million pounds (453,592 kilograms) of food.

Arkansas
$25 million
July, 4:43 a.m.

Property Characteristics and Operating Status
This one-story machinery parts manufacturing plant covered 250,000 square feet (23,226 square meters). Its type of construction was not reported. No one was at the site when the fire broke out.

Fire Protection Systems
Neither automatic detection nor suppression equipment was present.

Fire Development
Lightning struck a roof vent and started a fire in the storage area.

Contributing Factors and Other Details
A security guard in a nearby facility detected the fire nearly 3½ hours after the lightning strike and called the fire department to report smoke in the area. By the time firefighters arrived, the factory was heavily involved in flames. The delayed discovery, as well as the high-rack storage, made fighting the blaze difficult. Damage to the structure was estimated at $15 million, and damage to its contents was estimated at $10 million. The large monetary loss was due to a large number of machines and a warehouse full of finished product.

Washington
$15 million
May, 10:35 p.m.

Property Characteristics and Operating Status
This one-story wood truss and beam laminating plant was of unprotected noncombustible construction and covered 5,000 square feet (465 square meters). No one was in the plant at the time of the fire.

Fire Protection Systems
No smoke alarms or suppression equipment were present.

Fire Development
The cause and origin of the fire were undetermined.

Contributing Factors and Other Details
Damage to the building came to $5 million; damage to its contents came to $10 million.

California
$12.5 million
September, 10:34 a.m.

Property Characteristics and Operating Status
This two- and three-story saw mill was of unprotected, wood-frame construction, had metal-covered walls, and covered 19,500 square feet (1,812 square meters). The mill was operating at the time of the fire.

Fire Protection Systems
There were no smoke alarms. A dry-pipe sprinkler system of unreported coverage was present, and all the sprinklers activated, but no water flowed because a backflow device had been turned off.

Fire Development
The fire began when cutting torch operations ignited sawdust and wood chips.

Contributing Factors and Other Details
The rapid fire spread was attributed to the presence of sawdust, pitch, and a large quantity of wood throughout the structure. The fire also spread through the many vertical openings in the walls. Lack of water prevented the sprinkler system from controlling the fire. Air tankers made two fire retardant drops, followed by water drops from helicopters. The loss to the structure was estimated at $12 million and to the contents at $500,000.

Wildland

California
$100 million
May, 1:40 p.m.

Property Characteristics and Operating Status
This fire occurred in a wildland/urban interface area.

Weather Conditions
The temperature at the time was in the 80oF (20oC) range, and wind was from the west at 5 miles (8 kilometers) per hour.

Fire Development
The fire broke out when a metal cutting wheel on a brush trimmer hit a rock and the spark ignited fine fuels. The fire smoldered undetected by the equipment operator until a motorist on a nearby highway spotted it about an hour after ignition.

Contributing Factors and Other Details
The fire destroyed 82 homes and burned 8,733 acres (3,534 hectares). Thirty-two firefighters were injured fighting this fire. At one time, a fire shelter was deployed, but it was abandoned before it was used.

South Carolina
$44 million
April, 12:22 p.m.

Property Characteristics and Operating Status
This fire occurred in a wildland/urban interface area.

Weather Conditions
The temperature was 71°F (22°C), humidity was 25 percent, winds were from the west at 17 miles (27 kilometers) per hour with gusts to 30 miles (48 kilometers) per hour, and rainfall was below normal.

Fire Development
A property owner's debris fire burned out of control and started this 19,130-acre (7,742-hectare) wildfire.

Contributing Factors and Other Details
Gusty winds, dry conditions, and volatile vegetation of pine, palmetto, gall berry (shrub), wax myrtles, and other waxy plants contributed to the fast spread of this fire. Organic soils allowed the fire to burn under the fire lines, trees with no root systems to fall, and equipment to bog down in the many snags and holes. On the first night of the blaze, two firefighters operating tractors were forced to deploy their fire shelters when the wind shifted and their vehicles bogged down. They were uninjured. The fire destroyed 76 homes and damaged another 97, causing up to 4,000 people to evacuate their homes. Timber loss was estimated at $17 million, and structural and content loss in the city was estimated at $20.5 million. The rest was miscellaneous county, state, and forestry losses to fences, outbuildings, roads, and other infrastructure.

California
$25 million
August, 2:22 p.m.

Property Characteristics and Operating Status
This fire occurred in a wildland/urban interface area.

Weather Conditions
Temperature at the time was 90°F (32°C), and the wind was from the west at 15 miles (24 kilometers) per hour.

Fire Development
This was an incendiary fire. No further information was reported.

Contributing Factors and Other Details
The wind-driven fire destroyed 65 homes and 5 businesses, and burned 311 acres (126 hectares).

Storage Properties

North Carolina
$30 million
April, 9:40 p.m.

Time: Property Characteristics and Operating Status
This one-story produce warehouse, which contained crates of sweet potatoes, was of unprotected noncombustible construction and covered 40,000 square feet (3,716 square meters). The facility was closed for the weekend.

Fire Protection Systems
No information was reported as to the presence or absence of automatic detection equipment. There was a partial-coverage wet-pipe sprinkler system, which activated and kept the fire from spreading into the protected area of the building.

Fire Development
The cause of the fire was unknown and is under investigation. The fire began in an exterior shelter and spread into and throughout the nonprotected area of the warehouse. Upon arrival, firefighters found the warehouse well involved. An arriving pumper supplied the sprinkler system in the protected area of the building through the fire department connection, while firefighters made a defensive attack against the involved section.

Contributing Factors and Other Details
Two firefighters were injured. The loss to the building was estimated at $15 million, and damage to the contents was estimated at $15 million.

Ohio
$29.7 million
May, 12:07 a.m.

Property Characteristics and Operating Status
This 20-acre (8-hectare) chemical waste facility comprised eight structures of various types and sizes. The explosion occurred in a one-story building that covered 7,500 square feet (697 square meters). The type of construction was not reported. At the time of the explosion, six workers were in different parts of the facility.

Fire Protection Systems
Smoke alarms were present in the building where ignition occurred, but their coverage was not reported, and it is not known if they operated. There was no automatic suppression equipment.

Fire Development
A flame in a natural gas burner in the lab/operations building in front of the tank farm ignited a vapor cloud from an overpressure leak in the tank farm, causing a large explosion and fire.

Contributing Factors and Other Details
The explosion heavily damaged all the structures in the facility, as were about 20 surrounding residences and 5 businesses. Four civilians were injured in the explosion, and a firefighter was injured fighting the fire.

Florida
$10.3 million
October, 6:51 p.m.

Property Characteristics and Operating Status
This single-story book storage building covered 19,500 square feet (1,812 square meters). No information about the operation of the building or the type of construction was reported.

Fire Protection Systems
Neither smoke alarms nor automatic suppression equipment was present.

Fire Development
No information was reported.

Contributing Factors and Other Details
Damage to the structure was estimated at $10 million, and damage to its contents was estimated at $300,000.

Vehicle

Texas
$44 million
April, 3:55 a.m.

Property Characteristics and Operating Status
A tractor-trailer containing electronic equipment for television sports broadcasting caught fire on an interstate highway. The operator was the only person in the truck.

Fire Development
No information was reported.

Contributing Factors and Other Details
No information was reported.

Texas
Date, Time of Alarm, Dollar Loss
January, 4:38 a.m., $10,500,000

Property Characteristics and Operating Status
This fire involved a twin-engine cargo plane landing at an airport.

Fire Development
The plane crashed short of the runway, struck the approach lighting system, and caught fire.

Contributing Factors and Other Details
Fire damage to the aircraft was estimated at $10 million, while damage to the cargo it was carrying was estimated at $500,000. For further information, read the NTSB accident report online.

Residential

Michigan
$25 million
July, 4:19 a.m.

Property Characteristics and Operating Status
This two- and three-story, single-family home of unprotected wood-frame construction covered 23,000 square feet (2,137 square meters). The house was occupied at the time of the fire.

Fire Protection Systems
Smoke alarms of unreported coverage operated to alert the occupants. There was no automatic suppression equipment.

Fire Development
The cause of this fire, which broke out in a lower-level recreation room, was undetermined. It traveled into a void between the floors and up the walls to the upper-level hallway.

Contributing Factors and Other Details
The occupant evacuated the structure. Firefighters were forced from an interior attack by a back draft on the upper level of the house. Damage to the structure was estimated at $15 million, and damage to the contents, which included artwork, was put at $10 million.

District of Columbia
$15 million
July, 8:15 p.m.

Property Characteristics and Operating Status
This three-story, single-family home of unprotected wood-frame construction covered 1,710 square feet (159 square meters). There was one person at home when the fire broke out.

Fire Protection Systems
Smoke alarms of unreported coverage were present and operated. No automatic suppression equipment was present.

Fire Development
The cause of this fire, which broke out on a balcony or porch, is under investigation.

Contributing Factors and Other Details
The fire was shielded from public view until it had engulfed a large portion of the porch and a neighbor spotted it. Another neighbor's attention was caught by the sounding alarms around the same time. Multiple roof, floor, and ceiling collapses forced firefighters to an exterior position. The water supply was an issue, although no further information was reported. Damage to the structure, which contained quite a bit of combustible artwork and decorative finishes, was estimated at $6 million. Damage to the contents, including the artwork, was estimated at $9 million. One firefighter was injured. The occupant evacuated the structure unharmed.

Basic Industry

Texas
$20 million
July, 5:36 p.m.

Property Characteristics and Operating Status
The fire started in a manure tunnel connecting one barn of this 11-barn egg farm to another that was 20 feet (6 meters) high, of unprotected wood-frame construction, and covered 45,000 square feet (4,181 square meters). This barn and four others were destroyed. No one was in the facility at the time of the fire.

Fire Protection Systems
Neither automatic detection nor suppression equipment was present.

Fire Development
The fire broke out in a manure tunnel where welding had been done earlier. Hot materials that had dropped into the manure and feathers on a conveyer belt flamed after the workers had left for the day, and the fire burned in the tunnel between the buildings before it spread to the barns.

Contributing Factors and Other Details
Firefighters from 12 departments arrived to find at least two barns totally engulfed in flames and tried to cool exposed structures using an irrigation well on an adjacent property as a water supply. Three firefighters were injured in the process.

Illinois
$12 million
September, 1:33 p.m.

Property Characteristics and Operating Status
This was a transformer next to a power plant. No additional information was reported.

Fire Protection Systems
There was no information available as to the presence or absence of detection equipment. A fire pump and an unreported type of suppression system failed to operate for an unreported reason.

Fire Development
A mechanical malfunction in the transformer led to the fire, which spread to the roof of the power plant.

Contributing Factors and Other Details
By the time local fire companies arrived, the plant fire brigade had extinguished the transformer fire using foam, and the brigade and the fire department together extinguished the fire on the roof. Water from a nearby lake had to be drafted and trucked to the scene, so additional tankers were called to assist. Early in the incident, live power lines overhead hampered firefighters' activities.

Educational Properties

Ohio
$22.5 million
February, 5:25 p.m.

Property Characteristics and Operating Status
This fire started in a tunnel containing wire and fiber optics that extended into a one-story college classroom building that covered 10,000 square feet (929 square meters). The building, which was of protected noncombustible construction, was closed at the time of the fire.

Fire Protection Systems
Neither smoke alarms nor automatic suppression equipment was present.

Fire Development
The cause of the fire was not reported.

Contributing Factors and Other Details
Fire and smoke damaged at least 10 other buildings on campus. Three firefighters were injured during extinguishment operations.

Stores and Offices

Texas
$20 million
May, 8:30 p.m.

Property Characteristics and Operating Status
This two-story furniture store of unprotected ordinary construction was open and operating at the time of the fire. The ground floor area was not reported.

Fire Protection Systems
The store had no automatic detection systems. A dry-pipe sprinkler system of unreported coverage operated, but the fire overwhelmed it, and it shut down within minutes of operating. No reason for this was given.

Fire Development
Someone started this incendiary fire by pouring gasoline in the warehouse and igniting it with an open flame. The fire quickly spread to several pallets containing 150 gallons (568 liters) of highly flammable fabric protector.

Contributing Factors and Other Details
The fabric protector, which was insoluble in water, and the fire loading in the warehouse allowed the blaze to accelerate. Damage to the structure was estimated at $5 million, and damage to its contents was estimated at $15 million. One firefighter was injured.

National Study of Ambulance Transports to United States Emergency Departments: Importance of Mental Health Problems

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Abbreviations:
ED = emergency department
EMS = emergency medical services
MSA = metropolitan statistical area
NCHS = National Center for Health Statistics
NHAMCS = National Hospital Ambulatory Medical Care Survey

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Abstract
Introduction: Understanding ambulance utilization patterns is essential to assessing prehospital system capacity and preparedness at the national level.
Objective: To describe the characteristics of patients transported to US emergency departments (EDs) by ambulance and to determine predictors of ambulance utilization.
Methods: Data were obtained from the National Hospital Ambulatory Medical Care Survey using mode of arrival, demographic and visit information, ICD-9-CM E and V-codes, and classified reasons for the visit.
Results: The rates for ED visits of persons conveyed by ambulence were stable between 1997 and 2003, consisting of approximately one in every seven ED visits (14%). In 2003, there were 16.2 million ED visits for which an ambulance was used in the US. However, for patients with mental health visits, nearly one in three ED presentations (31%) arrived by ambulance. Significantly higher rates of ambulance use were associated with: (1) mental health visits; (2) older age; (3) African-Americans; (4) Medicare or self-pay insurance status; (5) urban ED location; (6) US regions outside of the South; (7) presentation between 12 midnight to 0800 hours; (8) injury-related visits; (9) urgent visit status; and/or (10) those resulting in hospital admission. Among mental health patients, older age, self-pay insurance status, urban ED location, regions outside the southern US, and urgent visit classification predicted ambulance use. Ambulance usage within the mental health group was highest for suicide and lowest for mood and anxiety disorder-related visits.
Conclusion: Reliance on ambulance services varies by age, insurance status, geographic factors, time of day, urgency of visit, subsequent admission status, and type of mental health disorder. Even after controlling for many confounding factors, mental health problems remain an important predictor of ambulance use.

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Introduction

Of the 114 million visits to US emergency departments (EDs) in 2003, an estimated 16 million arrived by ambulance (14%).[1] Given that basic ambulance transport average charges equal [US] $550–660 per trip, emergency medical services (EMS) transports to the ED cost the nation almost $10 billion annually.[2–4] In the context of ever-increasing EMS demand, ED closures and overcrowding have placed serious compensatory strains on existing prehospital resources, resulting in longer transport times, increased members of ambulance diversions, and longer out-of-service times for individual units.[5–7]

A number of studies have examined the relationship between system-specific predictors and ambulance use in narrowly defined service areas,[8–11] but there is a paucity of national, population-based data on ambulance utilization.[12] A Boston study by Rucker *et al* examined patient-specific predictors of ambulance use among non-mental health patients, and found that managed care insurance status, clinical severity, and older age were associated positively with increased usage.[13]

More inclusive, epidemiologically based, ED studies suggest that mental-health patients often rely on prehospital care while psychiatric visits constitute an increasing burden on emergency services nationwide.[14] Some authors have suggested that patients with mental illness are over-represented among ED ambulance referrals as they allegedly abuse or misuse EMS services.[15–19] A study from Australia showed that the strongest predictors of ambulance use in Brisbane were >65 years of age and were experiencing a mental health condition.[20] In San Diego County, California, psychiatric problems have been listed among the most prevalent chief complaints for both emergency and non-emergency ambulance transports for five continuous years (1999-2004).[21] To date, no large studies have examined the specific predictors of ambulance usage among mental health patients presenting to an ED, an epidemiologically important and rapidly growing subgroup of consumers seeking emergency care.

The purpose of this paper is to examine both demographic and clinical correlates of ambulance utilization for a national, population-based sample of ED visits. Also, the predictors of overall ambulance utilization are identified and the subgroups of ED patients with mental disorders are described.

Methods

Initiated in 1992 as part of the ambulatory component of the National Health Care Survey, the National Hospital Ambulatory Medical Care Survey (NHAMCS) assesses ED and outpatient department utilization by employing a four-stage probability sample of visits to non-institutional, general and short-stay hospitals in the US.[1,22] Conducted annually, the NHAMCS covers geographic, primary sampling units, hospitals within primary sampling units, EDs within hospitals, and patients within the EDs. Trained hospital staff from participating institutions collect and code data during a four-week period for each of the sampled hospitals on a 16-month, rotating cycle.[23] National estimates are obtained through the use of a multi-stage, estimation procedure that weighs patient visits and includes three basic components: (1) inflation by reciprocals of the sampling selection probabilities; (2) adjustment for non-response; and (3) a population weighting-ratio adjustment. Quality control includes computer checks to assess inconsistencies with value ranges at the central data entry site, a two-way, 10% independent procedure for medical and drug coding, and adjudication by the National Center for Health Statistics (NCHS) for ambiguous or illegible responses for fields including reasons for visit and diagnosis. The non-response rate for items generally is <5%, and error rates are <2% for items that require medical coding.[24]

Utilizing the ED component of the NHAMCS, mental health-related ED visits were included if their records met any one of three criteria: (1) DSM-IV-TR-based, major mental health problems (ICD-9-CM diagnoses 290.0-305; 307-310; 311-319.0 or V-codes 61.1-71.02 in any of the three available diagnosis fields); (2) NCHS-assigned Patient Reason-for-Visit Classification codes related to mental health in any of the three reason for visit fields,[23–25] 1100.0-1199.9; and/or (3) injury E-codes related to suicide in any of the three injury E-code fields, E950.0-E959.9. Otherwise, visits that did not meet at least one of the above criteria were deemed non-mental-health visits. Those ICD-9-CM codes in the 290–319 ranges were excluded if they were in the following categories: (1) psychosexual disorders (ICD 302); (2) sleeping disturbances (ICD 307.4); (3) physiological malfunction (ICD 306); (4) post-concussive syndrome (ICD-310.2); (5) non-dependent tobacco-use disorder (ICD 305.1); and (6) enuresis and encopresis (ICD 307.6, 307.7). Mental health-related ED visits were assigned specific DSM IV-compatible categories as listed in the Appendix.

For the NHAMCS "mode of arrival" variable for all major years contained in these analyses, <5% of the data were missing. Cases were analyzed by age, gender, race, ethnicity, insurance status, location in a metropolitan statistical area (MSA), and region of the US (Northeast, Midwest, South, and West). Metropolitan statistical areas and US regional categories as used here represent standardized geographical divisions defined by the US Census Bureau.[26] Visits were analyzed further by time and day of presentation, admission status, injury-related visit (defined by ICD-9-CM Injury and Poisoning E-Codes and Reason for Visit Classification) and NHAMCS-defined urgency ("urgent/emergent" or "non-urgent") at triage. Visits were considered "urgent" if expected triage time was recorded as $\leq$1 hour.

All analyses were performed using STATA 9.0 (StataCorp, College Station, Texas). A masked, ultimate, cluster sample design was used to estimate variance. In accordance with NCHS recommendations, only estimates with a relative standard error of <30% and observations >29 are reported. A non-parametric trend test was performed to examine trends over time. Weighted logistic regression was performed to obtain odds ratios (OR) and 95% confidence intervals (95% CI). To examine the stability of the two final multivariate models, they were tested using 1997 data and the results did not differ materially (data not shown). Two-sided p-values <0.05 were considered statistically significant.

Results

Between 1997 and 2003 inclusive, ambulance utilization remained stable between 14 and 15% for all ED patients (p_{trend} = 0.32). As illustrated in Figure 1, the absolute number of patient visits by ambulance increased even though this proportion of ambulance-related visits remained stable, since the overall number of ED visits continued to rise. Because there was no statistically significant change in the rate of ambulance utilization, all subsequent analyses were focused on all 12 months of 2003 data, the most recent year of NHAMCS available.

There were 16.2 million ambulance visits to the EDs in 2003. Of the 114 million emergency department (ED) visits in the US, approximately one in seven (14%) arrived via ambulance. For the 7.4 million mental health patients, however, nearly one in three (31%) used an ambulance in order to access the ED.

The characteristics of ambulance users versus non-ambulance users are listed in Table 1. Patients arriving by

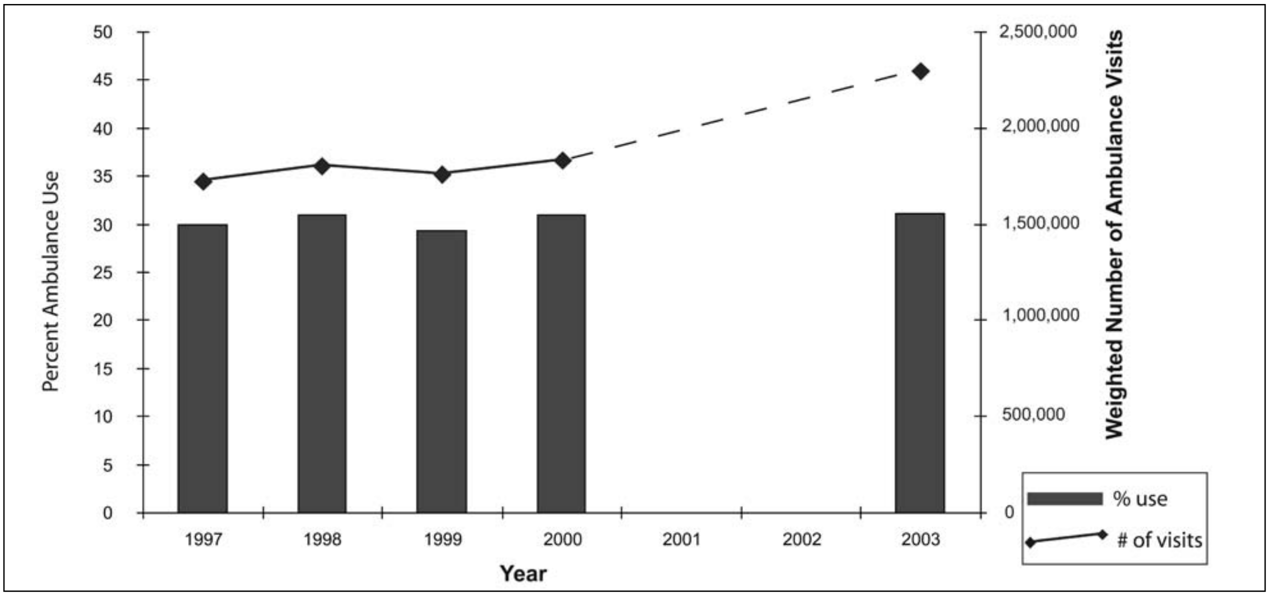

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Figure 1—Mental health ambulance visit trends (# = number; Data not available for 2001, 2002)

ambulance tended to be older, of Caucasian, non-Hispanic race/ethnicity, and had public rather than private insurance. Ambulance users also were more likely to be from an urban area and from a US region outside of the South. They were more likely to arrive during the night, have medical conditions classified as requiring "urgent" care at triage, visit the ED for an injury, and to be admitted to the hospital (all p <0.05). Multivariate predictors for ambulance use among all ED patients are listed in Table 2. Mental health visits were a significant predictor of ambulance usage.

Among patients admitted to US EDs with mental health problems, selected demographic and visit-related descriptors, and their respective age-adjusted odds ratios, by ambulance utilization status are listed in Table 3. Substance and suicide-related visits were 1.8 and 2.6 times (respectively) more likely than were any other ambulance visits. Mental health patients between 60 and 74 years of age were 6.7 times more likely, and patients >75 years were 11.7 times more likely to use the ambulance, compared to patients <15 years. Ambulance users with mental health problems were more likely to arrive between midnight and 0800 hours and tended to have Medicare, self-pay insurance status (versus private), or another insurance provider. Mental health patients in the emergency department are more likely to use an ambulance if their visit is injury-related, or if their visit resulted in admission to the hospital. Urgent classification among mental health patients also was associated with ambulance use. Gender, race/ethnicity, and arrival on a weekend (versus weekday) were not related to ambulance use among visits for mental health reasons.

The results from multivariate logistic regression computed to predict ambulance use among mental health patients are provided in Table 4. Independent predictors included older age, self-pay insurance status, urban location, US regions outside of the South, injury-related visit, and urgent visit classification. Those with an anxiety or mood disorder were less likely (statistically significant) to arrive by ambulance, while suicide-related visits had a borderline statistically significant increase in ambulance usage in the multivariate model.

Discussion

This is one of the few studies to examine ambulance utilization rates for ED patients in the US using a national probability sample. Most demographic variables other than older age were not predictive of ambulance use. The exponential increase in ambulance use with advanced age is in substantial agreement with other studies.[13,20,27] In a study from Australia, Clark and colleagues documented the importance of age and also found that males had higher rates of prehospital EMS utilization than did females across every age group.[28] The US Centers for Disease Control and Prevention's National Center for Health Statistics reported that in 2003, more than half of all visits for those >85 years of age arrived by ambulance,[29] and prehospital EMS can expect to be increasingly busy servicing an aging American population in the future. No effects of race or ethnicity on ambulance were found in the present analysis. A recent study from Canada, by contrast, found minority ethnicity to be associated with both ambulance and police referrals to an ED, but this was a small, non-population-based report from Montreal that included police and ambulance transports together as one outcome.[15]

As indicated by previous studies, an increased rate of ambulance use was found among those seeking emergency care for mental-health reasons. While this is an epidemiologically important group of emergency service consumers, long suspected of over-using and abusing ambulance services,[14,30] the high urgency (35%) and admission (46%) rates of psychiatric patients in this national sample questions these suspicions. Understanding existing prejudice against psychiatric patients may be important, as a study by

	Ambulance Users		Non-Ambulance Users		
	Weighted n	Weighted (%)	Weighted n	Weighted (%)	*p*-value
Age (years)					
<15	939,240	(5.8)	23,800,000	(24.3)	*p*<0.001
15-29	2,487,121	(15.4)	23,600,000	(24.1)	
30-44	2,905,206	(18.0)	21,700,000	(22.2)	
45-59	2,865,584	(17.7)	14,500,000	(14.8)	
60-74	2,724,204	(16.9)	8,089,536	(8.3)	
75+	4,244,062	(26.3)	6,144,793	(6.3)	
Gender					
Female	8,763,226	(54.2)	52,200,000	(53.4)	= 0.46
Male	7,402,191	(45.8)	45,500,000	(46.6)	
Race/Ethnicity					
White non-hispanic	11,000,000	(68.1)	62,300,000	(63.8)	<0.01
Black non-hispanic	1,329,387	(8.2)	11,100,000	(11.4)	
Other non-hispanic	3,156,258	(19.5)	19,700,000	(20.2)	
Hispanic	225,109	(1.4)	1,624,452	(1.7)	
Missing ethicity	438,659	(2.7)	2,891,970	(3.0)	
Insurance					
Private	3,806,641	(23.5)	37,700,000	(38.5)	<0.001
Medicare	8,440,168	(52.2)	34,500,000	(35.3)	
Medicaid	708,306	(4.4)	5,335,531	(5.5)	
Self-pay	2,126,533	(13.2)	13,900,00	(14.3)	
Other	1,083,769	(6.7)	6,307,861	(6.5)	
Urbanicity					
Urban	13,800,000	(85.2)	79,100,000	(80.9)	<0.001
Non-urban	2,392,597	(14.8)	18,700,000	(19.1)	
Region					
Northeast	4,036,015	(25.0)	19,800,000	(20.2)	<0.01
Midwest	3,976,712	(24.6)	21,200,000	(21.7)	
South	5,327,341	(33.0)	39,600,000	(40.5)	
West	2,825,349	(17.5)	17,100,000	(17.5)	
Time of Day					
00:00-07:59 h	3,123,174	(19.5)	14,100,00	(14.7)	<0.001
08:00-15:59 h	6,895,756	(43.1)	40,500,000	(41.9)	
16:00-23:59 h	5,965,795	(37.3)	41,900,000	(43.4)	
Day					
Weekend	4,600,694	(28.5)	29,200,000	(29.9)	= 0.11
Weekday	11,600,000	(71.5)	68,500,000	(70.1)	
Visit Type					
Mental health	6,089,405	(14.2)	5,099,707	(5.2)	<0.001
Injury-related	6,579,371	(40.7)	33,600,000	(34.4)	<0.001
Urgent	10,800,000	(82.2)	45,100,000	(56.9)	<0.001
Admitted	6,089,405	(37.7)	10,000,000	(10.3)	<0.001

Table 1—Characteristics of ambulance users versus non-ambulance users among all emergency department patients

		Odds Ratio	95% CI
Age (10 year increments)		1.32	1.3-1.4
Male		0.95	0.8-1.1
Race (white reference)			
	Black	1.24	1.1-1.4
	Other race	0.97	0.7-1.3
	Hispanic ethnicity	1.06	0.9-1.3
Insurance (private reference)			
	Medicare	1.58	1.4-1.8
	Medicaid	1.25	0.9-1.7
	Self-pay	1.56	1.3-1.8
	Other	1.88	1.5-2.4
Urban		1.46	1.2-1.7
Northeast (reference)			
	Midwest	1.03	0.8-1.4
	South	0.71	0.6-0.9
	West	0.85	0.6-1.1
Time (12:00-08:00 h reference)			
	08:00-16:00 h	0.65	0.6-0.8
	16:00-00:00 h	0.64	0.5-0.7
Weekend		1.01	0.9-1.1
Mental health visit		2.33	2.0-2.7
Injury-related visit		1.99	1.8-2.2
Urgent		2.66	2.2-3.2
Admit		2.95	2.6-3.4

Table 2—Multivariate logistic regression: Predictors of ambulance use among all emergency department patients (CI = confidence interval; h = hours)

Schmidt *et al* suggested that EMS workers commonly and systematically under-triage patients with mental health problems.[31] The observation that mental health visits have higher urgency and admission rates, yet longer waiting times, may reflect a similar bias against such patients.

In contrast to non-mental health-related ED visitors, the proportion of male and female ambulance users among mental health patients in this study was equivalent when controlling for other factors. Similarly, multivariate analysis indicated that there were no rural and urban differences in ambulance demand for mental health patients. Ambulance use by mental health patients was lowest in the South. Prior studies have noted a lower density of board-certified psychiatrists per capita in the Northeast,[14] but smaller area variation analysis would be required to further explicate this observation.[32–34] Amidst threats of disaster and increased ambulance diversions due to ED closures and overcrowding, it is imperative that policy makers better understand the variations in demand for pre-hospital services.[35,36]

As with many older studies of ambulance utilization, non-private or self-pay insurance status was found to be predictive of EMS-ED transport among mental health, as well as non-mental health ED attendees.[9,11,12] While examining non-mental health patients, Rucker *et al* (1997) also found that traditional indemnity plans or privately insured patients used ambulance services the least.[13] Privately insured patients are likely to have alternative means of transportation; however, this finding also may be related to service gaps in mental health care delivery for self-pay patients and insurance coverage exclusion under many publicly funded and managed care arrangements for mental health.[37]

Ambulance use also was predicted by late night arrival to the ED (12 midnight to 08:00h), which may be related to the lack of public transportation alternatives at these times, as well as the higher acuity of overdose and substance abuse patients who typically arrive at night, intoxicated. Visits classified as injury-related also were more likely to require EMS services, and this includes self-poisoned and intentionally self-harming patients who are admitted involuntarily.

While anxiety-related visits were the least likely to use an ambulance, both substance abuse and suicide-related visits were highly predictive of ambulance transport. These data support the previously documented finding of increased ambulance use by those suffering from a substance-related disorder.[17,38–40]

There are several potential limitations to this analysis. The selection of candidate predictors was limited by what was collected in the NHAMCS. Acuity could not be measured or controlled. Therefore, it is impossible to assess who truly needed an ambulance and who did not, although it may be surmised that those visits identified as urgent and those ultimately admitted generally were more worthy of ambulance conveyance than others. In addition, the use of administrative databases to assign diagnoses, including mental-health diagnoses, may be problematic.[41] Others have shown that even highly trained emergency physicians can be poor at making accurate mental-health diagnoses. Therefore, the results of this study may under-represent these ED visits.[42–45] In order to control for systematic under-counting, patient-reported reason for visit and physician-identified injury E-codes were included to encompass as many mental health patient visits as the data would allow. Prior work in assessing occult mental-health problems suggests that under-counting is more likely than is over-counting for ED-identified mental health visits.[46]

Conclusion

In summary, the actual numbers of ED-related ambulance transports are rising, although they comprise a stable proportion of all ED visits over time. Ambulance use is associated with age, insurance, urbanicity, time of day, and surrogate markers of acuity, urgency, and admission. Usage also is associated with mental health problems—a significant issue in the wake of disasters or mass casualty incidents. For mental health-related visits, many of the same predictors of ambulance use apply, and patients with substance- or suicide-related visits were found to use ambulances more frequently than do those presenting for care of other disorders. Conversely, patients with anxiety disorders were least

	Mental Health % Ambulance Use		Age-adjusted Odds Ratio	
	Weighted n	Weighted (%)	Odds Ratio	95% CI
Age (years)				
<15	60,117	(9.7)		
15-29	464,227	(25.3)	3.17	1.76-5.70
30-44	618,211	(28.8)	3.79	2.04-7.03
45-59	525,345	(34.6)	4.94	2.67-9.16
60-74	245,405	(41.8)	6.71	3.58-12.59
75+	384,709	(55.6)	11.72	6.14-22.37
Gender				
Female	1,146,247	(31.1)		
Male	1,151,767	(31.0)	1.09	0.86-1.38
Race/Ethnicity				
White non-hispanic	1,511,076	(30.2)		
Black non-hispanic	215,246	(28.3)	1.10	0.79-1.55
Other non-hispanic	467,989	(36.3)	1.41	1.06-1.86
Hispanic	42,425	(31.0)	1.23	0.61-2.47
Missing ethnicity	61,278	(28.6)	0.98	0.55-1.76
Insurance				
Private	464,606	(23.4)		
Medicare	1,084,922	(35.6)	1.44	1.08-1.92
Medicaid	90,961	(29.1)	1.32	0.74-2.36
Self-pay	447,992	(31.6)	1.64	1.19-2.27
Other	209,533	(33.1)	1.58	1.04-2.39
Urbanicity				
Urban	1,994,398	(32.3)		
Non-urban	303,616	(24.7)	0.63	0.46-0.87
Region				
Northeast	614,486	(33.0)		
Midwest	481,740	(32.4)	1.02	0.71-1.47
South	669,510	(27.5)	0.75	0.53-1.06
West	532,278	(33.0)	1.00	0.71-1.42
Time of Day				
00:00-07:59 h	441,729	(32.4)		
08:00-15:59 h	853,680	(30.1)	0.72	0.53-0.97
16:00-23:59 h	954,777	(31.6)	0.90	0.66-1.22
Day				
Weekend	625,462	(31.7)	1.06	0.83-1.35
Weekday	1,672,552	(30.8)		
Visit Type				
Anxiety	273,554	(18.1)	0.39	0.28-0.54
Mood	403,639	(22.1)	0.66	0.51-0.85
Psychosis	244,487	(32.5)	0.99	0.72-1.35
Substance	904,736	(38.2)	1.76	1.38-2.24
Suicide	240,687	(44.7)	2.64	1.79-3.88
Injury-related	1,219,447	(39.2)	2.28	1.85-2.80
Urgency	1,486,096	(35.1)	2.00	1.47-2.73
Admit	819,988	(46.3)	1.28	1.07-1.53

Table 3—Mental health patients: Percent ambulance use (CI = confidence interval; h = hours; n = number)

	Odds Ratio	95% CI	
Age (10-year increments)	1.3	1.2	1.4
Male	0.8	0.6	1.1
Race (white reference)			
Black	1.2	0.8	1.7
Other race	1.6	0.8	3.3
Hispanic Ethnicity	1.1	0.7	1.7
Insurance (private reference)			
Medicare	1.4	0.9	2.0
Medicaid	0.8	0.4	1.4
Self-pay	1.6	1.01*	2.5
Other	1.3	0.6	2.8
Urban	1.5	1.03*	2.2
Northeast (reference)			
Midwest	1.2	0.8	1.8
South	0.6	0.4	0.95*
West	1.0	0.7	1.5
Time (12:00-08:00 h reference)			
08:00-16:00 h	0.7	0.4	0.95*
16:00-24:00 h	0.8	0.5	1.2
Weekend	1.0	0.7	1.3
Visit Type			
Mental health			
Anxiety	0.4	0.2	0.6
Mood	0.6	0.4	0.8
Psychosis	0.9	0.6	1.3
Substance	0.8	0.5	1.4
Suicide	1.6	0.97	2.8
Injury-related	1.8	1.2	2.8
Urgent	1.8	1.3	2.5
Admit	1.1	0.9	1.3

Table 4—Multivariate logistic regression: Predictors of ambulance use among mental health patients
*where OR 95% CI was 1.0, 2 decimal places were presented (CI = confidence ratio; h = hours)

likely to use EMS after controlling for age, race, ethnicity, gender, urbanicity, region, insurance status, and other factors. The twin problems of ED and ambulance over-subscription have at least one common denominator: mental illness. Indeed, psychiatric problems already pose a known and serious population threat in the wake of terrorism and disaster.[47,48] Hence, any solution to this challenge will require a restructuring of the emergency mental healthcare system informed by those working in disaster management, psychiatry, emergency medicine, and prehospital care.

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Appendix—Assignments of mental-health related emergency department visits to DSM IV-compatible categories

1. *Mood disorders* (ICD/DSM-IV: 296-296.9; 300.4; 311) e.g., Major Depressive Disorder, depression not otherwise specified, dysthymia, bipolar, other mood disorders; and NCHS reason-for-visit 1110.0 (depression).

2. *Anxiety disorders* (ICD/DSM-IV: 300.00-300.61 except 300.4 dysthymia) e.g., generalized anxiety disorder, panic disorder, obsessive-compulsive disorder, post-traumatic stress disorder, acute stress disorder, agoraphobia, anxiety disorder not otherwise specified; and NCHS reasons for visit 1100.0 (anxiety and nervousness) and 1105.0 (fears and phobias).

3. *Psychotic disorders* (ICD/DSM-IV: 295-295.9, 297.3, 298.8, 298.9) e.g., schizophrenia, psychosis; and NCHS reasons for visit code 1155.0 (delusions or hallucinations).

4. *Substance-related conditions* (ICD/DSM-IV codes 290.44-292.94 and 302.89-305.98) e.g., Alcohol and other substance abuse; and NCHS reasons for visit 1145.0 (alcohol-related problems) and 1150.0 (abnormal drug usage).

5. *Miscellaneous disorders* (ICD-9 V-codes 61.1-71.09) e.g. adjustment disorders, problems in living; and NCHS Reason-for-Visit Classification 1130.0 (behavioral disturbances) and 1165 (other symptoms or problems relating to psychological and mental disorders not elsewhere classified).

6. In addition, because of the emergent nature of the condition, identified *suicide attempts/ideation* were coded as ICD-9 E codes 950-959; and NCHS reasons-for-visit 5820.0 (suicide attempt) and 5820.1 (intentional overdose).

U.S. FIRE DEPARTMENT PROFILE THROUGH 2009

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October 2010

National Fire Protection Association
Fire Analysis and Research Division

Abstract

NFPA estimates that there were approximately 1,148,100 firefighters in the U.S. in 2009. Of the total number of firefighters 335,950 or 29% were career firefighters and 812,150 (71%) were volunteer firefighters. Most of the career firefighters are in communities that protect 25,000 or more people. Most of the volunteer firefighters (73%) are in departments that protect fewer than 2,500 people. There are an estimated 30,165 fire departments in the U.S. Of these, 2,457 departments are all career, 1,752 mostly career, 5,099 are mostly volunteer and 20,857 are all volunteer. In the U.S., 13,275 or 44% of departments provide EMS service, 4,475 departments or 15% provide EMS service and advance life support, while 12,415 departments or 41% provide no EMS support.

Keywords: fire departments, firefighters, career, volunteer, EMS, statistics.

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For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this analysis are available from:

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List of Tables and Figures

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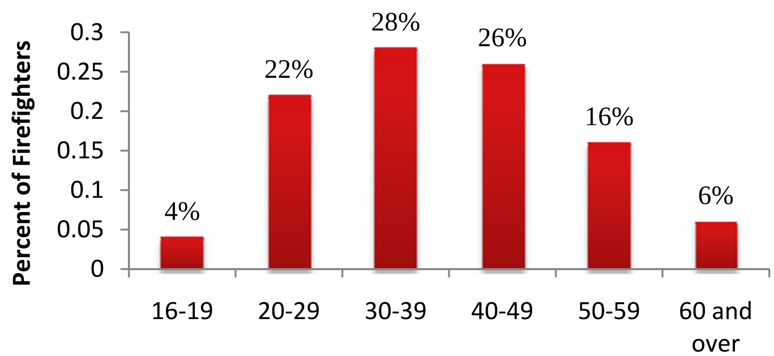
The U.S. Fire Department Profile Through 2009

There are **1,148,100** firefighters in the United States

- **29%** (335,950) are career firefighters.
- **71%** (812,150) are volunteer firefighters.
- Firefighters in smaller communities are more likely to be volunteers.
- Departments protecting larger communities tend to have a higher proportion of firefighters in the age groups 30-39 and 40-49 than smaller communities.

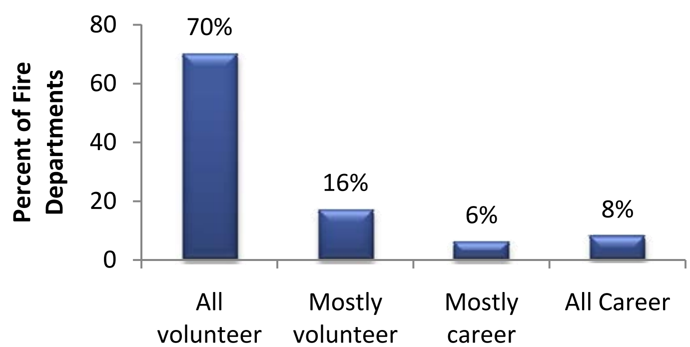
Number of Firefighters in the U. S. by Age Group, 2009



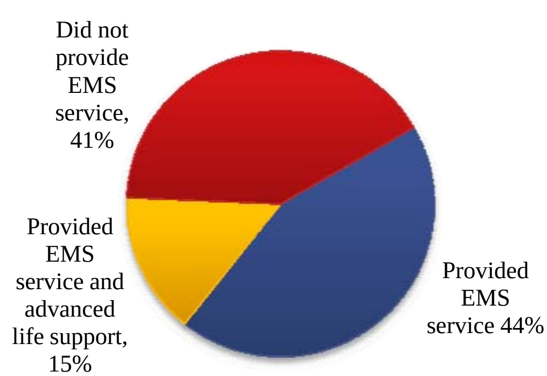
30,165 fire departments protected the United States in 2009

- All career 2,457
- Mostly career 1,752
- Mostly volunteer 5,099
- All volunteer 20,857

Fire Departments by Type, 2009



Fire Department Provision of Emergency Medical Service, 2007-2009 Annual Averages



Firefighters

There were approximately 1,148,100 firefighters in the U.S. in 2009, according to estimates based on NFPA's 2009 National Fire Experience Survey (see Table 1). This is a decrease of 0.1%, or virtually no change from a year ago.

Career firefighters include full-time (career) uniformed firefighters regardless of assignments, e.g., suppression, prevention/inspection, administrative. Career firefighters included here work for a public fire department that protects people in the community in their residences and in public buildings; they do not include career firefighters who work in private fire brigades.

Volunteer firefighters include any active part-time (call or volunteer) firefighters. Active volunteers are defined as being involved in fire fighting. Of the total number of firefighters, 335,950 or 29% were career firefighters, while 812,150 or 71% were volunteers.[1]

Most of the career firefighters (73%) are in communities that protect 25,000 or more people. Most of the volunteers (95%) are in departments that protect fewer than 25,000 people and more than half are located in the small, rural departments that protect fewer than 2,500 people (see Table 1).

Since 1986, the number of career firefighters in the U.S. has gone up quite steadily from 237,500 in 1986 to 335,900 in 2009 for an overall increase of 41% (Table 2, Figure 1). However when the rates of career firefighters per 1,000 people protected for mostly or all career departments are examined, the rates do not increase but stay in a range of 1.64 to 1.77 career firefighters per 1,000 people protected (Table 2, Figure 1). Essentially what this means is that even though the number of career firefighters has gone up, the number of people protected by career firefighters has also gone up as the population in the U.S. has increased.

---

[1] Note that these results are based on a sample survey, and as a result there is a confidence interval associated with each estimate. Based on data reported by fire departments responding to the 2009 National Fire Experience Survey, the NFPA is confident that the actual number of career firefighters falls within the range of 321,900 to 349,900, and the actual number of volunteer firefighters falls within the range of 795,150 to 829,150.

Table 1
Career and Volunteer Firefighters
in the U.S., by Population Protected, 2009

Population Protected	Career	Volunteer	Total
1,000,000 or more	36,800	650	37,450
500,000 to 999,999	35,050	5,700	40,750
250,000 to 499,999	27,750	3,300	31,050
100,000 to 249,999	50,550	2,300	52,850
50,000 to 99,999	43,600	7,750	51,350
25,000 to 49,999	50,250	23,250	73,500
10,000 to 24,999	53,400	75,850	129,250
5,000 to 9,999	20,650	108,800	129,450
2,500 to 4,999	9,850	183,850	193,700
Under 2,500	8,050	400,600	408,650
	335,950	812,150	1,148,100

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009

Note the number of volunteer firefighters for communities of 25,000 or more and the number of career firefighters for communities of less than 10,000 may change considerably from year to year because of their small size and sample variability.

Table 2
Number of Firefighters in the U.S., 1986-2009

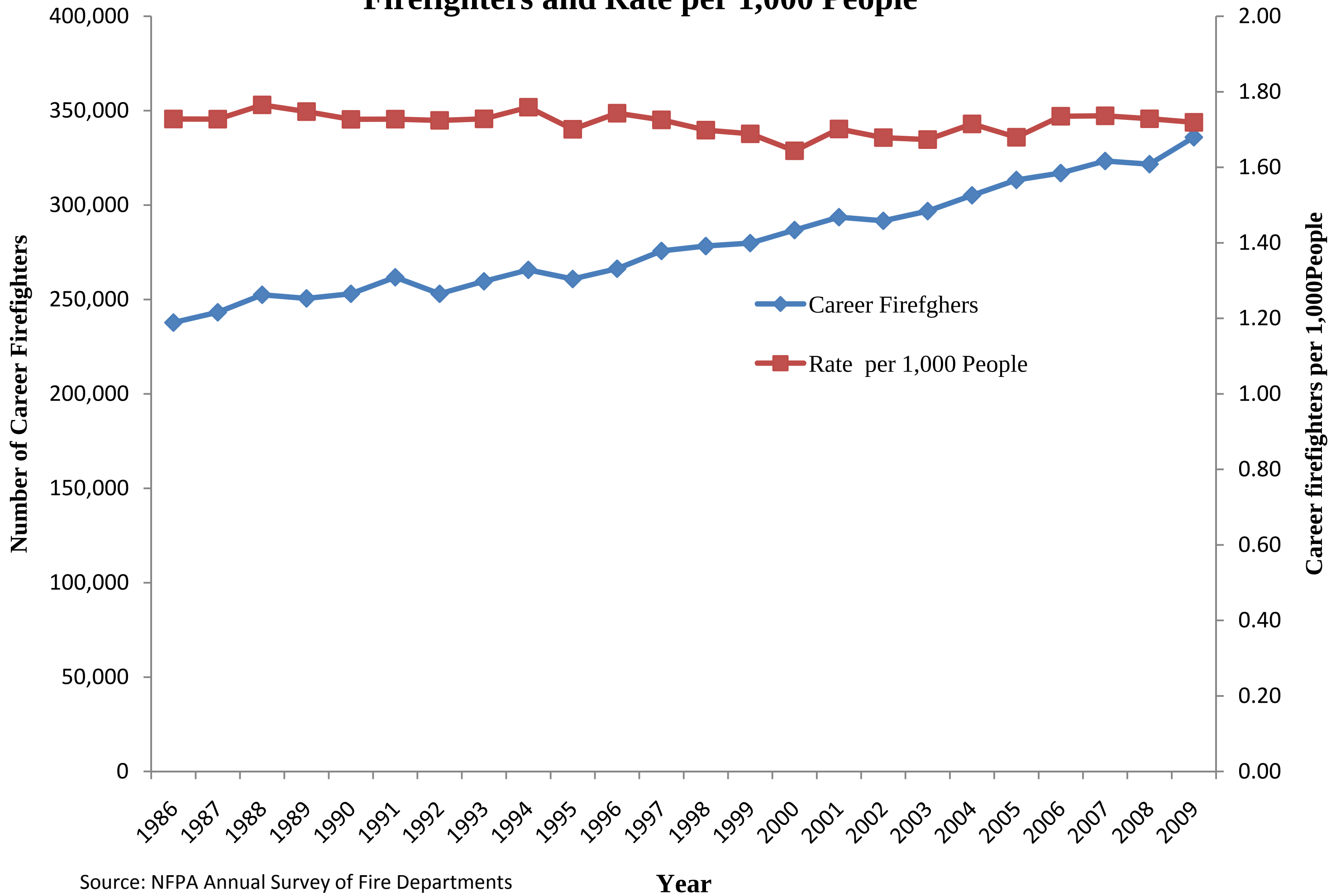
Year	**Total** Number	Rate per 1,000 People	**Career** Number	Rate per 1,000 People	**Volunteer** Number	Rate per 1,000 People
1986	1,045,950	4.35	237,750	1.73	808,200	7.88
1987	1,060,000	4.36	243,200	1.73	816,800	8.05
1988	1,040,750	4.25	252,500	1.77	788,250	7.77
1989	1,020,700	4.12	250,600	1.75	770,100	7.45
1990	1,025,650	4.11	253,000	1.73	772,650	7.56
1991	1,033,600	4.09	261,800	1.73	771,800	7.61
1992	1,058,300	4.14	253,000	1.72	805,300	7.34
1993	1,055,050	4.09	259,650	1.73	795,400	7.25
1994	1,073,600	4.12	265,700	1.76	807,900	7.19
1995	1,098,850	4.18	260,850	1.70	838,000	7.42
1996	1,081,800	4.07	266,300	1.74	815,500	6.98
1997	1,079,050	4.03	275,700	1.73	803,350	7.12
1998	1,082,500	4.00	278,300	1.70	804,200	7.18
1999	1,065,150	3.90	279,900	1.69	785,250	6.93
2000	1,064,150	3.86	286,800	1.64	777,350	7.25
2001	1,078,300	3.85	293,600	1.70	784,700	7.04
2002	1,108,250	3.89	291,650	1.68	816,600	7.12
2003	1,096,900	3.77	296,850	1.67	800,050	7.05
2004	1,100,750	3.76	305,150	1.71	795,600	6.88
2005	1,136,650	3.82	313,300	1.68	823,350	7.30
2006	1,140,900	3.81	316,950	1.74	823,950	7.26
2007	1,148,800	3.81	323,350	1.74	825,450	7.29
2008	1,148,850	3.81	321,700	1.73	827,150	7.01
2009	1,148,100	3.81	335,950	1.72	812,150	7.27

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1986-2009).

The rates listed above are based on data reported to the NFPA, and do not reflect recommended rates or some defined fire protection standard.

Note that the rates per 1000 people protected for career firefighters are based on population protected for departments that are comprised of all or mostly career firefighters. While the rates per 1000 people protected for volunteer firefighters are based on population protected for departments that are comprised of all or mostly volunteer firefighters.

Figure 1. Number of Career Firefighters and Rate per 1,000 People



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1986-2009)

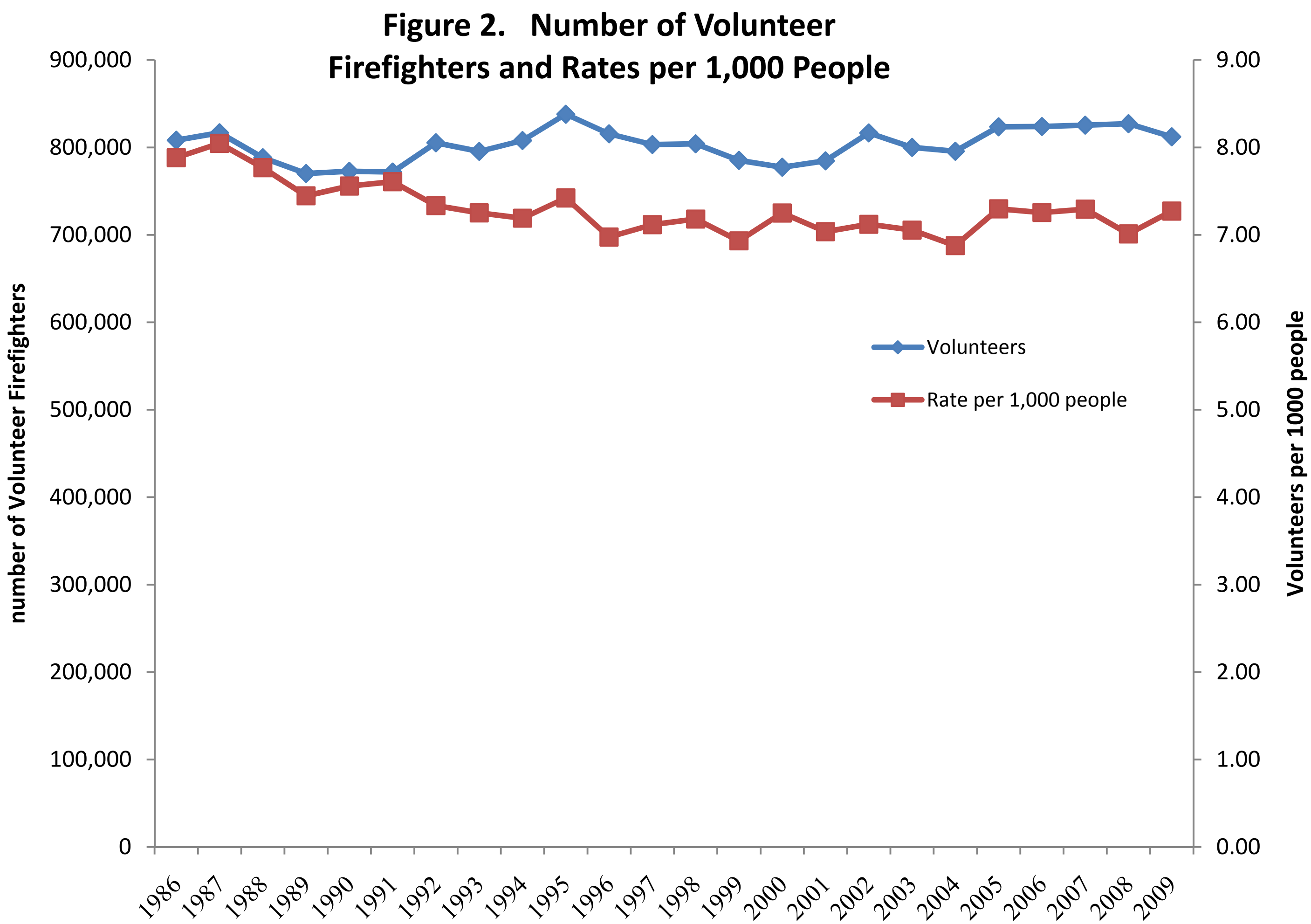
Since 1986, the number of volunteer firefighters declined in the late 1980s and in early 2000s, each time returning to the same level soon after. In 2005-2009, the number of volunteer firefighters has been stable at a level slightly higher than any previously recorded. (Table 2, Figure 2). When the rates of volunteer firefighters per 1,000 people protected for mostly or all volunteer departments are examined, the rates show a downward trend and fall within the range of 6.88 to 8.05 per 1,000 people protected.

According to the U.S. Department of Labor, Bureau of Labor Statistics for the 2005-2009 periods, there were on average 25,060 African-American career firefighters or 9% of the total and 11,140 female career firefighters, or 4% of the total.[2]

A good way to develop a sense of the size of departments relative to the population they protect is to examine the rate of firefighters per 1,000 people. Tables 3 and 4 provide the range of rates for career firefighters in departments protecting at least 25,000 people and for volunteer firefighters in departments protecting fewer than 25,000 people. **It is important to note that the rates are based on data reported to the NFPA and do not reflect recommended rates or some defined fire protection standard**.

Fire departments protecting communities of 25,000 people or more had median rates of career firefighters per 1,000 people of 1.23 to 1.30 (Table 3). However, ranges for departments by community size varied considerably within stratum and particularly for communities of 100,000 to 249,999, 50,000 to 99,999, and 25,000 to 49,999. Note that the rates for a particular size of community varied considerably, because departments face great variation in their specific circumstances and policies, including length of work week, unusual hazards, geographical

[2] Figures are from the *Annual Averages Tables Employment and Earnings*, Bureau of Labor Statistics, Washington, D.C. These numbers can change considerably from year to year because of their small size and sample variability.



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1986-2009)

Table 3
Career Firefighter Rates
By Population Protected, 2009

	Career Firefighters Per 1,000 People		
Population Protected	**Low**	**Median**	**High**
1,000,000 or more	0.63	1.30	1.39
500,000 to 999,999	0.50	1.29	3.23
250,000 to 499,999	0.62	1.20	2.44
100,000 to 249,999	0.51	1.29	3.88
50,000 to 99,999	0.00	1.30	3.97
25,000 to 49,999	0.00	1.23	5.20

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

The rates listed above are based on data reported to the NFPA, and do not reflect recommended rates or some defined fire protection standard.

The rates of a particular size of community may vary widely because departments face great variation in their specific circumstances and policies including length of work week, unusual structural conditions, types of service provided to the community, geographical dispersion of the community, and other factors.

Career rates are shown only for communities with populations of 25,000 or more, where departments are comprised of all career or mostly career firefighters. Also some of these departments have some volunteers, who are not reflected in these figures.

The low and high values are the lowest and highest values by size of community. The median value is chosen so that half the departments had higher values, and half had lower.

dispersion of the community, and scope of services provided (e.g., whether the department handles emergency medical calls).

Fire departments protecting less than 25,000 people had median rates of volunteer firefighters per 1,000 persons in the range of 1.40 to 20.57 (Table 4). This wide range in median rates for smaller communities reflects the fact that it takes a minimum number of firefighters to staff a department regardless of community size. Also volunteer firefighters are usually available on a part-time basis only, so it takes more of them to ensure an adequate response to each alarm.

Length of work week and its effect on rate of career firefighters per 1,000 population by size of community can be seen in Table 5. Tables 6 and 7 provide median rates for career and volunteer firefighters by region and size of community.

Of the 1,148,100 firefighters, the age group accounting for the largest share of firefighters was the 30-39 group, which accounted for 316,950 or 27.6% of all firefighters (Table 8 and Figure 3). Many firefighters fell in the 40-49 age group (25.6%) and the 20-29 age group (21.4%). Firefighters age 50-59 accounted for a smaller share (16.1%), but still more than one-sixth of all firefighters. Few firefighters fell outside this combined range of 20 to 59 years old. Only 3.5% of firefighters were age 16 to 19, and another 5.9% were age 60 and over.

Age group patterns did vary somewhat by population of community protected (Table 9, Figure 3). Departments that protect less than 25,000 people, and are comprised mostly of volunteers, tended to have higher proportions of firefighters in the under 30 age group, while departments that protect 25,000 people, and are comprised mostly of career firefighters, or more had higher proportions of firefighters in the 30-39 and 40-49 age groups.

When age group patterns by year are examined for the 1998-2009 period, there were slight changes over time (Figure 4). The 30-39 and the 40-49 age groups showed slight decreases over the period, while the 50-59 and 60 and over groups showed moderate increases over the period.

Table 4
Volunteer Firefighter Rates
By Population Protected, 2009

	Volunteer Firefighters Per 1,000 People		
Population Protected	**Low**	**Median**	**High**
10,000 to 24,999	0.00	1.40	12.87
5,000 to 9,999	0.00	3.73	13.00
2,500 to 4,999	0.77	7.81	20.06
Under 2,500	5.00	20.57	*

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

The rates listed above are based on data reported to the NFPA, and do not reflect recommended rates or some defined fire protection standard.

The rates of a particular size of community may vary widely because departments face great variation in their specific circumstances and policies including unusual structural conditions, types of service provided to the community, geographic dispersion of the community, and other factors.

Volunteer rates are shown only for communities under 25,000, where departments are comprised of all volunteer or mostly volunteers. Also, some of these departments, particularly those with population protected of 5,000 or more, have some career firefighters, who are not reflected in these figures.

The low and high values are the lowest and the highest values by size of community. The median value is chosen so that half of the departments had higher values, and half had lower.

*Because there are a minimum number of firefighters to form even a single company, smaller communities of under 100 people can have very high rates.

Table 5
Career Firefighters per 1,000 People For All Career Departments
By Work Week and Population Protected, 2007-2009

Population Protected	Career Firefighters Per 1,000 People 40-45 hour	46-51 hour	52-60 hour
1,000,000 or more	*	1.43	0.98
500,000 to 999,999	2.41	1.83	1.25
250,000 to 499,999	2.03	1.84	1.24
100,000 to 249,999	2.06	1.53	1.36
50,000 to 99,999	2.13	1.52	1.39
25,000 to 49,999	2.13	1.70	1.65

Source: NFPA Fire Service Survey, 2007-2009.

The rates listed above are based on data reported to the NFPA, and do not reflect recommended rates or some defined fire protection standard.

The rates of a particular size of community may vary widely because departments face great variation in their specific circumstances and policies including unusual structural conditions, type of service provided to the community, geographic dispersion of the community and other factors.

Career rates are shown only for communities over 25,000, where departments are comprised mostly of career firefighters.

*Insufficient data.

Table 6
Median Rates of Career Firefighters per 1,000 People
By Region and Population Protected, 2009

Population Protected	Northeast	Midwest	South	West
250,000 or more	1.64	1.50	1.32	0.83
100,000 to 249,999	2.16	1.30	1.48	0.90
50,000 to 99,999	2.00	1.24	1.57	0.97
25,000 to 49,999	1.59	1.00	1.86	0.98

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

The rates listed above are based on data reported to the NFPA, and do not reflect recommended rates or some defined fire protection standard.

The rates of a particular size of community may vary widely because departments face great variation in their specific circumstances and policies including unusual structural conditions, types of service provided to the community, geographic dispersion of the community, and other factors.

Career rates are shown only for communities over 25,000, where departments are comprised mostly of career firefighters.

As defined by the U.S. Bureau of the Census, the four regions are:
Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

Table 7
Median Rates of Volunteer Firefighters per 1,000 People
By Region and Population Protected, 2009

Population Protected	Northeast	Midwest	South	West
10,000 to 24,999	1.48	1.58	0.79	1.89
5,000 to 9,999	5.22	3.77	3.50	3.08
2,500 to 4,999	8.89	8.00	6.46	6.94
under 2,500	20.86	21.33	16.18	30.00

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

The rates listed above are based on data reported to the NFPA, and do not reflect recommended rates or some defined fire protection standard.

The rates of a particular size of community department may vary widely because departments face great variation in their specific circumstances and policies including unusual structural conditions, types of service provided to the community, geographic dispersion of the community, and other factors.

Volunteer rates are shown only for communities under 25,000, where departments are comprised of mostly volunteers.

As defined by the U.S. Bureau of the Census, the four regions are:
Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

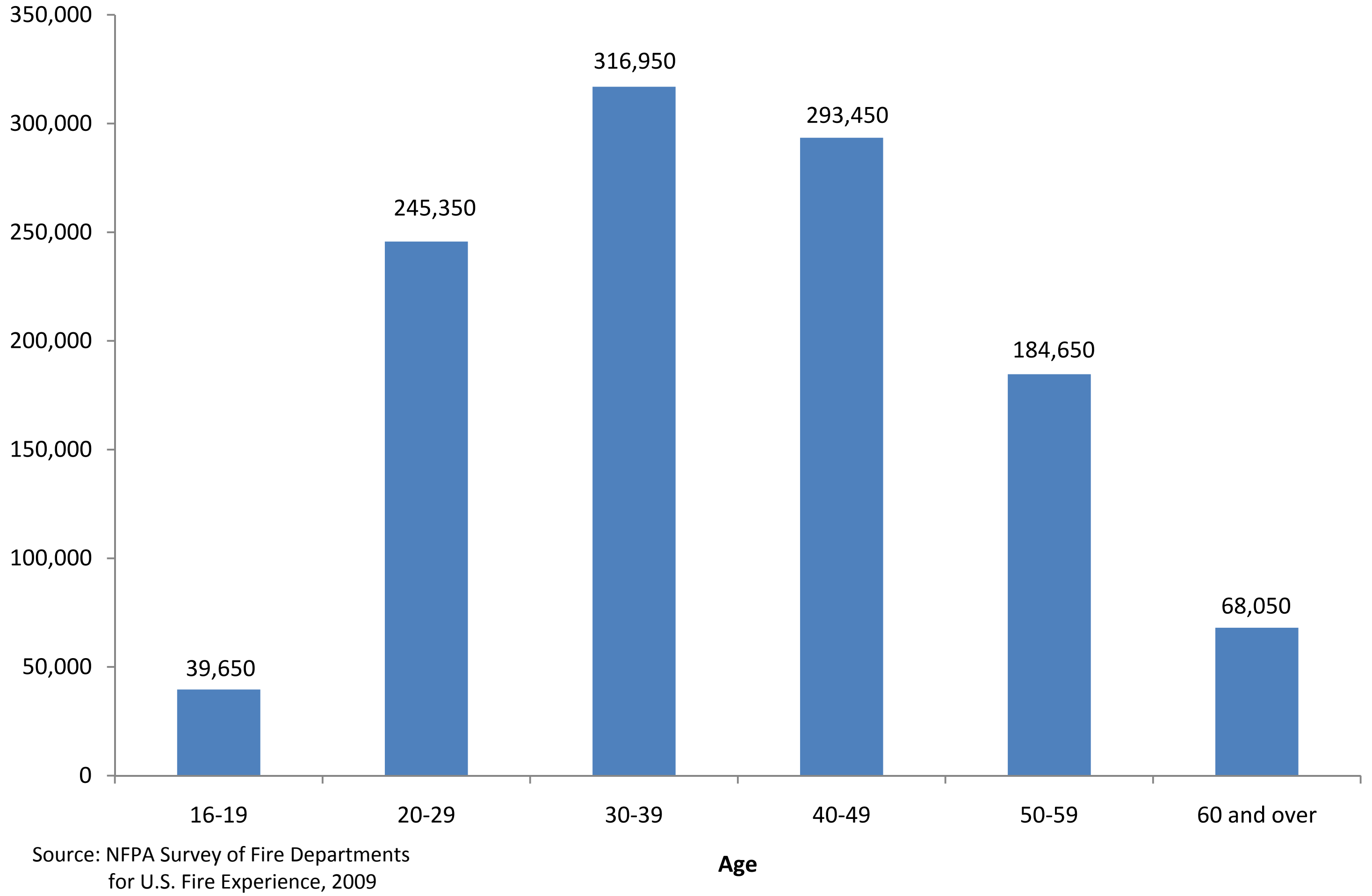
Table 8
Number of Firefighters in the U.S., by Age Group, 2009

Firefighters

Age	**Number**	**Percent**
16-19	39,650	3.5
20-29	245,750	21.4
30-39	316,950	27.6
40-49	293,450	25.6
50-59	184,650	16.1
60 and over	68,050	5.9
Total	1,148,100	100.0

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

Figure 3.
Number of Firefighters in the U.S.
By Age Group, 2009



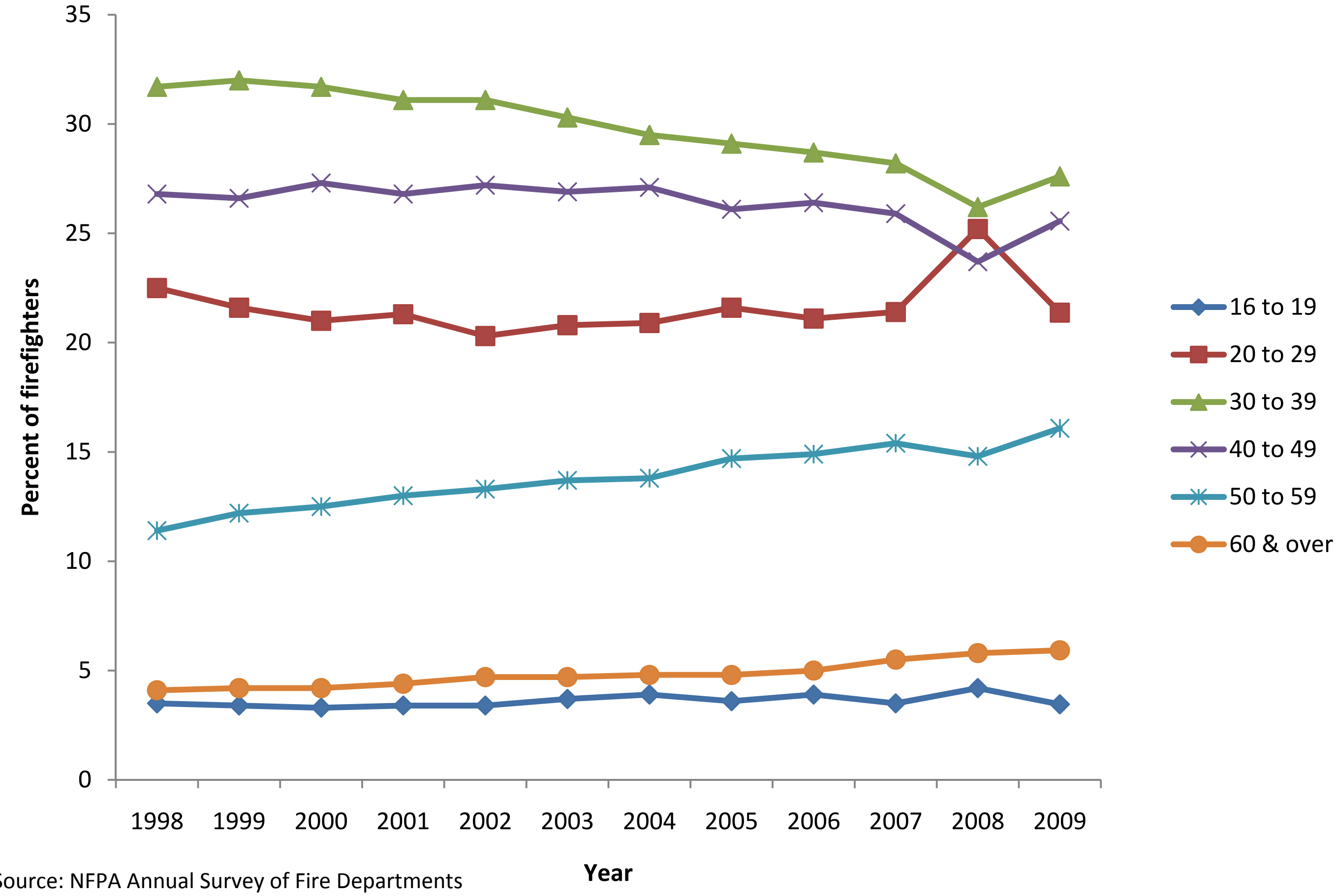
Source: NFPA Survey of Fire Departments
for U.S. Fire Experience, 2009

Table 9
Age Profile of Firefighters
By Size of Community, 2009

Size of Community	Percent Firefighters under Age 30	Percent Firefighters Age 30-39	Percent Firefighters Age 40-49	Percent Firefighters Age 50 and up	Total
Mostly Career Firefighters					
1,000,000 or more	13.0%	37.6%	32.1%	17.4%	100.0%
500,000 to 999,999	10.2	30.3	38.0	21.5	100.0
250,000 to 499,999	14.0	33.8	34.8	17.5	100.0
100,000 to 249,999	14.1	31.6	34.5	19.7	100.0
50,000 to 99,999	18.1	33.4	30.6	17.8	100.0
25,000 to 49,999	23.1	31.6	28.1	17.2	100.0
Mostly Volunteer Firefighters					
10,000 to 24,999	29.9%	29.4%	23.9%	16.8%	100.0%
5,000 to 9,999	32.3	27.3	22.1	21.8	100.0
2,500 to 4,999	30.2	25.8	22.1	21.8	100.0
Under 2,500	24.2	24.4	24.1	27.4	100.0

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

Figure 4. Percent of Firefighters in the U.S. by Age Group by Year



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1986-2009)

Fire Departments

There are an estimated 30,165 fire departments[3] in the United States. Of these, 2,457 departments or 8.1% are all career[4]; that is, they are comprised solely of career firefighters. An estimated 1,752 departments (5.8%) are mostly career, while 5,099 (16.9%) are mostly volunteer. An estimated 20,857 departments (69.1%) are all volunteer (Table 10).

Another way to put this is that 14% of all departments are all career or mostly career but protect 64% of the U.S. population, while 86% of the departments are mostly volunteer or all volunteer and protect 36% of the population (Table 10).

The number of fire departments by size of community is displayed in Table 11. Department type did vary considerably by population protected. For community sizes 25,000 and above, the percentage of departments classified as all career or mostly career ranged from 71 to 100%, while for community sizes less than 25,000, the percentage of departments classified as all volunteer or mostly volunteer ranged from 57 to 99% (Table 12).

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[3] A fire department is a public organization that provides fire prevention, fire suppression and associated emergency and non-emergency services to a jurisdiction such as a county, municipality, or organized fire district.

[4] Department type is broken into four categories. All career departments are comprised 100% of career firefighters. Mostly career is comprised of 51 to 99% career firefighters, while mostly volunteer is comprised of 1 to 50% career firefighters. All volunteer departments are comprised 100% of volunteer firefighters.

Table 10
Number of Departments and Percent of U.S. Population Protected
By Type of Department, 2009

Type of Department	**Number**	**Percent**	**Percent of U.S. Population Protected**
All Career	2,457	8.1%	47.0%
Mostly Career	1,752	5.8%	16.7%
Mostly Volunteer	5,099	16.9%	16.8%
All Volunteer	20,857	69.1%	19.5%
Total	30,165	100.0%	100.0%

Source: NFPA Fire Service Inventory, and 2009 NFPA Survey of Fire Departments.

Type of department is broken into four categories. All career departments are comprised of 100% career firefighters. Mostly career is comprised of 51 to 99% career firefighters, while mostly volunteer is comprised of 1 to 50% career firefighters. All volunteer departments are comprised of 100% volunteer firefighters.

Table 11
Number of Fire Departments in the U.S.,
By Population Protected, 2009

Population Protected	**Number of Fire Departments**
1,000,000 or more	15
500,000 to 999,999	40
250,000 to 499,999	61
100,000 to 249,999	255
50,000 to 99,999	505
25,000 to 49,999	1,305
10,000 to 24,999	3,561
5,000 to 9,999	4,372
2,500 to 4,999	5,767
under 2,500	14,284
Total	30,165

Source: NFPA Fire Service Inventory

Table 12
Department Type by Population Protected, 2009

Population Protected	All Career	Mostly Career	Mostly Volunteer	All Volunteer	Total
	Type of Department (Percent)				
1,000,000 or more	66.7%	33.3%	0.0%	0.0%	100.0%
500,000 to 999,999	77.8	14.8	7.4	0.0	100.0
250,000 to 499,999	76.9	17.9	5.1	0.0	100.0
100,000 to 249,999	85.8	12.3	1.9	0.0	100.0
50,000 to 99,999	71.6	17.5	10.0	0.9	100.0
25,000 to 49,999	47.7	23.7	22.7	5.9	100.0
10,000 to 24,999	21.3	21.7	41.9	15.1	100.0
5,000 to 9,999	5.0	8.2	41.9	44.9	100.0
2,500 to 4,999	1.7	1.7	16.6	80.0	100.0
Under 2,500	0.6	0.5	3.2	95.6	100.0
All Departments	8.1	5.8	16.9	69.1	100.0

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2009.

Type of department is broken into four categories. All career departments are comprised of 100% career firefighters. Mostly career is comprised of 51 to 99% career firefighters, while mostly volunteer is comprised of 1 to 50% career firefighters. All volunteer departments are comprised of 100% volunteer firefighters.

Fire Department Apparatus and Stations

Estimates of the number of apparatus and stations in the United States for the 2007-2009 period indicate that there were 68,400 pumpers, 6,750 aerial apparatus, 74,250 other suppression vehicles (which includes pumpers less than 1,000 gpm, hose usage, brush vehicles, tanker, etc.) and 52,050 stations. Table 13 provides a breakdown of the average apparatus and station rates by community size.

It is worth emphasizing what the rates in Table 13 really mean. The numbers reflect averages of apparatus and station rates per 1,000 people by population protected reported to the NFPA. They do *not* represent recommended rates or some defined fire protection standard.

The rates are higher for departments protecting smaller communities (under 25,000). This is because it takes a minimum number of apparatus and stations to operate a fire department regardless of the number of people protected. For instance, for a department protecting 1,000 people, you would expect according to Table 13 on the average 1.163 pumpers, 1.804 other suppression vehicles, .030 aerial apparatus, and .934 stations. The .943 stations per 1,000 people is the highest rate shown in Table 13, but for this community size it is equivalent to one station per department. Another way to put this is that for every 100 departments reporting 1,000 people, you would expect approximately 116 pumpers, 180 other suppression vehicles, 3 aerial apparatus, and 94 stations. For communities of 25,000 to 999,999, the rates tend to be quite similar: .055-.111 pumpers per 1,000 people; and .022-.065 other suppression vehicles; .013-.022 aerial apparatus per 1,000 people, and .054-.096 stations per 1,000 people.

Tables 14, 15, 16, and 17 display the frequency of occurrence of the number of pumpers, other suppression vehicles, aerial apparatus, and stations by size of community.

Table 13
Average Apparatus and Station Rates per 1,000 People
By Community Size, 2007-2009

Population Protected	Pumpers per 1,000 People	Other[1] Vehicles per 1,000 People	Aerial Apparatus per 1,000 People	Stations per 1,000 People
1,000,000 or more	.036	.011	.013	.035
500,000 to 999,999	.055	.022	.015	.054
250,000 to 499,999	.059	.025	.015	.057
100,000 to 249,999	.071	.030	.014	.071
50,000 to 99,999	.083	.037	.015	.080
25,000 to 49,999	.111	.065	.022	.096
10,000 to 24,999	.184	.133	.033	.191
5,000 to 9,999	.324	.291	.036	.196
2,500 to 4,999	.540	.629	.027	.344
Under 2,500	1.163	1.804	.030	.934
National Average	.222	.242	.022	.169

Source: NFPA Fire Service Survey, 2007-2009.

These results reflect average apparatus and station rates per 1,000 people by population protected reported to the NFPA. They do not reflect recommended rates or some defined fire protection standard.

[1] Other suppression vehicles include apparatus with pumps less than 1,000 gpm, hose wagons, brush fire vehicles, tankers, etc.

Table 14
Pumpers (750 gpm or greater) by Community Size, 2007-2009

Population Protected	1-5 Pumpers	6-9 Pumpers	10-19 Pumpers	20-39 Pumpers	40 or More Pumpers	Total
	Percentage of U.S. Fire Departments With					
1,000,000 or more	0.0%	0.0%	0.0%	7.1%	92.9%	100.0%
500,000 to 999,999	0.0	0.0	7.9	60.5	31.6	100.0%
250,000 to 499,999	1.6	1.6	45.9	47.5	3.3	100.0%
100,000 to 249,999	16.7	38.5	37.2	6.4	1.3	100.0%

Population Protected	No Pumpers	1 Pumper	2 Pumpers	3-4 Pumpers	5 or More Pumpers	Total
	Percentage of U.S. Fire Departments With					
50,000 to 999,999	0.9%	2.0%	6.1%	33.0%	58.1%	100.0%
25,000 to 49,999	0.9	3.7	20.8	48.1	26.4	100.0%
10,000 to 24,999	0.8	8.0	32.1	49.3	9.8	100.0%
5,000 to 9,999	1.3	13.6	44.2	37.4	3.4	100.0%
2,500 to 4,999	2.6	23.7	49.0	23.7	1.0	100.0%
Under 2,500	11.6	43.1	37.1	8.0	0.3	100.0%

Source: 2007-2009 NFPA Fire Service Survey
Note that pumpers reported above had a capability of 1,000 gpm or greater. Note that many departments reported other fire suppression vehicles including apparatus with pumps less than 1,000 gpm, hose wagons, brush fire vehicles, tankers, etc.

Table 15
Other Suppression Vehicles by Community Size, 2007-2009

Percentage of U.S. Fire Departments With Other Suppression Vehicles

Population Protected	1-3	4-5	6-9	10-19	20- 29	30 or More	Total
1,000,000 or more	14.3%	7.1%	7.1%	14.3%	21.4%	35.7	100.0%
500,000 to 999,999	17.1	11.4	11.4	25.7	22.9	11.4	100.0%
250,000 to 499,999	24.5	17.0	20.8	24.5	7.5	5.7	100.0%

Percentage of U.S. Fire Departments With Other Suppression Vehicles

Population Protected	None	1	2	3-4	5 or More	Total
100,000 to 249,999	20.4%	17.4%	13.2%	18.3%	30.6%	100.0%
50,000 to 999,999	35.0	17.7	15.5	16.6	15.2	100.0%
25,000 to 49,999	32.5	21.3	16.1	16.4	13.6	100.0%
10,000 to 24,999	25.0	23.5	19.8	21.1	10.5	100.0%
5,000 to 9,999	17.4	22.7	25.1	26.0	8.9	100.0%
2,500 to 4,999	12.0	20.7	28.8	29.2	9.3	100.0%
Under 2,500	10.4	23.9	29.3	28.8	7.5	100.0%

Source: 2007-2009 NFPA Fire Service Survey

Other suppression vehicles include apparatus with pumps less than 1,000 gpm, hose wagons, brush fire vehicles, tankers, etc.

Table 16
Aerial Apparatus by Community Size, 2007-2009

Population Protected	No Aerial Apparatus	1-5 Aerial Apparatus	6-9 Aerial Apparatus	10-19 Aerial Apparatus	20 or More Aerial Apparatus	Total
	Percentage of U.S. Fire Departments With					
1,000,000 or more	0.0%	7.1%	14.3%	28.6%	50.0%	100.0%
500,000 to 999,999	10.3	15.4	28.2	38.5	7.7	100.0%
250,000 to 499,999	11.3	53.2	22.6	12.9	0.0	100.0%

Population Protected	No Aerial Apparatus	1 Aerial Apparatus	2 Aerial Apparatus	3-4 Aerial Apparatus	5 or More Aerial Apparatus	Total
	Percentage of U.S. Fire Departments With					
100,000 to 249,999	19.5%	22.9%	27.1%	20.3%	10.2%	100.0%
50,000 to 99,999	30.7	39.7	22.6	6.7	0.2	100.0%
25,000 to 49,999	37.3	49.3	12.1	1.2	0.1	100.0%
10,000 to 24,999	49.8	46.5	3.5	0.1	0.0	100.0%
5,000 to 9,999	73.8	25.4	0.7	0.1	0.0	100.0%
2,500 to 4,999	90.1	9.5	0.4	0.0	0.0	100.0%
Under 2,500	96.6	3.2	0.2	0.0	0.0	100.0%

Source: 2007-2009 NFPA Fire Service Survey.

Table 17
Fire Stations by Community Size, 2007-2009

Percentage of U.S. Fire Departments With

Population Protected	1-5 Stations	6-9 Stations	10-19 Stations	20-29 Stations	30 or More Stations	Total
1,000,000 or more	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
500,000 to 999,999	0.0	2.6	5.1	12.8	79.5	100.0%
250,000 to 499,999	0.6	0.0	48.4	43.5	6.5	100.0%
100,000 to 249,999	10.6	41.9	41.1	3.8	2.5	100.0%

Percentage of U.S. Fire Departments With

Population Protected	No Stations	1 Station	2 Stations	3 Stations	4 or More Stations	Total
50,000 to 99,999	0.0	1.1	4.5	14.1	80.3	100.0%
25,000 to 49,999	0.0	13.4	23.5	27.6	35.4	100.0%
10,000 to 24,999	0.0	46.2	30.6	12.8	10.4	100.0%
5,000 to 9,999	0.0	69.9	20.0	6.6	3.5	100.0%
2,500 to 4,999	0.1	79.1	15.6	3.6	1.6	100.0%
Under 2,500	0.4	87.1	10.3	1.5	0.7	100.0%

Source: 2007-2009 NFPA Fire Service Survey

Emergency Medical Services

The level of emergency medical service (EMS) provided by fire departments by size of community for the 2007-2009 period can be seen in Table 18. The larger the community, the more likely EMS service was provided. Overall for the country, 13,275 or 44.0% of departments provided EMS service, 4,475 departments or 14.8% provided EMS service and advanced life support, while 12,415 departments or 41.2% provided no EMS service.

U.S. Expenditures on Local Fire Protection

Table 19 shows expenditures on local fire protection by governments, with and without adjustment for inflation. Note that these expenditures adjusted for inflation, have risen 166% from 1980 to 2008. Other municipal service costs like police protection have risen in a similar manner.

Fire protection costs rose 111% from 1986 to 2008 after adjusting for inflation, while the number of career firefighters was increasing 41%. Since chiefs of fire departments serving larger communities report problems with shrinking budgets or with level budgets combined with increasing responsibilities, this clear pattern of increasing fire department resources nationwide is difficult to interpret. Some of the factors possibly contributing to this increase in costs are (1) shrinkage of the work week[5] for some departments, which results in a need to increase staffing and apparatus or to pay firefighters at overtime rates; (2) increased EMS responsibilities requiring increased staffing and, in some communities, a more frequent replacement of apparatus; and (3) costs of retirement and health benefits continuing to rise as they do for the general population.

[5] This is the result at least to some extent of the Fair Labor Standards Act being applied to municipal fire departments.

Table 18
Departments Providing Emergency Medical Service
By Community Size (Percent), 2007-2009

Population Protected	No EMS	EMS	EMS and ALS	Total
1,000,000 or more	0%	0%	100%	100%
500,000 to 999,999	0	31	69	100%
250,000 to 499,999	0	31	69	100%
100,000 to 249,999	3	37	60	100%
50,000 to 99,999	10	36	54	100%
25,000 to 49,999	17	37	46	100%
10,000 to 24,999	28	41	31	100%
5,000 to 9,999	41	41	18	100%
2,500 to 4,999	43	46	11	100%
under 2,500	48	46	6	100%
Nationwide	41	44	15	100%

Source: NFPA Fire Service Survey, 2007-2009

ALS refers to fire departments providing advanced life support.

Table 19
Direct Expenditures on Local Fire Protection

Year	Expenditures (in Billions)	Expenditures (in Billions) Adjusted for Inflation*
1980	$5.7	$5.7
1981	$6.3	$5.7
1982	$7.0	$6.0
1983	$7.6	$6.3
1984	$8.2	$6.5
1985	$8.5	$6.5
1986	$9.6	$7.2
1987	$10.5	$7.9
1988	$11.8	$8.2
1989	$11.9	$7.9
1990	$13.2	$8.3
1991	$13.8	$8.3
1992	$14.4	$8.5
1993	$15.4	$9.0
1994	$16.1	$9.0
1995	$17.0	$9.2
1996	$17.7	$9.3
1997	$19.4	$10.0
1998	$20.3	$10.3
1999	$21.3	$10.5
2000	$23.1	$11.1
2001	$25.0	$11.6
2002	$26.0	$11.9
2003	$27.9	$12.5
2004	$28.4	$12.4
2005	$30.7	$13.0
2006	$34.2	$14.0
2007	$36.8	$14.6
2008	$39.7	$15.2

Source: U.S. Bureau of the Census, *Governments Division*

*Adjustments were made to 1980 dollars using the Consumer Price Index.

Data Sources

The report is based on two data sources: the annual NFPA Survey for U.S. Fire Experience, 2009, and the NFPA Fire Service Survey, 2007-2009.

The annual fire experience survey is a sample survey of fire departments in the United States, which serves as the basis for making national estimates of the fire problem. The sample is stratified by the size of the community protected by the fire department. All U.S. fire departments that protect communities of 50,000 or more are included in the sample, because they constitute a small number of departments with a large share of the total population protected. For departments that protect less than 50,000 population, a sample was selected stratified by size of community protected. Survey returns in recent years have ranged from 2,500 to 3,500 departments annually. The survey also includes questions on the number of career and volunteer firefighters. The national projections are made by weighing sample results according to the proportion of total U.S. population accounted for by communities of each size.

The NFPA Fire Service Survey is a three year cycle survey which attempts to survey about one third of the states in the country each year. The survey includes questions on the number of career firefighters, the number of volunteer firefighters, length of work week, number of apparatus and stations, etc. In recent years the survey has had a response rate of about 19% from departments.

National Hospital Ambulatory Medical Care Survey: 2008 Emergency Department Summary Tables

The Ambulatory and Hospital Care Statistics Branch of the Centers for Disease Control and Prevention's National Center for Health Statistics is pleased to release the most current nationally representative data on ambulatory care visits to hospital emergency departments (EDs) in the United States. Statistics are presented on selected hospital, patient, and visit characteristics based on data collected in the 2008 National Hospital Ambulatory Medical Care Survey (NHAMCS). NHAMCS is a national probability sample survey of visits to EDs and outpatient departments of nonfederal short-stay and general hospitals in the United States. Web table estimates are based on sample data weighted to produce annual national estimates and include standard errors. Detailed information on the design, conduct, and estimation procedures of NHAMCS can be found at: http://www.cdc.gov/nchs/ahcd.htm.

As in any survey, results are subject to sampling and nonsampling errors. Nonsampling errors include reporting and processing errors, as well as biases due to nonresponse and incomplete response. In 2008, race was missing for 15% (unweighted) of ED records, while ethnicity was missing for 24% (unweighted) of ED records. As in previous years, missing responses for race and ethnicity were imputed using a warm deck method. Nonetheless, the high amount of missing data are of concern. Tables 3,7,8, and 14 presenting race and ethnicity data include estimates based on both imputed and reported (known) values and estimates based on reported values only. The ''best'' estimates of ED use by race and ethnicity are those that include both imputed and reported data. For those who wish to understand the effects of imputation on percent distributions and their standard errors, we provide ''reported only'' data. Those who wish to conduct a complete-case analysis can use the ''reported only'' data for benchmarking.

Table 1. Emergency department visits, by selected hospital characteristics: United States, 2008

Selected hospital characteristic	Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)	Number of visits per 100 persons per year[1,2,3]	(Standard error of rate)
All visits	123,761	(4,918)	100.0	. . .	41.4	(1.6)
Ownership						
Voluntary	93,847	(5,102)	75.8	(2.6)	31.4	(1.7)
Government	15,237	(2,446)	12.3	(2.0)	5.1	(0.8)
Proprietary	14,677	(3,198)	11.9	(2.5)	4.9	(1.1)
Geographic region						
Northeast	24,529	(1,960)	19.8	(1.5)	45.4	(3.6)
Midwest	27,004	(2,434)	21.8	(1.7)	41.2	(3.7)
South	48,153	(3,188)	38.9	(2.1)	44.0	(2.9)
West	24,075	(2,653)	19.5	(1.9)	34.5	(3.8)
Metropolitan status[4]						
MSA	102,735	(5,271)	83.0	(1.9)	41.1	(2.1)
Non-MSA	21,027	(2,220)	17.0	(1.9)	43.3	(4.6)
Medical school affiliation						
Yes	65,786	(4,527)	53.2	(2.9)	22.0	(1.5)
No or blank[5]	57,975	(4,180)	46.8	(2.9)	19.4	(1.4)
Trauma center						
Yes	46,727	(4,700)	37.8	(3.3)	15.6	(1.6)
No or blank	77,034	(4,811)	62.2	(3.3)	25.8	(1.6)
Season[6]						
Winter	28,302	(3,620)	22.9	(2.8)	9.5	(1.2)
Spring	32,771	(3,384)	26.5	(2.5)	11.0	(1.1)
Summer	33,183	(3,486)	26.8	(2.7)	11.1	(1.2)
Fall	29,504	(3,941)	23.8	(2.9)	9.9	(1.3)

. . . Category not applicable.

[1]Visit rates are based on the July 1, 2008, set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

[2]Population estimates by metropolitian statistical area status are based on estimates of the civilian noninstitutionalized population of the United States as of July 1, 2008, from the 2008 National Heath Interview Survey, National Center for Health Statistics, compiled according to the November 2007 Office of Management and Budget definitions of core-based statistical areas. See http://www.census.gov/population/www/estimates/metrodef.html for more about metropolitan statistical area definitions.

[3]For geographic region and metropolitan statistical area, population denominators are different for each category and thus do not add to total population rate. For other variables, the denominator is the total population.

[4]MSA is metropolitan statistical area.

[5]In 2008, hospitals not affiliated with medical schools include hospitals with unknown or blank medical school affiliation status because this information could not be identified separately. In prior years, the percentage of unknowns or blanks was small.

[6]Winter is December 22 to March 19; spring is March 20 to June 20; summer is June 21 to September 22; and fall is September 23 to December 21.

NOTE: Numbers may not add to totals because of rounding.

Table 2. Emergency department visits, by patient age, sex, and residence: United States, 2008

Selected patient characteristic	Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)	Number of visits per 100 persons per year[1]	(Standard error of rate)
All visits	123,761	(4,918)	100.0	. . .	41.4	(1.6)
Age						
Under 15 years	23,157	(1,658)	18.7	(1.0)	37.9	(2.7)
Under 1 year	3,684	(349)	3.0	(0.3)	85.5	(8.1)
1–4 years	8,698	(700)	7.0	(0.5)	52.1	(4.2)
5–14 years	10,775	(709)	8.7	(0.4)	26.9	(1.8)
15–24 years	19,823	(874)	16.0	(0.3)	47.7	(2.1)
25–44 years	35,185	(1,511)	28.4	(0.5)	43.3	(1.9)
45–64 years	26,335	(1,130)	21.3	(0.4)	34.0	(1.5)
65 years and over	19,261	(896)	15.6	(0.5)	51.7	(2.4)
65–74 years	7,479	(341)	6.0	(0.2)	37.6	(1.7)
75 years and over	11,781	(631)	9.5	(0.3)	67.9	(3.6)
Sex and age						
Female	67,020	(2,784)	54.2	(0.4)	44.0	(1.8)
Under 15 years	10,395	(803)	8.4	(0.5)	34.8	(2.7)
15–24 years	11,543	(544)	9.3	(0.2)	56.1	(2.6)
25–44 years	20,220	(905)	16.3	(0.3)	49.4	(2.2)
45–64 years	13,793	(637)	11.1	(0.3)	34.6	(1.6)
65–74 years	3,964	(231)	3.2	(0.2)	37.0	(2.2)
75 years and over	7,104	(421)	5.7	(0.2)	67.8	(4.0)
Male	56,742	(2,212)	45.8	(0.4)	38.8	(1.5)
Under 15 years	12,762	(896)	10.3	(0.6)	40.9	(2.9)
15–24 years	8,280	(417)	6.7	(0.2)	39.5	(2.0)
25–44 years	14,965	(682)	12.1	(0.3)	37.1	(1.7)
45–64 years	12,542	(554)	10.1	(0.3)	33.3	(1.5)
65–74 years	3,515	(189)	2.8	(0.1)	38.4	(2.1)
75 years and over	4,677	(272)	3.8	(0.2)	68.1	(4.0)
Patient residence						
Private residence	113,298	(4,659)	91.5	(0.6)	37.9	(1.6)
Nursing home	2,504	(181)	2.0	(0.1)	167.8	(12.1)
Other institution	954	(107)	0.8	(0.1)	37.5	(4.2)
Other residence	924	(140)	0.7	(0.1)	0.3	(0.0)
Homeless	549	(77)	0.4	(0.1)	72.8	(10.2)
Unknown or blank	5,532	(727)	4.5	(0.6)	. . .	. . .

. . . Category not applicable.

[1]Visit rates for age, sex, race, ethnicity, private residence, and other residence are based on the July 1, 2008, set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau. Visit rates for nursing home residents are based on the 2004 CDC/NCHS National Nursing Home Survey (National Center for Health Statistics. National Nursing Home Survey: 2004 overview. Hyattsville, MD. 2009. http://www.cdc.gov/nchs/nnhs.htm. Accessed 12/18/09). Visit rate for homeless people is based on The Annual Homeless Assessment Report to Congress (Office of Community Planning and Development, U.S. Department of Housing and Urban Development. The third annual homeless assessment report to Congress. Washington, DC. 2008. http://www.hudhre.info/documents/3rdHomelessAssessmentReport.pdf. Accessed 10/15/09).

NOTE: Numbers may not add to totals because of rounding.

Table 3. Emergency department visits by patient race and age, and ethnicity: United States, 2008

Patient characteristic	Reported plus imputed race and ethnicity						Reported race and ethnicity only			
	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Number of visits per 100 persons per year[1]	(Standard error of rate)	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)
All visits	123,761	(4,918)	100.0	. . .	41.4	(1.6)	. . .	. . .	. . .	. . .
Race and age[2,3,4,5]										
Reported	103,905	(4,429)	84.0	(2.0)	34.8	(1.5)	103,905	(4,429)	100.0	. . .
Imputed (missing)	19,856	(2,714)	16.0	(2.0)	6.6	(0.9)	. . .	. . .	. . .	. . .
White	89,405	(4,127)	72.2	(1.5)	37.4	(1.7)	75,221	(3,741)	72.4	(1.6)
Under 15 years	15,626	(1,113)	12.6	(0.7)	33.7	(2.4)	12,540	(953)	12.1	(0.7)
15–24 years	13,899	(717)	11.2	(0.4)	43.3	(2.2)	11,725	(673)	11.3	(0.4)
25–44 years	24,868	(1,230)	20.1	(0.5)	38.8	(1.9)	20,732	(1,078)	20.0	(0.6)
45–64 years	18,950	(961)	15.3	(0.5)	29.6	(1.5)	16,151	(864)	15.5	(0.5)
65–74 years	5,879	(303)	4.8	(0.2)	34.6	(1.8)	5,128	(268)	4.9	(0.2)
75 years and over	10,182	(601)	8.2	(0.3)	66.7	(3.9)	8,944	(540)	8.6	(0.3)
Black or African American	28,985	(1,956)	23.4	(1.3)	77.0	(5.2)	24,760	(1,785)	23.8	(1.5)
Under 15 years	6,109	(665)	4.9	(0.5)	66.8	(7.3)	4,969	(536)	4.8	(0.5)
15–24 years	5,196	(396)	4.2	(0.3)	83.1	(6.3)	4,434	(362)	4.3	(0.3)
25–44 years	8,815	(606)	7.1	(0.4)	84.5	(5.8)	7,594	(552)	7.3	(0.5)
45–64 years	6,287	(520)	5.1	(0.4)	72.8	(6.0)	5,599	(485)	5.4	(0.4)
65–74 years	1,334	(121)	1.1	(0.1)	72.9	(6.6)	1,114	(110)	1.1	(0.1)
75 years and over	1,244	(136)	1.0	(0.1)	93.3	(10.2)	1,050	(126)	1.0	(0.1)
Asian	2,555	(472)	2.1	(0.4)	19.0	(3.5)	1,858	(293)	1.8	(0.3)
Native Hawaiian or other Pacific Islander	*765	(262)	*0.6	(0.2)	*138.4	(47.3)	488	(146)	0.5	(0.1)
American Indian or Alaska Native	*996	(330)	*0.8	(0.3)	*32.9	(10.9)	*685	(218)	*0.7	(0.2)
Multiple races	*1,055	(375)	*0.9	(0.3)	*20.6	(7.3)	*892	(368)	*0.9	(0.4)
Ethnicity[2,3,6,7]										
Reported	89,511	(4,520)	72.3	(3.0)	30.0	(1.5)	89,511	(4,520)	100.0	. . .
Imputed (missing)	34,250	(4,226)	27.7	(3.0)	11.5	(1.4)	. . .	. . .	. . .	. . .
Hispanic or Latino	17,274	(1,587)	14.0	(1.1)	37.2	(3.4)	12,402	(1,188)	13.9	(1.2)
Not Hispanic or Latino	106,487	(4,370)	86.0	(1.1)	42.2	(1.7)	77,109	(4,119)	86.1	(1.2)

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]Visit rates are based on the July 1, 2008, set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

[2]The race groups white, black or African American, Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, and multiple races include persons of Hispanic and not Hispanic origin. Persons of Hispanic origin may be of any race. Starting with data year 1999, race-specific estimates have been tabulated according to 1997 standards for federal data on race and ethnicity and are not strictly comparable with estimates for earlier years. The percent of visit records with multiple races indicated is small and lower than what is typically found for self-reported race in household surveys.

[3]For 2008, race data were missing for 16.0 percent of visits, and ethnicity data were missing for 27.7 percent of visits. Readers are therefore advised to treat these data with caution. In this table, estimates based on imputed race and ethnicity data are shown separately from comparison estimates using unimputed data. Missing race and ethnicity were imputed using a hot deck approach rather than the previously used cold deck strategy. The imputation process is described more fully in the 2008 public use file documentation (http://www.cdc.gov/nchs/ahcd.htm). Research is currently under way to evaluate further changes to the imputation strategy for use with 2009 data.

[4]"Reported plus imputed" includes race that was reported directly by emergency departments and imputed values for the 16.0 percent of visits for which race was not reported.

[5]"Reported only" calculations are based on 103,905,000 visits with race reported directly by emergency departments. The visits for which race was missing are excluded from the denominator so that readers may compare differences between estimates that include and exclude imputed race values.

[6]"Reported plus imputed" includes ethnicity that was reported directly by emergency departments and imputed values for the 27.7 percent of visits for which ethnicity was not reported.

[7]"Reported only" calculations are based on 89,511,000 visits with ethnicity reported directly by emergency departments. The visits for which ethnicity was missing are excluded from the denominator so that readers may compare differences between estimates that include and exclude imputed ethnicity values.

NOTE: Numbers may not add to totals because of rounding.

Table 4. Wait times at emergency department visits: United States, 2008

Visit characteristic	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)
All visits	123,761	(4,918)	100.0	. . .
Time spent waiting to see a physician[1]				
Fewer than 15 minutes	22,105	(1,526)	17.9	(1.1)
15–59 minutes	46,545	(1,981)	37.6	(1.0)
1 hour, but less than 2 hours	19,295	(1,066)	15.6	(0.6)
2 hours, but less than 3 hours	6,636	(501)	5.4	(0.3)
3 hours, but less than 4 hours	2,629	(250)	2.1	(0.2)
4 hours, but less than 6 hours	1,770	(208)	1.4	(0.1)
6 hours or more	662	(94)	0.5	(0.1)
Not seen by a physician	11,078	(1,124)	9.0	(0.8)
Blank	13,041	(1,707)	10.5	(1.3)
Time spent in emergency department[2]				
Less than 1 hour	13,728	(799)	11.1	(0.5)
1 hour, but less than 2 hours	29,750	(1,304)	24.0	(0.5)
2 hours, but less than 4 hours	42,421	(1,800)	34.3	(0.6)
4 hours, but less than 6 hours	18,594	(992)	15.0	(0.4)
6 hours, but less than 10 hours	10,254	(613)	8.3	(0.4)
10 hour, but less than 14 hours	1,803	(138)	1.5	(0.1)
14 hours, but less than 24 hours	1,144	(114)	0.9	(0.1)
24 hours or more	474	(142)	0.4	(0.1)
Blank	5,594	(719)	4.5	(0.5)
Patient arrived in emergency department after business hours[3]				
All ages:				
Yes	80,136	(3,203)	64.8	(0.4)
No	42,498	(1,736)	34.3	(0.3)
Blank	1,128	(308)	0.9	(0.2)

. . . Category not applicable.

[1]Median waiting time to see a physician was 35 minutes.

[2]Median time spent in the emergency department was 154 minutes.

[3]Business hours defined as Monday through Friday, 8 a.m. to 5 p.m.

NOTE: Numbers may not add to totals because of rounding.

Table 5. Mode of arrival at emergency department, by patient age: United States, 2008

Patient age	Number of visits inc thousands	Patient mode of arrival				
		Total	Walk-in[1]	Ambulance	Public service[2]	Unknown[3]
		Percent distribution (standard error of percent)				
All visits	123,761	100.0	77.0 (0.8)	15.8 (0.5)	1.6 (0.2)	5.5 (0.6)
Under 15 years	23,157	100.0	88.5 (1.0)	4.9 (0.5)	*1.1 (0.5)	5.5 (0.7)
Under 1 year	3,684	100.0	87.0 (2.1)	4.2 (0.8)	* . . .	6.4 (1.0)
1–4 years	8,698	100.0	89.3 (1.3)	4.1 (0.7)	*1.0 (0.6)	5.6 (1.0)
5–14 years	10,775	100.0	88.3 (1.1)	5.9 (0.6)	*0.7 (0.3)	5.1 (0.8)
15–24 years	19,823	100.0	83.2 (0.8)	9.5 (0.5)	1.7 (0.3)	5.6 (0.7)
25–44 years	35,185	100.0	81.3 (0.9)	11.3 (0.6)	2.1 (0.3)	5.3 (0.6)
45–64 years	26,335	100.0	72.2 (1.0)	20.3 (0.8)	1.7 (0.3)	5.8 (0.7)
65 years and over	19,261	100.0	55.8 (1.2)	37.5 (1.2)	1.2 (0.2)	5.4 (0.7)
65–74 years	7,479	100.0	66.2 (1.7)	26.3 (1.5)	1.6 (0.3)	5.9 (0.9)
75 years and over	11,781	100.0	49.2 (1.5)	44.7 (1.5)	1.0 (0.3)	5.1 (0.7)

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

[1]Includes patients arriving by car, taxi, bus, or foot.

[2]Includes patients arriving in a police car, social service vehicle, beach patrol, or escorted or carried by a public service official.

[3]The unknown category includes blanks.

NOTE: Numbers may not add to totals because of rounding.

Table 6. Expected sources of payment at emergency department visits: United States, 2008

Expected source of payment	Number of visits in thousands[1]	(Standard error in thousands)	Percent of visits	(Standard error of percent)
All visits	123,761	(4,918)	. . .	. . .
Private insurance	51,887	(2,904)	41.9	(1.4)
Medicaid or SCHIP[2]	29,701	(1,512)	24.0	(1.0)
Medicare	22,827	(1,094)	18.4	(0.5)
Medicare and Medicaid[3]	4,238	(349)	3.4	(0.3)
No insurance[4]	19,094	(1,238)	15.4	(0.8)
Self-pay	17,859	(1,187)	14.4	(0.8)
No change or charity	1,472	(301)	1.2	(0.2)
Worker's compensation	1,561	(133)	1.3	(0.1)
Other	5,706	(924)	4.6	(0.7)
Unknown or blank	7,492	(1,120)	6.1	(0.9)

. . . Category not applicable.

[1]Combined total of expected sources of payment exceeds "all visits," and percent of visits exceeds 100%, because more than one source of payment may be reported per visit.

[2]SCHIP is State Childrens Health Insurance Program.

[3]The visits in this category are included in both the Medicaid or SCHIP and Medicare categories.

[4]"No insurance" is defined as having only self-pay, or no charge or charity, as payment sources. The individual self-pay and no charge or charity categories are not mutually exclusive.

Table 7. Triage status of emergency department visits, by selected patient characteristics: United States, 2008

Patient and visit characteristic	Number of visits in thousands	Total	Immediate[1]	Emergent[2]	Urgent[3]	Semiurgent[4]	Nonurgent[5]	Unknown or no triage[6]
		Percent distribution (standard error of percent)						
All visits	123,761	100.0	3.7 (0.3)	11.9 (0.8)	38.9 (1.5)	21.2 (1.3)	8.0 (0.9)	16.3 (1.9)
Age								
Under 15 years	23,157	100.0	1.9 (0.3)	8.3 (0.9)	36.0 (2.7)	25.1 (2.2)	8.8 (1.1)	20.0 (3.5)
Under 1 year	3,684	100.0	* . . .	9.3 (1.5)	34.0 (3.0)	23.6 (2.7)	10.3 (1.8)	20.0 (3.9)
1–4 years	8,698	100.0	1.9 (0.4)	8.0 (1.1)	35.8 (3.2)	24.4 (2.5)	8.0 (1.2)	22.0 (4.0)
5–14 years	10,775	100.0	1.6 (0.3)	8.2 (1.0)	36.8 (2.6)	26.1 (2.2)	8.8 (1.1)	18.4 (3.1)
15–24 years	19,823	100.0	2.6 (0.4)	9.2 (0.9)	37.0 (2.0)	24.9 (2.0)	9.8 (1.2)	16.5 (2.1)
25–44 years	35,185	100.0	3.1 (0.4)	10.1 (0.9)	39.0 (1.7)	23.0 (1.5)	9.1 (1.1)	15.7 (1.9)
45–64 years	26,335	100.0	5.0 (0.5)	14.0 (1.0)	40.2 (1.5)	18.4 (1.2)	7.1 (0.9)	15.3 (1.9)
65 years and over	19,261	100.0	6.2 (0.8)	19.5 (1.1)	42.2 (1.6)	13.5 (1.1)	4.6 (0.7)	14.0 (1.8)
65–74 years	7,479	100.0	5.2 (0.8)	19.3 (1.5)	41.3 (1.9)	15.3 (1.4)	5.5 (1.1)	13.3 (1.7)
75 years and over	11,781	100.0	6.9 (0.9)	19.7 (1.2)	42.8 (1.8)	12.4 (1.1)	4.0 (0.6)	14.4 (2.0)
Sex								
Female	67,020	100.0	3.4 (0.4)	11.4 (0.8)	40.3 (1.6)	21.0 (1.3)	8.0 (0.9)	15.8 (1.8)
Male	56,742	100.0	4.0 (0.3)	12.5 (0.9)	37.1 (1.6)	21.5 (1.4)	8.1 (0.9)	16.8 (2.1)
Race[7,8,9,10]								
Reported	103,905	100.0	3.8 (0.4)	12.8 (0.9)	39.9 (1.7)	21.1 (1.4)	8.0 (0.9)	14.4 (1.9)
Imputed (missing)	19,856	100.0	3.1 (0.5)	7.4 (1.2)	33.6 (2.9)	22.0 (2.2)	*8.0 (2.1)	25.8 (4.9)
Reported plus imputed:								
White	89,405	100.0	3.6 (0.3)	12.7 (0.9)	38.8 (1.6)	21.2 (1.4)	7.0 (0.7)	16.7 (2.2)
Black or African American	28,985	100.0	4.2 (0.6)	10.3 (0.8)	37.3 (2.4)	21.8 (2.0)	11.8 (1.9)	14.6 (2.1)
Other	5,371	100.0	2.7 (0.7)	7.2 (1.1)	48.1 (4.1)	18.9 (2.5)	4.7 (1.0)	*18.4 (4.4)
Reported only:								
White	75,221	100.0	3.7 (0.3)	13.8 (1.1)	39.7 (1.7)	20.9 (1.5)	6.9 (0.8)	15.1 (2.2)
Black or African American	24,760	100.0	4.3 (0.7)	10.5 (0.9)	38.3 (2.7)	22.0 (2.2)	12.1 (2.1)	12.8 (2.1)
Other	3,923	100.0	2.9 (0.7)	8.6 (1.3)	53.2 (4.2)	18.3 (2.7)	4.7 (1.1)	12.3 (2.4)
Ethnicity[7,8,11,12]								
Reported	89,511	100.0	3.9 (0.4)	12.4 (1.0)	40.5 (1.9)	20.5 (1.4)	8.3 (1.0)	14.3 (2.1)
Imputed (missing)	34,250	100.0	3.1 (0.6)	10.7 (1.3)	34.5 (2.1)	23.1 (2.4)	7.2 (1.6)	21.4 (3.4)
Reported plus imputed:								
Hispanic or Latino	17,274	100.0	2.8 (0.4)	11.8 (1.4)	41.3 (2.5)	20.4 (1.6)	5.2 (0.8)	18.5 (2.7)
Not Hispanic or Latino	106,487	100.0	3.8 (0.4)	11.9 (0.8)	38.5 (1.6)	21.4 (1.4)	8.5 (1.0)	15.9 (1.9)
Reported only:								
Hispanic or Latino	12,402	100.0	2.8 (0.5)	11.2 (1.6)	42.6 (3.3)	18.8 (1.7)	5.5 (0.9)	18.9 (3.2)
Not Hispanic or Latino	77,109	100.0	4.1 (0.4)	12.6 (0.9)	40.2 (2.0)	20.8 (1.5)	8.7 (1.2)	13.6 (2.1)
Expected source of payment[13]								
Private insurance	51,887	100.0	3.5 (0.4)	13.5 (1.3)	40.6 (1.8)	21.3 (1.5)	6.3 (0.8)	14.7 (2.0)
Medicaid or SCHIP[14]	29,701	100.0	3.1 (0.4)	10.6 (0.9)	39.8 (2.0)	21.5 (1.6)	9.5 (1.0)	15.3 (1.9)
Medicare	22,827	100.0	6.0 (0.7)	18.5 (1.2)	41.3 (1.6)	14.0 (1.0)	6.0 (0.8)	14.3 (1.9)
Medicare and Medicaid[15]	4,238	100.0	5.3 (0.8)	17.1 (2.2)	41.2 (2.5)	15.6 (2.0)	7.9 (1.3)	12.9 (2.3)
No insurance[16]	19,094	100.0	3.0 (0.4)	8.9 (0.8)	34.0 (2.2)	23.9 (2.0)	11.7 (1.8)	18.5 (2.8)
Worker's compensation	1,561	100.0	* . . .	7.5 (1.6)	32.3 (3.0)	36.6 (3.7)	7.7 (1.9)	12.5 (2.6)
Other	5,706	100.0	*4.7 (1.6)	12.4 (2.0)	43.1 (3.3)	21.6 (3.1)	7.6 (1.3)	10.5 (2.1)
Unknown or blank	7,492	100.0	4.1 (0.8)	7.0 (1.0)	33.0 (3.2)	19.3 (2.4)	6.7 (1.2)	29.9 (5.4)

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

[1]A visit in which the patient should be seen immediately.

[2]A visit in which the patient should be seen in 1–14 minutes.

[3]A visit in which the patient should be seen within 15–60 minutes.

[4]A visit in which the patient should be seen within 61–120 minutes.

[5]A visit in which the patient should be seen within 121 minutes-24 hours.

[6]A visit in which there is no mention of triage level or immediacy rating in the medical record, the hospital did not perform triage, or the patient was dead on arrival.

[7]Other race includes visits by Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, and persons with more than one race. All race categories include visits by persons of Hispanic origin and not Hispanic origin. Persons of Hispanic origin may be of any race. Starting with data year 1999, race-specific estimates have been tabulated according to 1997 standards for federal data on race and ethnicity and are not strictly comparable with estimates for earlier years. The percent of visit records with multiple races indicated is small and lower than what is typically found for self-reported race.

[8]For 2008, race data were missing for 16.0 percent of visits, and ethnicity data were missing for 27.7 percent of visits. Readers are therefore advised to treat these data with caution. In this table, estimates based on imputed race and ethnicity data are shown separately from comparison estimates using unimputed data. Missing race and ethnicity were imputed using a hot deck approach rather than the previously used cold deck strategy. The imputation process is described more fully in the 2008 public use file documentation (http://www.cdc.gov/nchs/ahcd.htm). Research is currently under way to evaluate further changes to the imputation strategy for use with 2009 data.

[9]"Reported plus imputed" includes race that was reported directly by emergency departments and imputed values for the 16.0 percent of visits for which race was not reported.

[10]"Reported only" calculations are based on 103,905,000 visits with race reported directly by emergency departments. The visits for which race was missing are excluded from the denominator so that

readers can compare differences between estimates that include and exclude imputed race values.

[11]"Reported plus imputed" includes ethnicity that was reported directly by emergency departments and imputed values for the 27.7 percent of visits for which ethnicity was not reported.

[12]"Reported only" calculations are based on 89,511,000 visits with ethnicity reported directly by emergency departments. The visits for which ethnicity was missing are excluded from the denominator so that readers can compare differences between estimates that include and exclude imputed ethnicity values.

[13]Combined total of expected sources of payment exceeds "all visits," and percent of visits exceeds 100%, because more than one source of payment may be reported per visit.

[14]SCHIP is State Children's Health Insurance Program.

[15]The visits in this category are included in both the Medicaid or SCHIP and Medicare categories.

[16]"No insurance" is defined as having only self-pay, or no charge or charity as payment sources. The individual self-pay and no charge or charity categories are not mutually exclusive.

NOTE: Numbers may not add to totals because of rounding.

Table 8. Initial blood pressure measurements recorded at emergency department visits for adults, by selected patient characteristics: United States, 2008

Patient characteristic	Number of visit in thousands	Initial blood pressure[1]						
		Total	Low	Normal	Mildly high	Moderately high	Severely high	Blank
		Percent distribution (standard error of percent)						
Adult visits[2]	95,882	100.0	6.1 (0.2)	14.6 (0.4)	32.9 (0.4)	26.4 (0.4)	15.7 (0.3)	4.3 (0.4)
Age								
18–24 years	15,100	100.0	6.3 (0.4)	22.2 (1.0)	40.9 (1.0)	19.9 (1.0)	5.4 (0.6)	5.3 (0.7)
25–44 years	35,185	100.0	4.5 (0.3)	17.6 (0.5)	36.5 (0.7)	25.0 (0.6)	12.0 (0.5)	4.4 (0.5)
45–64 years	26,335	100.0	5.1 (0.3)	11.3 (0.5)	29.2 (0.8)	29.8 (0.7)	20.5 (0.6)	4.1 (0.5)
65–74 years	7,479	100.0	9.2 (0.9)	8.1 (0.7)	25.6 (1.2)	31.8 (1.4)	22.4 (1.2)	2.9 (0.5)
75 years and over	11,781	100.0	10.5 (0.7)	7.2 (0.6)	25.2 (1.1)	27.8 (0.9)	25.3 (1.0)	4.1 (0.6)
Sex								
Female	54,006	100.0	6.7 (0.3)	17.1 (0.5)	33.1 (0.5)	23.7 (0.4)	15.4 (0.4)	4.0 (0.4)
Male	41,875	100.0	5.3 (0.3)	11.3 (0.4)	32.7 (0.5)	29.8 (0.7)	16.1 (0.5)	4.7 (0.5)
Race[3,4,5,6]								
Reported	81,470	100.0	6.2 (0.2)	14.3 (0.4)	33.0 (0.4)	26.8 (0.4)	16.0 (0.3)	3.6 (0.4)
Imputed (missing)	14,412	100.0	5.2 (0.4)	16.0 (0.9)	32.6 (0.9)	24.1 (1.1)	14.1 (0.9)	8.0 (1.4)
Reported plus imputed:								
White	70,442	100.0	6.1 (0.2)	14.2 (0.4)	33.4 (0.4)	26.9 (0.4)	15.1 (0.4)	4.3 (0.4)
Black	21,674	100.0	6.0 (0.4)	15.5 (0.7)	31.5 (0.8)	25.3 (0.8)	17.7 (0.6)	3.9 (0.7)
Asian	1,857	100.0	7.8 (1.5)	17.5 (2.2)	31.0 (2.2)	22.2 (1.8)	17.0 (2.6)	4.5 (1.2)
Other	1,910	100.0	4.6 (1.2)	17.2 (2.3)	33.0 (2.3)	23.6 (2.1)	14.3 (2.0)	7.4 (2.1)
Reported only:								
White	59,857	100.0	6.3 (0.3)	13.8 (0.4)	33.5 (0.5)	27.4 (0.5)	15.3 (0.4)	3.7 (0.4)
Black	18,814	100.0	5.9 (0.4)	15.4 (0.7)	31.5 (0.9)	25.7 (0.8)	18.2 (0.6)	3.3 (0.7)
Asian	1,369	100.0	7.5 (1.4)	17.4 (3.0)	32.0 (2.7)	21.2 (2.1)	17.0 (3.1)	* . . .
Other	1,429	100.0	5.3 (1.3)	17.6 (2.0)	32.9 (2.2)	22.3 (2.3)	15.6 (2.4)	*6.3 (2.0)
Ethnicity[3,4,7,8]								
Reported	69,010	100.0	6.4 (0.2)	14.6 (0.4)	33.6 (0.4)	26.0 (0.4)	15.8 (0.4)	3.7 (0.4)
Imputed (missing)	26,871	100.0	5.2 (0.3)	14.6 (0.7)	31.3 (0.8)	27.5 (0.9)	15.6 (0.8)	5.9 (1.1)
Reported plus imputed:								
Hispanic or Latino	11,697	100.0	5.4 (0.6)	17.1 (0.9)	33.3 (1.1)	24.9 (0.9)	14.4 (0.9)	4.9 (0.7)
Not Hispanic or Latino	84,184	100.0	6.2 (0.2)	14.2 (0.4)	32.9 (0.4)	26.6 (0.4)	15.9 (0.3)	4.2 (0.4)
Reported only:								
Hispanic or Latino	7,939	100.0	6.1 (0.6)	18.6 (1.1)	33.9 (1.1)	24.0 (1.2)	12.8 (0.9)	4.8 (0.8)
Not Hispanic or Latino	61,071	100.0	6.5 (0.2)	14.1 (0.4)	33.5 (0.5)	26.2 (0.5)	16.2 (0.4)	3.5 (0.4)

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

[1]Blood pressure (BP) levels were categorized using the following hierarchical definitions. Severely high BP is defined as 160 mm Hg systolic or above, or 100 mm Hg diastolic or above. Moderately high BP is defined as 140–159 mm Hg systolic or 90–99 mm Hg diastolic. Mildly high BP is defined as 120–139 mm Hg systolic or 80–89 mm Hg diastolic. Low BP is defined as less than 100 mm Hg systolic or less than 60 mm Hg diastolic. Normal BP is defined as 100–119 mm Hg systolic and 60–79 mm Hg diastolic. BP classification was based on the "Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure" (JNC-7). "Mildly high" BP corresponds to the JNC-7 prehypertensive range. "Moderately high" BP corresponds to the JNC-7 stage 1 hypertensive range. "Severely high" BP corresponds to the JNC-7 stage 2 hypertensive range. (Reference: Chobanian AV, Bokris GL, Black HR, et al. Seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension 42:1206–52. 2003.)

[2]Visits by adults (18 years and over). Visits where blood pressure was recorded represent 95.7 percent (SE = 0.4) of all emergency department visits made by adults.

[3]Other race includes visits by Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, and persons with more than one race. All race categories may include visits by persons of Hispanic origin and not Hispanic origin. Persons of Hispanic origin may be of any race. Starting with data year 1999, race-specific estimates have been tabulated according to 1997 standards for federal data on race and ethnicity and are not strictly comparable with estimates for earlier years. The percent of visit records with multiple races indicated is small and lower than what is typically found for self-reported race in household surveys.

[4]For 2008, race data were missing for 16.0 percent of visits by adults, and ethnicity data were missing for 27.7 percent of visits by adults. Readers are therefore advised to treat these data with caution. In this table, estimates based on imputed race and ethnicity data are shown separately from comparison estimates using unimputed data. Missing race and ethnicity were imputed using a hot deck approach rather than the previously used cold deck strategy. The imputation process is described more fully in the 2008 public use file documentation (http://www.cdc.gov/nchs/ahcd.htm). Research is currently under way to evaluate further changes to the imputation strategy for use with 2009 data.

[5]"Reported plus imputed" includes race that was reported directly by emergency departments and imputed values for the 15.0 percent of visits for which race was not reported.

[6]"Reported only" calculations are based on 81,470,000 visits by adults with race reported directly by emergency departments. The visits for which race was missing are excluded from the denominator so that readers can compare differences between estimates that include and exclude imputed race values.

[7]"Reported plus imputed" includes ethnicity that was reported directly by emergency departments and imputed values for the 28.0 percent of visits for which ethnicity was not reported.

[8]"Reported only" calculations are based on 69,010,000 visits with ethnicity reported directly by emergency departments. The visits for which ethnicity was missing are excluded from the denominator so that readers can compare differences between estimates that include and exclude imputed ethnicity values.

NOTE: Numbers may not add to totals because of rounding.

Table 9. Initial vital signs and visit history of emergency department visits: United States, 2008

Visit characteristic	Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)
All visits	123,761	(4,918)	100.0	. . .
Temperature				
Febrile: >38.0°C or >100.4°F	6,035	(480)	4.9	(0.3)
Normal: 35.1–38.0°C or 95.1–100.4°F	109,413	(4,385)	88.4	(0.5)
Hypothermic: ≤35.0°C or <95.0°F	485	(68)	0.4	(0.1)
Unknown or blank	7,829	(581)	6.3	(0.4)
Pulse oximetry[1]				
95–100%	87,861	(4,011)	71.0	(1.7)
90–94%	6,252	(527)	5.1	(0.3)
<90%	3,748	(994)	3.0	(0.8)
Unknown or blank	25,901	(2,030)	20.9	(1.5)
Oriented to time, place, and person				
Yes	92,084	(3,729)	74.4	(1.5)
No	2,665	(194)	2.2	(0.1)
Unknown or blank	29,012	(2,490)	23.4	(1.6)
Presenting level of pain				
None	25,041	(1,368)	20.2	(0.7)
Mild	15,381	(925)	12.4	(0.6)
Moderate	27,215	(1,335)	22.0	(0.7)
Severe	28,275	(1,609)	22.8	(0.8)
Unknown or blank	27,849	(2,002)	22.5	(1.4)
Episode of care				
Initial visit	100,600	(4,494)	81.3	(1.4)
Follow-up visit	8,159	(621)	6.6	(0.4)
Unknown or blank	15,003	(1,710)	12.1	(1.4)
Patient seen in this emergency department within the last 72 hours				
Yes	4,199	(289)	3.4	(0.2)
No	93,189	(4,632)	75.3	(2.3)
Unknown or blank	26,373	(3,112)	21.3	(2.4)
Patient discharged from any hospital within the last 7 days				
Yes	2,800	(266)	2.3	(0.2)
No	63,033	(4,466)	50.9	(3.0)
Unknown or blank	57,928	(4,564)	46.8	(3.1)

. . . Category not applicable.

[1]Normal oxygen saturation as measured by pulse oximetry is 95% or more. An oxygen saturation less than 90% is consistent with severe hypoxemia.

NOTE: Numbers may not add to totals because of rounding.

Table 10. Ten leading principal reasons for emergency department visits, by patient age and sex: United States, 2008

Principal reason for visit and RVC code[1]	Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)
All visits . . .	123,761	(4,918)	100.0	. . .
All visits, under age 15 years . . .	23,157	(1,658)	100.0	. . .
Female . . .	10,395	(803)	44.9	(0.8)
Fever . . . S010	1,842	(174)	8.0	(0.5)
Cough . . . S440	644	(71)	2.8	(0.2)
Vomiting . . . S530	575	(85)	2.5	(0.3)
Stomach pain, cramps and spasms . . . S545	422	(65)	1.8	(0.2)
Skin rash . . . S860	397	(56)	1.7	(0.2)
Earache or ear infection . . . S355	367	(51)	1.6	(0.2)
Symptoms referable to throat . . . S455	260	(38)	1.1	(0.2)
Lacerations and cuts-facial area . . . J210	199	(41)	0.9	(0.2)
Injury, other and unspecified type-head, neck, and face . . . J505	190	(37)	0.8	(0.1)
Accident, not otherwise specified . . . J810	184	(35)	0.8	(0.1)
All other reasons[2] . . .	5,314	(421)	22.9	(0.7)
Male . . .	12,762	(896)	55.1	(0.8)
Fever . . . S010	2,030	(214)	8.8	(0.5)
Cough . . . S440	841	(96)	3.6	(0.4)
Vomiting . . . S530	537	(66)	2.3	(0.2)
Earache or ear infection . . . S355	443	(65)	1.9	(0.3)
Stomach pain, cramps and spasms . . . S545	407	(59)	1.8	(0.2)
Skin rash . . . S860	394	(56)	1.7	(0.2)
Injury, other and unspecified type-head, neck, and face . . . J505	371	(53)	1.6	(0.2)
Lacerations and cuts-facial area . . . J210	360	(49)	1.6	(0.2)
Accident, not otherwise specified . . . J810	310	(52)	1.3	(0.2)
Labored or difficult breathing (dyspnea) . . . S420	245	(44)	1.1	(0.2)
All other reasons[2] . . .	6,824	(500)	29.5	(0.8)
All visits, aged 15–64 years . . .	81,344	(3,327)	100.0	. . .
Female . . .	45,556	(1,939)	56.0	(0.5)
Stomach pain, cramps and spasms . . . S545	4,767	(243)	5.9	(0.2)
Chest pain and related symptoms . . . S050	2,576	(171)	3.2	(0.2)
Headache, pain in head . . . S210	1,788	(118)	2.2	(0.1)
Back symptoms . . . S905	1,544	(136)	1.9	(0.1)
Pain, site not referrable to a specific body system . . . S055	1,255	(104)	1.5	(0.1)
Problems of pregnancy and the post-partum period . . . S790	1,216	(112)	1.5	(0.1)
Symptoms referable to throat . . . S455	1,096	(99)	1.3	(0.1)
Shortness of breath . . . S415	1,018	(93)	1.3	(0.1)
Cough . . . S440	975	(94)	1.2	(0.1)
Nausea . . . S525	841	(86)	1.0	(0.1)
All other reasons[2] . . .	28,478	(1,275)	35.0	(0.5)
Male . . .	35,788	(1,480)	44.0	(0.5)
Chest pain and related symptoms . . . S050	2,271	(148)	2.8	(0.1)
Stomach pain, cramps and spasms . . . S545	2,025	(127)	2.5	(0.1)
Back symptoms . . . S905	1,364	(111)	1.7	(0.1)
Lacerations and cuts-upper extremity . . . J225	957	(93)	1.2	(0.1)
Headache, pain in head . . . S210	908	(91)	1.1	(0.1)
Pain, site not referrable to a specific body system . . . S055	882	(87)	1.1	(0.1)
Shortness of breath . . . S415	795	(80)	1.0	(0.1)
Motor vehicle accident, type of injury unspecified . . . J805	736	(93)	0.9	(0.1)
Symptoms of teeth and gums . . . S500	650	(78)	0.8	(0.1)
Symptoms referable to throat . . . S455	601	(65)	0.7	(0.1)
All other reasons[2] . . .	24,599	(1,011)	30.2	(0.4)
All visits, aged 65 years and over . . .	19,261	(896)	100.0	. . .
Female . . .	11,069	(574)	57.5	(1.0)
Chest pain and related symptoms . . . S050	854	(88)	4.4	(0.4)
Shortness of breath . . . S415	821	(88)	4.3	(0.4)
Stomach pain, cramps and spasms . . . S545	646	(60)	3.4	(0.3)
Accident, not otherwise specified . . . J810	545	(67)	2.8	(0.3)
General weakness . . . S020	443	(58)	2.3	(0.3)
Leg symptoms . . . S920	323	(58)	1.7	(0.3)
Nausea . . . S525	311	(47)	1.6	(0.2)
Labored or difficult breathing (dyspnea) . . . S420	268	(49)	1.4	(0.2)
Headache, pain in head . . . S210	265	(43)	1.4	(0.2)
Back symptoms . . . S905	257	(40)	1.3	(0.2)
All other reasons[2] . . .	6,337	(355)	32.9	(0.9)

Table 10. Ten leading principal reasons for emergency department visits, by patient age and sex: United States, 2008—Con.

Principal reason for visit and RVC code[1]		Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)
Male	...	8,192	(406)	42.5	(1.0)
Chest pain and related symptoms	S050	695	(66)	3.6	(0.3)
Shortness of breath	S415	616	(71)	3.2	(0.3)
Stomach pain, cramps and spasms	S545	448	(53)	2.3	(0.3)
General weakness	S020	298	(41)	1.5	(0.2)
Accident, not otherwise specified	J810	270	(42)	1.4	(0.2)
Labored or difficult breathing (dyspnea)	S420	241	(44)	1.3	(0.2)
Vertigo-dizziness	S225	214	(34)	1.1	(0.2)
Fever	S010	203	(33)	1.1	(0.2)
Fainting (syncope)	S030	192	(38)	1.0	(0.2)
Other symptoms or problems relating to psychological and mental disorders	S165	184	(37)	1.0	(0.2)
All other reasons[2]	...	4,831	(258)	25.1	(0.8)

. . . Category not applicable.

[1]Based on *A Reason for Visit Classification* (RVC) defined in the 2008 National Hospital Ambulatory Medical Care Survey public use documentation (ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHAMCS/doc08.pdf). Reason for visit is defined by patient.

[2]Category includes all other reasons not listed above, as well as unknown and blanks.

NOTE: Numbers may not add to totals because of rounding.

Table 11. Primary diagnosis at emergency department visits, classified by major disease category: United States, 2008

Major disease category and ICD–9–CM code range[1]		Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)
All visits	. . .	123,761	(4,918)	100.0	. . .
Infectious and parasitic diseases	001–139	3,841	(283)	3.1	(0.2)
Neoplasms	140–239	331	(50)	0.3	(0.0)
Endocrine, nutritional, metabolic diseases, and immunity disorders	240–279	2,072	(162)	1.7	(0.1)
Mental disorders	290–319	4,135	(268)	3.3	(0.2)
Diseases of the nervous system and sense organs	320–389	6,510	(396)	5.3	(0.3)
Diseases of the circulatory system	390–459	4,866	(284)	3.9	(0.2)
Diseases of the respiratory system	460–519	13,273	(723)	10.7	(0.4)
Diseases of digestive system	520–579	7,199	(327)	5.8	(0.2)
Diseases of the genitourinary system	580–629	5,888	(316)	4.8	(0.2)
Diseases of the skin and subcutaneous tissue	680–709	5,195	(280)	4.2	(0.2)
Diseases of the musculaoskeletal system and connective tissue	710–739	7,068	(394)	5.7	(0.2)
Symptoms, signs, and ill-defiend conditions	780–799	25,091	(1,109)	20.3	(0.4)
Injury and poisoning	800–999	28,503	(1,231)	23.0	(0.4)
Fractures	800–829	3,811	(206)	3.1	(0.1)
Sprains and strains	840–848	6,019	(363)	4.9	(0.2)
Intracranial injury	850–854	413	(56)	0.3	(0.0)
Open wounds	870–897	6,264	(330)	5.1	(0.2)
Superficial injury	910–919	1,536	(129)	1.2	(0.1)
Contusion with intact skin surface	920–924	4,800	(260)	3.9	(0.2)
Foreign bodies	930–939	503	(50)	0.4	(0.0)
Burns	940–949	390	(46)	0.3	(0.0)
Trauma complications and unspecified injuries	958–959	1,756	(153)	1.4	(0.1)
Poisoning and toxic effects	960–989	938	(79)	0.8	(0.1)
Surgical and medical complications	996–999	467	(53)	0.4	(0.0)
Other injuries	. . .	1,606	(123)	1.3	(0.1)
Supplementary classification[2]	V01–V8699	3,328	(239)	2.7	(0.1)
All other diagnoses[3]	. . .	5,607	(398)	4.5	(0.3)
Blank	. . .	855	(201)	0.7	(0.2)

. . . Category not applicable.

0.0 Quantity more than zero but less than 0.05.

[1]Based on the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD–9–CM)(U.S. Department of Health and Human Services. Centers for Medicare and Medicaid Services. Official version: International Classification of Diseases, Ninth Revision, Clinical Modification, Sixth Edition. DHHS Pub No. (PHS) 06–1260). However, certain codes have been combined in this table to better describe the utilization of ambulatory care services.*

[2]Includes general medical examination, routine prenatal examination, and health supervision of an infant or child, and other diagnoses not classifiable to injury or illness.

[3]Includes diseases of the blood and blood-forming organs (280–289); complications of pregnancy, childbirth, and the puerperium (630–677); certain conditions originating in perinatal period (760–779); entries not codable to the ICD–9–CM (e.g., illegible entries, patient left before being seen, patient was transferred to another facility, health maintenance organization did not authorize treatment, and entries of ''none,'' ''no diagnosis,'' or ''no disease.'')

NOTE: Numbers may not add to totals because of rounding.

Table 12. Ten leading primary diagnosis groups for emergency department visits, by patient age and sex: United States, 2008

Primary diagnosis group and ICD–9–CM code(s)[1]		Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)
All visits	...	123,761	(4,918)	100.0	...
All visits, aged under 15 years	...	23,157	(1,658)	100.0	...
Female	...	10,395	(803)	44.9	(0.8)
Acute upper respiratory infections, excluding pharyngitis	460–461,463–466	916	(111)	4.0	(0.4)
Otitis media and eustachian tube disorders	381–382	696	(93)	3.0	(0.3)
Pyrexia of unknown origin	780.6	650	(97)	2.8	(0.4)
Contusion with intact skin surface	920–924	363	(57)	1.6	(0.2)
Acute pharyngitis	462	308	(48)	1.3	(0.2)
Open wound of head	870–873	307	(46)	1.3	(0.2)
Abdominal pain	789.0	287	(56)	1.2	(0.2)
Open wound, excluding head	874–897	278	(47)	1.2	(0.2)
Unspecified viral and chlamydial infection	079.9	250	(41)	1.1	(0.2)
Asthma	493	250	(42)	1.1	(0.2)
All other diagnoses[2]	...	6,089	(474)	26.3	(0.7)
Male	...	12,762	(896)	55.1	(0.8)
Acute upper respiratory infections, excluding pharyngitis	460–461,463–466	1,129	(114)	4.9	(0.4)
Otitis media and eustachian tube disorders	381–382	826	(107)	3.6	(0.4)
Open wound of head	870–873	742	(77)	3.2	(0.3)
Pyrexia of unknown origin	780.6	718	(123)	3.1	(0.4)
Contusion with intact skin surface	920–924	577	(64)	2.5	(0.3)
Open wound, excluding head	874–897	497	(70)	2.1	(0.3)
Asthma	493	460	(70)	2.0	(0.3)
Unspecified viral and chlamydial infection	079.9	453	(76)	2.0	(0.3)
Fractures, excluding lower limb	800–819	399	(53)	1.7	(0.2)
Sprains and strains, excluding ankle and back	840–844,845.1,848	269	(48)	1.2	(0.2)
All other diagnoses[2]	...	6,692	(504)	28.9	(0.6)
All visits, aged 15–64 years	...	81,344	(3,327)	100.0	...
Female	...	45,556	(1,939)	56.0	(0.5)
Abdominal pain	789.0	2,804	(175)	3.4	(0.2)
Chest pain	786.5	1,971	(164)	2.4	(0.2)
Spinal disorders	720–724	1,560	(140)	1.9	(0.1)
Contusion with intact skin surface	920–924	1,554	(118)	1.9	(0.1)
Complications of pregnancy, childbirth, and the puerperium	630–677	1,409	(97)	1.7	(0.1)
Acute upper respiratory infections, excluding pharyngitis	460–461,463–466	1,355	(130)	1.7	(0.1)
Cellulitis and abscess	681–682	1,228	(113)	1.5	(0.1)
Sprains and strains of neck and back	846,847	1,028	(98)	1.3	(0.1)
Headache	784.0	1,023	(95)	1.3	(0.1)
Urinary tract infection, site not specified	599.0	1,013	(87)	1.2	(0.1)
All other diagnoses[2]	...	30,611	(1,325)	37.6	(0.4)
Male	...	35,788	(1,480)	44.0	(0.5)
Open wound, excluding head	874–897	1,829	(121)	2.2	(0.1)
Chest pain	786.5	1,655	(129)	2.0	(0.1)
Contusion with intact skin surface	920–924	1,514	(99)	1.9	(0.1)
Cellulitis and abscess	681–682	1,294	(105)	1.6	(0.1)
Spinal disorders	720–724	1,268	(99)	1.6	(0.1)
Abdominal pain	789.0	1,197	(108)	1.5	(0.1)
Sprains and strains of neck and back	846,847	1,046	(101)	1.3	(0.1)
Sprains and strains, excluding ankle and back	840–844,845.1,848	964	(91)	1.2	(0.1)
Fractures, excluding lower limb	800–819	961	(85)	1.2	(0.1)
Open wound of head	870–873	741	(73)	0.9	(0.1)
All other diagnoses[2]	...	23,320	(988)	28.7	(0.4)
All visits, aged 65 years and over	...	19,261	(896)	100.0	...
Female	...	11,069	(574)	57.5	(1.0)
Chest pain	786.5	628	(70)	3.3	(0.3)
Heart disease, excluding ischemic	391–392.0,393–398,402,404,415–416,420–429	541	(69)	2.8	(0.3)
Contusion with intact skin surface	920–924	537	(61)	2.8	(0.3)
Abdominal pain	789.0	459	(69)	2.4	(0.3)
Urinary tract infection, site not specified	599.0	316	(47)	1.6	(0.2)
Pneumonia	480–486	278	(43)	1.4	(0.2)
Fractures, excluding lower limb	800–819	264	(43)	1.4	(0.2)
Dyspnea and respiratory abnormalities	786.0	261	(48)	1.4	(0.2)
Syncope and collapse	780.2	250	(39)	1.3	(0.2)
Cerebrovascular disease	430–438	248	(42)	1.3	(0.2)
All other diagnoses[2]	...	7,287	(403)	37.8	(1.0)

Table 12. Ten leading primary diagnosis groups for emergency department visits, by patient age and sex: United States, 2008—Con.

Primary diagnosis group and ICD–9–CM code(s)[1]		Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)
Male	...	8,192	(406)	42.5	(1.0)
Chest pain	786.5	456	(50)	2.4	(0.2)
Heart disease, excluding ischemic	391–392.0,393–398,402,404,415–416,420–429	442	(59)	2.3	(0.3)
Pneumonia	480–486	356	(52)	1.8	(0.3)
Contusion with intact skin surface	920–924	254	(42)	1.3	(0.2)
Chronic and unspecified bronchitis	490–491	241	(46)	1.3	(0.2)
Syncope and collapse	780.2	240	(43)	1.2	(0.2)
Cerebrovascular disease	430–438	220	(38)	1.1	(0.2)
Open wound, excluding head	874–897	211	(31)	1.1	(0.2)
Abdominal pain	789.0	205	(34)	1.1	(0.2)
Symptoms involving the urinary system	788	178	(33)	0.9	(0.2)
All other diagnoses[2]	...	5,389	(272)	28.0	(0.8)

. . . Category not applicable.

[1]Based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD–9–CM) (U.S. Department of Health and Human Services. Centers for Medicare and Medicaid Services. Official version: International Classification of Diseases, Ninth Revision, Clinical Modification, Sixth Edition. DHHS Pub No. (PHS) 06–1260). However, certain codes have been combined in this table to better describe the utilization of ambulatory care services.

[2]Includes all other diagnoses not listed above, as well as unknown and blank diagnoses.

NOTE: Numbers may not add to totals because of rounding.

Table 13. Injury-related emergency department visits, by selected patient and hospital characteristics: United States, 2008

Selected patient and hospital characteristics	Number of visits in thousands	(Standard error of percent)	Percent distribution	(Standard error of percent)	Number of visits in thousands	(Standard error of percent)
All injury-related visits[2]	42,420	(1,767)	100.0	. . .	14.2	(0.6)
Patient characteristic						
Age:						
Under 15 years	7,780	(536)	18.3	(0.9)	12.7	(0.9)
Under 1 year	485	(60)	1.1	(0.1)	11.3	(1.4)
1–4 years	2,371	(197)	5.6	(0.4)	14.2	(1.2)
5–14 years	4,924	(348)	11.6	(0.6)	12.3	(0.9)
15–24 years	7,906	(373)	18.6	(0.5)	19.0	(0.9)
25–44 years	12,183	(574)	28.7	(0.6)	15.0	(0.7)
45–64 years	8,715	(421)	20.5	(0.5)	11.2	(0.5)
65 years and over	5,836	(315)	13.8	(0.5)	15.7	(0.8)
65–74 years	2,210	(152)	5.2	(0.3)	11.1	(0.8)
75 years and over	3,626	(228)	8.5	(0.4)	20.9	(1.3)
Sex and age:						
Female	19,891	(911)	46.9	(0.6)	13.0	(0.6)
Under 15 years	3,161	(270)	7.5	(0.5)	10.6	(0.9)
15–24 years	3,382	(190)	8.0	(0.3)	16.4	(0.9)
25–44 years	5,740	(314)	13.5	(0.5)	14.0	(0.8)
45–64 years	4,198	(227)	9.9	(0.3)	10.5	(0.6)
65–74 years	1,167	(115)	2.8	(0.3)	10.9	(1.1)
75 years and over	2,243	(165)	5.3	(0.3)	21.4	(1.6)
Male	22,529	(913)	53.1	(0.6)	15.4	(0.6)
Under 15 years	4,619	(309)	10.9	(0.6)	14.8	(1.0)
15–24 years	4,524	(249)	10.7	(0.4)	21.6	(1.2)
25–44 years	6,442	(325)	15.2	(0.5)	16.0	(0.8)
45–64 years	4,517	(244)	10.6	(0.4)	12.0	(0.6)
65–74 years	1,043	(91)	2.5	(0.2)	11.4	(1.0)
75 years and over	1,383	(105)	3.3	(0.2)	20.1	(1.5)
Hospital characteristic						
Ownership:						
Voluntary	32,100	(1,813)	75.7	(2.7)	10.7	(0.6)
Government	5,231	(1,193)	12.3	(2.7)	1.8	(0.4)
Proprietary	5,089	(858)	12.0	(2.1)	1.7	(0.3)
Geographic region:						
Northeast	8,457	(753)	19.9	(1.6)	15.6	(1.4)
Midwest	9,060	(778)	21.4	(1.7)	13.8	(1.2)
South	16,255	(1,113)	38.3	(2.2)	14.9	(1.0)
West	8,648	(997)	20.4	(2.1)	12.4	(1.4)
Metropolitan status[3]:						
MSA[4]	34,705	(1,839)	81.8	(2.0)	13.9	(0.7)
Non-MSA	7,714	(832)	18.2	(2.0)	15.9	(1.7)

. . . Category not applicable.

[1]Visit rates for age, sex, race, and region are based on the July 1, 2008, set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

[2]"Injury-related" includes injuries, poisoning, and adverse effects, accounting for 34.3 percent (SE = 0.5) of all visits.

[3]Population estimates by metropolitan statistical area status are based estimates of the civilian noninstitutionalized population of the United States as of July 1, 2008, from the 2008 National Health Interview Survey, National Center for Health Statistics, compiled according to the November 2007 Office of Management and Budget definitions of core-based statistical areas.
See http://www.census.gov/population/www/estimates/metrodef.html for more about metropolitan statistical area definitions.

[4]MSA is metropolitan statistical area.

NOTE: Numbers may not add to totals because of rounding.

Table 14. Injury-related emergency department visits, by race and age, and ethnicity: United States, 2008

Patient characteristic	Reported plus imputed						Reported only					
	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Number of visits per 100 persons per year[1]	(Standard error of rate)	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Number of visits per 100 persons per year[1]	(Standard error of rate)
All injury-related visits[2]	42,420	(1,767)	100.0	. . .	14.2	(0.6)	. . .	. . .	. . .	. . .	. . .	. . .
Race and age[3,4,5,6]												
Reported	35,708	(1,622)	84.2	(2.1)	12.0	(0.5)	35,708	(1,622)	100.0	(2.1)	12.0	(0.5)
Imputed (missing)	6,712	(989)	15.8	(2.1)	2.2	(0.3)	. . .	. . .	. . .	. . .	. . .	. . .
White	32,043	(1,532)	75.5	(1.4)	13.4	(0.6)	27,051	(1,416)	75.8	(1.5)	11.3	(0.6)
Under 15 years	5,566	(402)	13.1	(0.7)	12.0	(0.9)	4,505	(349)	12.6	(0.7)	9.7	(0.8)
15–24 years	5,967	(327)	14.1	(0.5)	18.6	(1.0)	5,125	(318)	14.4	(0.6)	16.0	(1.0)
25–44 years	9,007	(479)	21.2	(0.6)	14.1	(0.7)	7,573	(438)	21.2	(0.7)	11.8	(0.7)
45–64 years	6,500	(365)	15.3	(0.6)	10.1	(0.6)	5,513	(317)	15.4	(0.5)	8.6	(0.5)
65–74 years	1,784	(134)	4.2	(0.3)	10.5	(0.8)	1,530	(121)	4.3	(0.3)	9.0	(0.7)
75 years and over	3,219	(216)	7.6	(0.4)	21.1	(1.4)	2,805	(197)	7.9	(0.4)	18.4	(1.3)
Black or African American	8,515	(615)	20.1	(1.2)	22.6	(1.6)	7,252	(552)	20.3	(1.4)	19.3	(1.5)
Under 15 years	1,748	(183)	4.1	(0.4)	19.1	(2.0)	1,463	(152)	4.1	(0.4)	16.0	(1.7)
15–24 years	1,708	(159)	4.0	(0.3)	27.3	(2.5)	1,423	(142)	4.0	(0.4)	22.8	(2.3)
25–44 years	2,595	(211)	6.1	(0.4)	24.9	(2.0)	2,227	(195)	6.2	(0.5)	21.4	(1.9)
45–64 years	1,830	(181)	4.3	(0.4)	21.2	(2.1)	1,606	(164)	4.5	(0.4)	18.6	(1.9)
65–74 years	337	(56)	0.8	(0.1)	18.4	(3.1)	285	(53)	0.8	(0.1)	15.5	(2.9)
75 years and over	298	(50)	0.7	(0.1)	22.3	(3.7)	249	(44)	0.7	(0.1)	18.7	(3.3)
Asian	896	(171)	2.1	(0.4)	6.6	(1.3)	650	(114)	1.8	(0.3)	4.8	(0.8)
Native Hawaiian or other Pacific Islander	274	(74)	0.6	(0.2)	49.6	(13.4)	193	(49)	0.5	(0.1)	35.0	(8.9)
American Indian or Alaska Native	*339	(109)	*0.8	(0.3)	*11.2	(3.6)	*239	(81)	*0.7	(0.2)	*7.9	(2.7)
Multiple races	*352	(140)	*0.8	(0.3)	*6.9	(2.7)	*322	(140)	*0.9	(0.4)	*6.3	(2.7)
Ethnicity[3,4,7,8]												
Reported	30,550	(1,647)	72.0	(3.2)	10.2	(0.6)	30,550	(1,647)	100.0	(3.2)	10.2	(0.6)
Imputed (missing)	11,869	(1,521)	28.0	(3.2)	4.0	(0.5)	. . .	. . .	. . .	. . .	. . .	. . .
Hispanic or Latino	5,139	(493)	12.1	(1.0)	11.1	(1.1)	3,640	(376)	11.9	(1.1)	7.8	(0.8)
Not Hispanic or Latino	37,281	(1,602)	87.9	(1.0)	14.8	(0.6)	26,910	(1,525)	88.1	(1.1)	10.7	(0.6)

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]Visit rates are based on the July 1, 2008, estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

[2]"Injury-related" includes injuries, poisoning, and adverse effects, accounting for 34.3 percent (SE = 0.5) of all visits.

[3]The race groups white, black or African American, Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, and multiple races, include persons of Hispanic and not Hispanic origin. Persons of Hispanic origin may be of any race. Starting with data year 1999, race-specific estimates have been tabulated according to 1997 standards for federal data on race and ethnicity and are not strictly comparable with estimates for earlier years. The percent of visit records with multiple races indicated is small and lower than what is typically found for self-reported race in household surveys.

[4]For 2008, race data were missing for 16.0 percent of visits, and ethnicity data were missing for 27.7 percent of visits. Readers are therefore advised to treat these data with caution. In this table, estimates based on imputed race and ethnicity data are shown separately from comparison estimates using unimputed data. Missing race and ethnicity were imputed using a hot deck approach rather than the previously used cold deck strategy. The imputation process is described more fully in the 2008 public use file documentation (http://www.cdc.gov/nchs/ahcd.htm). Research is currently under way to evaluate further changes to the imputation strategy for use with 2009 data.

[5]"Reported plus imputed" includes race reported by emergency departments and imputed values for the 15.8% of injury-related visits for which race was not reported.

[6]"Reported only" calculations are based on 35,708,000 injury-related visits with race reported directly by emergency departments. The visits for which race was missing are excluded from the denominator so that readers can compare differences between estimates that include and exclude imputed race values.

[7]"Reported plus imputed" includes ethnicity reported by emergency departments and imputed values for the 28.0% of injury-related visits for which ethnicity was not reported.

[8]"Reported only" calculations are based on 30,550,000 visits with ethnicity reported directly by emergency departments. The visits for which ethnicity was missing are excluded from the denominator so that readers can compare differences between estimates that include and exclude imputed ethnicity values.

NOTE: Numbers may not add to totals because of rounding.

Table 15. Injury-related emergency department visits, by intent: United States, 2008

Intent and mechanism[1]	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)
All injury-related visits	42,420	(1,767)	100.0	. . .
Unintentional injuries	28,385	(1,279)	66.9	(0.8)
Falls	9,658	(484)	22.8	(0.5)
Motor vehicle traffic	3,942	(247)	9.3	(0.4)
Struck against or struck accidentally by objects or persons	3,128	(207)	7.4	(0.4)
Cutting or piercing instruments or objects	2,334	(166)	5.5	(0.3)
Overexertion and strenuous movements	1,993	(137)	4.7	(0.3)
Natural and environmental factors	1,762	(148)	4.2	(0.3)
Poisoning	695	(84)	1.6	(0.2)
Foreign body	649	(59)	1.5	(0.1)
Caught accidentally in or between objects	571	(76)	1.3	(0.2)
Pedal cycle, nontraffic	442	(58)	1.0	(0.1)
Fire and flames, hot substances or object, caustic or corrosive material and steam	431	(59)	1.0	(0.1)
Motor vehicle, nontraffic and other	429	(54)	1.0	(0.1)
Machinery	278	(43)	0.7	(0.1)
Other transportation	184	(31)	0.4	(0.1)
Suffocation	151	(27)	0.4	(0.1)
Other mechanism[2]	1,708	(144)	4.0	(0.3)
Mechanism unspecified	*	. . .	*	. . .
Intentional injuries	2,533	(154)	6.0	(0.3)
Assault	1,806	(132)	4.3	(0.3)
Unarmed fight or brawl, striking by blunt or thrown object	1,167	(113)	2.8	(0.2)
Cutting or piercing instrument	136	(30)	0.3	(0.1)
Other and unspecified mechanism[3]	503	(53)	1.2	(0.1)
Self-inflicted	666	(78)	1.6	(0.2)
Poisoning by solid or liquid substances, gases, and vapors	449	(58)	1.1	(0.1)
Other and unspecified mechanism[4]	217	(39)	0.5	(0.1)
Other causes of violence	*	. . .	*	. . .
Injuries of undetermined intent	420	(59)	1.0	(0.1)
Adverse effects of medical treatment	1,980	(148)	4.7	(0.3)
Medical and surgical complications	1,184	(100)	2.8	(0.2)
Adverse drug effects	796	(85)	1.9	(0.2)
Alcohol and drug use[5]	1,962	(158)	4.6	(0.3)
Unknown[6]	7,141	(421)	16.8	(0.7)

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]First-mentioned of three possible causes. *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD–9–CM)(U.S. Department of Health and Human Services. Centers for Medicare and Medicaid Services. Official version: International Classification of Diseases, Ninth Revision, Clinical Modification, Sixth Edition. DHHS Pub No. (PHS) 06–1260). A detailed description of the ICD–9–CM E-codes used to create the grouping in this table can be found in the 2003 Advance Data report. McCaig LF, Burt CW. National Hospital Ambulatory Medical Care Survey: 2003 emergency department summary. Advance data from vital and health statistics; no 358. Hyattsville, MD: National Center for Health Statistics. 2005.

[2]Includes drowning, firearms, and other mechanism.

[3]Includes assaults by firearms and explosives, and other mechanism.

[4]Includes injury by cutting and piercing instrument, and other and unspecified mechanism.

[5]Alcohol and drug abuse are not contained in the ''Supplementary Classification of External Causes of Injury and Poisoning,'' but are frequently recorded as a cause of injury or poisoning.

[6]Category includes illegible entries and blanks.

NOTE: Numbers may not add to totals because of rounding.

Table 16. Injury-related emergency department visits, by body site of primary injury-related diagnosis: United States, 2008

Body site[1]	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)
All injury visits	42,420	(1,767)	100.0	. . .
Head and neck	5,880	(321)	13.9	(0.4)
Traumatic brain injury	485	(57)	1.1	(0.1)
Other head	1,653	(144)	3.9	(0.3)
Face	1,878	(129)	4.4	(0.2)
Eye	567	(61)	1.3	(0.1)
Head, face, and neck unspecified	1,297	(111)	3.1	(0.2)
Spinal cord	*	. . .	*	. . .
Vertebral column	2,029	(166)	4.8	(0.3)
Cervical	1,033	(116)	2.4	(0.2)
Thoracic and dorsal	181	(30)	0.4	(0.1)
Lumbar	788	(85)	1.9	(0.2)
Other vertebral column	*	. . .	*	. . .
Torso	1,873	(124)	4.4	(0.2)
Chest	850	(71)	2.0	(0.1)
Abdomen	135	(29)	0.3	(0.1)
Pelvis and urogenital	238	(35)	0.6	(0.1)
Trunk	154	(29)	0.4	(0.1)
Back and buttocks	495	(66)	1.2	(0.2)
Upper extremity	7,707	(386)	18.2	(0.6)
Shoulder and upper arm	1,308	(92)	3.1	(0.2)
Forearm and elbow	1,249	(108)	2.9	(0.2)
Wrist, hand, and fingers	4,726	(272)	11.1	(0.4)
Other and unspecified upper extremity	424	(54)	1.0	(0.1)
Lower extremity	6,335	(335)	14.9	(0.5)
Hip	530	(70)	1.2	(0.1)
Upper leg and thigh	183	(36)	0.4	(0.1)
Knee	509	(62)	1.2	(0.1)
Lower leg and ankle	1,815	(125)	4.3	(0.2)
Foot and toes	1,573	(123)	3.7	(0.3)
Other and unspecified lower extremity	1,725	(143)	4.1	(0.3)
System-wide	1,556	(104)	3.7	(0.2)
Other and unspecified body site injuries	1,819	(167)	4.3	(0.3)
Adverse effects and medical complications	1,203	(100)	2.8	(0.2)
All other diagnoses[2]	12,921	(614)	30.5	(0.7)
Unknown[3]	1,088	(102)	2.6	(0.2)

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]Public Health Service and Health Care Financing Administration. International Classification of Diseases, ninth revision, clinical modification, 6th ed. (ICD–9–CM). Washington: Public Health Service. 2004. A detailed description of the Barell Injury Diagnosis Matrix: Classification by Region of Body and Nature of the Injury can be found at: http://www.cdc.gov/nchs/injury_tools.htm. Three additional categories were added that were not in the Barell Injury Diagnosis Matrix, to account for all injury-related visits: illness diagnoses, supplementary classification, and other adverse effects and medical complications.

[2]All other diagnoses include musculoskeletal system (710–739), symptoms and ill-defined conditions (780–799), skin and subcutaneous tissue (680–709), mental disorders (290–319), nervous system and sense organs (320–389), other illnesses (001–289, 390–677, 740–779), and supplementary classification (V01-V82).

[3]Category includes blank, uncodable, and illegible diagnoses.

NOTE: Numbers may not add to totals because of rounding.

Table 17. Selected diagnostic and screening services ordered or provided at emergency department visits: United States, 2008

Diagnostic and screening service ordered or provided	Number of visits in thousands	(Standard error in thousands)	Percent of visits	(Standard error of percent)
All visits	123,761	(4,918)	. . .	. . .
One or more diagnostic or screening service listed	83,922	(3,525)	67.8	(0.8)
None	37,572	(1,762)	30.4	(0.8)
Blank	2,267	(286)	1.8	(0.2)
Blood tests				
Complete blood count	44,552	(1,964)	36.0	(0.9)
Blood urea nitrogen or creatinine	29,695	(1,690)	24.0	(1.2)
Glucose	26,849	(1,720)	21.7	(1.2)
Electrolytes	25,828	(1,683)	20.9	(1.2)
Cardiac enzymes	16,390	(1,020)	13.2	(0.8)
Liver function tests	10,593	(833)	8.6	(0.7)
Prothrombin time or international normalized ratio (INR)	8,120	(600)	6.6	(0.4)
Blood culture	4,909	(365)	4.0	(0.3)
Toxicology screen	3,716	(382)	3.0	(0.3)
Arterial blood gases	2,850	(326)	2.3	(0.3)
Blood alcohol concentration	2,630	(266)	2.1	(0.2)
Other blood test	22,576	(1,298)	18.2	(0.9)
Any blood test listed	49,904	(2,189)	40.3	(0.8)
Imaging				
X-ray	43,965	(1,893)	35.5	(0.6)
Computed tomography scan	18,071	(943)	14.6	(0.4)
Head	8,966	(518)	7.2	(0.3)
Other than head	9,356	(562)	7.6	(0.3)
Ultrasound	3,819	(223)	3.1	(0.1)
Magnetic resonance imaging scan	712	(87)	0.6	(0.1)
Head	346	(51)	0.3	(0.0)
Other than head	297	(52)	0.2	(0.0)
Other Imaging	1,286	(137)	1.0	(0.1)
Any imaging	57,688	(2,480)	46.6	(0.7)
Examinations and tests				
Urinalysis	28,225	(1,338)	22.8	(0.5)
Electrocardiogram	22,547	(1,085)	18.2	(0.5)
Cardiac monitor	10,566	(697)	8.5	(0.5)
Pregnancy test[2]	6,515	(458)	9.7	(0.6)
Rapid flu or influenza test	1,981	(335)	1.6	(0.3)
Wound culture	1,158	(159)	0.9	(0.1)
Other test or service	15,714	(1,670)	12.7	(1.2)

. . . Category not applicable.

0.0 Quantity more than zero but less than 0.05.

[1]Combined total of services exceeds ''all visits,'' and percent of visits exceeds 100%, because more than one service may be reported per visit.

[2]Based on N = 67,019,620 female visits.

Table 18. Selected procedures at emergency department visits: United States, 2008

Procedure performed	Number of visits in thousands	(Standard error in thousands)	Percent of visits	(Standard error of percent)
All visits	123,761	(4,918)	. . .	. . .
One or more procedure listed	57,300	(2,729)	46.3	(1.3)
None[2]	61,329	(2,958)	49.6	(1.3)
Blank[3]	5,133	(537)	4.1	(0.4)
Intravenous fluids	32,950	(1,726)	26.6	(0.9)
Splint or wrap	7,071	(416)	5.7	(0.3)
Laceration repair	5,486	(309)	4.4	(0.2)
Nebulizer therapy	3,556	(295)	2.9	(0.2)
Bladder catheter	2,631	(221)	2.1	(0.2)
Wound debridement	1,862	(232)	1.5	(0.2)
Incision and drainage	1,437	(126)	1.2	(0.1)
Foreign body removal	569	(73)	0.5	(0.1)
Cast	422	(63)	0.3	(0.0)
Nasogastric tube/gastric suction	406	(82)	0.3	(0.1)
Endotracheal intubation	234	(50)	0.2	(0.0)
Cardiopulmonary resuscitation	119	(30)	0.1	(0.0)
Other	11,723	(1,796)	9.5	(1.4)

. . . Category not applicable.

0.0 Quantity more than zero but less than 0.05.

[1]Combined total of procedures exceeds "all visits," and percent of visits exceeds 100%, because more than one procedures may be reported per visit.

[2]The "none" checkbox was marked on the Patient Record form (PRF).

[3]No checkboxes were marked on PRF.

Table 19. Medication therapy and number of medications mentioned at emergency department visits: United States, 2008

Medication therapy[1]	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)
All visits	123,761	(4,918)	100.0	. . .
Visits with mention of medication[2]	96,419	(4,034)	77.9	(0.7)
Number of medications provided or prescribed[3]:				
1	31,749	(1,338)	25.7	(0.5)
2	26,925	(1,090)	21.8	(0.3)
3	17,789	(889)	14.4	(0.4)
4	9,897	(590)	8.0	(0.3)
5	4,845	(311)	3.9	(0.2)
6	2,440	(224)	2.0	(0.1)
7	1,316	(152)	1.1	(0.1)
8	1,460	(268)	1.2	(0.2)
Visits without mention of medication	27,343	(1,307)	22.1	(0.7)

. . . Category not applicable.

[1]Includes prescription drugs, over-the-counter preparations, immunizations, and desensitizing agents.

[2]Visits at which one or more medications were provided or prescribed.

[3]There were 238,301,000 drug mentions at emergency department visits in 2008. The average drug mention rate was 1.9 drug mentions per emergency department visit (SE = 0.04). For visits with at least one drug mention, the average drug visit rate was 2.5 drugs per visit (SE = 0.04).

NOTE: Numbers may not add to totals because of rounding.

Table 20. Twenty most frequently mentioned drugs by therapeutic drug categories at emergency department visits: United States, 2008

Drug category[1]	Number of occurrence in thousands	(Standard error in thousands)	Percent of drug mentions[2,3]	(Standard error of percent)
Analgesics[3]	85,473	(4,265)	35.9	(0.5)
Antiemetic or antivertigo agents	26,798	(1,440)	11.2	(0.3)
Antihistamines	12,075	(699)	5.1	(0.2)
Anxiolytics, sedatives, and hypnotics	10,353	(574)	4.3	(0.1)
Minerals and electrolytes	10,301	(951)	4.3	(0.3)
Bronchodilators	8,572	(661)	3.6	(0.2)
Cephalosporins	7,806	(410)	3.3	(0.1)
Penicillins	7,444	(405)	3.1	(0.1)
Miscellaneous respiratory agents	7,191	(851)	3.0	(0.3)
Adrenal cortical steroids	7,160	(422)	3.0	(0.1)
Miscellaneous antibiotics	6,803	(390)	2.9	(0.1)
Anticonvulsants	6,102	(395)	2.6	(0.1)
Quinolones	5,402	(338)	2.3	(0.1)
Macrolide derivatives	4,282	(265)	1.8	(0.1)
Dermatological agents	4,210	(304)	1.8	(0.1)
Antiplatelet agents	4,097	(325)	1.7	(0.1)
Muscle relaxants	3,777	(289)	1.6	(0.1)
Antiparkinson agents	3,741	(261)	1.6	(0.1)
Antiarrhythmic agents	3,714	(245)	1.6	(0.1)
Local injectable anesthetics	3,328	(250)	1.4	(0.1)

[1]Based on Multum Lexicon second-level therapeutic drug category (see: http://www.multum.com/Lexicon.htm).

[2]Based on an estimated 238,301,000 drug mentions at emergency department visits in 2008.

[3]Mentions refers to drugs provided or prescribed.

[3]Includes narcotic and nonnarcotic analgesics and nonsteroidal anti-inflammatory drugs.

Table 21. Twenty most frequently mentioned drug names at emergency department visits: United States, 2008

					Percent of mentions[1] (standard error of percent)			
Drug name[1]	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Given in emergency department	Prescribed at discharge	Unknown[3]	Therapeutic drug category[3]
All drug mentions	238,341	(11,365)	100.0	. . .	64.2 (1.0)	43.6 (1.1)	2.1 (0.4)	. . .
Ibuprofen	17,000	(1,025)	7.1	(0.3)	3.3 (0.2)	4.7 (0.2)	*0.2 (0.1)	Analgesics
Acetaminophen-hydrocodone . . .	14,466	(926)	6.1	(0.3)	2.2 (0.1)	4.9 (0.2)	*0.1 (0.0)	Analgesics
Acetaminophen	11,333	(724)	4.8	(0.2)	2.8 (0.1)	2.3 (0.2)	*0.1 (0.1)	Analgesics
Ondansetron	9,382	(621)	3.9	(0.2)	3.7 (0.2)	0.5 (0.0)	*0.1 (0.0)	Antiemetic or antivertigo agents
Ketorolac	7,630	(413)	3.2	(0.1)	3.0 (0.1)	0.3 (0.0)	0.0 (0.0)	Analgesics
Morphine	7,097	(485)	3.0	(0.2)	2.9 (0.2)	0.1 (0.0)	*0.1 (0.0)	Analgesics
Sodium chloride	7,065	(846)	3.0	(0.3)	2.9 (0.3)	0.0 (0.0)	0.1 (0.0)	Minerals and electrolytes or miscellaneous respiratory agents
Promethazine	6,913	(484)	2.9	(0.2)	2.2 (0.1)	1.0 (0.1)	*0.0 (0.0)	Antiemetic or antivertigo agents or antihistamines
Hydromorphone	5,711	(518)	2.4	(0.2)	2.3 (0.2)	0.1 (0.0)	0.0 (0.0)	Analgesics
Acetaminophen-oxycodone	5,258	(533)	2.2	(0.2)	1.0 (0.1)	1.6 (0.1)	*0.0 (0.0)	Analgesics
Albuterol.	5,000	(406)	2.1	(0.1)	1.4 (0.1)	1.1 (0.1)	0.0 (0.0)	Bronchodilators
Azithromycin	3,828	(253)	1.6	(0.1)	0.7 (0.0)	1.1 (0.1)	*0.0 (0.0)	Macrolide derivatives
Aspirin	3,696	(289)	1.6	(0.1)	1.4 (0.1)	*0.2 (0.1)	*0.0 (0.0)	Analgesics or antiplatelet agents
Diphenhydramine	3,586	(249)	1.5	(0.1)	1.1 (0.1)	0.6 (0.0)	*0.0 (0.0)	Antiemetic or antivertigo agents or antihistamines or antiparkinson agents or anxiolytics, sedatives, and hypnotics
Amoxicillin.	3,564	(276)	1.5	(0.1)	0.3 (0.0)	1.4 (0.1)	*0.0 (0.0)	Penicillins
Ceftriaxone	3,284	(210)	1.4	(0.1)	1.3 (0.1)	0.1 (0.0)	*0.0 (0.0)	Cephalosporins
Sulfamethoxazole-trimethoprim . .	3,154	(222)	1.3	(0.1)	0.4 (0.0)	1.1 (0.1)	*0.0 (0.0)	Miscellaneous antibiotics or sulfonamides
Cephalexin	3,084	(215)	1.3	(0.1)	0.4 (0.0)	1.1 (0.1)	*0.0 (0.0)	Cephalosporins
Lorazepam	3,071	(233)	1.3	(0.1)	1.1 (0.1)	0.2 (0.0)	*0.0 (0.0)	Anticonvulsants; antiemetic or antivertigo agents; or anxiolytics, sedatives, and hypnotics"
Methylprednisolone	2,889	(216)	1.2	(0.1)	0.9 (0.1)	0.3 (0.0)	*0.0 (0.0)	Adrenal cortical steroids
All other	111,329	(5,528)	46.7	(0.6)	29.0 (0.5)	20.8 (0.7)	1.1 (0.2)	

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

[1]Mentions refers to drugs provided or prescribed.

[2]Based on Multum Lexicon terminology, drug name reflects the active ingredients of a drug mention.

[3]Unknown includes drugs provided or prescribed that did not have either the "given in ED" or "prescribed at discharge" check boxes marked.

[4]Based on Multum Lexicon second-level therapeutic drug category (see: http://www.multum.com/lexicon.htm).

Table 22. Providers seen at emergency department visits: United States, 2008

Type of provider	Number of visits in thousands	(Standard error in thousands)	Percent of visits	(Standard error of percent)
All visits	123,761	(4,918)	. . .	. . .
Registered nurse or licensed practical nurse	114,299	(4,819)	92.4	(1.0)
Any physician	111,248	(4,411)	89.9	(0.8)
Emergency department attending physician	107,038	(4,380)	86.5	(1.3)
Emergency department resident or intern	12,003	(1,683)	9.7	(1.3)
Other on-call attending physician, fellow, or resident	5,898	(855)	4.8	(0.7)
Physician assistant	10,765	(1,265)	8.7	(0.9)
Emergency medical technican	10,730	(1,365)	8.7	(1.1)
Nurse practitioner	4,450	(546)	3.6	(0.4)
Other	32,775	(2,657)	26.5	(2.0)
Blank	1,435	(183)	1.2	(0.1)

. . . Category not applicable.

[1]Combined total of providers seen exceeds ''all visits,'' and percent of visits exceeds 100%, because more than one provider may be reported per visit.

Table 23. Dispostion of emergency department visits: United States, 2008

Disposition	Number of visits in thousands	(Standard error in thousands)	Percent of visits	(Standard error of percent)
All visits	123,761	(4,918)	. . .	. . .
Admitted, transferred, or died				
Admitted to hospital	16,559	(1,021)	13.4	(0.6)
Step-down or telemetry unit	3,217	(298)	2.6	(0.2)
Critical care unit[2]	2,124	(261)	1.7	(0.2)
Operating room	716	(90)	0.6	(0.1)
Mental health or detoxification unit	603	(85)	0.5	(0.1)
Cardiac catheterization lab	176	(34)	0.1	(0.0)
Other bed or unit	7,242	(497)	5.9	(0.4)
Unknown or blank	2,481	(454)	2.0	(0.3)
Admitted to observation unit	2,318	(234)	1.9	(0.2)
Transferred to different hospital	2,095	(178)	1.7	(0.1)
Died in emergency department	139	(31)	0.1	(0.0)
Outpatient follow-up				
Returned or referred to physician or clinic for follow-up	79,916	(3,557)	64.6	(1.2)
Returned to emergency department as needed or by appointment	43,661	(2,776)	35.3	(2.0)
No follow-up planned	6,266	(800)	5.1	(0.6)
Referred to social services	1,037	(125)	0.8	(0.1)
Left or referred out from triage				
Left before medical screening exam	2,014	(206)	1.6	(0.1)
Left after medical screening exam	1,275	(175)	1.0	(0.1)
Left against medical advice	1,255	(111)	1.0	(0.1)
Other	861	(164)	0.7	(0.1)
Blank	792	(151)	0.6	(0.1)

. . .Category not applicable.

0.0 Quantity more than zero but less than 0.05.

[1]Combined total of dispositions exceeds "all visits," and percent of visits exceeds 100%, because more than one disposition may be reported per visit.

[2]Critical care units include intensive care and coronary care units.

Table 24. Emergency department visits resulting in hospital admission, by selected patient and visit characteristics: United States, 2008

Selected characteristic	Number of visits in thousands	(Standard error in thousands)	Percent of visits	(Standard error of percent)	Mean length of stay in days[1]	(Standard error in days)	Admissions as percent of visits	(Standard error of percent)
All admissions	16,559	(1,021)	100.0	. . .	5.5	(0.2)	13.4	(0.0)
Age								
Under 15 years	816	(117)	4.9	(0.6)	4.0	(0.4)	3.5	(0.6)
15–24 years	823	(85)	5.0	(0.5)	4.2	(0.2)	4.2	(0.4)
25–24 years	2,838	(229)	17.1	(0.8)	5.2	(0.3)	8.1	(0.5)
45–64 years	4,939	(353)	29.8	(0.9)	5.2	(0.2)	18.8	(1.0)
65–74 years	2,316	(154)	14.0	(0.6)	5.9	(0.3)	31.0	(1.4)
75 years and over	4,828	(363)	29.2	(1.2)	6.1	(0.2)	41.0	(1.7)
Residence								
Private residence	13,690	(878)	82.7	(1.5)	5.3	(0.2)	12.1	(0.5)
Nursing home	1,215	(114)	7.3	(0.6)	7.3	(0.4)	48.5	(2.4)
Other institution	250	(41)	1.5	(0.2)	6.3	(0.6)	26.2	(3.5)
Other residence	186	(39)	1.1	(0.2)	5.1	(0.7)	20.1	(4.4)
Homeless	99	(28)	0.6	(0.2)	5.5	(0.7)	18.0	(4.4)
Unknown or blank	1,119	(250)	6.8	(1.4)	6.0	(0.6)	20.2	(2.7)
Expected source of payment[2]								
Private insurance	7,279	(536)	44.0	(1.7)	5.2	(0.1)	14.0	(1.2)
Medicare	7,620	(527)	46.0	(1.3)	6.1	(0.2)	33.4	(1.3)
Medicaid or SCHIP[3]	3,205	(264)	19.4	(1.1)	5.5	(0.3)	10.8	(0.7)
No insurance[4]	1,341	(167)	8.1	(0.9)	4.9	(0.4)	6.1	(0.6)
Mode of arrival								
Ambulance	6,759	(501)	40.8	(1.1)	6.0	(0.2)	34.5	(1.2)
Other	9,800	(581)	59.2	(1.1)	5.1	(0.1)	9.4	(0.4)
Triage category								
Immediate or emergent[5]	5,814	(456)	35.1	(1.7)	5.7	(0.3)	30.1	(1.9)
Other	10,745	(728)	64.9	(1.7)	5.3	(0.1)	10.3	(0.5)
Patient seen in this emergency department within the last 72 hours								
Yes	581	(70)	3.5	(0.4)	5.3	(0.7)	13.8	(1.4)
No, unknown, or blank	15,978	(985)	96.5	(0.4)	5.5	(0.2)	13.4	(0.6)
Patient discharged from any hospital within the last 7 days								
Yes	970	(98)	5.9	(0.5)	6.0	(0.6)	34.6	(2.6)
No, unknown, or blank	15,589	(975)	94.1	(0.5)	5.4	(0.1)	12.9	(0.6)
Length of stay								
1–2 days	3,172	(267)	19.2	(1.1)	. . .	. . .	. . .	. . .
3–4 days	5,297	(345)	32.0	(1.2)	. . .	. . .	. . .	. . .
5–6 days	2,944	(217)	17.8	(0.8)	. . .	. . .	. . .	. . .
7–8 days	1,280	(116)	7.7	(0.5)	. . .	. . .	. . .	. . .
9–10 days	636	(70)	3.8	(0.4)	. . .	. . .	. . .	. . .
More than 10 days	1,324	(133)	8.0	(0.6)	. . .	. . .	. . .	. . .
Unknown or blank	1,906	(351)	11.5	(1.9)	. . .	. . .	. . .	. . .
Hospital discharge status								
Alive	14,063	(887)	85.0	(1.9)	5.4	(0.2)	. . .	. . .
Home or residence	11,449	(770)	81.4	(1.7)	5.1	(0.1)	. . .	. . .
Transferred to another hospital	1,058	(135)	7.5	(0.8)	7.3	(0.5)	. . .	. . .
Other	771	(109)	5.5	(0.7)	7.4	(0.5)	. . .	. . .
Unknown or blank	785	(171)	5.6	(1.2)	5.3	(0.6)	. . .	. . .
Died	376	(52)	2.3	(0.3)	8.8	(0.9)	. . .	. . .
Unknown or blank	2,120	(358)	12.8	(1.9)	5.9	(0.7)	. . .	. . .

. . . Category not applicable.

0.0 Quantitiy more than zero but less than 0.05.

[1]Denominator for length of stay is 14,653,000 visits where this variable was known. Length of stay was unknown in 11.5 percent of visits resulting in admission.

[2]Combined total exceeds "all admissions," and percent of visits exceeds 100%, because more than one source of payment may be reported per visit. Workers' compensation, other, and unknown sources of payment are not included in this table but account for 8.7 percent of expected sources of payment.

[3]SCHIP is State Children's Health Insurance Program.

[4]No insurance is defined as having only self-pay, or no charge or charity as payment sources.

[5]Emergent is needing to be seen within 1–14 minutes.

NOTE: Numbers may not add to totals because of rounding.

Table 25. Twenty leading principal hospital discharge diagnosis groups for emergency department visits: United States, 2008

Principal diagnosis group and ICD–9–CM code(s)[1]	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)
All visits . . .	16,559	(1,021)	100.0	. . .
Heart disease, excluding ischemic . . . 391–392.0,393–398,402,404,415–416,420–429	1,001	(93)	6.0	(0.5)
Chest pain . . . 786.5	888	(99)	5.4	(0.5)
Pneumonia . . . 480–486	673	(76)	4.1	(0.4)
Ischemic heart disease . . . 410–414.9	445	(63)	2.7	(0.3)
Cerebrovascular disease . . . 430–438	443	(56)	2.7	(0.3)
Malignant neoplasms . . . 140–208,230–234	345	(55)	2.1	(0.3)
Psychoses, excluding major depressive disorder . . . 290–295,296.0–296.1,296.4–299	315	(49)	1.9	(0.3)
Asthma . . . 493	299	(59)	1.8	(0.3)
Cellulitis and abscess . . . 681–682	298	(41)	1.8	(0.2)
Gastrointestinal hemmorhage . . . 578	291	(54)	1.8	(0.3)
Urinary tract infection, site not specified . . . 599.0	288	(50)	1.7	(0.3)
Chronic and unspecified bronchitis . . . 490–491	283	(41)	1.7	(0.2)
Fracture of the lower limb . . . 820–829	264	(42)	1.6	(0.2)
Abdominal pain . . . 789.0	262	(61)	1.6	(0.4)
Syncope and collapse . . . 780.2	250	(39)	1.5	(0.2)
Diabetes mellitus . . . 250	242	(41)	1.5	(0.2)
Anemia . . . 280–285	217	(37)	1.3	(0.2)
Dyspnea and respiratory abnormalities . . . 786.0	194	(40)	1.2	(0.2)
Noninfectious entertis and colitis . . . 555–558	194	(32)	1.2	(0.2)
Fractures, excluding lower limb . . . 800–819	190	(34)	1.1	(0.2)
All other diagnoses[2] . . .	9,176	(636)	55.4	(1.3)

. . . Category not applicable.

[1]Based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD–9–CM)(U.S. Department of Health and Human Services. Centers for Medicare and Medicaid Services. Official version: International Classification of Diseases, Ninth Revision, Clinical Modification, Sixth Edition. DHHS Pub No. (PHS) 06–1260). However, certain codes have been combined in this table to better describe the utilization of ambulatory care services.

[2]All other diagnoses include blanks and the 15.5 percent of hospital discharges where the discharge diagnosis was unknown or blank.

NOTE: Numbers may not add to totals because of rounding.

Table 26. Visit volume and metropolitan status of emergency department visits, by selected characteristics: United States 2008

Hospital and ED characteristics	ED[1] annual visit volume								Metropolitan status			
	Total[2]		Fewer than 20,000		20,000 to 50,000		50,000 or more		Metropilitan statistical area		Not a metropolitan statistical area	
	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
All EDs	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .
Hospital characteristic												
Number of days in week that elective surgeries are scheduled:												
0–4	*12.6	(3.9)	*24.6	(7.4)	*1.5	(1.1)	*1.4	(0.9)	*3.6	(1.9)	*27.6	(9.0)
5	68.5	(4.4)	65.8	(8.0)	69.2	(4.8)	74.6	(4.0)	69.7	(3.9)	66.3	(9.6)
6–7	10.2	(1.9)	*3.6	(1.6)	15.8	(3.9)	17.4	(3.8)	15.3	(2.8)	*1.7	(1.3)
Unknown or blank	8.8	(2.2)	*6.1	(2.8)	*13.4	(4.6)	*6.7	(2.3)	11.4	(3.1)	*4.3	(2.9)
Has bed coordinator:												
Yes	58.1	(4.4)	38.1	(7.1)	69.5	(5.5)	91.4	(2.2)	68.8	(4.6)	40.3	(8.1)
No	34.3	(4.6)	54.4	(7.6)	21.3	(4.6)	*4.2	(2.0)	26.9	(4.6)	46.7	(8.9)
Unknown or blank	*7.6	(2.5)	*7.5	(4.1)	*9.2	(4.2)	*4.4	(1.9)	*4.3	(2.0)	*13.0	(5.8)
How often hospital bed census data are available:												
Instantaneously	70.4	(3.7)	70.7	(6.7)	67.7	(4.8)	74.9	(4.5)	68.8	(3.9)	73.0	(7.6)
Every 4 hours	4.3	(0.9)	4.1	(0.8)	*3.8	(2.0)	*5.8	(2.7)	*3.9	(1.4)	4.9	(1.0)
Every 8 hours	*1.4	(0.6)	*0	. . .	*0.7	(0.6)	*7.2	(3.5)	*2.3	(1.0)	*0	. . .
Every 12 hours	*4.7	(1.8)	*4.6	(3.1)	*6.2	(2.8)	*1.5	(1.1)	*5.7	(2.4)	*3.0	(2.9)
Every 24 hours	9.6	(2.9)	*12.9	(5.3)	*7.9	(3.0)	*3.8	(1.6)	*11.3	(3.5)	*6.9	(4.9)
Other	*0.5	(0.3)	*0	. . .	*1.3	(0.9)	*0	. . .	*0.7	(0.5)	*0	. . .
Unknown or blank	9.2	(2.4)	*7.6	(2.9)	*12.4	(5.1)	*6.8	(2.2)	*7.3	(2.7)	*12.3	(4.4)
ED characteristic												
ED uses electronic medical records:												
Yes, all electronic	22.7	(3.6)	*13.6	(5.9)	28.1	(4.6)	37.3	(6.4)	25.1	(3.3)	*18.7	(7.8)
Yes, part electronic	49.0	(3.6)	53.2	(6.4)	42.3	(5.3)	50.9	(6.7)	44.3	(4.2)	56.9	(6.4)
No	28.3	(4.2)	33.0	(7.3)	29.6	(5.9)	*11.8	(4.2)	30.5	(5.0)	*24.5	(7.6)
Unknown or blank	*0.0	(0.0)	*0.1	(0.1)	*0	. . .	*0	. . .	*0.1	(0.1)	*0	. . .
ED has observation or clinical decision unit:												
Yes	32.1	(3.8)	24.7	(5.7)	30.8	(5.4)	56.0	(6.8)	36.7	(4.6)	24.5	(6.3)
No	66.3	(3.9)	74.2	(5.8)	68.0	(5.4)	39.9	(6.6)	61.0	(4.7)	74.9	(6.4)
Unknown or blank	*1.6	(0.6)	*1.1	(0.6)	*1.1	(0.7)	*4.0	(2.2)	*2.3	(0.8)	0.6	(0.6)
Observation or clinical decision unit is adminstratively part of the ED or inpatient side of the hospital[3]												
Part of ED	62.0	(6.7)	*	. . .	58.6	(9.2)	68.1	(8.9)	63.0	(6.4)	*	. . .
Part of inpatient side of hospital	30.1	(6.2)	*	. . .	37.3	(9.2)	*13.9	(5.2)	25.9	(5.0)	*	. . .
Unknown or blank	*7.9	(3.4)	*	. . .	*4.1	(2.8)	*18.0	(9.4)	*11.1	(4.6)	*	. . .
Admitted ED patients ever boarded for more than 2 hours in the ED while waiting for an inpatient bed:												
Yes	61.4	(5.2)	35.9	(8.3)	83.5	(3.0)	88.7	(4.0)	73.9	(4.3)	40.7	(10.4)
No	35.9	(5.3)	63.1	(8.4)	11.3	(2.9)	*9.1	(4.0)	22.1	(4.4)	58.8	(10.4)
Unknown or blank	*2.7	(1.2)	*1.1	(0.6)	*5.2	(3.2)	*2.3	(1.6)	*4.0	(1.9)	*0.6	(0.6)

Table 26. Visit volume and metropolitan status of emergency department visits, by selected characteristics: United States 2008—Con.

Hospital and ED characteristics	ED[1] annual visit volume								Metropolitan status			
	Total[2]		Fewer than 20,000		20,000 to 50,000		50,000 or more		Metropilitan statistical area		Not a metropolitan statistical area	
	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
If ED is critically overloaded, admitted patients are boarded in inpatient hallways or in another space outside the ED:												
Yes	17.5	(3.1)	*14.1	(5.2)	20.1	(3.9)	21.9	(5.6)	19.8	(3.5)	*13.7	(5.7)
No	80.1	(3.2)	83.8	(5.3)	78.1	(3.9)	73.8	(6.2)	77.6	(3.6)	84.3	(5.8)
Unknown or blank	*2.4	(0.8)	*2.1	(1.2)	*1.7	(0.8)	*4.3	(2.0)	*2.6	(0.9)	*2.0	(1.5)
ED went on ambulance diversion 2007:												
Yes	30.8	(3.5)	*12.5	(4.6)	42.9	(5.1)	57.9	(6.0)	43.3	(4.5)	*9.9	(4.7)
No	55.2	(3.7)	80.3	(5.2)	36.5	(5.0)	22.2	(5.3)	36.5	(4.1)	86.1	(5.3)
Unknown or blank	14.1	(2.5)	*7.3	(3.5)	20.6	(4.4)	19.9	(4.1)	20.1	(3.6)	*4.0	(2.6)
Ambulance diversion is actively managed on a regional versus hospital level[4]:												
Yes	47.4	(4.6)	*	. . .	47.4	(6.5)	57.1	(5.8)	47.6	(4.6)	*	. . .
No	45.5	(4.7)	*	. . .	49.0	(6.4)	31.2	(5.3)	46.1	(4.5)	*	. . .
Unknown or blank	7.1	(2.0)	*	. . .	*3.6	(1.5)	*11.7	(3.9)	6.3	(1.8)	*	. . .
Hospital continues to admit elective or scheduled surgery cases when ED is on ambulance diversion[4]:												
Yes	69.3	(4.9)	*	. . .	70.9	(5.8)	75.9	(5.6)	73.7	(4.4)	*	. . .
No	12.8	(3.1)	*	. . .	*12.4	(3.7)	*9.7	(4.2)	11.6	(2.5)	*	. . .
Unknown or blank	17.9	(4.3)	*	. . .	*16.7	(5.3)	14.4	(4.1)	14.7	(4.0)	*	. . .
ED increased the number of standard treatment spaces in last 2 years:												
Yes	27.9	(3.3)	21.4	(5.0)	29.4	(4.4)	43.7	(6.7)	34.2	(4.3)	17.5	(4.4)
No	69.6	(3.3)	77.8	(5.0)	67.2	(4.6)	51.0	(6.8)	63.8	(4.3)	79.2	(5.0)
Unknown or blank	*2.5	(1.1)	*0.8	(0.5)	*3.4	(2.8)	*5.3	(2.2)	*2.0	(0.7)	*3.3	(2.7)
ED's physical space was expanded in last 2 years:												
Yes	22.4	(3.0)	17.8	(4.4)	26.5	(4.6)	26.8	(5.9)	27.7	(4.1)	13.5	(3.3)
No	76.2	(3.1)	81.4	(4.5)	72.5	(4.6)	68.8	(6.3)	70.3	(4.2)	85.9	(3.4)
Unknown or blank	*1.5	(0.5)	*0.8	(0.5)	*1.0	(0.6)	*4.4	(2.0)	*2.0	(0.7)	*0.6	(0.6)
ED plans to expand physical space in next 2 years[4]:												
Yes	28.3	(4.0)	26.5	(6.5)	27.7	(5.4)	35.3	(6.3)	30.0	(4.4)	25.9	(7.4)
No	56.8	(4.3)	58.2	(7.2)	56.5	(6.1)	52.8	(6.9)	56.9	(4.9)	56.6	(7.9)
Unknown or blank	14.9	(3.7)	*15.3	(6.6)	*15.8	(5.1)	*11.9	(3.7)	13.1	(3.6)	*17.5	(7.5)
ED uses:												
Bedside registration	72.3	(3.8)	54.3	(7.5)	87.3	(3.2)	92.6	(2.5)	83.4	(3.8)	53.8	(8.7)
Computer-assisted triage	46.5	(4.6)	26.9	(7.2)	61.4	(4.8)	71.4	(6.0)	57.6	(4.7)	28.0	(8.1)
Separate fast track unit for nonurgent care	34.9	(3.2)	*8.2	(3.6)	52.2	(5.1)	75.3	(5.9)	53.1	(4.5)	*4.7	(2.5)
Separate operating room dedicated to ED patients	3.1	(0.9)	*0	. . .	*4.2	(1.8)	*9.7	(3.6)	4.9	(1.4)	*0	. . .
Electronic dashboard[5]	40.7	(4.1)	*12.7	(5.4)	61.7	(5.5)	77.3	(3.9)	58.8	(4.4)	*10.8	(5.4)
Radio frequency identification tracking[6]	11.8	(2.3)	*6.5	(3.2)	15.2	(3.5)	19.8	(5.7)	15.0	(2.7)	*6.3	(3.9)
Zone nursing[7]	37.5	(2.9)	16.9	(4.2)	51.3	(5.2)	67.9	(5.3)	51.3	(3.9)	14.8	(4.1)
Pool nurses[8]	44.8	(4.3)	43.3	(7.4)	44.8	(5.5)	49.0	(5.5)	54.0	(4.5)	29.5	(7.2)
Full capacity protocol[9]	27.0	(3.0)	25.8	(5.2)	24.2	(4.4)	36.3	(7.0)	30.6	(3.7)	21.1	(4.9)
None of the above	12.4	(3.4)	24.7	(6.5)	*1.4	(1.3)	*0	. . .	*2.3	(1.7)	29.1	(8.0)

. . . Category not applicable.

0 Quantity equals zero.

0.0 Quantity more than zero, but less than 0.05.

* Figure does not meet standards of reliability or precision. Only an asterisk (*) appears in the table if the estimates for the entire category are based on fewer than 30 cases in the sample data. Estimates based on 30 or more cases include an asterisk if the relative standard error of the estimate exceeds 30 percent.

[1]ED is emergency department.

[2]Number of sampled records: all EDs (N = 331); less than 20,000 (N = 68); 20,000–50,000 (N = 140); 50,000 or more (N = 123); metropolitan area (N = 279); and not a metropolitan area (N = 52).

[3]Denominator is number of EDs with observation or clinical decision units.

[4]Denominator is number of emergency departments that did not expand their physical space in the last 2 years.

[5]An electronic dashboard displays updated patient information and integrates multiple data sources.

[6]Radio frequency identification tracking shows the exact location of patients, caregivers, and equipment.

[7]Zone nursing refers to all of a nurse's patients being located in one area.

[8]Pool nurses are those that can be pulled to the ED to respond to surges in demand.

[9]A full capacity protocol allows some admitted patients to move from the emergency department to inpatient corridors while awaiting a bed.

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Vital and Health Statistics

Series 13, Number 169

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Ambulatory Medical Care Utilization Estimates for 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

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Data From the National Health Care Surveys

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

Hyattsville, Maryland
April 2011
DHHS Publication No. (PHS) 2011–1740

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Abstract

Objectives

This report presents statistics on ambulatory care visits to physician offices, hospital outpatient departments (OPDs), and hospital emergency departments (EDs) in the United States in 2007. Ambulatory medical care utilization is described in terms of patient, provider, and visit characteristics.

Methods

Data from the 2007 National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey were combined to produce annual estimates of ambulatory medical care utilization.

Results

Patients in the United States made an estimated 1.2 billion visits to physician offices and hospital OPDs and EDs, a rate of 405.0 visits per 100 persons annually. This was not significantly different than the rate of 381.9 visits per 100 persons in 2006, neither were significant differences found in overall visit rates by age, sex, or geographic region. Visit distribution by ambulatory care setting differed by poverty level in the patient's ZIP Code of residence, with higher proportions of visits to hospital OPDs and EDs as poverty levels increased. Between 1997 and 2007, the age-adjusted visit rate increased by 11 percent, fueled mainly by a 29 percent increase in the visit rate to medical specialty offices. Nonillness and noninjury conditions, such as general and prenatal exams, accounted for the largest percentage of ambulatory care diagnoses in 2007, about 19 per 100 visits. Seven of 10 ambulatory care visits had at least one medication provided, prescribed, or continued in 2007, for a total of 2.7 billion drugs overall. These were not significantly different than 2006 figures. Analgesics were the most common therapeutic category, accounting for 13.1 drugs per 100 drugs reported, and were most often utilized at primary care and ED visits. The number of viral vaccines that were ordered or provided increased by 79 percent, from 33.2 million occurrences in 2006 to 59.3 million in 2007; significant increases were also noted for anticonvulsants and antiemetics.

Keywords: ambulatory care visits • diagnoses • injury • medications

Ambulatory Medical Care Utilization Estimates for 2007

by Susan M. Schappert, M.A., and Elizabeth A. Rechtsteiner, M.S., Division of Health Care Statistics

Introduction

This report presents summary information on the utilization of ambulatory medical care across physician offices and hospital emergency departments (EDs) and outpatient departments (OPDs). Physician offices are further classified by the physician specialty: primary care, surgical, and medical. The tables present total visits across all settings as well as percent distributions by setting type. Data are from the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS), which are part of the ambulatory care component of the National Health Care Surveys, a family of provider-based surveys conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS).

Methods

Individual reports are available that contain detailed methods and analyses by setting: physician offices (1), OPDs (2), and EDs (3). A brief overview of NAMCS and NHAMCS methodology, highlighting issues of concern to this report, is presented below.

Data Source

The estimates of ambulatory medical care use presented in this report are based on a national probability sample survey of visits to nonfederal office-based physicians (NAMCS), and a national probability sample survey of the emergency and outpatient departments of nonfederal general and short-stay hospitals in the 50 states and District of Columbia (NHAMCS). These reports, issued annually, provide a comprehensive analysis of visits to ambulatory health care settings in the United States. Estimates of visits are made from a sample of medical record abstracts from each sampled provider during defined reporting periods, weighted to provide national annual estimates. More information on the sampling design and scope of the surveys can be found at http://www.cdc.gov/nchs/ahcd.htm.

In 2007, of the 3,540 physicians who were sampled in NAMCS, 2,399 were found to be in scope, or eligible to participate. A total of 1,568 physicians participated, yielding an unweighted response rate of 64.7 percent (64.1 percent weighted). Some physicians did not provide the expected number of visit records, thereby reducing the unweighted total visit response rate to 60.9 percent (60.5 percent weighted). Sampled physicians were asked to complete Patient Record forms (PRFs) for a systematic random sample of approximately 30 office visits occurring during a randomly assigned 1-week reporting period. The total number of PRFs completed for 2007 was 32,778.

For NHAMCS, hospital staffs were asked to complete PRFs for a sample of visits during a 4-week reporting period. Of the 482 hospitals sampled in the 2007 NHAMCS, 384 were in scope and had eligible EDs, and 357 of these EDs responded (ED-level response rate of 93.0 percent unweighted and 92.6 percent weighted for the probability of selection). A total of 438 of the 477 emergency service areas (ESAs) within the participating EDs responded and provided 35,490 PRFs. Of these 438 ESAs, 432 responded fully or adequately by providing at least one-half of their expected forms (ESA-level response rate of 90.6 percent unweighted and 93.1 weighted). The overall response rate, which is the product of the response rates of the EDs and the ESAs, was 84.2 percent unweighted and 86.2 percent weighted.

Of the 482 hospitals selected for the 2007 NHAMCS, 252 were in scope and had eligible OPDs, and 214 of these OPDs responded (OPD-level response rate of 84.9 percent unweighted and 82.5 percent weighted for the probability of selection). A total of 932 of the 1,069 clinics within the participating OPDs responded and provided 34,473 PRFs. Of these 932 clinics, 911 responded fully or adequately by providing at least one-half of their expected forms (clinic-level response rate of 85.2 percent unweighted and 74.4 percent weighted). The overall response rate, which is the product of the response rates of the OPDs and clinics, was 72.4 percent unweighted and 61.3 percent weighted.

Data collection for both surveys was conducted by the U.S. Census Bureau. In many cases, medical providers or their staffs completed the NAMCS and NHAMCS PRFs. However, for 57 percent of physician office visits, 57 percent of ED visits, and 53 percent of OPD visits, data were obtained through Census field staff abstraction of medical records.

Injury Data

The injury data presented in this report were collected using a slightly different format depending on ambulatory care setting. In physician offices and hospital OPDs, injury data were collected using a checkbox item that asked if the visit is related to unintentional injury/poisoning, intentional injury/poisoning, injury/poisoning of unknown intent, adverse effect of medical/surgical care or adverse effect of medicinal drug, or none of the above. In hospital EDs, a yes/no question was asked as to whether the visit is related to injury, poisoning, or adverse effect of medical treatment. Subsequent questions collected data on the intentionality and cause of the injury. For all settings, an additional injury item was created which considered a visit as injury related based on both the specific injury questions as well as the presence of an injury-related reason for visit or provider diagnosis.

Drug Coding

Starting with the 2006 data release, drugs collected in NAMCS and NHAMCS are coded in terms of their generic components and therapeutic classifications using Lexicon Plus, a proprietary database of Cerner Multum, Inc. Lexicon Plus is a comprehensive database of all prescription and some nonprescription drug products available in the U.S. drug market. Because of this change, therapeutic class information presented in this report will not be comparable with years of data prior to 2006, which were coded using the National Drug Code Directory. More information about the Multum Lexicon and how researchers can conduct drug trend analysis with NAMCS and NHAMCS data is available at http://www.cdc.gov/nchs/ahcd.htm. For additional information on the Multum Lexicon Drug Database, please refer to http://www.multum.com/Lexicon.htm.

Race and Ethnicity

Race and ethnicity data were each missing for more than 30 percent of NAMCS records in 2007. Race data were missing for 13 percent of ED and 12 percent of OPD records, while ethnicity data were missing from 19 percent of ED and 21 percent of OPD records. Missing race and ethnicity data were imputed for both surveys using a method that was based, where possible, on diagnosis and patient's locality (ZIP Code or state/county of residence). A hot deck approach (i.e., filling in missing values on incomplete records using values from similar but complete records of the same dataset) was employed starting with 2006 data, except in cases where a matching record could not be obtained from the current data. When race or ethnicity data could not be assigned using patient locality, the method attempted to impute within the same physician office or hospital wherever possible. Failing that, imputation was based on physician specialty and diagnosis (NAMCS) and diagnosis, hospital, and clinic (NHAMCS), and, as a last resort, on a randomly selected record. An internal NCHS evaluation study found that this approach more correctly identified patients' race and ethnicity than did the method used in 2005 and previous years. Further refinements to the imputation strategy are being studied for future use. Because of the high percentages of missing data for race and ethnicity in 2007, statistical comparisons have not been included in the text and readers are advised to use these data with caution. In the tables, both imputed and unimputed race and ethnicity data are presented.

Estimation

Because of the complex multistage design of both NAMCS and NHAMCS, a sample weight is computed for each sample visit that takes all design stages into account. Survey data were inflated or weighted to produce unbiased national annual estimates. The visit weight includes four basic components: inflation by reciprocals of selection probabilities, adjustment for nonresponse, population ratio adjustments, and weight smoothing. These are described in more detail in the references previously cited (1–3).

The standard error is primarily a measure of the sampling variability that occurs by chance because only a sample rather than an entire universe is surveyed. Estimates of the sampling variability for this report were calculated using the Taylor series linearization method in SUDAAN, which takes into account the complex sample design of NAMCS and NHAMCS. A description of the software and its approach has been published (4). The standard errors of statistics presented in this report are included in each of the tables.

Tests of Significance

In this report, the determination of statistical inference is based on the two-tailed *t* test. The Bonferroni inequality was used to establish the critical value for statistically significant differences (0.05 level of significance) based on the number of possible comparisons within a particular variable (or combination of variables) of interest. A weighted least-squares regression analysis was used to determine the significance of trends at the 0.05 level. Chi-square tests to analyze the association between poverty level, educational level, and median household income in the patient's ZIP Code of residence were performed using PROC CROSSTAB in SUDAAN. Terms relating to differences such as ''greater than'' or ''less than'' indicate that the difference is statistically significant. Differences not mentioned may or may not be statistically significant.

Use of Tables

In this report, estimates are not presented if they are based on fewer than 30 cases in the sample data; only an asterisk (*) appears in the tables. The relative standard error (RSE) of an estimate is obtained by dividing the standard error by the estimate itself. The result is then expressed as a percentage of the estimate. Estimates based on 30 or more cases include an asterisk (*) if the RSE of the estimate exceeds 30 percent.

In the tables, estimates of ambulatory care visits have been rounded to the nearest thousand. Consequently, estimates will not always add to totals. Rates and percentages were calculated from original unrounded figures and do not necessarily agree with figures calculated from rounded data. Denominators used in computing estimates of visit rates by expected source of payment were obtained from the 2007 National Health Interview Survey. Population estimates for insurance coverage were recoded from multiple sources to a primary source of coverage using the following hierarchy: Medicare, Medicaid/ SCHIP, Private Insurance, and No Insurance.

Results

There were 1.2 billion visits to physician offices and hospital emergency and outpatient departments in the United States during 2007, a rate of 405.0 visits per 100 persons annually. About one-half of ambulatory medical care visits (48.1 percent) were made to primary care physicians in office-based practices. The rest were to medical specialists (18.4 percent) and surgical specialists (16.4 percent) in office-based practices, and to EDs (9.7 percent) and OPDs (7.4 percent) in nonfederal general and short-stay hospitals (Table 1).

Estimates of ambulatory care visits by patient race and ethnicity are shown separately in Table 2. The race and ethnicity data are presented in two ways: first with missing responses imputed and added to reported data, and second with reported data only (i.e., missing data are shown) (see the ''Methods'' section). This was done so that readers could see the effects of both nonresponse and imputation on the resulting estimates.

Visit rates by selected patient and provider characteristics are shown in Table 3; none differed significantly from 2006 rates. Visit rates for persons with no insurance for the care provided (i.e., expected payment from solely self-pay, no charge, or charity) were lowest for all three office-based settings compared with visit rates for persons with various kinds of insurance. In contrast, the visit rate to EDs for the uninsured (41.6 visits per 100 persons) was about twice the rate of persons with private insurance (19.9 visits per 100 persons).

As shown in Figure 1, from 1997 through 2007, the annual number of ambulatory care visits increased by 25 percent, driven both by the aging of the population, as older persons have higher visit rates than younger persons in general, and by an increase in utilization by older persons. After adjustment for changes in the age distribution of the population between 1997 and 2007, the overall rate of visits increased by 10.6 percent, from 364.3 to 403.1 visits per 100 persons. The age-adjusted rate of visits to office-based medical specialists showed the most significant change, increasing 29.5 percent, from 56.4 visits per 100 persons in 1997 to 73.0 visits per 100 persons in 2007 (Figure 2). Rates of visits to primary care and surgical specialists, and to hospital emergency and outpatient departments, were not

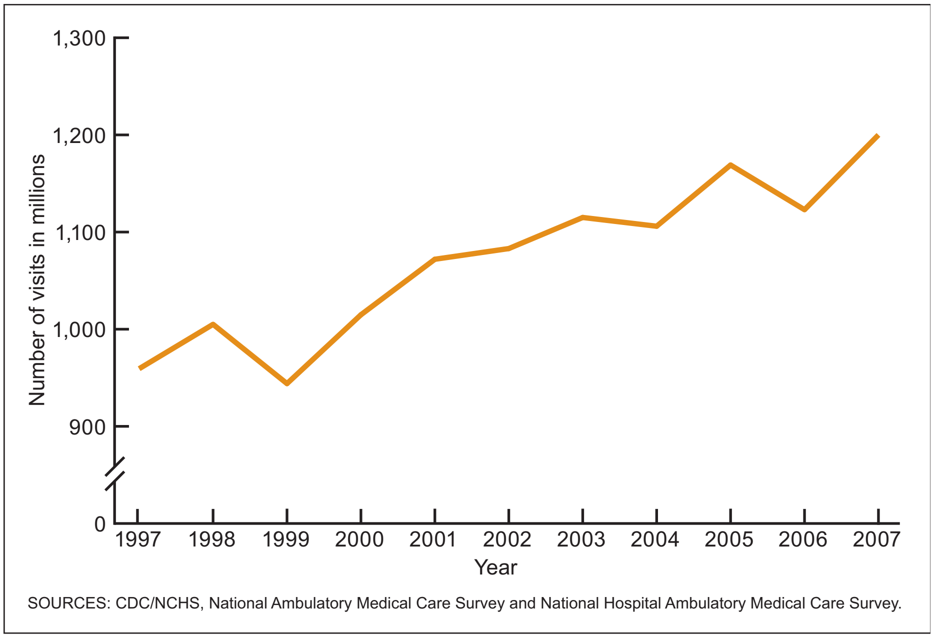


Figure 1. Annual number of ambulatory care visits: United States, 1997–2007

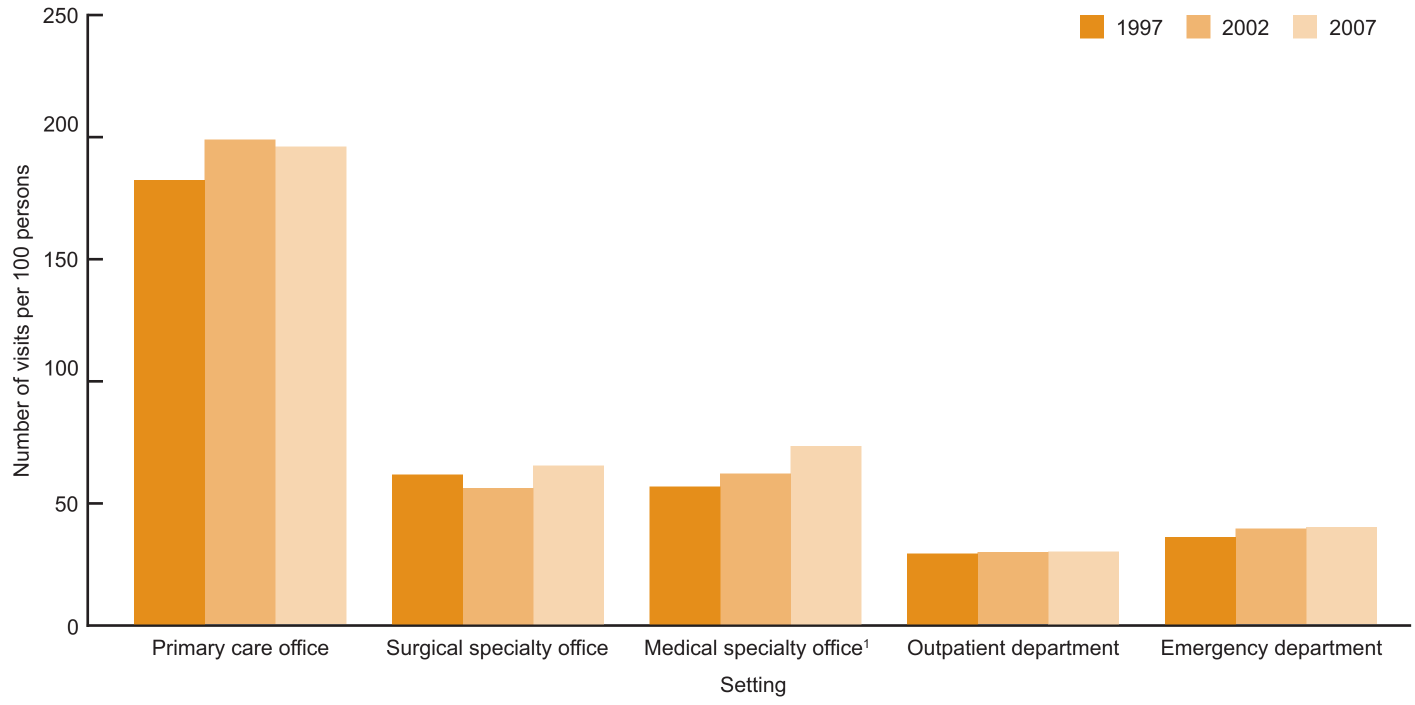


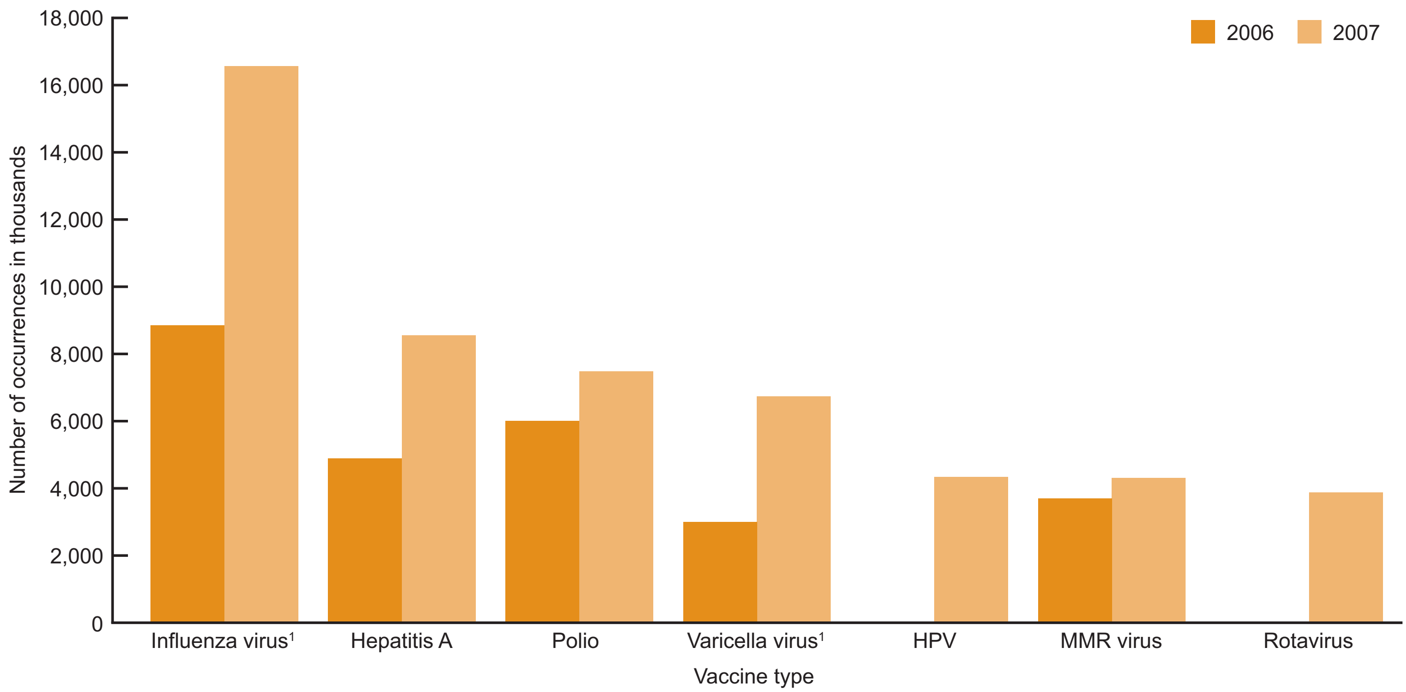
Figure 2. Age-adjusted ambulatory care visit rates by setting: United States, 1997, 2002, and 2007

significantly different in 1997, 2002, and 2007. Readers should note that the NAMCS estimator was revised with the 2003 data release, based on new information obtained through the physician induction interview starting in 2001. Data shown subsequent to 2002 in Figures 1 and 2 reflect the new estimator and so are not strictly comparable with data years prior to 2003. This change in the methodology and its effect on NAMCS estimates has been described in greater detail elsewhere (5).

Estimates of ambulatory care visit rates by patient race and ethnicity are shown separately in Table 4. It should be noted that in Table 4, both imputed and unimputed data are provided for those who wish to understand the effects of imputation on the data, or who wish to conduct a complete-case analysis and can use the unimputed columns on the right side of each table for benchmarking purposes. However, the ''best'' estimates of ambulatory care visit rates by race and ethnicity remain those on the left side of each table, which include both reported (known) and imputed data, subject to the caveats discussed in the ''Methods'' section.

The relationship between characteristics of the patient's ZIP Code and the choice of ambulatory care setting is shown in Table 5. For persons living in areas where the poverty level was above 40 percent, 31.8 percent of ambulatory care visits were to hospital OPDs and EDs. (While this would appear to indicate a change from the 2006 figure of 45.8 percent, the difference is not statistically significant.) In contrast, for persons living in areas where the poverty level was less than 5 percent, only 11.0 percent of visits were to hospital outpatient and emergency departments. Ambulatory care setting was significantly associated with poverty level, educational level, and median household income in the patient's ZIP Code of residence. In general, higher levels of education and income and lower levels of poverty were associated with higher proportions of visits to office-based physicians and lower levels of visits to hospital-based ambulatory settings.

Essential hypertension was the primary illness diagnosis recorded most frequently (46.3 million) at ambulatory care visits, or 3.9 percent of the total. Eight out of 10 of these visits (36.6 million) occurred in primary care offices, accounting for 6.3 percent of the 576.6 million visits to this setting in 2007. About one-fifth (19.6 percent) of all ambulatory care visits in 2007 had diagnoses of nonillness or noninjury conditions, such as routine checkups and pregnancy exams (data not shown). Routine infant or child health check led the list of nonillness conditions with 43.3 million visits in 2007, or 3.6 percent of all ambulatory care visits. All but 4 of the top 35 diagnoses were also among the top 35 reported in 2006; no significant changes were noted between any, except for a small increase in visits for benign neoplasms. Table 6 shows the 35 leading diagnoses by setting and Table 7 shows the complete classification of primary diagnoses ordered by diagnosis group with breakdowns across ambulatory care settings. Because of the detail shown in Table 7, estimates from 2006 and 2007



[1]Significant difference ($p < 0.05$).
NOTES: HPV is human papillomavirus. MMR is measles-mumps-rubella. Data for HPV vaccine and rotavirus vaccine for 2006 are not shown due to small sample sizes.
SOURCES: CDC/NCHS, National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey.

Figure 3. Number of occurrences of selected viral vaccines at ambulatory care visits: United States, 2006 and 2007

were averaged to improve reliability. The classification scheme used in Table 7 is described in the text Table.

Table 8 shows data on injury visits. There were an estimated 156.8 million injury visits in 2007, or 13.1 percent of all ambulatory medical care visits. About one-quarter (25.1 percent) were made to hospital EDs. Injury visit rates were significantly higher for persons aged 65–74 and 75 and over than for all other age groups. However, older persons utilized nonemergency settings for injury visits proportionately more often than younger persons did. About 31 percent of injury visits by those under age 45 were to EDs compared with 18 percent of injury visits by those aged 45 and over (calculated from data in Table 8). Males under age 24 had higher rates of injury visits than females, but rates were not different for other age categories.

In 2007, medication therapy was reported at 73.5 percent of all ambulatory care visits, not significantly different than the 71.6 percent of visits in 2006. An estimated 2.7 billion medications, including over-the-counter preparations, immunizations, allergy shots, anesthetics, and dietary supplements, were provided, prescribed, or continued at ambulatory care visits (Table 9). Each such occurrence is referred to as a ‘‘drug mention’’ in NAMCS and NHAMCS. Central nervous system agents were the most common therapeutic category (22.7 drugs per 100 drug mentions). Within that group, analgesics were most frequently reported, accounting for 13.1 drugs per 100 mentions, and were most often utilized at primary care and ED visits (Tables 10 and 11). Among the broad therapeutic classes, cardiovascular agents (15.4 mentions per 100 drugs) and respiratory agents (9.6 mentions per 100 drugs) were also prominent. Small but significant increases were noted for anticonvulsant drugs and antiemetics.

Although viral vaccines account for only a small proportion of all drug mentions in general, they were reported significantly more often in 2007 than in 2006, up 79 percent from 33.2 million to 59.3 million occurrences. This increase appears to be driven mainly by four vaccines: influenza virus vaccine, occurrences of which jumped 88 percent from 2006 to 2007; varicella virus vaccine, up 127 percent since 2006; human papillomavirus (HPV) vaccine; and rotavirus vaccine (Figure 3). Influenza virus vaccine was the most frequently reported viral vaccine, accounting for 27.9 percent of all viral vaccines reported at ambulatory care visits, while varicella virus vaccine accounted for 11.3 percent (data not shown).

In February 2007, the Advisory Committee on Immunization Practices (ACIP), a panel of experts who provide guidance to the Secretary and Assistant Secretary at the Department of Health and Human Services, and to CDC, released their recommendations for the 2007–2008 flu season. These included some updates from the previous season’s recommendations, specifically that children aged 6 months through 8 years should now receive two doses of vaccine if they had not been vaccinated previously, and that children aged 6 months through 8 years who received only one dose in their first year of vaccination should now receive two doses the following year (6). NAMCS and NHAMCS data for 2007 showed significant increases in the number and rate of visits by children under age 15 where influenza virus vaccine was provided or prescribed (data not shown). It should be kept in mind that NAMCS does not include certain sites where people are likely to receive influenza vaccines (for example, schools, workplaces, and retail settings). Therefore, NAMCS data will underestimate the number of such vaccines actually administered (7).

In June 2006, ACIP voted to recommend that all children should routinely receive two doses of varicella vaccine, rather than the single dose previously recommended. In addition, the committee recommended that all adolescents and adults who missed the second dose be given a ''catch-up'' dose of vaccine (8).

The HPV vaccine, manufactured by Merck and Company, Inc. and marketed as Gardasil, was approved by the Food and Drug Administration (FDA) in June 2006 (9). It became the first vaccine to be marketed for the prevention of cancer; it is effective against the virus that causes most cervical, vaginal, and vulvar cancers and genital warts. It was also recently approved (October 2009) by FDA for the prevention of genital warts in boys and men (10). Reports of HPV vaccine were few in the 2006 NAMCS and NHAMCS data, but by 2007 the vaccine accounted for 7.3 percent of all viral vaccines reported (data not shown).

In 2006, a new vaccine against rotavirus, a common cause of gastroenteritis in infants and children, was approved by FDA (11). Like the HPV vaccine, this vaccine (RotaTeq by Merck) was barely found in the 2006 NAMCS and NHAMCS data but accounted for 6.5 percent of all viral vaccines in 2007. It replaced an earlier rotavirus vaccine first introduced in 1998 (RotaShield, by Wyeth) that was voluntarily discontinued by the manufacturer in 1999 (ibid). A second rotavirus vaccine (Rotarix, by GlaxoSmithKline) was approved by FDA in 2008 (12).

While the overall rate at which drugs were prescribed at ambulatory care visits did not increase overall compared with 2006, the rate increased significantly for visits to surgical specialists, from 112.5 drugs per 100 visits in 2006 to 163.6 drugs per 100 visits in 2007. The percentage of visits to surgical specialists at which drugs were prescribed also rose from 45.8 percent in 2006 to 55.0 percent in 2007. The use of drug therapy increased significantly at all settings between 1997 and 2007 (Figure 4) and for many specialty groups including internal medicine, pediatrics, obstetrics and gynecology, orthopedic surgery, urology, psychiatry, neurology, and ophthalmology (Figure 5).

For more information or to download NCHS reports or 2007 NAMCS and NHAMCS public-use microdata visit files, visit http://www.cdc.gov/nchs/ahcd.htm.

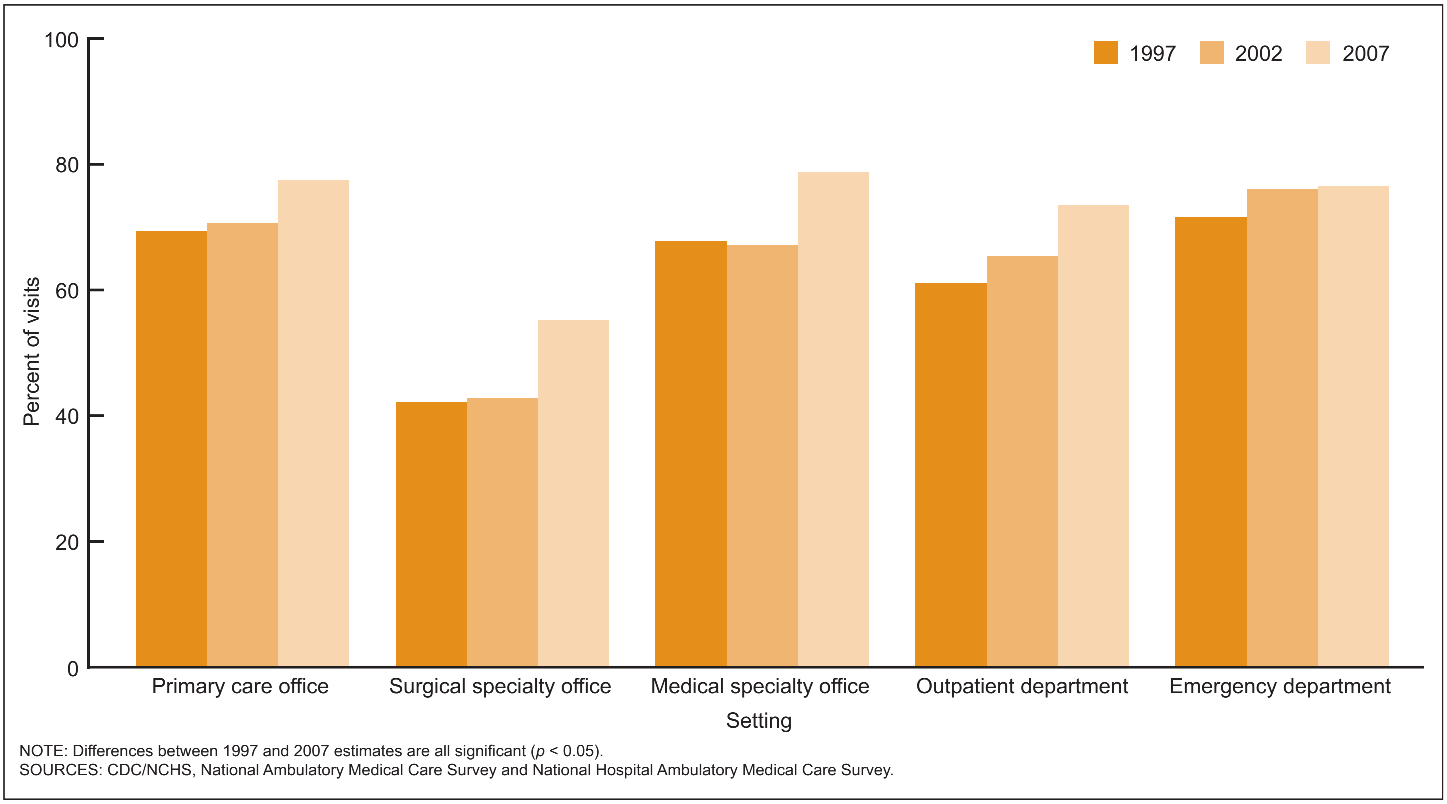


Figure 4. Percentage of ambulatory care visits at which drugs were prescribed, provided, or continued, by setting: United States, 1997, 2002, and 2007

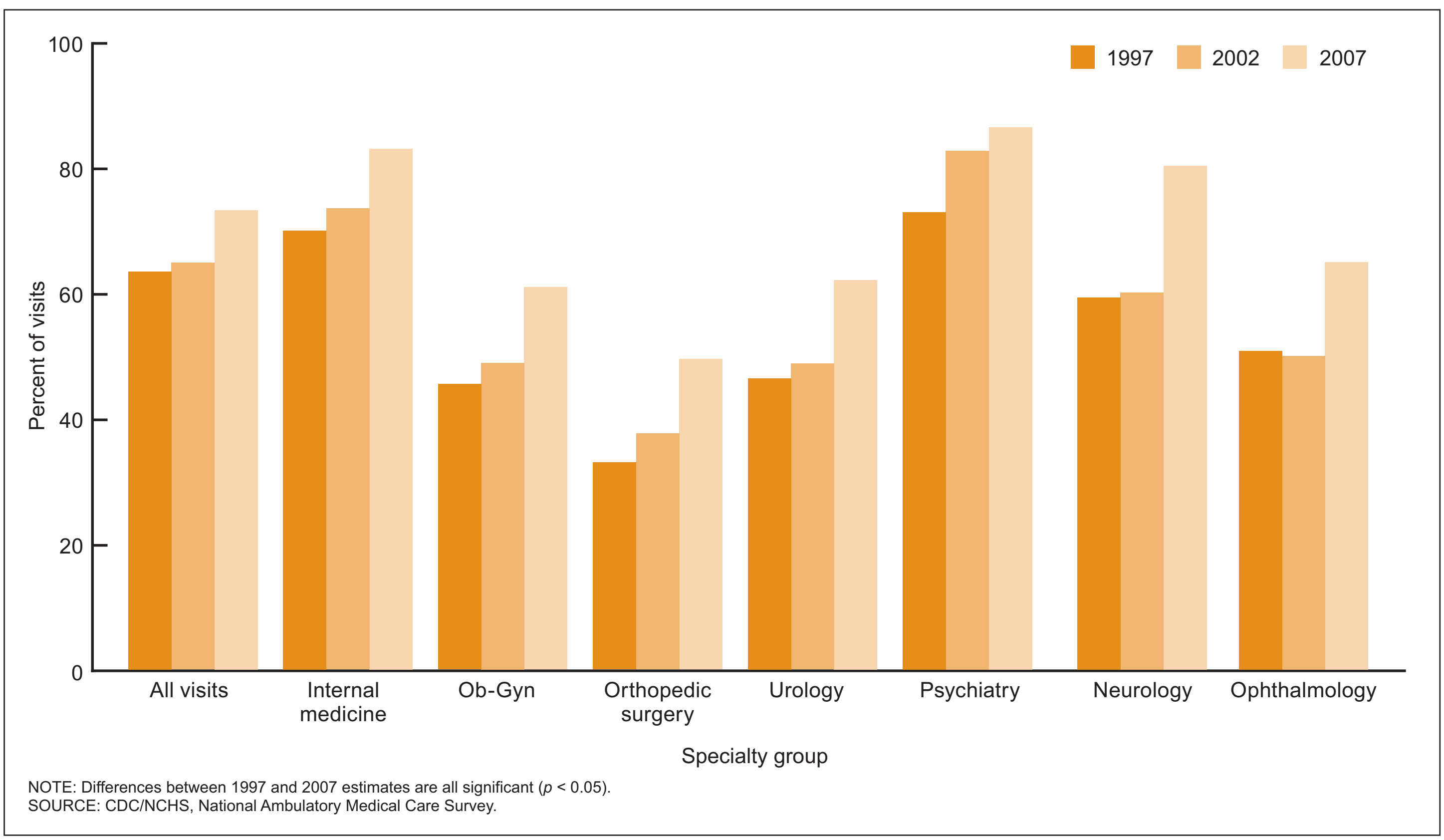


Figure 5. Percentage of office visits at which drugs were prescribed, provided, or continued, by selected specialty groups: United States, 1997, 2002, and 2007

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Table. Reclassification of diagnosis codes for use with National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey data: United States, 2006–2007

Diagnosis group	ICD–9–CM code[1]
Infectious and parasitic diseases	001–139
Streptococcal sore throat	034.0
HIV[2] disease	042
Viral warts	078.1
Unspecified viral and chlamydial infections	079.9
Dermatophytosis	110
Candidiasis	112
Other infectious and parasitic diseases	001–033,034.1–041.9,045.0–078.0,078.2–079.8,080–104,111,114–139
Neoplasms	140–239
Malignant neoplasm of colon and rectum	153–154,197.5
Malignant neoplasm of skin	172–173,176.0,198.2
Malignant neoplasm of breast	174–175,198.81
Malignant neoplasm of prostate	185
Malignant neoplasm of lymphatic and hematopoietic tissue	176.5,196,200–208
Other malignant neoplasms	140–152,155–171,176.1–176.4,176.6–184,186–195,197.0–197.4,197.6–198.1, 198.3–198.7,198.82–199,230–234
Benign neoplasm of skin	216
Other benign neoplasm	210–215,217–229
Neoplasm of uncertain behavior and unspecified nature	235–239
Endocrine, nutritional and metabolic diseases, and immunity disorders	240–279
Acquired hypothyroidism	244
Other disorders of the thyroid gland	240–243,245–246
Diabetes mellitus	250
Disorders of lipoid metabolism	272
Obesity	278.0
Other endocrine, nutritional and metabolic diseases, and immunity disorders	251–271,273–277,278.1–279
Diseases of the blood and blood-forming organs	280–289
Anemias	280–285
Other diseases of the blood and blood-forming organs	286–289
Mental disorders	290–319
Schizophrenic disorders	295
Major depressive disorder	296.2–296.3
Other psychoses	290–294,296.0–296.1,296.4–299
Anxiety states	300.0
Neurotic depression	300.4
Alcohol dependence syndrome	303
Drug dependence and nondependent abuse of drugs	304–305
Acute reaction to stress and adjustment reaction	308–309
Depressive disorder, not elsewhere classified	311
Attention deficit disorder	314.0
Other mental disorders	300.1–300.3,300.5–300.9,301–302,306–307,310,312–313,314.1–319
Diseases of the nervous system and sense organs	320–389
Migraine	346
Other disorders of the central nervous system	320–326,330–337,340–345,347–349
Carpal tunnel syndrome	354.0
Other disorders of the nervous system	350–353,354.1–359
Retinal detachment and other retinal disorders	361–362
Glaucoma	365
Cataract	366
Disorders of refraction and accommodation	367
Conjunctivitis	372.0–372.3
Disorders of eyelids	373–374
Other disorders of the eye and adnexa	360,363–364,368–369, 370–371,372.4–372.9,375–379
Disorders of external ear	380
Otitis media and eustachian tube disorders	381–382
Other diseases of the ear and mastoid process	383–389
Diseases of the circulatory system	390–459
Angina pectoris	413
Coronary atherosclerosis	414.0
Other ischemic heart disease	410–412,414.1–414.9
Cardiac dysrhythmias	427

See footnotes at end of table.

Table. Reclassification of diagnosis codes for use with National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey data: United States, 2006–2007—Con.

Diagnosis group	ICD–9–CM code[1]
Congestive heart failure	428.0
Other heart disease	391–392.0,393–398,402,404,415–416,420–426,428.1–429
Essential hypertension	401
Cerebrovascular disease	430–438
Diseases of the arteries, arterioles, and capillaries	440–448
Hemorrhoids	455
Other diseases of the circulatory system	390,392.9,403,405,417,451–454,456–459
Diseases of the respiratory system	460–519
Acute sinusitis	461
Acute pharyngitis	462
Acute tonsillitis	463
Acute bronchitis and bronchiolitis	466
Other acute respiratory infections	460,464–465
Chronic sinusitis	473
Allergic rhinitis	477
Pneumonia	480–486
Chronic and unspecified bronchitis	490–491
Asthma	493
Other chronic obstructive pulmonary disease and allied conditions	492,494–496
Other diseases of the respiratory system	470–472,474–476,478,487,500–519
Diseases of the digestive system	520–579
Diseases of the teeth and supporting structures	520–525
Gastritis and duodenitis	535
Esophagitis	530.1
Ulcer of stomach and small intestine	531–534
Hernia of abdominal cavity	550–553
Noninfectious enteritis and colitis	555–558
Diverticula of intestine	562
Constipation	564.0
Irritable bowel syndrome	564.1
Anal and rectal diseases	565–566,569.0–569.4
Disorders of the gallbladder and biliary tract	574–576
Gastrointestinal hemorrhage	578
Other diseases of the digestive system	526.0–530.0,530.2–530.9,536–543,560,564.2–564.9, 576–568,569.5–573.9,577,579
Diseases of the genitourinary system	580–629
Calculus of kidney and ureter	592
Cystitis and other disorders of the bladder	595–596
Urinary tract infection, site not specified	599.0
Other diseases of the urinary system	580–589,590–591,593–594,597–598,599.1–599.9
Hyperplasia of prostate	600
Other disorders of male genital organs	601–608
Disorders of breast	610–611
Inflammatory disorders of female pelvic organs	614–616
Noninflammatory disorders of female genital organs	620,622–624
Disorders of menstruation and abnormal bleeding	626
Menopausal and postmenopausal disorders	627
Other disorders of the female genital tract	617–619,621,625,628,629
Complications of pregnancy, childbirth, and the puerperium	630–677
Diseases of the skin and subcutaneous tissue	680–709
Cellulitis and abscess	681–682
Other infection of the skin and subcutaneous tissue	680,683–686
Contact dermatitis and other eczema	692
Psoriasis and similar disorders	696
Other inflammatory conditions of skin and subcutaneous tissue	690–691,693–695,697–698
Corns, callosities, and other hypertrophic and atrophic skin conditions	700–701
Actinic and seborrheic keratosis	702.0–702.1
Acne	706.0–706.1
Sebaceous cyst	706.2
Urticaria	708
Other disorders of the skin and subcutaneous tissue	702.8,703–705,706.3–707.9,709

See footnotes at end of table.

Table. Reclassification of diagnosis codes for use with National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey data: United States, 2006–2007—Con.

Diagnosis group	ICD–9–CM code[1]
Diseases of the musculoskeletal system and connective tissue	710–739
Rheumatoid arthritis	714.0
Osteoarthrosis and allied disorders	715
Other arthropathies and related disorders	710–713,714.1–714.9,716
Derangements and other and unspecified joint disorders	717–719
Intervertebral disc disorders	722
Lumbago	724.2
Other dorsopathies	720–721,723.0–724.1,724.3–724.9
Peripheral enthesopathies and allied disorders	726
Synovitis and tenosynovitis	727.0
Myalgia and myositis, unspecified	729.1
Other rheumatism, excluding back	725,727.1–727.9,728,729.0,729.2–729.9
Disorders of bone and cartilage	730–733
Other diseases of the musculoskeletal system and connective tissue	734–739
Congenital anomalies	740–759
Certain conditions originating in the perinatal period	760–779
Symptoms, signs, and ill-defined conditions	780–799
Syncope and collapse	780.2
Convulsions	780.3
Dizziness and giddiness	780.4
Pyrexia of unknown origin	780.6
Symptoms involving skin and other integumentary tissue	782
Headache	784.0
Epistaxis	784.7
Abnormal heart sounds	785.0–785.3
Dyspnea and respiratory abnormalities	786.0
Cough	786.2
Chest pain	786.5
Symptoms involving urinary system	788
Abdominal pain	789.0
Other symptoms, signs and ill-defined conditions	780.0–780.1,780.5,780.7–780.9,781,783,784.1–784.6,784.8–784.9, 785.4–785.9,786.1,786.3–786.4,786.6–787.9,789.1–799.9
Injury and poisoning	800–999
Fracture of radius and ulna	813
Fracture of hand and fingers	814–817
Fracture of lower limb	820–829
Other fractures	800–812,818–819
Sprains and strains of wrist and hand	842
Sprains and strains of knee and leg	844
Sprains and strains of ankle	845.0
Sprains and strains of neck	847.0
Other sprains and strains of back	846,847.1–847.9
Other sprains and strains	840–841,843,845.1,848
Intracranial injury, excluding those with skull fracture	850–854
Open wound of head	870–873
Open wound of hand and fingers	882–883
Other open wound	874–881,884–897
Superficial injury of cornea	918.1
Other superficial injury	910.0–918.0,918.2,919.9
Contusion with intact skin surface	920–924
Other injuries	830–839,860–869,900–909,925–959
Poisonings	960–989
Other and unspecified effects of external causes	990–995
Complications of surgical and medical care, not elsewhere classified	996–999
Supplementary classification of factors influencing health status and contact with health services	V01–V82
Potential health hazards related to communicable diseases	V01–V09
Potential health hazards related to personal and family history	V10–V19
Routine infant or child health check	V20.2
Normal pregnancy	V22
Postpartum care and examination	V24

See footnotes at end of table.

Table. Reclassification of diagnosis codes for use with National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey data: United States, 2006–2007—Con.

Diagnosis group	ICD–9–CM code[1]
Encounter for contraceptive management	V25
Other encounter related to reproduction	V23–V24,V26–V28
Lens replaced by pseudophakos	V43.1
Artificial opening status and other postsurgical states	V44–V45
Attention to dressings and sutures	V58.3
Follow-up examination	V67
General medical examination	V70
Observation and evaluation for suspected conditions not found	V71
Gynecological examination	V72.3
Other factors influencing health status and contact with health services	V20.0–V20.1,V21,V29.0–V43.0,V43.2–V43.8,V46–V66,V68–V69, V72.0–V72.2,V72.4–V82.9

[1]Based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (13).
[2]HIV is human immunodeficiency virus.

Table 1. Ambulatory care visits by setting type, according to selected patient and provider characteristics: United States, 2007

Characteristic	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Number of visits in thousands					
All visits	1,200,017	576,650	196,598	221,073	88,894	116,802
Patient age						
Under 15 years	205,765	141,716	13,274	12,491	15,976	22,308
Under 1 year	38,072	29,014	1,367	*	3,187	3,766
1–4 years	69,220	50,346	3,682	2,162	4,689	8,340
5–14 years	98,473	62,356	8,225	9,591	8,099	10,202
15–24 years	111,171	55,852	11,269	14,453	10,613	18,983
25–44 years	259,318	131,076	28,591	43,494	22,672	33,485
45–64 years	334,088	139,637	68,647	75,606	25,707	24,491
65 years and over	289,675	108,369	74,816	75,029	13,926	17,535
65–74 years	142,528	54,431	36,449	36,925	7,815	6,908
75 years and over	147,147	53,938	38,367	38,104	6,111	10,627
Patient sex						
Female	699,206	354,044	104,025	122,472	55,494	63,170
Male	500,811	222,606	92,573	98,601	33,400	53,632
Expected source(s) of payment[1]						
Private insurance	721,961	375,919	128,787	136,222	35,453	45,580
Medicare	274,927	101,118	68,491	69,512	15,673	20,133
Medicare and Medicaid	23,613	8,349	3,506	5,586	2,694	3,478
Medicaid or SCHIP[2]	181,232	88,685	13,940	19,759	29,469	29,379
No insurance[3]	74,896	28,230	7,423	13,013	8,303	17,926
Self-pay	68,159	26,306	6,844	12,410	5,563	17,037
No charge or charity	7,529	*2,299	*	*651	*2,844	1,155
Worker's compensation	15,208	1,920	4,796	*5,759	910	1,823
Other	34,891	14,657	6,237	6,665	4,568	2,764
Unknown or blank	54,298	24,571	*6,925	*8,412	3,905	10,484
Geographic region of provider						
Northeast	221,676	89,505	42,607	46,291	22,789	20,484
Midwest	259,276	118,571	44,788	43,187	27,668	25,062
South	491,407	250,089	70,103	94,826	27,676	48,713
West	227,658	118,485	39,100	36,768	10,761	22,543
MSA[4] status of provider						
MSA	1,027,481	482,327	174,172	198,724	73,183	99,074
Not MSA	172,536	94,323	22,426	22,349	15,711	17,728
	Percent distribution					
All visits	100.0	48.1	16.4	18.4	7.4	9.7
Patient age						
Under 15 years	100.0	68.9	6.5	6.1	7.8	10.8
Under 1 year	100.0	76.2	3.6	*	8.4	9.9
1–4 years	100.0	72.7	5.3	3.1	6.8	12.0
5–14 years	100.0	63.3	8.4	9.7	8.2	10.4
15–24 years	100.0	50.2	10.1	13.0	9.5	17.1
25–44 years	100.0	50.5	11.0	16.8	8.7	12.9
45–64 years	100.0	41.8	20.5	22.6	7.7	7.3
65 years and over	100.0	37.4	25.8	25.9	4.8	6.1
65–74 years	100.0	38.2	25.6	25.9	5.5	4.8
75 years and over	100.0	36.7	26.1	25.9	4.2	7.2
Patient sex						
Female	100.0	50.6	14.9	17.5	7.9	9.0
Male	100.0	44.4	18.5	19.7	6.7	10.7

See footnotes at end of table.

Table 1. Ambulatory care visits by setting type, according to selected patient and provider characteristics: United States, 2007—Con.

Characteristic	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
Expected source(s) of payment			Percent distribution			
Private insurance	100.0	52.1	17.8	18.9	4.9	6.3
Medicare	100.0	36.8	24.9	25.3	5.7	7.3
Medicare and Medicaid	100.0	35.4	14.8	23.7	11.4	14.7
Medicaid or SCHIP[2]	100.0	48.9	7.7	10.9	16.3	16.2
No insurance[3]	100.0	37.7	9.9	17.4	11.1	23.9
Self-pay	100.0	38.6	10.0	18.2	8.2	25.0
No charge or charity	100.0	*30.5	*	*8.7	*37.8	15.3
Worker's compensation	100.0	12.6	31.5	37.9	6.0	12.0
Other	100.0	42.0	17.9	19.1	13.1	7.9
Unknown or blank	100.0	45.3	*12.8	15.5	7.2	19.3
Geographic region of provider						
Northeast	100.0	40.4	19.2	20.9	10.3	9.2
Midwest	100.0	45.7	17.3	16.7	10.7	9.7
South	100.0	50.9	14.3	19.3	5.6	9.9
West	100.0	52.0	17.2	16.2	4.7	9.9
MSA[4] status of provider						
MSA	100.0	46.9	17.0	19.3	7.1	9.6
Not MSA	100.0	54.7	13.0	13.0	9.1	10.3

* Figure does not meet standards of reliability or precision.

1 Sum of pay sources exceeds total number of visits because more than one pay source may be reported per visit.

2 SCHIP is State Children's Health Insurance Program.

3 Defined as having only self-pay, no charge, or charity as payment sources.

4 MSA is metropolitan statistical area.

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 2. Ambulatory care visits by setting type, according to patient race and ethnicity: United States, 2007

Characteristic	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Reported plus imputed[1,2,3] Number of visits in thousands						Reported only[1,4,5] Number of visits in thousands					
All visits	1,200,017	576,650	196,598	221,073	88,894	116,802	. . .	. . .	. . .	. . .	. . .	. . .
Race[6]												
Reported visits	855,289	387,711	129,874	163,399	74,851	99,455	855,289	387,711	129,874	163,399	74,851	99,455
Imputed (missing) visits	344,729	188,939	66,724	57,674	14,043	17,347	. . .	. . .	. . .	. . .	. . .	. . .
White	966,210	455,484	168,518	194,222	62,815	85,171	696,610	310,871	113,437	146,350	52,950	73,001
Black or African American	168,023	79,535	19,180	19,622	21,815	27,870	122,348	54,557	13,354	12,655	18,268	23,513
Asian	44,864	30,363	5,318	4,931	2,116	2,134	27,949	19,085	2,164	3,322	1,752	1,626
Native Hawaiian or Other Pacific Islander	4,261	2,581	*	*	*324	313	2,153	933	*	*	*300	*289
American Indian or Alaska Native	12,494	6,885	*2,690	1,300	*589	*1,031	3,416	1,358	*	*	*493	*773
Two or more races reported	4,166	1,802	*	*	*1,235	284	2,813	907	*	*	*1,087	*253
Ethnicity[6]												
Reported visits	805,515	373,770	123,820	151,779	68,443	87,702	805,515	373,770	123,820	151,779	68,443	87,702
Imputed (missing) visits	394,502	202,880	72,778	69,294	20,451	29,100	. . .	. . .	. . .	. . .	. . .	. . .
Hispanic or Latino	164,587	88,007	20,731	25,875	14,169	15,804	111,867	58,708	13,714	16,359	10,883	12,202
Not Hispanic or Latino	1,035,430	488,643	175,867	195,198	74,725	100,998	693,648	315,062	110,106	135,420	57,560	75,500
	Percent distribution of visits											
All visits	100.0	48.1	16.4	18.4	7.4	9.7	. . .	. . .	. . .	. . .	. . .	. . .
Race[6]												
Reported visits	100.0	45.3	15.2	19.1	8.8	11.6	100.0	45.3	15.2	19.1	8.8	11.6
Imputed (missing) visits	100.0	54.8	19.4	16.7	4.1	5.0	. . .	. . .	. . .	. . .	. . .	. . .
White	100.0	47.1	17.4	20.1	6.5	8.8	100.0	44.6	16.3	21.0	7.6	10.5
Black or African American	100.0	47.3	11.4	11.7	13.0	16.6	100.0	44.6	10.9	10.3	14.9	19.2
Asian	100.0	67.7	11.9	11.0	4.7	4.8	100.0	68.3	7.7	11.9	6.3	5.8
Native Hawaiian or Other Pacific Islander	100.0	60.6	*	*	*7.6	7.3	100.0	43.3	*	*	*13.9	13.4
American Indian or Alaska Native	100.0	55.1	21.5	10.4	*4.7	*8.3	100.0	39.8	*	*	*14.4	22.6
Two or more races reported	100.0	43.3	*	*	29.6	*6.8	100.0	32.2	*	*	38.6	*9.0
Ethnicity[6]												
Reported visits	100.0	46.4	15.4	18.8	8.5	10.9	100.0	46.4	15.4	18.8	8.5	10.9
Imputed (missing) visits	100.0	51.4	18.4	17.6	5.2	7.4	. . .	. . .	. . .	. . .	. . .	. . .
Hispanic or Latino	100.0	53.5	12.6	15.7	8.6	9.6	100.0	52.5	12.3	14.6	9.7	10.9
Not Hispanic or Latino	100.0	47.2	17.0	18.9	7.2	9.8	100.0	45.4	15.9	19.5	8.3	10.9

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]For 2007, race data were missing for 28.7 percent of visits, and ethnicity data were missing for 32.9 percent of visits. Readers are therefore advised to treat these data with caution. In this table, estimates based on imputed race and ethnicity data are shown separately from comparison estimates using unimputed data. Missing race and ethnicity were imputed using a hot deck approach rather than the previously used cold deck strategy. The imputation process is described more fully in the 2007 public-use documentation (http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm). Research is currently under way to evaluate further changes to the imputation strategy for use with 2008 data.

[2]Includes race that was reported directly and imputed values for the 28.7 percent of visits for which race was not reported.

[3]Includes ethnicity that was reported directly and imputed values for the 32.9 percent of visits for which ethnicity was not reported.

[4]Calculations are based on 855,289 visits (in thousands) with race reported directly. The 28.7 percent of visits for which race was missing are excluded from the denominator, so that readers can compare differences between estimates that include and exclude imputed race values.

[5]Calculations are based on 805,515 visits (in thousands) with ethnicity reported directly. The 32.9 percent of visits for which ethnicity was missing are excluded from the denominator, so that readers can compare differences between estimates that include and exclude imputed ethnicity values.

[6]The race groups White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, and multiple races include persons of Hispanic and not Hispanic origin. Persons of Hispanic origin may be of any race. Starting with data year 1999, race-specific estimates have been tabulated according to 1997 Standards for Federal Data on Race and Ethnicity and are not strictly comparable with estimates for earlier years. The percentage of visit records with multiple races indicated is small and lower than what is typically found for self-reported race in household surveys.

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 3. Rate of ambulatory care visits by setting type and selected patient and provider characteristics: United States, 2007

Characteristic	Combined settings		Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
	Number of visits per 100 persons[1,2,3]	(Standard error of rate)	Number of visits per 100 persons	(Standard error of rate)	Number of visits per 100 persons	(Standard error of rate)	Number of visits per 100 persons	(Standard error of rate)	Number of visits per 100 persons	(Standard error of rate)	Number of visits per 100 persons	(Standard error of rate)
All visits	405.0	(14.5)	194.6	(10.3)	66.4	(4.6)	74.6	(4.4)	30.0	(3.3)	39.4	(2.2)
Patient age												
Under 15 years	338.2	(19.3)	232.9	(18.0)	21.8	(3.0)	20.5	(3.8)	26.3	(3.5)	36.7	(3.1)
Under 1 year	895.1	(68.1)	682.1	(65.7)	32.1	(8.2)	*	. . .	74.9	(10.3)	88.5	(10.1)
1–4 years	420.4	(28.6)	305.8	(28.0)	22.4	(4.3)	13.1	(3.5)	28.5	(3.8)	50.7	(4.5)
5–14 years	245.4	(13.4)	155.4	(11.5)	20.5	(2.7)	23.9	(4.3)	20.2	(2.9)	25.4	(2.0)
15–24 years	267.9	(10.5)	134.6	(8.6)	27.2	(2.5)	34.8	(2.9)	25.6	(2.9)	45.7	(3.1)
25–44 years	317.5	(13.9)	160.5	(11.0)	35.0	(3.0)	53.3	(3.8)	27.8	(3.1)	41.0	(2.3)
45–64 years	439.3	(19.1)	183.6	(13.0)	90.3	(6.5)	99.4	(6.7)	33.8	(4.1)	32.2	(1.8)
65 years and over	799.2	(42.7)	299.0	(27.1)	206.4	(17.7)	207.0	(16.6)	38.4	(5.7)	48.4	(2.9)
65–74 years	745.9	(40.1)	284.9	(26.2)	190.8	(15.7)	193.2	(15.2)	40.9	(6.2)	36.2	(2.2)
75 years and over	858.6	(49.0)	314.7	(31.1)	223.9	(21.2)	222.3	(19.6)	35.7	(5.5)	62.0	(3.8)
Patient sex												
Female	462.3	(17.5)	234.1	(12.9)	68.8	(5.0)	81.0	(5.1)	36.7	(4.1)	41.8	(2.3)
Male	345.3	(12.8)	153.5	(8.9)	63.8	(4.4)	68.0	(4.5)	23.0	(2.5)	37.0	(2.1)
Primary expected source of payment[4]												
Private insurance	348.4	(14.2)	192.0	(11.6)	55.1	(3.9)	61.5	(4.0)	17.3	(2.5)	22.5	(1.5)
Medicare	696.5	(40.0)	256.2	(26.2)	173.5	(15.5)	176.1	(15.2)	39.7	(5.6)	51.0	(3.1)
Medicaid/SCHIP[5]	499.7	(30.9)	254.7	(25.6)	33.1	(4.3)	44.9	(6.7)	84.9	(10.6)	82.1	(5.3)
No insurance[6]	173.2	(13.0)	65.3	(10.2)	17.2	(3.6)	30.1	(4.9)	19.2	(4.3)	41.5	(3.1)
Geographic region of provider												
Northeast	411.7	(22.2)	166.2	(16.5)	79.1	(13.2)	86.0	(8.3)	42.3	(8.8)	38.0	(3.6)
Midwest	397.0	(31.7)	181.5	(18.4)	68.6	(9.6)	66.1	(9.5)	42.4	(7.9)	38.4	(4.1)
South	454.4	(29.4)	231.2	(22.6)	64.8	(6.9)	87.7	(9.3)	25.6	(5.9)	45.0	(4.3)
West	330.0	(24.1)	171.7	(15.3)	56.7	(9.1)	53.3	(7.0)	15.6	(3.6)	32.7	(4.7)
MSA[7] status of provider												
MSA	412.5	(17.6)	193.6	(11.4)	69.9	(5.4)	79.8	(5.3)	29.4	(3.5)	39.8	(2.6)
Not MSA	365.4	(56.1)	199.7	(39.4)	47.5	(11.5)	47.3	(13.0)	33.3	(9.8)	37.5	(4.7)

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

[1]Visit rates for age, sex, and region are based on the July 1, 2007 set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

[2]Population estimates by metropolitan statistical area status are based on estimates of the civilian noninstitutionalized population of the United States as of July 1, 2007 from the 2007 National Health Interview Survey, National Center for Health Statistics, compiled according to the December 2006 Office of Management and Budget definitions of core-based statistical areas. See http://www.census.gov/population/www/metroareas/metroarea.html for more about metropolitan statistical definitions.

[3]Population estimates for primary expected source of payment are based on data from the 2007 National Health Interview Survey that were recoded according to the following hierarchy: Medicare, Medicaid/SCHIP, Private Insurance, and No Insurance.

[4]Derived by recoding the expected sources of payment item according to the following hierarchy: Medicare, Medicaid/SCHIP, Private Insurance, and No Insurance. "No insurance" reflects visits for which only self-pay, no charge, or charity were reported as the expected source(s) of payment.

[5]SCHIP is State Children's Health Insurance Program.

[6]Defined as having only self-pay, no charge, or charity as payment sources.

[7]MSA is metropolitan statistical area.

NOTE: The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 4. Rate of ambulatory care visits by setting type, and patient race and ethnicity: United States, 2007

Characteristic	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Reported plus imputed[1,2,3] Number of visits per 100 persons[6,7]						Reported only[1,4,5] Number of visits per 100 persons[6,7]					
All visits	405.0	194.6	66.4	74.6	30.0	39.4	. . .	. . .	. . .	. . .	. . .	. . .
Race												
Reported visits	288.7	130.8	43.8	55.1	25.3	33.6	288.7	130.8	43.8	55.1	25.3	33.6
Imputed (missing) visits	116.3	63.8	22.5	19.5	4.7	5.9	. . .	. . .	. . .	. . .	. . .	. . .
White	406.9	191.8	71.0	81.8	26.5	35.9	293.4	130.9	47.8	61.6	22.3	30.7
Black or African American	449.9	212.9	51.4	52.5	58.4	74.6	327.6	146.1	35.8	33.9	48.9	63.0
Asian	337.4	228.3	40.0	37.1	15.9	16.0	210.2	143.5	16.3	25.0	13.2	12.2
Native Hawaiian or Other Pacific Islander	807.0	488.8	*	*	*61.4	*59.2	407.7	176.7	*	*	*56.8	*54.8
American Indian or Alaska Native	433.1	238.7	*93.2	*45.1	*20.4	*35.7	118.4	47.1	*	*	*17.1	*26.8
Two or more races reported	86.7	37.5	*	*	*25.7	*5.9	58.6	18.9	*	*	*22.6	*5.3
Ethnicity												
Reported visits	271.9	126.1	41.8	51.2	23.1	29.6	271.9	126.1	41.8	51.2	23.1	29.6
Imputed (missing) visits	133.1	68.5	24.6	23.4	6.9	9.8	. . .	. . .	. . .	. . .	. . .	. . .
Hispanic or Latino	366.0	195.7	46.1	57.5	31.5	35.1	162.1	85.1	19.9	23.7	15.8	17.7
Not Hispanic or Latino	412.0	194.4	70.0	77.7	29.7	40.2	1,005.3	456.6	159.6	196.3	83.4	109.4
	Standard error of rate											
All visits	14.5	10.3	4.6	4.4	3.3	2.2	. . .	. . .	. . .	. . .	. . .	. . .
Race												
Reported visits	13.4	9.3	3.7	4.6	2.9	1.9	13.4	9.3	3.7	4.6	2.9	1.9
Imputed (missing) visits	8.1	6.2	2.8	2.1	1.0	0.9	. . .	. . .	. . .	. . .	. . .	. . .
White	16.2	11.0	5.3	5.2	3.4	2.3	15.4	10.4	4.4	5.4	3.0	2.0
Black or African American	27.0	21.2	5.3	7.0	9.0	6.1	23.0	17.9	4.6	6.2	8.2	5.1
Asian	47.0	42.9	6.3	5.1	2.7	1.9	36.7	35.0	3.0	4.3	2.4	1.5
Native Hawaiian or Other Pacific Islander	105.1	87.3	. . .	. . .	21.5	17.0	71.6	48.4	. . .	. . .	21.2	16.8
American Indian or Alaska Native	61.0	40.9	30.6	12.7	8.6	14.3	23.2	12.4	. . .	. . .	8.4	9.7
Two or more races reported	14.0	8.2	. . .	. . .	10.2	1.7	12.3	5.6	. . .	. . .	9.9	1.7
Ethnicity												
Reported visits	13.4	9.2	3.6	4.8	2.7	1.9	13.4	9.2	3.6	4.8	2.7	1.9
Imputed (missing) visits	9.0	6.3	2.9	2.7	1.4	1.2	. . .	. . .	. . .	. . .	. . .	. . .
Hispanic or Latino	28.9	22.0	7.7	9.1	4.6	3.1	15.9	12.3	4.0	4.9	2.5	1.5
Not Hispanic or Latino	15.7	10.7	5.0	4.9	3.6	2.3	53.3	35.4	14.4	19.1	10.7	7.6

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]For 2007, race data were missing for 28.7 percent of visits, and ethnicity data were missing for 32.9 percent of visits. Readers are therefore advised to treat these data with caution. In this table, estimates based on imputed race and ethnicity data are shown separately from comparison estimates using unimputed data. Missing race and ethnicity were imputed using a hot deck approach rather than the previously used cold deck strategy. The imputation process is described more fully in the 2007 public-use documentation (http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm). Research is currently under way to evaluate further changes to the imputation strategy for use with 2008 data.

[2]Includes race that was reported directly and imputed values for the 28.7 percent of visits for which race was not reported.

[3]Includes ethnicity that was reported directly and imputed values for the 32.9 percent of visits for which ethnicity was not reported.

[4]Calculations are based on 855,289 visits (in thousands) with race reported directly. The 28.7 percent of visits for which race was missing are excluded from the denominator, so that readers can compare differences between estimates that include and exclude imputed race values.

[5]Calculations are based on 805,515 visits (in thousands) with ethnicity reported directly. The 32.9 percent of visits for which ethnicity was missing are excluded from the denominator, so that readers can compare differences between estimates that include and exclude imputed ethnicity values.

[6]Visit rates for age, sex, and region are based on the July 1, 2007 set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

[7]The race groups White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, and multiple races include persons of Hispanic and not Hispanic origin. Persons of Hispanic origin may be of any race. Starting with data year 1999, race-specific estimates have been tabulated according to 1997 Standards for Federal Data on Race and Ethnicity and are not strictly comparable with estimates for earlier years. The percentage of visit records with multiple races indicated is small and lower than what is typically found for self-reported race in household surveys.

NOTES: The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs. Also, in this table, estimates of reported plus imputed data were flagged as unreliable if the reported estimate alone was based on fewer than 30 cases. This occurred for three estimates only, in the Asian, Native Hawaiian or Other Pacific Islander, and Multiple Race categories.

Table 5. Ambulatory care visits by setting type, according to characteristics of patient's ZIP Code of residence: United States, 2007

Characteristic	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Total	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
					Percent distribution (standard error of percent)					
All visits	1,200,017	(42,950)	100.0	. . .	100.0	48.1 (1.4)	16.4 (1.0)	18.4 (1.0)	7.4 (0.8)	9.7 (0.5)
Urban-rural classification[1]										
Large central metro	305,695	(28,614)	25.5	(2.2)	100.0	52.1 (3.0)	14.4 (1.6)	15.7 (1.6)	7.3 (1.1)	10.5 (1.2)
Large fringe metro	254,086	(17,840)	21.2	(1.4)	100.0	49.6 (2.8)	16.9 (1.9)	19.4 (2.0)	5.9 (1.1)	8.1 (1.0)
Medium metro	284,802	(34,738)	23.7	(2.7)	100.0	42.4 (2.9)	18.0 (2.2)	21.1 (2.4)	8.0 (1.7)	10.4 (1.3)
Small metro	99,767	(15,065)	8.3	(1.2)	100.0	50.7 (4.9)	16.9 (2.5)	16.3 (2.2)	6.8 (2.0)	9.2 (2.4)
Nonmetropolitan	196,784	(20,981)	16.4	(1.7)	100.0	45.5 (3.2)	16.1 (2.0)	19.1 (2.1)	9.5 (2.5)	9.8 (1.4)
Micropolitan	111,627	(18,147)	9.3	(1.4)	100.0	47.1 (3.9)	17.7 (2.3)	20.7 (2.7)	5.9 (1.4)	8.6 (1.7)
Noncore (nonmetro)	85,158	(9,990)	7.1	(0.9)	100.0	43.5 (4.6)	14.0 (2.4)	16.9 (3.2)	*14.2 (5.0)	11.4 (1.6)
Median household income[2]	1,200,017	(42,950)	100.0	. . .	100.0	48.1 (1.4)	16.4 (1.0)	18.4 (1.0)	7.4 (0.8)	9.7 (0.5)
Quartile 1 ($0 to $32,793)	273,597	(19,945)	22.8	(1.5)	100.0	45.1 (2.7)	14.0 (1.3)	16.5 (1.7)	11.0 (1.9)	13.4 (1.4)
Quartile 2 ($32,794 to $40,626)	260,852	(15,437)	21.7	(1.1)	100.0	48.1 (2.0)	15.5 (1.3)	17.7 (1.5)	8.5 (1.1)	10.1 (0.8)
Quartile 3 ($40,627 to $52,387)	267,658	(16,544)	22.3	(1.1)	100.0	44.3 (1.8)	19.7 (1.8)	20.7 (1.4)	6.3 (0.8)	9.0 (0.7)
Quartile 4 ($52,388 and over)	311,314	(19,317)	25.9	(1.4)	100.0	53.0 (2.2)	16.3 (1.4)	18.8 (1.4)	4.9 (0.8)	7.0 (0.7)
Percentage with bachelor's degree or higher[3]	1,200,017	(42,950)	100.0	. . .	100.0	48.1 (1.4)	16.4 (1.0)	18.4 (1.0)	7.4 (0.8)	9.7 (0.5)
Quartile 1 (0–12.83)	276,791	(16,854)	23.1	(1.3)	100.0	47.6 (2.3)	13.7 (1.3)	15.9 (1.7)	9.8 (1.3)	13.0 (1.1)
Quartile 2 (12.84–19.66)	268,486	(18,082)	22.4	(1.1)	100.0	44.5 (2.3)	18.4 (1.5)	18.3 (1.3)	8.2 (1.2)	10.5 (0.9)
Quartile 3 (19.67–31.68)	275,661	(14,862)	23.0	(1.1)	100.0	49.4 (2.0)	17.6 (1.5)	17.6 (1.2)	7.0 (0.9)	8.4 (0.6)
Quartile 4 (31.69 and over)	292,200	(17,662)	24.3	(1.2)	100.0	49.7 (2.3)	15.9 (1.3)	21.7 (1.6)	5.5 (0.9)	7.2 (0.7)
Percentage of poverty[4]	1,200,017	(42,950)	100.0	. . .	100.0	48.1 (1.4)	16.4 (1.0)	18.4 (1.0)	7.4 (0.8)	9.7 (0.5)
Less than 5 percent	250,565	(15,654)	20.9	(1.1)	100.0	53.7 (2.4)	16.7 (1.5)	18.7 (1.6)	4.4 (0.8)	6.6 (0.7)
5.00–9.99 percent	330,123	(17,574)	27.5	(1.1)	100.0	47.0 (1.8)	18.3 (1.5)	20.0 (1.3)	6.0 (0.7)	8.8 (0.6)
10.00–19.99 percent	359,314	(19,956)	29.9	(1.2)	100.0	46.4 (2.0)	16.0 (1.4)	17.9 (1.3)	9.1 (1.3)	10.6 (0.8)
20 percent of more	173,347	(13,382)	14.4	(1.1)	100.0	43.9 (3.1)	13.2 (1.3)	16.4 (1.9)	12.1 (1.8)	14.5 (1.4)
Percentage of poverty (method 2)[4]	1,200,017	(42,950)	100.0	. . .	100.0	48.1 (1.4)	16.4 (1.0)	18.4 (1.0)	7.4 (0.8)	9.7 (0.5)
Less than 20 percent	940,001	(36,699)	78.3	(1.3)	100.0	48.6 (1.4)	17.0 (1.1)	18.8 (1.0)	6.7 (0.8)	8.9 (0.5)
20.00–29.99 percent	127,133	(10,888)	10.6	(0.8)	100.0	46.5 (2.9)	13.3 (1.5)	16.3 (1.7)	10.5 (1.6)	13.5 (1.4)
30.00–39.99 percent	34,118	(4,369)	2.8	(0.4)	100.0	33.5 (5.4)	14.1 (2.3)	18.2 (5.3)	17.3 (3.9)	16.9 (2.4)
40 percent or more	12,096	(2,568)	1.0	(0.2)	100.0	45.9 (9.0)	10.0 (2.1)	*12.3 (4.6)	14.0 (3.6)	17.8 (4.4)

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

[1]Excludes 4.9 percent of visits for which data were missing. For each record, county of residence was determined using patient ZIP Code and was then matched to the National Center for Health Statistics' Urban-Rural Classification Scheme for Counties described here: http://www.cdc.gov/nchs/data_access/urban_rural.htm.

[2]Excludes 7.2 percent of visits for which data were missing. Median household income was based on the patient's ZIP code of residence matched to data from the 2000 census. Population quartiles were estimated using U.S. Census Bureau data aggregated at the ZIP Code level.

[3]Excludes 7.2 percent of visits for which data were missing. Education level was based on patient's ZIP Code of residence matched to data from the 2000 census. Population quartiles were estimated using data aggregated at the ZIP Code level.

[4]Excludes 7.2 percent of visits for which data were missing.

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 6. The 35 leading primary diagnosis groups at ambulatory care visits, with percent distribution by setting type: United States, 2007

Primary diagnosis group and ICD–9–CM code(s)[1]	Combined settings					Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
	Number of visits in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Total	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
All visits	1,200,017	(42,950)	100.0	. . .	100.0	48.1	(1.4)	16.4	(1.0)	18.4	(1.0)	7.4	(0.8)	9.7	(0.5)
Essential hypertension .401	46,284	(3,508)	3.9	(0.3)	100.0	79.1	(2.7)	*	. . .	11.8	(2.1)	7.3	(1.4)	1.6	(0.2)
Routine infant or child health check V20.2	43,317	(3,680)	3.6	(0.3)	100.0	91.5	(1.3)	*	. . .	*	. . .	7.6	(1.3)	0.2	(0.1)
Acute upper respiratory infections, excluding pharyngitis .460–461,463–466	40,207	(2,744)	3.4	(0.2)	100.0	81.2	(1.8)	1.8	(0.4)	*	. . .	5.9	(0.9)	10.5	(1.1)
Arthropathies and related disorders .710–719	36,218	(4,016)	3.0	(0.3)	100.0	32.2	(4.3)	40.7	(5.0)	*17.3	(6.1)	5.7	(1.5)	4.1	(0.6)
Spinal disorders .720–724	31,675	(3,161)	2.6	(0.2)	100.0	42.2	(4.0)	22.4	(4.8)	19.7	(4.6)	7.0	(1.4)	8.7	(1.1)
Malignant neoplasms .140–208,230–234	28,150	(2,936)	2.3	(0.2)	100.0	10.2	(2.9)	20.2	(2.6)	59.3	(4.2)	9.8	(2.6)	0.6	(0.1)
Diabetes mellitus .250	27,683	(2,671)	2.3	(0.2)	100.0	65.4	(4.4)	17.2	(4.5)	4.6	(1.2)	11.0	(1.7)	1.7	(0.3)
Rheumatism, excluding back .725–729	22,490	(1,960)	1.9	(0.1)	100.0	45.6	(4.3)	27.0	(3.8)	13.7	(3.8)	5.7	(1.1)	8.0	(0.9)
Specific procedures and aftercare .V50–V59.9	21,845	(2,360)	1.8	(0.2)	100.0	44.3	(4.0)	24.9	(3.9)	19.3	(2.9)	7.2	(1.3)	4.2	(0.7)
General medical examination .V70	20,914	(2,419)	1.7	(0.2)	100.0	78.0	(6.5)	*	. . .	*13.0	(6.9)	*7.4	(2.3)	1.0	(0.3)
Normal pregnancy .V22	19,747	(2,438)	1.6	(0.2)	100.0	85.1	(2.3)	*	. . .	*0.3	(0.3)	13.3	(2.1)	1.3	(0.3)
Follow up examination .V67	19,653	(3,078)	1.6	(0.2)	100.0	25.0	(4.5)	46.6	(5.6)	*23.5	(7.5)	3.7	(0.9)	1.2	(0.3)
Otitis media and eustachian tube disorders .381–382	17,972	(1,446)	1.5	(0.1)	100.0	65.9	(3.6)	15.3	(2.6)	*	. . .	6.8	(1.3)	11.0	(1.2)
Asthma .493	17,034	(2,383)	1.4	(0.2)	100.0	49.9	(6.2)	*	. . .	31.1	(7.7)	8.3	(2.0)	10.3	(1.6)
Heart disease, excluding ischemic .391–392.0,393–398,402,404,415–416,420–429	16,687	(1,740)	1.4	(0.1)	100.0	29.6	(4.4)	*	. . .	49.1	(5.0)	10.5	(3.0)	9.1	(1.2)
Gynecological examination .V72.3	14,679	(2,491)	1.2	(0.2)	100.0	92.2	(2.1)	*	. . .	*	. . .	7.3	(2.0)	*	. . .
Ischemic heart disease .410–414.9	13,928	(1,487)	1.2	(0.1)	100.0	21.8	(3.4)	*	. . .	64.7	(4.2)	*7.2	(2.6)	4.0	(0.6)
Allergic rhinitis .477	13,393	(2,562)	1.1	(0.2)	100.0	43.5	(7.8)	*9.9	(3.2)	42.8	(9.7)	3.2	(0.8)	*0.7	(0.3)
Psychoses, excluding major depressive disorder .290–295,296.0–296.1,296.4–299	12,996	(1,278)	1.1	(0.1)	100.0	12.2	(2.5)	–	. . .	67.4	(4.2)	13.2	(2.6)	7.2	(1.0)
Chronic sinusitis .473	12,482	(1,149)	1.0	(0.1)	100.0	69.7	(5.4)	*13.1	(4.8)	*	. . .	9.3	(2.3)	4.2	(0.8)
Glaucoma .365	12,222	(2,364)	1.0	(0.2)	100.0	–	. . .	97.8	(0.7)	*	. . .	*2.1	(0.6)	*	. . .
Benign neoplasms .210–229,235–239	11,856	(1,142)	1.0	(0.1)	100.0	23.3	(3.5)	25.1	(4.7)	44.0	(4.9)	7.1	(1.7)	*	. . .
Abdominal pain .789	11,772	(901)	1.0	(0.1)	100.0	42.0	(4.2)	*	. . .	*9.1	(4.4)	6.2	(1.0)	39.2	(3.2)
Acute pharyngitis .462	11,570	(970)	1.0	(0.1)	100.0	74.6	(2.9)	*	. . .	*	. . .	7.4	(1.4)	14.6	(1.5)
Disorders of lipoid metabolism .272	11,404	(1,294)	1.0	(0.1)	100.0	82.7	(3.7)	*	. . .	*11.1	(3.3)	5.3	(1.3)	*	. . .
Sprains and strains, excluding ankle and back .840–844,845.1,848	11,075	(1,366)	0.9	(0.1)	100.0	26.1	(4.9)	41.3	(6.9)	*	. . .	5.0	(1.2)	22.1	(2.9)
Potential health hazards related to personal and family history .V10–V19	10,980	(969)	0.9	(0.1)	100.0	46.4	(4.3)	18.5	(2.7)	23.7	(3.1)	9.0	(1.8)	2.4	(0.6)
Chronic and unspecified bronchitis .490–491	10,835	(1,065)	0.9	(0.1)	100.0	75.2	(3.5)	*	. . .	*	. . .	4.7	(1.0)	13.6	(1.7)
Contact dermatitis and other eczema .692	10,360	(1,252)	0.9	(0.1)	100.0	49.3	(5.0)	*	. . .	39.9	(5.3)	4.9	(1.2)	5.1	(0.9)
Cataract .366	9,957	(1,535)	0.8	(0.1)	100.0	*	. . .	95.0	(1.7)	–	. . .	*2.3	(0.8)	*	. . .
Depressive disorder, not elsewhere classified .311	9,356	(1,013)	0.8	(0.1)	100.0	54.6	(5.5)	–	. . .	32.5	(5.7)	6.9	(1.5)	6.0	(0.9)
Chest pain .786.5	9,338	(801)	0.8	(0.1)	100.0	36.6	(4.5)	*	. . .	14.6	(3.1)	4.9	(1.2)	43.9	(3.7)
Contusion with intact skin surface .920–924	9,087	(692)	0.8	(0.1)	100.0	30.1	(3.9)	9.8	(2.4)	*4.1	(3.5)	4.5	(1.1)	51.5	(3.7)

See footnotes at end of table.

Table 6. The 35 leading primary diagnosis groups at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

Primary diagnosis group and ICD–9–CM code(s)[1]	Combined settings: Number of visits in thousands	Combined settings: (Standard error in thousands)	Combined settings: Percent distribution	Combined settings: (Standard error of percent)	Total	Primary care offices: Percent distribution	Primary care offices: (Standard error of percent)	Surgical specialty offices: Percent distribution	Surgical specialty offices: (Standard error of percent)	Medical specialty offices: Percent distribution	Medical specialty offices: (Standard error of percent)	Hospital outpatient departments: Percent distribution	Hospital outpatient departments: (Standard error of percent)	Hospital emergency departments: Percent distribution	Hospital emergency departments: (Standard error of percent)
Complications of pregnancy, childbirth, and the puerperium 630–677	8,994	(1,355)	0.7	(0.1)	100.0	60.6	(5.8)	*	. . .	*	. . .	17.6	(4.2)	20.0	(3.2)
Urinary tract infection, site not specified 599	8,642	(862)	0.7	(0.1)	100.0	59.1	(4.2)	7.0	(1.4)	*	. . .	5.9	(1.1)	23.3	(2.8)
All other diagnoses	565,217	(19,717)	47.1	(0.6)	100.0	41.9	(1.5)	18.2	(1.1)	19.7	(1.0)	7.5	(0.8)	12.7	(0.7)

. . . Category not applicable.

* Figure does not meet standards of reliability or precision.

– Quantity zero.

[1]Based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD–9–CM) (13). However, certain codes have been combined in this table to form larger categories that better describe the utilization of ambulatory care services.

Table 7. Annual number and percent distribution of ambulatory care visits, by setting type according to diagnosis group: United States, 2006–2007

Diagnosis group[1]	Combined settings	Percent distribution	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Number of visits in thousands							Percent distribution					
All visits	1,161,685	100.0	551,129	187,146	209,864	95,551	117,997	100.0	47.4	16.1	18.1	8.2	10.2
Infectious and parasitic diseases	29,807	2.6	18,232	1,104	3,970	3,170	3,331	100.0	61.2	3.7	13.3	10.6	11.2
Streptococcal sore throat	4,911	0.4	4,003	*	*	348	447	100.0	81.5	*	*	7.1	9.1
Human immunodeficiency virus disease (HIV)	1,209	0.1	*309	–	*	*701	*	100.0	*25.5	. . .	*	58.0	*
Viral warts	2,723	0.2	1,232	*	1,180	154	*	100.0	45.3	*	43.3	5.7	*
Unspecified viral and chlamydial infection	6,152	0.5	4,190	*	*	392	1,345	100.0	68.1	*	*	6.4	21.9
Dermatophytosis	2,277	0.2	1,518	*	*	211	110	100.0	66.7	*	*	9.3	4.8
Candidiasis	1,641	0.1	1,125	*	*	143	138	100.0	68.5	*	*	8.7	8.4
Other infectious and parasitic diseases	10,895	0.9	5,855	864	1,705	1,220	1,251	100.0	53.7	7.9	15.7	11.2	11.5
Neoplasms	36,768	3.2	5,401	7,921	19,271	3,950	226	100.0	14.7	21.5	52.4	10.7	0.6
Malignant neoplasms of colon and rectum	2,388	0.2	*	*406	1,462	262	*	100.0	*	17.0	61.2	11.0	*
Malignant neoplasm of skin	4,577	0.4	*	457	3,666	158	*	100.0	*	10.0	80.1	3.5	*
Malignant neoplasm of breast	4,600	0.4	*415	653	2,812	707	*	100.0	*9.0	14.2	61.1	15.4	*
Malignant neoplasm of prostate	3,248	0.3	*	2,054	658	*236	*	100.0	*	63.2	20.2	*7.3	*
Malignant neoplasm of lymphatic and hematopoietic tissue	3,051	0.3	*	*	2,006	600	*	100.0	*	*	65.8	19.7	*
Other malignant neoplasms	8,487	0.7	912	1,946	4,356	1,152	122	100.0	10.7	22.9	51.3	13.6	1.4
Benign neoplasm of skin	2,939	0.3	600	*	1,980	116	*	100.0	20.4	*	67.4	3.9	*
Other benign neoplasm	5,034	0.4	2,218	1,380	928	477	*	100.0	44.1	27.4	18.4	9.5	*
Neoplasm of uncertain behavior and unspecified nature	2,443	0.2	*	*580	1,404	241	*	100.0	*	23.7	57.5	9.9	*
Endocrine, nutritional and metabolic diseases, and immunity disorders	56,588	4.9	36,427	6,491	5,485	6,304	1,882	100.0	64.4	11.5	9.7	11.1	3.3
Acquired hypothyroidism	3,501	0.3	2,821	*	*	390	*	100.0	80.6	*	*	11.1	*
Other disorders of thyroid gland	1,812	0.2	912	354	*	243	*	100.0	50.3	19.5	*	13.4	*
Diabetes mellitus	28,122	2.4	17,757	4,463	1,746	3,694	462	100.0	63.1	15.9	6.2	13.1	1.6
Disorders of lipoid metabolism	10,688	0.9	8,646	*	1,221	682	*	100.0	80.9	*	11.4	6.4	*
Obesity	5,700	0.5	3,179	*1,149	*809	552	*	100.0	55.8	*20.1	*14.2	9.7	*
Other endocrine, nutritional and metabolic diseases, and immunity disorders	6,766	0.6	3,111	390	1,162	743	1,360	100.0	46	5.8	17.2	11.0	20.1
Diseases of the blood and blood-forming organs	7,239	0.6	2,995	*	2,686	863	574	100.0	41.4	*	37.1	11.9	7.9
Anemias	5,270	0.5	2,203	*	1,964	608	410	100.0	41.8	*	37.3	11.5	7.8
Other diseases of the blood and blood-forming organs	1,969	0.2	792	*	722	254	164	100.0	40.2	*	36.7	12.9	8.3
Mental disorders	58,176	5.0	17,931	*	28,393	7,553	4,106	100.0	30.8	*	48.8	13.0	7.1
Schizophrenic disorders	2,479	0.2	*	–	1,599	460	220	100.0	*	. . .	64.5	18.6	8.9
Major depressive disorder	7,908	0.7	*	–	6,282	1,077	143	100.0	*	. . .	79.4	13.6	1.8
Other psychoses	9,485	0.8	1,390	*	6,036	1,323	730	100.0	14.7	*	63.6	13.9	7.7
Anxiety states	7,078	0.6	3,143	–	2,700	572	663	100.0	44.4	. . .	38.2	8.1	9.4
Neurotic depression	4,080	0.4	1,949	–	1,693	370	68	100.0	47.8	. . .	41.5	9.1	1.7
Alcohol dependence syndrome	538	0.0	*	–	*	*290	113	100.0	*	. . .	*	53.9	21
Drug dependence and nondependent abuse of drugs	2,878	0.2	515	*	*389	*869	1,078	100.0	17.9	*	*13.5	30.2	37.5
Acute reaction to stress and adjustment reaction	2,928	0.3	596	–	1,668	559	104	100.0	20.4	. . .	57.0	19.1	3.6
Depressive disorder, not elsewhere classified	8,676	0.7	4,764	–	2,550	800	563	100.0	54.9	. . .	29.4	9.2	6.5
Attention deficit disorder	7,304	0.6	3,834	–	2,662	800	*	100.0	52.5	. . .	36.4	11.0	*
Other mental disorders	4,822	0.4	1,034	*	2,779	434	415	100.0	21.4	*	57.6	9.0	8.6
Diseases of the nervous system and sense organs	103,264	8.9	29,644	49,975	10,816	6,121	6,707	100.0	28.7	48.4	10.5	5.9	6.5
Migraine	5,919	0.5	2,386	*757	1,389	308	1,079	100.0	40.3	*12.8	23.5	5.2	18.2
Other disorders of the central nervous system	12,346	1.1	3,478	1,081	5,174	1,180	1,433	100.0	28.2	8.8	41.9	9.6	11.6
Carpal tunnel syndrome	2,354	0.2	643	832	689	155	*	100.0	27.3	35.4	29.3	6.6	*

See footnotes at end of table.

Table 7. Annual number and percent distribution of ambulatory care visits, by setting type according to diagnosis group: United States, 2006–2007—Con.

Diagnosis group[1]	Combined settings	Percent distribution	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Number of visits in thousands							Percent distribution					
Other disorders of the peripheral nervous system	3,605	0.3	1,114	550	1,481	271	188	100.0	30.9	15.3	41.1	7.5	5.2
Retinal detachment and other retinal disorders	5,225	0.4	*	4,916	*	179	*	100.0	*	94.1	*	*3.4	*
Glaucoma	10,158	0.9	*	9,879	*	252	*	100.0	*	97.3	*	2.5	*
Cataract	10,257	0.9	*	9,800	–	272	*	100.0	*	95.6	. . .	2.6	*
Disorders of refraction and accommodation	3,113	0.3	*	2,744	*	168	*	100.0	*	88.1	*	*5.4	*
Conjunctivitis	5,734	0.5	3,462	982	*	447	603	100.0	60.4	17.1	*	7.8	10.5
Disorder of eyelids	2,828	0.2	*	1,866	*	159	149	100.0	*	66.0	*	5.6	5.3
Other disorders of the eye and adnexa	12,309	1.1	896	9,577	*774	617	445	100.0	7.3	77.8	6.3	5.0	3.6
Disorders of external ear	5,106	0.4	2,593	1,580	*	388	431	100.0	50.8	31.0	*	7.6	8.4
Otitis media and eustachian tube disorders	17,623	1.5	11,748	2,319	*	1,396	1,949	100.0	66.7	13.2	*	7.9	11.1
Other disorders of the ear and mastoid process	6,689	0.6	2,579	3,092	*	330	371	100.0	38.6	46.2	*	4.9	5.5
Diseases of the circulatory system	87,418	7.5	46,755	4,384	24,785	7,281	4,213	100.0	53.5	5.0	28.4	8.3	4.8
Angina pectoris	850	0.1	*	*	457	*	61	100.0	*	*	53.8	*	7.2
Coronary atherosclerosis	9,833	0.8	2,740	*	6,234	606	46	100.0	27.9	*	63.4	6.2	0.5
Other ischemic heart disease	2,357	0.2	*	–	1,348	126	539	100.0	*	. . .	57.2	*5.4	22.9
Cardiac dysrhythmias	7,388	0.6	2,644	*	3,300	679	667	100.0	35.8	*	44.7	9.2	9.0
Congestive heart failure	3,191	0.3	1,328	–	885	309	670	100.0	41.6	. . .	27.7	9.7	21.0
Other heart disease	5,751	0.5	1,652	*	3,351	469	165	100.0	28.7	*	58.3	8.2	2.9
Essential hypertension	43,413	3.7	33,647	*	5,245	3,645	798	100.0	77.5	*	12.1	8.4	1.8
Cerebrovascular disease	3,328	0.3	1,045	569	865	213	636	100.0	31.4	17.1	26.0	6.4	19.1
Diseases of the arteries, arterioles and capillaries	2,958	0.3	785	*1,233	577	286	77	100.0	26.5	41.7	19.5	9.7	2.6
Hemorrhoids	1,999	0.2	507	*635	*	133	122	100.0	25.3	*31.8	*	*6.7	6.1
Other diseases of the circulatory system	6,350	0.5	1,780	*1,446	*1,920	*772	431	100.0	28.0	*22.8	30.2	*12.2	6.8
Diseases of the respiratory system	127,064	10.9	82,726	6,604	16,135	9,391	12,208	100.0	65.1	5.2	12.7	7.4	9.6
Acute sinusitis	4,404	0.4	3,324	*	*	515	246	100.0	75.5	*	*	11.7	5.6
Acute pharyngitis	12,037	1.0	8,934	*	*	1,086	1,722	100.0	74.2	*	*	9.0	14.3
Acute tonsillitis	2,107	0.2	1,553	*	–	*139	283	100.0	73.7	*	. . .	*6.6	13.4
Acute bronchitis and bronchiolitis	4,706	0.4	3,330	*	*	436	856	100.0	70.8	*	*	9.3	18.2
Other acute respiratory infections	28,093	2.4	22,469	227	*	2,019	2,552	100.0	80.0	0.8	*	7.2	9.1
Chronic sinusitis	13,750	1.2	9,939	1,391	*	1,302	565	100.0	72.3	10.1	*	9.5	4.1
Allergic rhinitis	13,255	1.1	6,059	1,142	*5,310	637	107	100.0	45.7	8.6	40.1	4.8	0.8
Pneumonia	4,487	0.4	2,578	–	*	243	1,429	100.0	57.5	. . .	*	5.4	31.8
Chronic and unspecified bronchitis	11,666	1.0	8,525	*	792	789	1,522	100.0	73.1	*	6.8	6.8	13.0
Asthma	15,154	1.3	7,876	*	4,314	1,250	1,673	100.0	52.0	*	28.5	8.3	11.0
Other chronic obstructive pulmonary disease and allied conditions	6,130	0.5	3,397	*	2,226	264	194	100.0	55.4	*	36.3	4.3	3.2
Other diseases of the respiratory system	11,275	1.0	4,742	3,182	1,582	709	1,060	100.0	42.1	28.2	14.0	6.3	9.4
Diseases of the digestive system	44,109	3.8	18,118	6,336	9,271	3,090	7,293	100.0	41.1	14.4	21.0	7.0	16.5
Diseases of the teeth and supporting structures	3,651	0.3	1,170	*539	*	280	1,640	100.0	32.1	*14.8	*	7.7	44.9
Gastritis and duodenitis	2,765	0.2	1,375	*	*	124	481	100.0	49.7	*	*	4.5	17.4
Esophagitis	508	0.0	*	*	*	*	54	100.0	*	*	*	*	*10.7
Ulcer of stomach and small intestine	*669	0.1	*	*	*	*	57	100.0	*	*	*	*	*8.5
Hernia of abdominal cavity	3,770	0.3	882	2,175	*	287	242	100.0	23.4	57.7	*	7.6	6.4
Noninfectious enteritis and colitis	6,101	0.5	3,007	*	*1,046	409	1,531	100.0	49.3	*	17.1	6.7	25.1
Diverticula of intestine	1,992	0.2	734	*	*	*115	204	100.0	36.9	*	*	*5.8	10.3
Constipation	3,074	0.3	1,504	*	*	268	529	100.0	48.9	*	*	8.7	17.2
Irritable bowel syndrome	1,262	0.1	*	*	*	72	*	100.0	*	*	*	*5.7	*
Anal and rectal diseases	2,060	0.2	708	*510	*	115	196	100.0	34.4	*24.8	*	5.6	9.5

See footnotes at end of table.

Table 7. Annual number and percent distribution of ambulatory care visits, by setting type according to diagnosis group: United States, 2006–2007—Con.

Diagnosis group[1]	Combined settings	Percent distribution	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Number of visits in thousands							Percent distribution					
Disorder of gallbladder and biliary tract	2,206	0.2	*	1,207	*	137	302	100.0	*	54.7	*	6.2	13.7
Gastrointestinal hemorrhage	1,163	0.1	*	*	*	*119	442	100.0	*	*	*	*10.2	38.0
Other diseases of the digestive system	14,889	1.3	7,168	1,296	3,802	1,028	1,594	100.0	48.1	8.7	25.5	6.9	10.7
Diseases of the genitourinary system	48,140	4.1	25,128	10,452	2,771	3,955	5,834	100.0	52.2	21.7	5.8	8.2	12.1
Calculus of kidney and ureter	2,397	0.2	*	1,180	*	144	666	100.0	*	49.2	*	6.0	27.8
Cystitis and other disorders of the bladder	2,187	0.2	853	1,021	–	99	214	100.0	39.0	46.7	. . .	4.5	9.8
Urinary tract infection, site not specified	8,334	0.7	4,577	716	*	633	2,027	100.0	54.9	8.6	*	7.6	24.3
Other diseases of the urinary system	6,526	0.6	1,466	1,909	1,751	494	906	100.0	22.5	29.2	26.8	7.6	13.9
Hyperplasia of prostate	3,232	0.3	857	2,181	*	117	*	100.0	26.5	67.5	*	3.6	*
Other disorders of male genital organs	3,800	0.3	1,347	1,689	*	277	325	100.0	35.4	44.4	*	7.3	8.6
Disorders of the breast	3,548	0.3	1,816	1,092	*	381	134	100.0	51.2	30.8	*	10.7	3.8
Inflammatory disease of female pelvic organs	2,788	0.2	2,105	*	–	254	394	100.0	75.5	*	. . .	9.1	14.1
Noninflammatory disorders of the female genital organs	3,667	0.3	2,626	*	*	379	514	100.0	71.6	*	*	10.3	14.0
Disorders of menstruation and abnormal bleeding	4,083	0.4	3,349	*	*	423	215	100.0	82.0	*	*	10.4	5.3
Menopausal and postmenopausal disorders	2,070	0.2	1,939	*	*	85	*	100.0	93.7	*	*	4.1	*
Other disorders of female genital tract	5,510	0.5	3,792	502	*	670	420	100.0	68.8	9.1	*	12.2	7.6
Complications of pregnancy, childbirth, and the puerperium	8,437	0.7	5,164	*	*	1,494	1,613	100.0	61.2	*	*	17.7	19.1
Diseases of the skin and subcutaneous tissue	51,821	4.5	18,998	2,898	22,348	3,088	4,490	100.0	36.7	5.6	43.1	6.0	8.7
Cellulitis and abscess	8,083	0.7	3,840	455	576	532	2,679	100.0	47.5	5.6	7.1	6.6	33.1
Other infection of the skin and subcutaneous tissue	2,336	0.2	1,353	*	*	206	352	100.0	57.9	*	*	8.8	15.1
Contact dermatitis and other eczema	9,759	0.8	5,013	*	3,592	545	528	100.0	51.4	*	36.8	5.6	5.4
Psoriasis and similar disorders	2,020	0.2	*	*	1,610	154	*	100.0	*	*	79.7	7.6	*
Other inflammatory conditions of skin and subcutaneous tissue	5,588	0.5	2,178	*	2,765	339	238	100.0	39.0	*	49.5	6.1	4.3
Corns, callosities, other hypertrophic and atrophic skin conditions	2,068	0.2	595	*443	884	133	*	100.0	28.8	21.4	42.7	6.4	*
Actinic and seborrheic keratosis	6,079	0.5	*	*	5,374	*	*	100.0	*	*	88.4	*	*
Acne	4,443	0.4	843	*	3,394	149	*	100.0	19.0	*	76.4	*3.4	*
Sebaceous cyst	2,091	0.2	800	629	510	108	*	100.0	38.3	30.1	24.4	5.2	*
Urticaria	1,439	0.1	539	*	*	104	282	100.0	37.5	*	*	7.2	19.6
Other disorders of the skin and subcutaneous tissue	7,914	0.7	3,146	790	2,933	746	298	100.0	39.8	10.0	37.1	9.4	3.8
Diseases of the musculoskeletal system and connective tissue	91,953	7.9	35,313	28,423	14,811	6,575	6,831	100.0	38.4	30.9	16.1	7.2	7.4
Rheumatoid arthritis	2,899	0.2	612	*	*1,991	*249	*	100.0	*21.1	*	68.7	*8.6	*
Osteoarthrosis and allied disorders	12,392	1.1	3,772	6,336	*1,689	511	85	100.0	30.4	51.1	13.6	4.1	0.7
Other arthropathies and related disorders	5,323	0.5	1,629	1,612	*1,502	404	175	100.0	30.6	30.3	*28.2	7.6	3.3
Derangements and other unspecified disorders of joints	13,522	1.2	4,969	4,977	*1,076	1,141	1,358	100.0	36.7	36.8	8.0	8.4	10.0
Intervertebral disc disorders	6,069	0.5	1,546	3,224	801	418	81	100.0	25.5	53.1	13.2	6.9	1.3
Lumbago	6,863	0.6	3,648	825	*803	513	1,074	100.0	53.2	12.0	*11.7	7.5	15.7
Other dorsopathies	17,688	1.5	7,202	3,692	3,492	1,301	2,002	100.0	40.7	20.9	19.7	7.4	11.3
Peripheral enthesopathies	6,724	0.6	2,504	3,037	*	431	183	100.0	37.2	45.2	*	6.4	2.7
Synovitis and tenosynovitis	1,887	0.2	733	962	*	90	93	100.0	38.9	50.9	*	4.8	4.9
Myalgia and myositis, unspecified	2,694	0.2	1,315	*	*872	211	286	100.0	48.8	*	32.4	7.8	10.6
Other rheumatism,excluding back	9,824	0.8	4,224	2,161	1,422	739	1,277	100.0	43.0	22.0	14.5	7.5	13.0
Disorders of bone and cartilage	4,219	0.4	2,434	845	*	400	192	100.0	57.7	20.0	*	9.5	4.5
Other diseases of the musculoskeletal system and connective tissue	1,846	0.2	726	703	*	167	*	100.0	39.3	38.1	*	9.0	*

See footnotes at end of table.

Table 7. Annual number and percent distribution of ambulatory care visits, by setting type according to diagnosis group: United States, 2006–2007—Con.

Diagnosis group[1]	Combined settings	Percent distribution	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Number of visits in thousands							Percent distribution					
Congenital anomalies	3,234	0.3	692	1,073	818	582	70	100.0	21.4	33.2	25.3	18.0	2.2
Certain conditions originating in the perinatal period	1,293	0.1	974	–	*	160	83	100.0	75.3	. . .	*	12.4	6.4
Symptoms, signs, and ill-defined conditions	88,564	7.6	40,382	5,840	13,244	5,995	23,104	100.0	45.6	6.6	15.0	6.8	26.1
Syncope and collapse	2,399	0.2	658	*	554	*81	1,078	100.0	27.4	*	23.1	*3.4	44.9
Convulsions	2,361	0.2	498	*	829	228	784	100.0	21.1	*	35.1	9.6	33.2
Dizziness and giddiness	3,591	0.3	1,897	399	373	152	771	100.0	52.8	11.1	10.4	4.2	21.5
Pyrexia of unknown origin	3,246	0.3	1,358	*	*	131	1,642	100.0	41.8	*	*	4.0	50.6
Symptoms involving skin and other integumentary tissue	7,265	0.6	4,115	526	1,143	614	867	100.0	56.6	7.2	15.7	8.4	11.9
Headache	5,136	0.4	2,147	*	789	356	1,602	100.0	41.8	*	15.4	6.9	31.2
Epistaxis	1,306	0.1	*	471	*	45	388	100.0	*	36.1	*	3.4	29.7
Abnormal heart sounds	1,897	0.2	536	–	645	188	528	100.0	28.3	. . .	34.0	9.9	27.9
Dyspnea and respiratory abnormalities	3,352	0.3	1,122	*	1,010	183	984	100.0	33.5	*	30.1	5.4	29.3
Cough	3,862	0.3	2,592	*	*	389	359	100.0	67.1	*	*	10.1	9.3
Chest pain	8,645	0.7	2,786	*	1,261	422	4,171	100.0	32.2	*	14.6	4.9	48.3
Symptoms involving the urinary system	5,160	0.4	2,406	1,561	*	363	731	100.0	46.6	30.2	*	7.0	14.2
Abdominal pain	12,574	1.1	5,010	398	*1,614	743	4,809	100.0	39.8	3.2	*12.8	5.9	38.2
Other symptoms, signs and ill-defined conditions	27,770	2.4	14,858	2,080	4,341	2,101	4,390	100.0	53.5	7.5	15.6	7.6	15.8
Injury and poisoning	79,978	6.9	21,779	18,206	6,916	5,176	27,902	100.0	27.2	22.8	8.6	6.5	34.9
Fracture of radius and ulna	2,240	0.2	*	1,361	–	167	460	100.0	*	60.8	. .	7.5	20.5
Fracture of hand and fingers	2,923	0.3	*	1,269	*	215	866	100.0	*	43.4	*	7.4	29.6
Fracture of lower limb	5,038	0.4	*	2,683	*	404	1,332	100.0	*	53.3	*	8.0	26.4
Other fractures	3,568	0.3	*	1,543	*	281	1,107	100.0	*	43.2	*	7.9	31.0
Sprains and strains of wrist and hand	1,635	0.1	*	*	*	143	542	100.0	*	*	*	8.8	33.2
Sprains and strains of knee and leg	2,516	0.2	728	918	*	163	571	100.0	28.9	36.5	*	6.5	22.7
Sprains and strains of ankle	3,235	0.3	928	823	*	268	1,087	100.0	28.7	25.5	*	8.3	33.6
Sprains and strains of neck	2,239	0.2	684	*	*	*100	955	100.0	30.6	*	*	*4.5	42.7
Other sprains and strains of back	5,332	0.5	2,222	*	*1,142	264	1,219	100.0	41.7	*	21.4	5.0	22.9
Other sprains and strains	6,867	0.6	1,907	2,563	*	312	1,423	100.0	27.8	37.3	*	4.5	20.7
Intracranial injury, excluding those with skull fracture	608	0.1	*	*	*	*20	312	100.0	*	*	*	*3.2	51.4
Open wound of head	3,230	0.3	*	*	*	138	2,096	100.0	*	*	*	4.3	64.9
Open wound of hand and fingers	3,286	0.3	582	*	*	218	1,774	100.0	17.7	*	*	6.6	54.0
Other open wound	4,706	0.4	1,494	389	*	455	2,089	100.0	31.7	8.3	*	9.7	44.4
Superficial injuries of cornea	692	0.1	*	*	*	*37	288	100.0	*	*	*	*5.3	41.6
Other superficial injury	3,612	0.3	1,915	*	*	252	1,043	100.0	53.0	*	*	7.0	28.9
Contusion with intact skin surface	9,620	0.8	2,584	818	*	530	4,990	100.0	26.9	8.5	*	5.5	51.9
Other injuries	10,892	0.9	3,218	2,856	*537	795	3,486	100.0	29.5	26.2	*4.9	7.3	32.0
Poisonings	1,367	0.1	*	*	*	*	806	100.0	*	*	*	*	58.9
Other and unspecified effects of external causes	4,299	0.4	1,626	*	*1,255	210	971	100.0	37.8	*	*29.2	4.9	22.6
Complications of surgical and medical care, not elsewhere classified	2,073	0.2	*	620	*	164	485	100.0	*	29.9	*	7.9	23.4
Supplementary classification of factors influencing health status and contact with health services	212,607	18.3	131,567	34,145	23,901	19,542	3,452	100.0	61.9	16.1	11.2	9.2	1.6
Potential health hazards related to communicable diseases	6,136	0.5	3,624	*247	*707	1,427	131	100.0	59.1	*4.0	*11.5	23.3	2.1
Potential health hazards related to personal and family history	11,112	1.0	4,929	2,213	2,620	1,122	228	100.0	44.4	19.9	23.6	10.1	2.1
Routine infant or child health check	43,180	3.7	39,364	*	*	3,475	91	100.0	91.2	*	*	8.0	0.2
Normal pregnancy	21,396	1.8	18,168	*	*	2,831	265	100.0	84.9	*	*	13.2	1.2

See footnotes at end of table.

Table 7. Annual number and percent distribution of ambulatory care visits, by setting type according to diagnosis group: United States, 2006–2007—Con.

Diagnosis group[1]	Combined settings	Percent distribution	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments	Combined settings	Primary care offices	Surgical specialty offices	Medical specialty offices	Hospital outpatient departments	Hospital emergency departments
	Number of visits in thousands							Percent distribution					
Postpartum care and examination	2,400	0.2	2,144	*	*	229	*	100.0	89.4	*	*	9.5	*
Encounter for contraceptive management	3,428	0.3	2,698	236	*	484	*	100.0	78.7	6.9	*	14.1	*
Other encounter related to reproduction	3,211	0.3	2,557	*	*	570	*30	100.0	79.6	*	*	17.8	*0.9
Lens replaced by pseudophakos	1,590	0.1	–	1,568	–	*	–	100.0	. . .	98.7	. . .	*	. . .
Artificial opening status and other postsurgical states	7,246	0.6	1,457	4,604	542	576	67	100.0	20.1	63.5	7.5	7.9	0.9
Attention to dressings and sutures	2,165	0.2	831	415	*	197	554	100.0	38.4	19.2	*	9.1	25.6
Follow-up examination	17,295	1.5	4,500	8,254	3,427	931	183	100.0	26.0	47.7	19.8	5.4	1.1
General medical examination	18,007	1.6	12,948	*568	*2,862	1,403	226	100.0	71.9	*3.2	*15.9	7.8	1.3
Observation and evaluation for suspected conditions not found	7,592	0.7	3,356	1,294	1,677	729	535	100.0	44.2	17.0	22.1	9.6	7.0
Gynecological examination	15,779	1.4	14,510	*	*	1,161	*	100.0	92.0	*	*	7.4	*
Other factors influencing health status and contact with health services	52,071	4.5	20,480	14,609	11,469	4,384	1,129	100.0	39.3	28.1	22.0	8.4	2.2
Blank and illegible	25,226	2.2	12,903	2,969	4,011	1,262	4,081	100.0	51.2	11.8	15.9	5.0	16.2

* Figure does not meet standards of reliability or precision.

– Quantity zero.

. . . Category not applicable.

0.0 Quantity more than zero but less than 0.05.

[1]Based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (13). See the text Table for the list of codes that constitute each category.

NOTES: Numbers may not add to totals because of rounding. Figures are annual averages. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 8. Injury visits by patient age and sex, according to ambulatory care setting: United States, 2007

Patient age and sex	Combined settings		Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
	Number of visits in thousands	(Standard error in thousands)	Number of visits in thousands	(Standard error in thousands)	Number of visits in thousands	(Standard error in thousands)	Number of visits in thousands	(Standard error in thousands)	Number of visits in thousands	(Standard error in thousands)	Number of visits in thousands	(Standard error in thousands)
All visits	156,844	(7,094)	45,153	(3,440)	34,028	(3,870)	27,269	(3,309)	10,999	(1,428)	39,395	(2,155)
Under 15 years	22,682	(1,404)	9,241	(1,096)	3,435	(723)	*	. . .	1,521	(265)	7,304	(527)
15–24 years	20,675	(1,289)	5,886	(798)	4,321	(716)	1,672	(407)	1,684	(267)	7,112	(477)
25–44 years	39,400	(2,317)	10,816	(1,213)	7,735	(1,142)	5,788	(1,007)	3,429	(581)	11,633	(707)
45–64 years	42,692	(2,499)	10,457	(1,097)	11,888	(1,681)	9,024	(1,214)	3,202	(415)	8,119	(469)
65–74 years	15,784	(1,204)	4,974	(664)	3,580	(566)	4,641	(717)	625	(114)	1,963	(150)
75 years and over	15,612	(1,149)	3,778	(659)	3,069	(477)	4,963	(823)	538	(104)	3,265	(217)
Female	77,114	(3,673)	23,841	(1,951)	16,165	(1,909)	13,266	(1,538)	5,393	(705)	18,449	(1,028)
Under 15 years	9,476	(789)	4,016	(611)	*1,229	(432)	*	. . .	684	(129)	3,076	(235)
15–24 years	7,953	(610)	2,547	(465)	1,079	(217)	*	. . .	681	(127)	3,103	(206)
25–44 years	19,070	(1,168)	5,767	(642)	3,423	(602)	3,173	(529)	1,624	(278)	5,082	(338)
45–64 years	22,195	(1,447)	6,165	(736)	5,882	(923)	4,502	(680)	1,699	(234)	3,947	(259)
65–74 years	8,679	(807)	2,789	(505)	2,467	(444)	2,028	(374)	332	(63)	1,063	(103)
75 years and over	9,740	(810)	2,557	(487)	2,085	(359)	2,550	(491)	372	(73)	2,178	(163)
Male	79,730	(3,874)	21,311	(1,915)	17,864	(2,138)	14,003	(2,084)	5,606	(762)	20,946	(1,174)
Under 15 years	13,206	(924)	5,225	(753)	2,206	(417)	*	. . .	837	(149)	4,227	(339)
15–24 years	12,722	(982)	3,339	(567)	3,242	(621)	*1,129	(392)	1,002	(177)	4,009	(306)
25–44 years	20,331	(1,489)	5,049	(875)	4,312	(664)	2,615	(664)	1,805	(326)	6,550	(413)
45–64 years	20,497	(1,394)	4,291	(590)	6,007	(923)	4,522	(776)	1,503	(204)	4,173	(257)
65–74 years	7,104	(619)	2,185	(391)	1,113	(226)	2,613	(440)	293	(64)	900	(85)
75 years and over	5,871	(524)	*	. . .	984	(233)	2,413	(406)	*166	(51)	1,087	(90)
	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
All visits	100.0	. . .	28.8	(1.8)	21.7	(2.0)	17.4	(1.9)	7.0	(0.9)	25.1	(1.4)
Under 15 years	100.0	. . .	40.7	(3.4)	15.1	(3.0)	*	. . .	6.7	(1.2)	32.2	(2.5)
15–24 years	100.0	. . .	28.5	(3.2)	20.9	(2.9)	8.1	(1.9)	8.1	(1.3)	34.4	(2.1)
25–44 years	100.0	. . .	27.5	(2.5)	19.6	(2.4)	14.7	(2.3)	8.7	(1.4)	29.5	(2.1)
45–64 years	100.0	. . .	24.5	(2.3)	27.8	(3.0)	21.1	(2.4)	7.5	(1.0)	19.0	(1.3)
65–74 years	100.0	. . .	31.5	(3.1)	22.7	(3.1)	29.4	(3.6)	4.0	(0.8)	12.4	(1.3)
75 years and over	100.0	. . .	24.2	(3.7)	19.7	(2.7)	31.8	(4.1)	3.4	(0.7)	20.9	(1.9)
Female	100.0	. . .	30.9	(1.9)	21.0	(2.0)	17.2	(1.7)	7.0	(0.9)	23.9	(1.4)
Under 15 years	100.0	. . .	42.4	(4.5)	*13.0	(4.2)	*	. . .	7.2	(1.4)	32.5	(3.1)
15–24 years	100.0	. . .	32.0	(4.2)	13.6	(2.5)	*	. . .	8.6	(1.5)	39.0	(3.0)
25–44 years	100.0	. . .	30.2	(2.7)	17.9	(2.7)	16.6	(2.4)	8.5	(1.4)	26.7	(2.0)
45–64 years	100.0	. . .	27.8	(2.8)	26.5	(3.2)	20.3	(2.6)	7.7	(1.2)	17.8	(1.5)
65–74 years	100.0	. . .	32.1	(4.4)	28.4	(4.1)	23.4	(3.7)	3.8	(0.8)	12.2	(1.5)
75 years and over	100.0	. . .	26.2	(4.2)	21.4	(3.2)	26.2	(4.0)	3.8	(0.8)	22.4	(2.1)
Male	100.0	. . .	26.7	(2.1)	22.4	(2.1)	17.6	(2.4)	7.0	(0.9)	26.3	(1.5)
Under 15 years	100.0	. . .	39.6	(3.8)	16.7	(3.1)	*	. . .	6.3	(1.2)	32.0	(2.8)
15–24 years	100.0	. . .	26.2	(3.9)	25.5	(3.9)	*8.9	(3.0)	7.9	(1.4)	31.5	(2.5)
25–44 years	100.0	. . .	24.8	(3.4)	21.2	(2.6)	12.9	(3.0)	8.9	(1.5)	32.2	(2.6)
45–64 years	100.0	. . .	20.9	(2.7)	29.3	(3.5)	22.1	(3.2)	7.3	(1.1)	20.4	(1.5)
65–74 years	100.0	. . .	30.8	(4.4)	15.7	(2.9)	36.8	(4.8)	4.1	(1.0)	12.7	(1.6)
75 years and over	100.0	. . .	*	. . .	16.8	(3.5)	41.1	(5.3)	*2.8	(0.9)	18.5	(2.2)

See footnotes at end of table.

Table 8. Injury visits by patient age and sex, according to ambulatory care setting: United States, 2007—Con.

Patient age and sex	Combined settings		Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
	Number of visits per 100 persons[1]	(Standard error of rate)	Number of visits per 100 persons[1]	(Standard error of rate)	Number of visits per 100 persons[1]	(Standard error of rate)	Number of visits per 100 persons[1]	(Standard error of rate)	Number of visits per 100 persons[1]	(Standard error of rate)	Number of visits per 100 persons[1]	(Standard error of rate)
All visits	52.9	2.4	15.2	1.2	11.5	(1.3)	9.2	(1.1)	3.7	(0.5)	13.3	(0.7)
Under 15 years	37.3	2.3	15.2	1.8	5.7	(1.2)	*	. . .	2.5	(0.4)	12.0	(0.9)
15–24 years	49.8	3.1	14.2	1.9	10.4	(1.7)	4.0	(1.0)	4.1	(0.6)	17.1	(1.2)
25–44 years	48.2	2.8	13.2	1.5	9.5	(1.4)	7.1	(1.2)	4.2	(0.7)	14.2	(0.9)
45–64 years	56.1	3.3	13.8	1.4	15.6	(2.2)	11.9	(1.6)	4.2	(0.6)	10.7	(0.6)
65–74 years	82.6	6.3	26.0	3.5	18.7	(3.0)	24.3	(3.8)	3.3	(0.6)	10.3	(0.8)
75 years and over	91.1	6.7	22.1	3.9	17.9	(2.8)	29.0	(4.8)	3.1	(0.6)	19.1	(1.3)
Female	51.0	2.4	15.8	1.3	10.7	(1.3)	8.8	(1.0)	3.6	(0.5)	12.2	(0.7)
Under 15 years	31.9	2.7	13.5	2.1	*4.1	(1.5)	*	. . .	2.3	(0.4)	10.4	(0.8)
15–24 years	38.8	3.0	12.4	2.3	5.3	(1.1)	*	. . .	3.3	(0.6)	15.1	(1.0)
25–44 years	46.3	2.8	14.0	1.6	8.3	(1.5)	7.7	(1.3)	3.9	(0.7)	12.3	(0.8)
45–64 years	56.8	3.7	15.8	1.9	15.0	(2.4)	11.5	(1.7)	4.3	(0.6)	10.1	(0.7)
65–74 years	84.0	7.8	27.0	4.9	23.9	(4.3)	19.6	(3.6)	3.2	(0.6)	10.3	(1.0)
75 years and over	93.9	7.8	24.6	4.7	20.1	(3.5)	24.6	(4.7)	3.6	(0.7)	21.0	(1.6)
Male	55.0	2.7	14.7	1.3	12.3	(1.5)	9.7	(1.4)	3.9	(0.5)	14.4	(0.8)
Under 15 years	42.4	3.0	16.8	2.4	7.1	(1.3)	*	. . .	2.7	(0.5)	13.6	(1.1)
15–24 years	60.7	4.7	15.9	2.7	15.5	(3.0)	*5.4	(1.9)	4.8	(0.8)	19.1	(1.5)
25–44 years	50.2	3.7	12.5	2.2	10.7	(1.6)	6.5	(1.6)	4.5	(0.8)	16.2	(1.0)
45–64 years	55.5	3.8	11.6	1.6	16.3	(2.5)	12.2	(2.1)	4.1	(0.6)	11.3	(0.7)
65–74 years	81.0	7.1	24.9	4.5	12.7	(2.6)	29.8	(5.0)	3.3	(0.7)	10.3	(1.0)
75 years and over	86.9	7.8	*	. . .	14.6	(3.4)	35.7	(6.0)	*2.5	(0.8)	16.1	(1.3)

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

[1]Visit rates are based on the July 1, 2007 set of estimates of the civilian noninstitutionalized population of the United States as developed by the Population Division, U.S. Census Bureau.

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 9. Drug visits, and drug mentions at ambulatory care visits, by setting type: United States, 2007

Ambulatory care setting	Drug visits[1]				Drug mentions[2]				Percent drug visits[3]		Drug mention rates[4]	
	Number in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Number in thousands	(Standard error in thousands)	Percent distribution	(Standard error of percent)	Percent	(Standard error of percent)	Number of drug mentions per 100 visits	(Standard error of rate)
All ambulatory care settings	881,858	(33,266)	100.0	. . .	2,688,748	(122,222)	100.0	. . .	73.5	(0.8)	224.1	5.9
Primary care offices	445,864	(24,202)	50.6	(1.6)	1,301,050	(80,510)	48.4	(1.9)	77.3	(1.0)	225.6	7.9
Medical specialty offices	173,642	(11,348)	19.7	(1.1)	627,819	(56,028)	23.3	(1.7)	78.5	(1.9)	284.0	14.8
Surgical specialty offices	108,212	(8,847)	12.3	(0.9)	321,620	(32,369)	12.0	(1.0)	55.0	(2.1)	163.6	11.4
Hospital outpatient departments	65,033	(7,729)	7.4	(0.9)	224,872	(30,291)	8.4	(1.1)	73.2	(1.9)	253.0	13
Hospital emergency departments	89,108	(4,975)	10.1	(0.6)	213,387	(12,348)	7.9	(0.5)	76.3	(0.7)	182.7	3.9

. . . Category not applicable.

[1]Visits at which one or more drugs were provided, prescribed, or continued by the provider. A drug mention is defined as any medication that is provided, prescribed, or continued at the visit, including over-the-counter preparations, immunizations, desensitizing agents, and anesthetics. Up to eight mentions are collected per visit.

[2]Number of drugs provided, prescribed, or continued at visits (up to eight per visit).

[3]Percentage of visits that included one or more drug mentions (number of drug visits divided by number of all visits multiplied by 100).

[4]Average number of drugs that were provided, prescribed, or continued per 100 visits (number of drug mentions divided by total number of all visits multiplied by 100).

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 10. The 20 most frequently prescribed therapeutic categories of drugs at ambulatory care visits, with percent distribution by setting type: United States, 2007

Therapeutic drug category[1]	Number of occurrences in thousands[2]	(Standard error in thousands)	Number of occurences per 100 drug mentions[3]	(Standard error of rate)	Total	Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
						Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
All occurrences	3,032,619	(138,669)	112.8	(0.2)	100.0	47.7	(1.9)	11.7	(1.0)	23.7	(1.7)	8.4	(1.1)	8.6	(0.5)
Analgesics	353,057	(18,682)	13.1	(0.3)	100.0	41.0	(2.1)	11.9	(1.1)	17.1	(1.8)	8.1	(1.1)	22.0	(1.3)
Antihyperlipidemic agents	134,452	(9,235)	5.0	(0.2)	100.0	54.2	(2.8)	13.4	(1.6)	24.6	(2.3)	7.3	(1.2)	0.4	(0.1)
Antidepressants	120,578	(6,498)	4.5	(0.2)	100.0	46.3	(2.7)	8.3	(1.1)	35.7	(2.6)	8.9	(1.3)	0.7	(0.1)
Anxiolytics, sedatives, and hypnotics	103,031	(6,053)	3.8	(0.1)	100.0	45.9	(2.8)	7.1	(0.8)	30.2	(2.6)	7.9	(1.2)	8.9	(0.6)
Antidiabetic agents	92,853	(6,401)	3.5	(0.1)	100.0	56.4	(2.9)	14.2	(1.9)	17.8	(2.2)	9.6	(1.4)	2.0	(0.2)
Beta-adrenergic blocking agents	87,765	(6,442)	3.3	(0.1)	100.0	42.9	(3.1)	13.8	(1.9)	31.8	(3.1)	9.1	(1.7)	2.3	(0.2)
Bronchodilators	83,083	(6,169)	3.1	(0.2)	100.0	51.9	(3.6)	5.1	(0.9)	24.9	(4.3)	9.3	(1.5)	8.8	(0.8)
Antiplatelet agents	82,537	(6,339)	3.1	(0.1)	100.0	37.8	(3.2)	13.8	(2.0)	34.7	(3.1)	9.1	(1.7)	4.7	(0.5)
Anticonvulsants	80,130	(5,006)	3.0	(0.1)	100.0	39.4	(2.8)	8.3	(1.2)	36.4	(2.6)	8.9	(1.2)	7.0	(0.6)
Antihistamines	77,432	(5,106)	2.9	(0.1)	100.0	47.4	(3.4)	6.8	(1.0)	22.8	(4.4)	7.4	(1.1)	15.6	(1.4)
Dermatological agents	75,101	(4,733)	2.8	(0.2)	100.0	38.7	(2.8)	7.9	(1.1)	40.9	(3.1)	8.0	(1.6)	4.6	(0.5)
Diuretics	73,450	(5,272)	2.7	(0.1)	100.0	48.0	(3.4)	10.7	(1.5)	27.8	(2.9)	10.9	(2.0)	2.5	(0.3)
Proton pump inhibitors	73,392	(4,592)	2.7	(0.1)	100.0	51.1	(3.3)	13.3	(1.7)	24.3	(2.9)	8.5	(1.4)	2.8	(0.3)
Angiotensin converting enzyme inhibitors	68,635	(4,276)	2.6	(0.1)	100.0	51.5	(2.8)	12.5	(1.4)	24.7	(2.4)	9.9	(1.8)	1.4	(0.1)
Antiemetic/antivertigo agents	65,698	(3,639)	2.4	(0.1)	100.0	35.9	(2.7)	3.5	(0.5)	17.3	(2.0)	7.9	(1.7)	35.4	(2.0)
Viral vaccines	59,319	(6,024)	2.2	(0.2)	100.0	90.7	(1.4)	*	. . .	*1.3	(0.6)	7.6	(1.2)	0.3	(0.1)
Adrenal cortical steroids	54,386	(3,533)	2.0	(0.1)	100.0	43.3	(2.9)	13.7	(1.8)	24.5	(3.4)	6.9	(1.1)	11.5	(1.0)
Ophthalmic preparations	50,271	(7,970)	1.9	(0.3)	100.0	11.0	(2.0)	75.1	(4.1)	7.5	(2.0)	4.1	(0.9)	2.3	(0.4)
Minerals and electrolytes	46,550	(3,210)	1.7	(0.1)	100.0	40.2	(3.0)	11.7	(1.7)	23.3	(2.8)	8.2	(1.6)	16.5	(1.7)
Penicillins	45,658	(3,009)	1.7	(0.1)	100.0	70.5	(2.4)	3.7	(0.7)	3.0	(0.7)	7.1	(1.2)	15.6	(1.4)

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

[1]Based on Multum Lexicon second-level therapeutic drug category (see http://www.multum.com/lexicon.htm). Drugs for which the second-level category was not known are not included.

[2]Total of all therapeutic drug categories will exceed total number of drug mentions because up to four categories may be coded for each drug.

[3]Based on an estimated 2,688,748,000 drug mentions at ambulatory care visits in 2007. A drug mention is defined as any medication that is provided, prescribed, or continued at the visit, including over-the-counter preparations, immunizations, desensitizing agents, and anesthetics.

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007

Therapeutic drug category[1]	Combined settings: Number of occurrences in thousands[2]	Combined settings: (Standard error in thousands)	Combined settings: Number of occurences per 100 drug mentions[3]	Combined settings: (Standard error of rate)	Total	Primary care offices: Percent distribution	Primary care offices: (Standard error of percent)	Surgical specialty offices: Percent distribution	Surgical specialty offices: (Standard error of percent)	Medical specialty offices: Percent distribution	Medical specialty offices: (Standard error of percent)	Hospital outpatient departments: Percent distribution	Hospital outpatient departments: (Standard error of percent)	Hospital emergency departments: Percent distribution	Hospital emergency departments: (Standard error of percent)
All occurrences	3,040,323	(138,837)	113.1	(0.2)	100.0	47.7	(1.9)	11.7	(1.0)	23.7	(1.7)	8.4	(1.1)	8.6	(0.5)
Anti-infectives	203,797	(8,124)	7.6	(0.3)	100.0	56.1	(2.0)	9.2	(0.8)	10.3	(1.2)	7.8	(1.0)	16.7	(1.0)
Amebicides	4,308	(498)	0.2	(0.0)	100.0	56.4	(4.9)	*	. . .	*	. . .	11.2	(2.3)	17.9	(2.3)
Antifungals	6,625	(598)	0.2	(0.0)	100.0	65.7	(3.8)	*	. . .	17.0	(3.5)	9.7	(1.7)	4.5	(0.7)
Azole antifungals	6,043	(566)	0.2	(0.0)	100.0	65.2	(4.0)	*	. . .	17.2	(3.7)	9.9	(1.8)	4.5	(0.8)
Miscellaneous antifungals	443	(114)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Antimalarial agents	10,145	(1,086)	0.4	(0.0)	100.0	44.0	(4.9)	5.6	(1.4)	34.1	(4.7)	8.9	(1.9)	7.4	(1.0)
Antimalarial quinolines	3,876	(787)	0.1	(0.0)	100.0	40.2	(8.7)	*	. . .	42.5	(10.1)	*8.8	(3.2)	*	. . .
Miscellaneous antimalarials	6,187	(705)	0.2	(0.0)	100.0	46.0	(5.3)	*	. . .	29.2	(3.9)	8.7	(1.9)	11.9	(1.6)
Antituberculosis agents	*866	(263)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*14.4	(6.1)	*	. . .
Nicotinic acid derivatives	*362	(161)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	*	. . .
Rifamycin derivatives	*420	(126)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	*	. . .
Antiviral agents	10,100	(1,284)	0.4	(0.0)	100.0	42.8	(6.3)	*	. . .	26.8	(7.4)	18.8	(5.6)	5.6	(1.1)
Protease inhibitors	*1,279	(474)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*34.0	(14.3)	*	. . .
NRTIs	*766	(232)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*34.7	(12.6)	*	. . .
NNRTIs	*183	(83)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*63.7	(21.2)	*	. . .
Adamantane antivirals	557	(164)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Purine nucleosides	5,128	(606)	0.2	(0.0)	100.0	60.3	(4.8)	*	. . .	14.4	(3.3)	10.7	(2.1)	5.5	(1.2)
Neuraminidase inhibitors	648	(191)	0.0	(0.0)	100.0	*	. . .	*	. . .	–	. . .	–	. . .	*27.0	(9.7)
Antiviral combinations	*920	(359)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*43.6	(18.7)	*	. . .
Cephalosporins	30,232	(1,860)	1.1	(0.1)	100.0	52.3	(3.0)	8.5	(1.6)	6.1	(1.4)	6.6	(1.1)	26.6	(2.0)
First generation cephalosporins	15,071	(1,273)	0.6	(0.0)	100.0	50.2	(3.7)	9.1	(1.7)	*6.2	(1.9)	7.8	(1.5)	26.8	(2.5)
Second generation cephalosporins	3,329	(520)	0.1	(0.0)	100.0	58.1	(9.0)	*14.9	(7.3)	*	. . .	*5.1	(2.0)	6.0	(1.3)
Third generation cephalosporins	11,672	(916)	0.4	(0.0)	100.0	53.6	(3.8)	6.0	(1.7)	*	. . .	5.5	(1.4)	31.7	(2.7)
Fourth generation cephalosporins	77	(19)	0.0	(0.0)	100.0	–	. . .	–	. . .	–	. . .	*	. . .	*	. . .
Leprostatics	272	(79)	0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	–	. . .
Macrolide derivatives	30,033	(2,040)	1.1	(0.1)	100.0	69.8	(2.5)	4.4	(1.1)	*4.3	(1.5)	7.4	(1.2)	14.1	(1.3)
Macrolides	29,967	(2,035)	1.1	(0.1)	100.0	69.8	(2.6)	4.4	(1.1)	*4.3	(1.6)	7.4	(1.2)	14.1	(1.3)
Miscellaneous antibiotics	25,887	(1,783)	1.0	(0.1)	100.0	48.3	(3.2)	8.3	(1.1)	12.0	(2.4)	8.6	(1.2)	22.8	(1.9)
Penicillins	45,658	(3,009)	1.7	(0.1)	100.0	70.5	(2.4)	3.7	(0.7)	3.0	(0.7)	7.1	(1.2)	15.6	(1.4)
Penicillinase resistant penicillins	*323	(104)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	*	. . .
Aminopenicillins	27,398	(2,306)	1.0	(0.1)	100.0	74.4	(2.5)	2.5	(0.5)	*	. . .	7.4	(1.3)	13.1	(1.5)
Beta-lactamase inhibitors	14,543	(1,207)	0.5	(0.1)	100.0	69.0	(3.5)	6.9	(1.9)	*	. . .	6.0	(1.2)	14.9	(1.6)
Natural penicillins	3,358	(414)	0.1	(0.0)	100.0	47.9	(6.5)	*	. . .	*	. . .	8.9	(2.5)	38.2	(5.0)
Quinolones	30,921	(1,762)	1.2	(0.1)	100.0	47.5	(2.9)	25.3	(2.7)	5.9	(1.5)	4.8	(0.7)	16.5	(1.3)
Sulfonamides	13,978	(1,150)	0.5	(0.0)	100.0	50.7	(4.0)	6.4	(1.2)	12.2	(2.5)	8.9	(1.5)	21.8	(2.3)
Tetracyclines	8,902	(836)	0.3	(0.0)	100.0	37.6	(4.5)	*	. . .	40.4	(3.8)	7.7	(1.6)	8.6	(1.0)
Urinary anti-infectives	3,773	(475)	0.1	(0.0)	100.0	56.7	(4.9)	15.4	(3.3)	*	. . .	9.2	(2.2)	14.1	(2.2)
Aminoglycosides	969	(183)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*19.6	(5.9)	14.1	(3.8)
Lincomycin derivatives	4,039	(433)	0.2	(0.0)	100.0	26.7	(5.6)	*15.2	(5.7)	23.7	(5.3)	*5.5	(1.7)	28.9	(3.4)
Antineoplastics	28,655	(2,580)	1.1	(0.1)	100.0	29.6	(3.6)	10.5	(2.1)	47.0	(4.3)	12.5	(3.5)	0.4	(0.1)
Alkylating agents	1,651	(344)	0.1	(0.0)	100.0	*	. . .	*	. . .	64.3	(11.0)	*25.4	(10.2)	*	. . .

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

Therapeutic drug category[1]	Combined settings: Number of occurrences in thousands[2]	Combined settings: (Standard error in thousands)	Combined settings: Number of occurences per 100 drug mentions[3]	Combined settings: (Standard error of rate)	Total	Primary care offices: Percent distribution	Primary care offices: (Standard error of percent)	Surgical specialty offices: Percent distribution	Surgical specialty offices: (Standard error of percent)	Medical specialty offices: Percent distribution	Medical specialty offices: (Standard error of percent)	Hospital outpatient departments: Percent distribution	Hospital outpatient departments: (Standard error of percent)	Hospital emergency departments: Percent distribution	Hospital emergency departments: (Standard error of percent)
Antibiotics/antineoplastics	396	(92)	0.0	(0.0)	100.0	*	...	*	...	*	...	*34.4	(13.4)	*	...
Antimetabolites	7,073	(1,349)	0.3	(0.0)	100.0	25.6	(6.2)	*	...	58.3	(7.5)	*10.6	(3.9)	*	...
Hormones/antineoplastics	12,416	(916)	0.5	(0.0)	100.0	46.5	(4.1)	13.9	(2.8)	28.4	(3.5)	10.6	(2.3)	*	...
Miscellaneous antineoplastics	3,119	(390)	0.1	(0.0)	100.0	*	...	*	...	75.8	(5.3)	*7.5	(2.5)	*	...
Mitotic inhibitors	1,298	(274)	0.0	(0.0)	100.0	*	...	*	...	62.3	(11.7)	*21.7	(8.2)	–	...
Antineoplastic monoclonal antibodies	2,017	(418)	0.1	(0.0)	100.0	*	...	*	...	44.8	(9.9)	*17.6	(7.5)	–	...
Tyrosine kinase inhibitors	644	(175)	0.0	(0.0)	100.0	*	...	*	...	71.4	(11.8)	*	...	*	...
Biologicals	4,242	(853)	0.2	(0.0)	100.0	*	...	*	...	62.0	(7.1)	*11.2	(4.0)	*	...
Colony stimulating factors	823	(211)	0.0	(0.0)	100.0	*	...	*	...	52.2	(13.2)	*23.7	(12.6)	*	...
Recombinant human erythropoietins	2,705	(667)	0.1	(0.0)	100.0	*	...	*	...	77.6	(6.9)	*10.1	(4.1)	*	...
Cardiovascular agents	414,246	(25,003)	15.4	(0.4)	100.0	46.9	(2.8)	13.7	(1.5)	27.4	(2.6)	9.0	(1.5)	3.0	(0.2)
Angiotensin converting enzyme inhibitors	68,635	(4,276)	2.6	(0.1)	100.0	51.5	(2.8)	12.5	(1.4)	24.7	(2.4)	9.9	(1.8)	1.4	(0.1)
Antiadrenergic agents, peripherally acting	17,238	(1,447)	0.6	(0.0)	100.0	46.2	(4.3)	25.5	(3.0)	21.8	(3.5)	5.3	(1.3)	1.1	(0.2)
Antiadrenergic agents, centrally acting	6,373	(518)	0.2	(0.0)	100.0	40.7	(4.4)	*	...	26.1	(3.1)	12.9	(2.3)	12.4	(1.7)
Antianginal agents	10,659	(988)	0.4	(0.0)	100.0	30.4	(4.3)	*	...	32.1	(4.3)	5.9	(1.5)	24.7	(2.9)
Antiarrhythmic agents	16,855	(1,866)	0.6	(0.1)	100.0	24.0	(3.8)	23.9	(5.1)	27.2	(4.8)	*12.4	(5.0)	12.5	(1.6)
Beta-adrenergic blocking agents	87,765	(6,442)	3.3	(0.1)	100.0	42.9	(3.1)	13.8	(1.9)	31.8	(3.1)	9.1	(1.7)	2.3	(0.2)
Cardioselective beta blockers	67,720	(4,873)	2.5	(0.1)	100.0	45.7	(3.3)	13.1	(1.9)	29.2	(2.9)	9.6	(1.8)	2.4	(0.3)
Non-cardioselective beta blockers	20,045	(2,093)	0.7	(0.1)	100.0	33.7	(3.7)	16.4	(3.1)	40.7	(4.9)	7.3	(1.5)	2.0	(0.3)
Calcium channel blocking agents	41,164	(2,747)	1.5	(0.1)	100.0	46.9	(3.3)	14.3	(1.7)	27.4	(3.1)	9.4	(1.8)	1.9	(0.2)
Diuretics	73,450	(5,272)	2.7	(0.1)	100.0	48.0	(3.4)	10.7	(1.5)	27.8	(2.9)	10.9	(2.0)	2.5	(0.3)
Loop diuretics	33,848	(2,687)	1.3	(0.1)	100.0	44.9	(3.5)	8.6	(1.5)	32.9	(3.5)	9.3	(1.8)	4.3	(0.5)
Potassium-sparing diuretics	7,426	(834)	0.3	(0.0)	100.0	41.6	(4.6)	*	...	38.2	(4.4)	7.7	(1.9)	*	...
Thiazide diuretics	31,387	(2,424)	1.2	(0.1)	100.0	53.5	(3.9)	12.1	(2.3)	20.0	(2.7)	13.5	(2.7)	0.9	(0.2)
Carbonic anhydrase inhibitors	584	(154)	0.0	(0.0)	100.0	*	...	*	...	*	...	*	...	*	...
Inotropic agents	9,373	(1,124)	0.3	(0.0)	100.0	39.7	(5.0)	10.0	(2.5)	40.6	(5.2)	7.1	(1.8)	2.5	(0.5)
Miscellaneous cardiovascular agents	804	(166)	0.0	(0.0)	100.0	*	...	*	...	*	...	*	...	*	...
Vasodilators	11,627	(960)	0.4	(0.0)	100.0	31.6	(4.1)	7.3	(1.8)	30.9	(4.2)	7.1	(1.5)	23.1	(2.5)
Vasopressors	4,572	(1,206)	0.2	(0.0)	100.0	*	...	*34.6	(14.7)	*	...	*9.4	(4.9)	13.5	(3.8)
Antihypertensive combinations	35,560	(2,937)	1.3	(0.1)	100.0	61.5	(4.5)	11.0	(1.8)	21.6	(3.7)	5.6	(1.2)	0.4	(0.1)
Angiotensin II inhibitors	36,385	(2,676)	1.4	(0.1)	100.0	53.8	(3.9)	15.1	(2.6)	24.4	(3.0)	6.2	(1.1)	0.5	(0.1)
Agents for pulmonary hypertension	3,504	(526)	0.1	(0.0)	100.0	62.7	(6.1)	14.8	(3.9)	*	...	9.3	(2.6)	*	...
Aldosterone receptor antagonists	5,498	(656)	0.2	(0.0)	100.0	43.8	(5.4)	*	...	41.0	(5.6)	8.6	(2.4)	*	...
Central nervous system agents	609,893	(30,557)	22.7	(0.5)	100.0	41.4	(2.0)	10.1	(1.0)	22.2	(1.7)	8.3	(1.2)	18.1	(1.1)
Analgesics	353,057	(18,682)	13.1	(0.3)	100.0	41.0	(2.1)	11.9	(1.1)	17.1	(1.8)	8.1	(1.1)	22.0	(1.3)
Miscellaneous analgesics	46,574	(2,907)	1.7	(0.1)	100.0	47.1	(2.7)	8.1	(1.6)	10.6	(2.0)	8.1	(1.2)	26.1	(2.2)
Narcotic analgesics	40,240	(3,175)	1.5	(0.1)	100.0	27.8	(3.5)	5.8	(1.1)	19.0	(3.0)	9.4	(2.5)	38.0	(3.0)

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

	Combined settings					Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
Therapeutic drug category[1]	Number of occurrences in thousands[2]	(Standard error in thousands)	Number of occurences per 100 drug mentions[3]	(Standard error of rate)	Total	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
Nonsteroidal anti-inflammatory agents	98,039	(5,543)	3.6	(0.1)	100.0	44.2	(2.4)	12.9	(1.4)	9.7	(1.6)	8.0	(1.1)	25.2	(1.6)
Salicylates	65,446	(5,325)	2.4	(0.1)	100.0	38.1	(3.3)	13.9	(2.0)	33.0	(3.1)	9.6	(1.9)	5.4	(0.6)
Analgesic combinations	6,659	(762)	0.2	(0.0)	100.0	50.4	(5.5)	14.4	(4.0)	23.2	(4.1)	4.2	(0.9)	7.8	(1.3)
Narcotic analgesic combinations	76,396	(5,344)	2.8	(0.1)	100.0	38.1	(3.0)	13.3	(1.5)	13.9	(2.2)	7.2	(1.2)	27.5	(2.0)
Antimigraine agents	7,553	(853)	0.3	(0.0)	100.0	60.1	(5.4)	*	. . .	25.0	(4.3)	5.7	(1.4)	2.6	(0.6)
Cox-2 inhibitors	12,149	(1,240)	0.5	(0.0)	100.0	51.1	(4.7)	20.1	(3.2)	23.4	(4.2)	4.5	(1.0)	*	. . .
Anticonvulsants	80,130	(5,006)	3.0	(0.1)	100.0	39.4	(2.8)	8.3	(1.2)	36.4	(2.6)	8.9	(1.2)	7.0	(0.6)
Hydantoin anticonvulsants	3,655	(445)	0.1	(0.0)	100.0	50.7	(5.8)	*	. . .	23.0	(4.0)	6.0	(1.4)	14.2	(2.3)
Barbiturate anticonvulsants	1,289	(237)	0.0	(0.0)	100.0	*	. . .	*	. . .	35.3	(7.1)	*10.9	(3.5)	*	. . .
Benzodiazepine anticonvulsants	35,536	(2,617)	1.3	(0.1)	100.0	42.9	(3.4)	7.0	(1.1)	31.2	(3.1)	7.4	(1.2)	11.5	(1.0)
Miscellaneous anticonvulsants	*568	(193)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	*24.2	(9.5)
Dibenzazepine anticonvulsants	3,287	(422)	0.1	(0.0)	100.0	31.9	(6.1)	*	. . .	40.2	(5.0)	14.0	(2.8)	4.4	(1.1)
Fatty acid derivative anticonvulsants	3,854	(410)	0.1	(0.0)	100.0	32.9	(6.2)	*	. . .	41.2	(5.0)	15.0	(2.9)	5.2	(1.0)
Gamma-aminobutyric acid analogs	18,667	(1,547)	0.7	(0.0)	100.0	42.9	(3.9)	13.8	(2.9)	32.7	(3.1)	9.7	(1.8)	0.9	(0.2)
Triazine anticonvulsants	5,069	(643)	0.2	(0.0)	100.0	*	. . .	*	. . .	68.2	(5.5)	9.7	(2.4)	*	. . .
Pyrrolidine anticonvulsants	1,225	(173)	0.0	(0.0)	100.0	*	. . .	*	. . .	59.6	(7.5)	13.9	(3.1)	*	. . .
Carbonic anhydrase inhibitor anticonvulsants	5,593	(568)	0.2	(0.0)	100.0	31.6	(5.1)	*	. . .	47.3	(5.1)	8.6	(1.6)	*	. . .
Antiemetic/antivertigo agents	65,698	(3,639)	2.4	(0.1)	100.0	35.9	(2.7)	3.5	(0.5)	17.3	(2.0)	7.9	(1.7)	35.4	(2.0)
5HT3 receptor antagonists	9,138	(942)	0.3	(0.0)	100.0	*	. . .	*	. . .	13.9	(3.5)	*11.7	(4.6)	67.4	(4.5)
Phenothiazine antiemetics	17,964	(1,387)	0.7	(0.0)	100.0	34.5	(3.9)	*	. . .	10.6	(2.9)	6.9	(2.0)	46.5	(3.4)
Anticholinergic antiemetics	16,015	(1,149)	0.6	(0.0)	100.0	45.8	(3.7)	5.6	(1.5)	16.5	(2.8)	7.9	(1.5)	24.2	(1.9)
Miscellaneous antiemetics	22,578	(1,835)	0.8	(0.1)	100.0	42.2	(4.2)	4.5	(0.9)	24.5	(2.9)	7.3	(1.4)	21.5	(1.9)
Anti-Parkinson agents	18,692	(1,199)	0.7	(0.0)	100.0	37.3	(3.2)	7.7	(2.0)	29.5	(3.0)	8.9	(1.5)	16.6	(1.3)
Anticholinergic anti-Parkinson agents	11,852	(839)	0.4	(0.0)	100.0	39.7	(3.9)	*	. . .	20.0	(3.6)	10.8	(2.0)	25.7	(2.1)
Dopaminergic anti-Parkinson agents	6,814	(771)	0.3	(0.0)	100.0	33.1	(5.7)	14.5	(3.8)	45.7	(5.3)	5.7	(1.2)	*	. . .
Anxiolytics, sedatives, and hypnotics	103,031	(6,053)	3.8	(0.1)	100.0	45.9	(2.8)	7.1	(0.8)	30.2	(2.6)	7.9	(1.2)	8.9	(0.6)
Barbiturates	844	(183)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*13.3	(4.6)	*	. . .
Benzodiazepines	62,707	(4,567)	2.3	(0.1)	100.0	45.9	(3.5)	7.8	(1.0)	30.6	(3.1)	7.8	(1.5)	7.8	(0.7)
Miscellaneous anxiolytics, sedatives and hypnotics	39,375	(2,254)	1.5	(0.1)	100.0	45.9	(2.8)	5.8	(1.1)	29.6	(2.7)	8.0	(1.2)	10.7	(0.8)
CNS stimulants	23,057	(2,604)	0.9	(0.1)	100.0	54.4	(5.7)	*4.7	(1.7)	33.9	(6.1)	6.7	(1.5)	0.3	(0.1)
General anesthetics	*2,314	(1,427)	*0.1	(0.1)	100.0	*	. . .	*	. . .	*	. . .	*67.3	(21.4)	*10.0	(6.3)
Muscle relaxants	30,161	(2,521)	1.1	(0.1)	100.0	48.0	(3.1)	12.3	(2.5)	18.7	(2.9)	7.6	(1.2)	13.5	(1.4)
Neuromuscular blocking agents	*273	(85)	*0.0	(0.0)	100.0	–	. . .	–	. . .	*	. . .	*	. . .	*45.8	(14.4)
Skeletal muscle relaxants	29,720	(2,500)	1.1	(0.1)	100.0	48.2	(3.1)	12.5	(2.5)	18.6	(2.9)	7.5	(1.2)	13.2	(1.4)
Miscellaneous central nervous system agents	1,933	(386)	0.1	(0.0)	100.0	*	. . .	*	. . .	53.7	(8.7)	*6.3	(2.5)	*	. . .

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

Therapeutic drug category[1]	Combined settings: Number of occurrences in thousands[2]	Combined settings: (Standard error in thousands)	Combined settings: Number of occurences per 100 drug mentions[3]	Combined settings: (Standard error of rate)	Total	Primary care offices: Percent distribution	Primary care offices: (Standard error of percent)	Surgical specialty offices: Percent distribution	Surgical specialty offices: (Standard error of percent)	Medical specialty offices: Percent distribution	Medical specialty offices: (Standard error of percent)	Hospital outpatient departments: Percent distribution	Hospital outpatient departments: (Standard error of percent)	Hospital emergency departments: Percent distribution	Hospital emergency departments: (Standard error of percent)
Anorexiants	7,795	(2,186)	0.3	(0.1)	100.0	69.7	(15.9)	*7.3	(6.2)	*	. . .	*1.7	(0.8)	*	. . .
Cholinesterase inhibitors	3,920	(447)	0.1	(0.0)	100.0	38.9	(5.8)	*	. . .	42.7	(5.4)	7.7	(2.3)	*	. . .
Drugs used in alcohol dependence	*223	(70)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*22.5	(10.7)	*	. . .
Coagulation modifiers	107,703	(8,037)	4.0	(0.2)	100.0	37.7	(3.1)	12.7	(1.7)	34.8	(3.1)	9.4	(1.8)	5.3	(0.6)
Anticoagulants	24,507	(2,142)	0.9	(0.1)	100.0	37.5	(3.8)	9.2	(1.7)	35.5	(4.3)	10.2	(2.2)	7.7	(1.2)
Heparins	2,896	(400)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*10.8	(4.3)	57.2	(6.4)
Coumarins and indandiones	21,467	(2,038)	0.8	(0.1)	100.0	40.7	(4.3)	10.1	(2.0)	38.2	(4.7)	10.0	(2.3)	0.9	(0.2)
Antiplatelet agents	82,537	(6,339)	3.1	(0.1)	100.0	37.8	(3.2)	13.8	(2.0)	34.7	(3.1)	9.1	(1.7)	4.7	(0.5)
Platelet aggregation inhibitors	82,516	(6,340)	3.1	(0.1)	100.0	37.8	(3.2)	13.8	(2.0)	34.7	(3.1)	9.1	(1.7)	4.6	(0.5)
Miscellaneous coagulation modifiers	647	(184)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Gastrointestinal agents	140,345	(7,510)	5.2	(0.2)	100.0	48.3	(2.8)	11.3	(1.3)	22.7	(2.7)	9.5	(1.3)	8.3	(0.6)
Antacids	8,898	(870)	0.3	(0.0)	100.0	47.0	(5.0)	9.6	(2.2)	17.9	(3.5)	12.7	(2.5)	12.7	(1.6)
Antidiarrheals	3,261	(439)	0.1	(0.0)	100.0	47.8	(6.6)	*	. . .	18.7	(4.5)	6.7	(1.8)	18.1	(2.9)
Digestive enzymes	706	(182)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*20.2	(9.0)	*	. . .
Gallstone solubilizing agents	*447	(158)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*26.4	(12.7)	*	. . .
GI stimulants	6,423	(842)	0.2	(0.0)	100.0	37.6	(7.1)	*	. . .	17.0	(5.1)	7.0	(1.6)	31.9	(4.2)
H2 antagonists	17,510	(1,427)	0.7	(0.0)	100.0	47.6	(3.6)	10.8	(2.6)	20.5	(2.8)	9.2	(1.6)	12.0	(1.3)
Laxatives	15,265	(1,167)	0.6	(0.0)	100.0	46.0	(3.8)	7.5	(1.6)	23.1	(3.3)	14.6	(2.3)	8.8	(0.9)
Miscellaneous GI agents	3,875	(525)	0.1	(0.0)	100.0	43.0	(6.2)	*	. . .	*	. . .	*13.1	(5.4)	31.8	(3.9)
Proton pump inhibitors	73,392	(4,592)	2.7	(0.1)	100.0	51.1	(3.3)	13.3	(1.7)	24.3	(2.9)	8.5	(1.4)	2.8	(0.3)
5-aminosalicylates	2,922	(534)	0.1	(0.0)	100.0	*	. . .	*	. . .	43.1	(10.2)	*7.7	(2.7)	*	. . .
Functional bowel disorder agents	7,157	(691)	0.3	(0.0)	100.0	45.5	(6.3)	14.2	(2.6)	*20.0	(7.1)	6.0	(1.3)	14.3	(1.9)
Anticholinergics/ antispasmodics	6,579	(656)	0.2	(0.0)	100.0	44.4	(6.6)	14.8	(2.8)	*19.3	(7.6)	6.0	(1.3)	15.6	(2.1)
Hormones	163,559	(9,329)	6.1	(0.2)	100.0	52.4	(2.4)	14.0	(1.5)	22.1	(2.2)	7.3	(1.1)	4.2	(0.3)
Adrenal cortical steroids	54,386	(3,533)	2.0	(0.1)	100.0	43.3	(2.9)	13.7	(1.8)	24.5	(3.4)	6.9	(1.1)	11.5	(1.0)
Glucocorticoids	51,543	(3,330)	1.9	(0.1)	100.0	44.0	(2.8)	13.8	(1.8)	23.1	(3.1)	7.1	(1.1)	12.0	(1.0)
Miscellaneous hormones	5,401	(680)	0.2	(0.0)	100.0	50.9	(5.7)	*	. . .	27.1	(5.0)	*7.6	(2.3)	2.2	(0.5)
Sex hormones	44,225	(2,898)	1.6	(0.1)	100.0	66.3	(2.7)	12.3	(1.6)	13.3	(1.7)	7.5	(1.2)	0.5	(0.1)
Contraceptives	18,958	(1,570)	0.7	(0.1)	100.0	77.5	(2.6)	5.3	(1.2)	7.3	(1.5)	9.0	(1.5)	0.8	(0.2)
Androgens and anabolic steroids	1,883	(404)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*4.8	(2.0)	*	. . .
Estrogens	13,585	(1,423)	0.5	(0.0)	100.0	60.2	(4.4)	18.4	(3.2)	14.1	(2.1)	6.9	(1.5)	*	. . .
Gonadotropins	*165	(84)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	*	. . .
Progestins	6,301	(643)	0.2	(0.0)	100.0	70.5	(4.0)	*	. . .	11.6	(2.8)	12.6	(2.3)	*	. . .
Sex hormone combinations	3,919	(590)	0.1	(0.0)	100.0	72.1	(5.3)	*	. . .	*	. . .	6.4	(1.9)	*	. . .
Miscellaneous sex hormones	1,472	(330)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*6.0	(2.1)	–	. . .
5-alpha-reductase inhibitors	4,457	(575)	0.2	(0.0)	100.0	38.7	(5.7)	27.5	(4.6)	29.1	(5.5)	*4.5	(1.4)	*	. . .
Thyroid drugs	39,440	(2,781)	1.5	(0.1)	100.0	50.8	(3.3)	16.5	(2.2)	24.7	(2.8)	7.4	(1.2)	0.6	(0.1)
Bisphosphonates	18,333	(1,829)	0.7	(0.1)	100.0	49.1	(4.2)	14.0	(2.6)	29.3	(4.0)	7.4	(1.6)	*	. . .
Incretin mimetics	1,263	(254)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*5.2	(2.2)	*	. . .
Miscellaneous agents	118,440	(7,209)	4.4	(0.2)	100.0	44.2	(2.8)	15.4	(1.8)	27.4	(2.7)	7.8	(1.5)	5.1	(0.5)
Antidotes	1,107	(197)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*7.9	(3.2)	36.7	(7.1)

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

	Combined settings					Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
Therapeutic drug category[1]	Number of occurrences in thousands[2]	(Standard error in thousands)	Number of occurences per 100 drug mentions[3]	(Standard error of rate)	Total	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
Chelating agents	558	(153)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Local injectable anesthetics	17,402	(2,156)	0.6	(0.1)	100.0	22.6	(4.1)	26.4	(5.3)	23.4	(5.7)	*12.9	(5.6)	14.7	(2.0)
Miscellaneous uncategorized agents	48,665	(4,272)	1.8	(0.2)	100.0	50.5	(4.4)	14.1	(2.6)	24.6	(3.0)	6.4	(1.3)	4.4	(0.6)
Genitourinary tract agents	19,015	(1,568)	0.7	(0.0)	100.0	54.3	(3.3)	21.5	(2.9)	13.8	(2.1)	6.6	(1.1)	3.8	(0.5)
Impotence agents	6,964	(827)	0.3	(0.0)	100.0	64.6	(4.1)	17.0	(2.9)	12.1	(2.7)	6.1	(1.5)	*	. . .
Urinary antispasmodics	9,232	(914)	0.3	(0.0)	100.0	49.3	(4.6)	27.4	(4.4)	17.4	(3.2)	5.4	(1.1)	*	. . .
Urinary pH modifiers	634	(164)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*19.6	(6.3)
Miscellaneous genitourinary tract agents	2,186	(338)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	12.0	(3.2)	24.2	(4.2)
Antirheumatics	12,730	(2,953)	0.5	(0.1)	100.0	27.6	(7.3)	6.3	(1.7)	57.6	(9.2)	*8.3	(3.2)	*	. . .
Antipsoriatics	4,944	(1,311)	0.2	(0.0)	100.0	32.3	(9.4)	–	. . .	56.0	(10.4)	*5.5	(2.3)	–	. . .
Smoking cessation agents	17,757	(1,297)	0.7	(0.0)	100.0	51.9	(3.5)	7.4	(1.6)	31.8	(3.2)	8.0	(1.3)	0.9	(0.2)
Nutritional products	143,923	(10,107)	5.4	(0.2)	100.0	50.6	(2.6)	11.2	(1.5)	21.1	(2.1)	10.8	(1.7)	6.3	(0.7)
Iron products	9,334	(986)	0.3	(0.4)	100.0	57.2	(4.2)	*	. . .	19.3	(2.8)	16.2	(2.7)	1.7	(0.4)
Minerals and electrolytes	46,550	(3,210)	1.7	(0.1)	100.0	40.2	(3.0)	11.7	(1.7)	23.3	(2.8)	8.2	(1.6)	16.5	(1.7)
Oral nutritional supplements	620	(143)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*22.1	(7.8)	*	. . .
Vitamins	31,921	(2,964)	1.2	(0.1)	100.0	48.6	(3.5)	11.4	(2.0)	27.9	(2.7)	10.0	(2.0)	2.2	(0.3)
Vitamin and mineral combinations	31,826	(2,881)	1.2	(0.1)	100.0	50.6	(3.8)	17.4	(2.7)	20.8	(2.6)	10.5	(2.3)	0.8	(0.2)
Respiratory agents	257,262	(15,160)	9.6	(0.4)	100.0	52.8	(3.0)	7.5	(0.9)	21.1	(3.5)	7.7	(1.1)	10.9	(0.9)
Antihistamines	77,432	(5,106)	2.9	(0.1)	100.0	47.4	(3.4)	6.8	(1.0)	22.8	(4.4)	7.4	(1.1)	15.6	(1.4)
Antitussives	8,384	(1,045)	0.3	(0.0)	100.0	48.7	(5.7)	12.1	(2.8)	24.9	(5.7)	6.5	(1.8)	7.8	(1.2)
Bronchodilators	83,083	(6,169)	3.1	(0.2)	100.0	51.9	(3.6)	5.1	(0.9)	24.9	(4.3)	9.3	(1.5)	8.8	(0.8)
Methylxanthines	1,625	(388)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Adrenergic bronchodilators	50,745	(3,688)	1.9	(0.1)	100.0	54.3	(3.8)	3.7	(0.7)	21.6	(4.3)	10.0	(1.6)	10.3	(0.9)
Bronchodilator combinations	22,590	(2,220)	0.8	(0.1)	100.0	50.2	(4.5)	6.7	(1.2)	30.9	(4.9)	8.5	(1.6)	3.7	(0.6)
Anticholinergic bronchodilators	8,123	(970)	0.3	(0.0)	100.0	38.5	(4.9)	*	. . .	30.3	(6.9)	7.9	(1.8)	15.0	(2.1)
Decongestants	6,054	(1,192)	0.2	(0.0)	100.0	52.9	(9.8)	*31.0	(11.3)	*	. . .	6.4	(1.7)	5.1	(1.2)
Expectorants	8,555	(1,177)	0.3	(0.0)	100.0	71.4	(5.5)	*	. . .	*	. . .	6.4	(1.6)	6.3	(1.1)
Miscellaneous respiratory agents	10,608	(980)	0.4	(0.0)	100.0	27.3	(4.3)	12.2	(2.8)	*	. . .	*6.9	(2.5)	47.6	(4.7)
Respiratory inhalant products	11,558	(1,079)	0.4	(0.0)	100.0	56.2	(4.7)	7.5	(1.8)	26.4	(4.2)	8.1	(2.0)	1.8	(0.4)
Inhaled corticosteroids	11,241	(1,061)	0.4	(0.0)	100.0	55.8	(4.8)	7.4	(1.8)	27.1	(4.3)	8.0	(2.1)	1.7	(0.3)
Antiasthmatic combinations	2,984	(455)	0.1	(0.0)	100.0	54.5	(7.6)	*	. . .	*	. . .	6.8	(1.7)	6.2	(1.5)
Upper respiratory combinations	29,132	(2,618)	1.1	(0.1)	100.0	77.4	(2.7)	5.6	(1.7)	5.7	(1.4)	5.6	(1.2)	5.8	(0.7)
Leukotriene modifiers	19,356	(2,331)	0.7	(0.1)	100.0	47.1	(5.2)	11.6	(2.2)	34.3	(6.1)	6.5	(1.4)	0.6	(0.1)
Lung surfactants	*115	(67)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*69.2	(21.9)	*	. . .
Topical agents	178,462	(12,424)	6.6	(0.4)	100.0	34.6	(2.4)	28.4	(3.3)	26.5	(2.9)	6.8	(1.1)	3.6	(0.3)
Anorectal preparations	1,056	(263)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Antiseptics and germicides	2,811	(512)	0.1	(0.0)	100.0	*	. . .	*25.1	(8.4)	*	. . .	*11.7	(3.7)	17.3	(4.1)
Dermatological agents	75,101	(4,733)	2.8	(0.2)	100.0	38.7	(2.8)	7.9	(1.1)	40.9	(3.1)	8.0	(1.6)	4.6	(0.5)
Topical anti-infectives	2,481	(406)	0.1	(0.0)	100.0	*	. . .	*	. . .	48.4	(8.0)	7.3	(2.1)	10.7	(2.5)
Topical steroids	27,393	(2,068)	1.0	(0.1)	100.0	37.6	(3.3)	10.2	(1.6)	37.4	(3.3)	9.4	(2.2)	5.4	(0.7)
Topical anesthetics	1,964	(500)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*26.2	(15.6)	*17.1	(5.2)
Miscellaneous topical agents	13,420	(1,433)	0.5	(0.1)	100.0	28.7	(3.7)	*14.5	(4.6)	49.2	(5.7)	5.9	(1.4)	1.6	(0.3)

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

Therapeutic drug category[1]	Combined settings: Number of occurrences in thousands[2]	Combined settings: (Standard error in thousands)	Combined settings: Number of occurences per 100 drug mentions[3]	Combined settings: (Standard error of rate)	Total	Primary care offices: Percent distribution	Primary care offices: (Standard error of percent)	Surgical specialty offices: Percent distribution	Surgical specialty offices: (Standard error of percent)	Medical specialty offices: Percent distribution	Medical specialty offices: (Standard error of percent)	Hospital outpatient departments: Percent distribution	Hospital outpatient departments: (Standard error of percent)	Hospital emergency departments: Percent distribution	Hospital emergency departments: (Standard error of percent)
Topical steroids with anti-infectives	2,537	(472)	0.1	(0.0)	100.0	73.1	(6.4)	*	. . .	*	. . .	*9.7	(3.2)	*	. . .
Topical acne agents	9,915	(1,157)	0.4	(0.0)	100.0	30.9	(4.9)	*	. . .	63.5	(5.1)	*3.8	(1.3)	*	. . .
Topical antipsoriatics	1,225	(257)	0.0	(0.0)	100.0	*	. . .	–	. . .	75.8	(7.6)	*	. . .	–	. . .
Topical emollients	3,695	(576)	0.1	(0.0)	100.0	35.0	(6.9)	*	. . .	55.7	(7.0)	4.9	(1.3)	*	. . .
Topical antibiotics	5,098	(602)	0.2	(0.0)	100.0	48.7	(5.8)	*	. . .	30.9	(5.2)	6.7	(1.5)	10.1	(1.9)
Topical antifungals	7,860	(765)	0.3	(0.0)	100.0	59.2	(4.6)	*	. . .	22.1	(4.4)	9.6	(2.0)	5.2	(0.8)
Topical debriding agents	*103	(41)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*40.7	(17.1)	*	. . .
Mouth and throat products	1,404	(318)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*16.3	(7.4)	*	. . .
Ophthalmic preparations	50,271	(7,970)	1.9	(0.3)	100.0	11.0	(2.0)	75.1	(4.1)	7.5	(2.0)	4.1	(0.9)	2.3	(0.4)
Ophthalmic anti-infectives	3,678	(437)	0.1	(0.0)	100.0	48.0	(5.5)	*	. . .	*	. . .	8.6	(2.0)	16.0	(2.2)
Ophthalmic glaucoma agents	18,551	(2,784)	0.7	(0.1)	100.0	7.6	(2.2)	83.0	(3.4)	*5.5	(1.8)	3.7	(1.0)	*	. . .
Ophthalmic steroids	5,655	(1,064)	0.2	(0.0)	100.0	*	. . .	91.2	(2.6)	*	. . .	*2.6	(0.9)	*	. . .
Ophthalmic steroids with anti-infectives	1,144	(273)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Ophthalmic anti-inflammatory agents	2,005	(432)	0.1	(0.0)	100.0	*	. . .	77.3	(7.6)	*	. . .	*3.2	(1.1)	*	. . .
Ophthalmic lubricants and irrigations	936	(262)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	–	. . .
Miscellaneous ophthalmic agents	5,151	(855)	0.2	(0.0)	100.0	*	. . .	74.1	(5.2)	*	. . .	5.1	(1.2)	4.8	(1.1)
Ophthalmic antihistamines and decongestants	4,190	(931)	0.2	(0.0)	100.0	*	. . .	*32.1	(9.8)	*	. . .	*5.3	(1.7)	*	. . .
Mydriatics	*4,276	(2,468)	*0.2	(0.1)	100.0	*	. . .	93.2	(4.4)	–	. . .	*4.9	(3.5)	*	. . .
Ophthalmic anesthetics	*1,903	(1,726)	*0.1	(0.1)	100.0	–	. . .	93.2	(6.3)	–	. . .	*	. . .	*4.0	(3.8)
Ophthalmic diagnostic agents	*2,242	(2,174)	*0.1	(0.1)	100.0	–	. . .	*	. . .	–	. . .	*	. . .	*	. . .
Otic preparations	3,621	(432)	0.1	(0.0)	100.0	60.3	(5.1)	*	. . .	*	. . .	7.6	(1.7)	18.3	(2.8)
Miscellaneous otic agents	3,474	(429)	0.1	(0.0)	100.0	60.8	(5.2)	*	. . .	*	. . .	7.3	(1.7)	18.9	(3.0)
Vaginal preparations	7,522	(816)	0.3	(0.0)	100.0	59.2	(5.1)	*	. . .	17.0	(2.8)	8.0	(1.9)	6.8	(1.3)
Spermicides	*182	(138)	*0.0	(0.0)	100.0	81.0	(15.7)	–	. . .	–	. . .	*	. . .	–	. . .
Vaginal anti-infectives	7,329	(798)	0.3	(0.0)	100.0	58.8	(5.2)	*	. . .	17.4	(2.9)	7.7	(1.9)	6.9	(1.4)
Nasal preparations	43,545	(4,487)	1.6	(0.2)	100.0	50.9	(5.1)	13.5	(2.3)	27.0	(6.3)	7.2	(1.3)	1.4	(0.2)
Nasal steroids	39,059	(3,813)	1.5	(0.1)	100.0	52.5	(5.0)	12.9	(2.2)	25.9	(5.9)	7.7	(1.4)	1.1	(0.2)
Nasal antihistamines and decongestants	4,006	(869)	0.1	(0.0)	100.0	36.7	(9.3)	*18.5	(6.1)	*38.3	(12.8)	*3.1	(1.2)	*3.5	(1.1)
Alternative medicines	19,720	(2,269)	0.7	(0.1)	100.0	48.6	(5.0)	21.8	(3.8)	22.1	(3.2)	7.0	(1.6)	0.4	(0.1)
Nutraceutical products	14,579	(1,594)	0.5	(0.0)	100.0	47.2	(4.7)	23.3	(4.2)	22.0	(3.6)	7.2	(1.8)	*	. . .
Herbal products	4,765	(938)	0.2	(0.0)	100.0	52.4	(9.2)	18.3	(4.9)	21.7	(5.1)	6.9	(1.8)	*	. . .
Psychotherapeutic agents	146,056	(7,722)	5.4	(0.2)	100.0	42.5	(2.5)	7.4	(1.0)	38.6	(2.7)	9.7	(1.4)	1.8	(0.2)
Antidepressants	120,578	(6,498)	4.5	(0.2)	100.0	46.3	(2.7)	8.3	(1.1)	35.7	(2.6)	8.9	(1.3)	0.7	(0.1)
Miscellaneous antidepressants	17,171	(1,255)	0.6	(0.0)	100.0	51.8	(3.6)	7.8	(1.7)	31.9	(3.3)	7.9	(1.3)	0.6	(0.2)
SSRI antidepressants	60,240	(3,281)	2.2	(0.1)	100.0	49.3	(2.6)	7.5	(1.0)	32.9	(2.3)	9.5	(1.4)	0.8	(0.1)
Tricyclic antidepressants	11,518	(978)	0.4	(0.0)	100.0	38.7	(4.2)	11.1	(2.2)	40.0	(4.4)	9.2	(1.7)	*0.9	(0.3)
Phenylpiperazine antidepressants	9,474	(883)	0.4	(0.0)	100.0	44.4	(4.9)	8.0	(2.1)	36.2	(5.2)	10.4	(2.1)	0.9	(0.2)

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

	Combined settings					Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
Therapeutic drug category[1]	Number of occurrences in thousands[2]	(Standard error in thousands)	Number of occurences per 100 drug mentions[3]	(Standard error of rate)	Total	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
Tetracyclic antidepressants	2,595	(381)	0.1	(0.0)	100.0	*	. . .	*	. . .	54.8	(7.5)	11.0	(2.6)	*	. . .
SSNRI antidepressants	19,399	(1,607)	0.7	(0.1)	100.0	40.5	(3.8)	10.3	(1.8)	42.2	(3.9)	6.5	(1.2)	0.5	(0.1)
Antipsychotics	25,477	(1,971)	0.9	(0.1)	100.0	24.1	(2.7)	3.3	(1.0)	52.1	(3.7)	13.6	(2.4)	6.9	(0.7)
Miscellaneous antipsychotic agents	3,390	(441)	0.1	(0.0)	100.0	*	. . .	*	. . .	46.5	(6.2)	11.3	(2.6)	10.1	(1.9)
Phenothiazine antipsychotics	2,860	(377)	0.1	(0.0)	100.0	*	. . .	*	. . .	29.0	(5.3)	*15.4	(6.2)	31.8	(4.3)
Atypical antipsychotics	18,882	(1,623)	0.7	(0.1)	100.0	24.2	(3.1)	*	. . .	56.1	(4.0)	13.9	(2.5)	2.6	(0.4)
Immunologic agents	113,295	(9,949)	4.2	(0.4)	100.0	81.0	(2.8)	0.7	(0.2)	*8.2	(2.7)	7.5	(1.2)	2.7	(0.3)
Bacterial vaccines	21,155	(2,246)	0.8	(0.1)	100.0	91.2	(1.5)	*	. . .	*	. . .	7.3	(1.4)	*	. . .
Immune globulins	794	(232)	0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*11.2	(4.6)	*9.8	(3.7)
Toxoids	20,006	(1,673)	0.7	(0.1)	100.0	78.9	(2.1)	*	. . .	*	. . .	6.8	(1.1)	13.6	(1.3)
Viral vaccines	59,319	(6,024)	2.2	(0.2)	100.0	90.7	(1.4)	*	. . .	*1.3	(0.6)	7.6	(1.2)	0.3	(0.1)
Miscellaneous biologicals	*6,049	(2,718)	*0.2	(0.1)	100.0	*28.2	(14.1)	*	. . .	65.4	(16.4)	*3.3	(1.7)	*	. . .
Immunosuppressive agents	2,363	(509)	0.1	(0.0)	100.0	*	. . .	*	. . .	55.4	(8.8)	20.9	(5.2)	*	. . .
Interferons	509	(113)	0.0	(0.0)	100.0	*	. . .	*	. . .	78.7	(7.4)	*	. . .	–	. . .
Immunosuppressive monoclonal antibodies	2,284	(661)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*8.3	(4.4)	*	. . .
Radiologic agents	979	(182)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*7.8	(2.9)	35.4	(7.7)
Radiocontrast agents	437	(92)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*12.5	(5.8)	58.6	(10.8)
Non-ionic iodinated contrast media	*70	(35)	*0.0	(0.0)	100.0	–	. . .	–	. . .	*	. . .	*	. . .	*	. . .
Ionic iodinated contrast media	206	(54)	0.0	(0.0)	100.0	–	. . .	–	. . .	–	. . .	*	. . .	*	. . .
Radiologic adjuncts	*454	(142)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Cardiac stressing agents	*454	(142)	*0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	*	. . .
Metabolic agents	235,856	(15,452)	8.8	(0.3)	100.0	54.9	(2.6)	13.6	(1.6)	22.2	(2.2)	8.2	(1.2)	1.1	(0.1)
Antihyperlipidemic agents	134,452	(9,235)	5.0	(0.2)	100.0	54.2	(2.8)	13.4	(1.6)	24.6	(2.3)	7.3	(1.2)	0.4	(0.1)
HMG-CoA reductase inhibitors	95,408	(6,400)	3.5	(0.1)	100.0	53.1	(2.7)	13.3	(1.6)	24.9	(2.4)	8.1	(1.4)	0.5	(0.1)
Miscellaneous antihyperlipidemic agents	5,125	(648)	0.2	(0.0)	100.0	55.6	(5.7)	16.2	(4.0)	21.5	(4.3)	6.3	(1.6)	*	. . .
Fibric acid derivatives	8,983	(825)	0.3	(0.0)	100.0	52.8	(4.3)	16.0	(2.8)	25.6	(3.6)	5.4	(1.1)	*	. . .
Bile acid sequestrants	626	(144)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*11.4	(5.1)	–	. . .
Cholesterol absorption inhibitors	9,434	(999)	0.4	(0.0)	100.0	52.9	(4.5)	11.5	(2.6)	28.5	(3.8)	6.9	(1.5)	*	. . .
Antihyperlipidemic combinations	14,877	(1,575)	0.6	(0.0)	100.0	62.7	(4.7)	12.8	(2.7)	20.1	(3.4)	4.3	(0.9)	*	. . .
Antidiabetic agents	92,853	(6,401)	3.5	(0.1)	100.0	56.4	(2.9)	14.2	(1.9)	17.8	(2.2)	9.6	(1.4)	2.0	(0.2)
Sulfonylureas	21,356	(1,589)	0.8	(0.0)	100.0	53.3	(4.0)	15.0	(2.4)	22.0	(3.2)	8.8	(1.4)	0.9	(0.2)
Non-sulfonylureas	30,091	(2,259)	1.1	(0.1)	100.0	60.2	(3.1)	13.8	(2.2)	15.4	(1.9)	9.6	(1.6)	1.0	(0.2)
Insulin	19,805	(1,639)	0.7	(0.0)	100.0	49.1	(3.5)	12.2	(2.8)	19.4	(3.2)	13.0	(2.2)	6.2	(0.7)
Thiazolidinediones	13,818	(1,158)	0.5	(0.0)	100.0	58.2	(3.9)	19.1	(3.1)	14.5	(2.6)	7.7	(1.3)	0.5	(0.1)
Meglitinides	1,024	(293)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*8.4	(3.5)	*	. . .
Antidiabetic combinations	5,027	(837)	0.2	(0.0)	100.0	67.6	(5.9)	*	. . .	16.0	(4.5)	5.6	(1.5)	*	. . .
Dipeptidyl peptidase 4 inhibitors	1,236	(273)	0.0	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*	. . .	–	. . .

See footnotes at end of table.

Table 11. Therapeutic categories for drugs provided, prescribed, or continued at ambulatory care visits, with percent distribution by setting type: United States, 2007—Con.

	Combined settings					Primary care offices		Surgical specialty offices		Medical specialty offices		Hospital outpatient departments		Hospital emergency departments	
Therapeutic drug category[1]	Number of occurrences in thousands[2]	(Standard error in thousands)	Number of occurences per 100 drug mentions[3]	(Standard error of rate)	Total	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)	Percent distribution	(Standard error of percent)
Antigout agents	8,171	(931)	0.3	(0.0)	100.0	50.0	(4.8)	10.8	(2.7)	31.4	(4.4)	5.9	(1.5)	1.8	(0.5)
Antihyperuricemic agents	6,325	(743)	0.2	(0.0)	100.0	47.8	(4.9)	12.0	(2.9)	34.0	(4.3)	5.4	(1.5)	*	. . .
Glucose elevating agents	*199	(106)	*0.0	(0.0)	100.0	*	. . .	–	. . .	*	. . .	*	. . .	*	. . .
Medical gases	1,468	(325)	0.1	(0.0)	100.0	*	. . .	*	. . .	*	. . .	*8.7	(4.7)	41.8	(10.3)
Pharmaceutical aids	6,945	(1,498)	0.3	(0.1)	100.0	*	. . .	*	. . .	86.0	(4.4)	*0.9	(0.4)	*	. . .

0.0 Quantity more than zero but less than 0.05.

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

– Quantity zero.

[1]Based on Multum Lexicon first-, second-, and third-level therapeutic drug categories (see http://www.multum.com/Lexicon.htm).

[2]Total of all therapeutic drug categories will exceed total number of drug mentions because up to four categories may be coded for each drug.

[3]Based on an estimated 2,688,748,000 drug mentions at ambulatory care visits in 2007. A drug mention is defined as any medication that is provided, prescribed, or continued at the visit, including over-the-counter preparations, immunizations, desensitizing agents, and anesthetics. Up to eight mentions are collected per visit.

NOTES: Numbers may not add to totals because of rounding. The 2007 National Ambulatory Medical Care Survey included a sample of community health centers (CHCs) in addition to the traditional sample of office-based physicians. Estimates presented in this table include office-based physicians as defined by the American Medical Association, as well as data from a sample of physicians working in CHCs.

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