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BOROUGH PRESIDENT

Testimony by Manhattan Borough President Scott Stringer
Before the New York City Council
Committee on Environmental Protection
Regarding Hydraulic Fracturing and
New York City Drinking Water Infrastructure

September 22, 2011

Thank you Chairman Gennaro and members of the Committee on Environmental Protection for the opportunity to testify at this important hearing.

Many in attendance today have spent the better part of three years weighing the risks of hydraulic fracturing against the perceived benefits for New York State and New York City. We've witnessed the litany of leaks, spills and contamination associated with hydraulic fracturing expand dramatically – especially in Pennsylvania. We've also seen conflicting projections of the overall economic and environmental benefits that hydraulic fracturing will bring to New York. In other states, many of the rosy economic projections made by Government and outside experts have not materialized.

Despite these problems and inconsistencies, the New York State Department of Environmental Conservation appears to be set on approving the use of hydraulic fracturing in our state on an expedited timeline. Let's be very clear about the situation that we're currently in: hydraulic fracturing in New York will be a roll of the dice. I strongly believe that New York State should wait until shale gas drilling technologies become more environmentally reliable before we embark on hydraulic fracturing anywhere within our State lines.

However, if the DEC does insist on pushing the SGEIS to completion, against the will of tens of thousands of concerned New Yorkers, it is our responsibility to ensure that stringent protections will be put in place to safeguard the City's unfiltered water supply.

Governor Cuomo should be commended for his recent decision to allow a New York City hearing on hydraulic fracturing, as part of the public comment period on the new SGEIS and for taking steps to ban hydrofracking within the immediate confines of City's vast watershed. But additional critical safeguards still need to be put in place.

Hazen and Sawyer's rapid impact assessment written for the New York City Department of Environmental Protection notes that "*risks to the water supply cannot be eliminated entirely, and water quality incidents (e.g. spills, leaks) should be anticipated,*" and that "*the ability of*

regulatory agencies to manage the process will have a substantial influence on the resulting level of risk to the NYC water supply system." It is clear to me that the revised draft SGEIS does not go far enough in mitigating these risks.

Most significantly, the revised draft SGEIS does not provide adequate protection of New York City's vast subsurface water delivery infrastructure. A 1,000 foot buffer around the tunnels and aqueducts that deliver unfiltered water from the Catskill/Delaware watershed is grossly insufficient.

If we get this wrong, we risk poisoning our water and in turn the millions of people who drink it. We would also be opening the door to an EPA mandate requiring the construction of a $10 billion water filtration plant, an additional burden to our pocket books.

The potential costs of such an inappropriately narrow buffer zone – to government and to private citizens – far outweigh the benefits. If we care about the well being of our cities and water supply, we should widen the buffer zone to at least seven miles, as recommended by outside experts.

In addition to my testimony before you today, I will be submitting additional testimony on the technical merits of the revised draft SGEIS before the expiration of the DEC's commenting period. For now however, I would like to make the following calls to action for the immediate term:

- First, the DEC should extend the comment period on the revised draft SGEIS from 96 days to 180 days. The revised draft SGEIS is a 1,500 page technical document and it takes an enormous amount of time to read and digest. It is unrealistic for the DEC to expect concerned citizens to make sound public comments without a sufficient amount of time for review.

- Second, I strongly urge Mayor Bloomberg and the New York City DEP to endorse the recommendations made by City consultants related to subsurface infrastructure buffer zones. These pronouncements should be provided in hearings like this one and in other public forums so that New York City residents fully understand what is at stake.

- Finally, I call on every person at this hearing to join me at the DEC's public hearing in New York City this November. We need every concerned New Yorker to participate in that hearing and send a clear message to Albany: Keep our water clean and Keep our citizens safe.

Thank you again Chairman Gennaro for the opportunity to testify. I commend you for your continued advocacy on this issue and look forward to working together with you and other members of the New York City Council to Kill the Drill in New York.

NRDC
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NATURAL RESOURCES DEFENSE COUNCIL

Statement of the Natural Resources Defense Council
Before the
New York City Council Environmental Protection Committee
Regarding
New York State's Draft EIS on Fracking in the Marcellus Shale
September 22, 2011

Good afternoon, Chairman Gennaro and members of the Committee. My name is Eric A. Goldstein and I am New York City Environment Director at the Natural Resources Defense Council ("NRDC"). With me is NRDC consultant, Craig Michaels. As you know, NRDC is a national, non-profit legal and scientific organization that has been active for more than 40 years on, among other things, a wide range of environmental health and natural resource protection issues affecting New Yorkers. We have paid particular attention to safeguarding public drinking water supplies, both nationally and in New York City, and appreciate the opportunity to testify today regarding New York State's recently released "Revised Draft Supplemental Generic Environmental Impact Statement On the Oil, Gas and Solution Mining Regulation Program," ("the draft EIS"), dated September 7, 2011.

NRDC is undertaking an exhaustive review of the 1500 page draft EIS and will be submitting detailed comments to the State in December. Our preliminary review suggests that the draft, while certainly stronger than the fatally flawed version released by the Paterson Administration in 2009, still leaves significant issues unresolved and important questions unanswered. To be sure, the new draft contains several noteworthy protections including a prohibition on drilling in the unfiltered watersheds of New York City and Syracuse, in part to help preserve federal filtration avoidance waivers for these two cities and to avoid the multi-billion dollar costs that would be incurred if such waivers were lost.

Nevertheless, NRDC will not support industrial gas drilling in New York State unless and until we are convinced that the state has put in place a comprehensive, precedent-setting program of regulatory safeguards sufficient to insure that the state's water, air, landscapes and communities will be protected. (Also essential is that the State has mechanisms in place to effectively monitor, inspect and enforce all such safeguards.) But tthe current draft EIS contains significant gaps in such areas as handling and disposal of fracking fluids and other hazardous waste, protection of floodplains and preservation of the state's rural landscapes and communities. And in view of the numerous environmental problems that have occurred as a result of accelerated and poorly controlled industrial gas drilling and Pennsylvania and other states, any future fracking operations in New York State should be strictly limited in number and should not advance without local support.

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In the remainder of this statement, we focus on two issues of particular significance to New York City residents.

First, we are especially troubled about the state's plans to fast-track the review processes for fracking environmental impact study and for the as-yet-unreleased proposed rules that would govern the program. In the state's press release, dated September 7, 2011, which accompanied DEC's release of the draft EIS, the Department indicated that it would likely be issuing proposed fracking rules in October and requiring that final comments be submitted on those rules by December, 12, 2011 – the same day as comments on the EIS itself are due.

But this proposed fast-track schedule is problematic. For one thing, it undercuts the main purpose of the state's EIS review which is to solicit information that can guide government officials in future decision-making. How can the state benefit from public comments on the draft EIS if it is releasing its proposed rulemaking for the gas drilling program even before the comment period is complete? And equally troubling is that the state's proposed schedule will leave insufficient time for members of the public to review and comment thoroughly on the proposed rules, if those comments are due at the same time as the comments on the 1500 page draft EIS. The whole schedule makes it seem as if the Department is just going through the motions and has already made its mind up on a final regulatory program. We still hold out hope that this is not the case and that DEC will revise its timetable to release the draft rules after the comment period on the EIS has concluded.

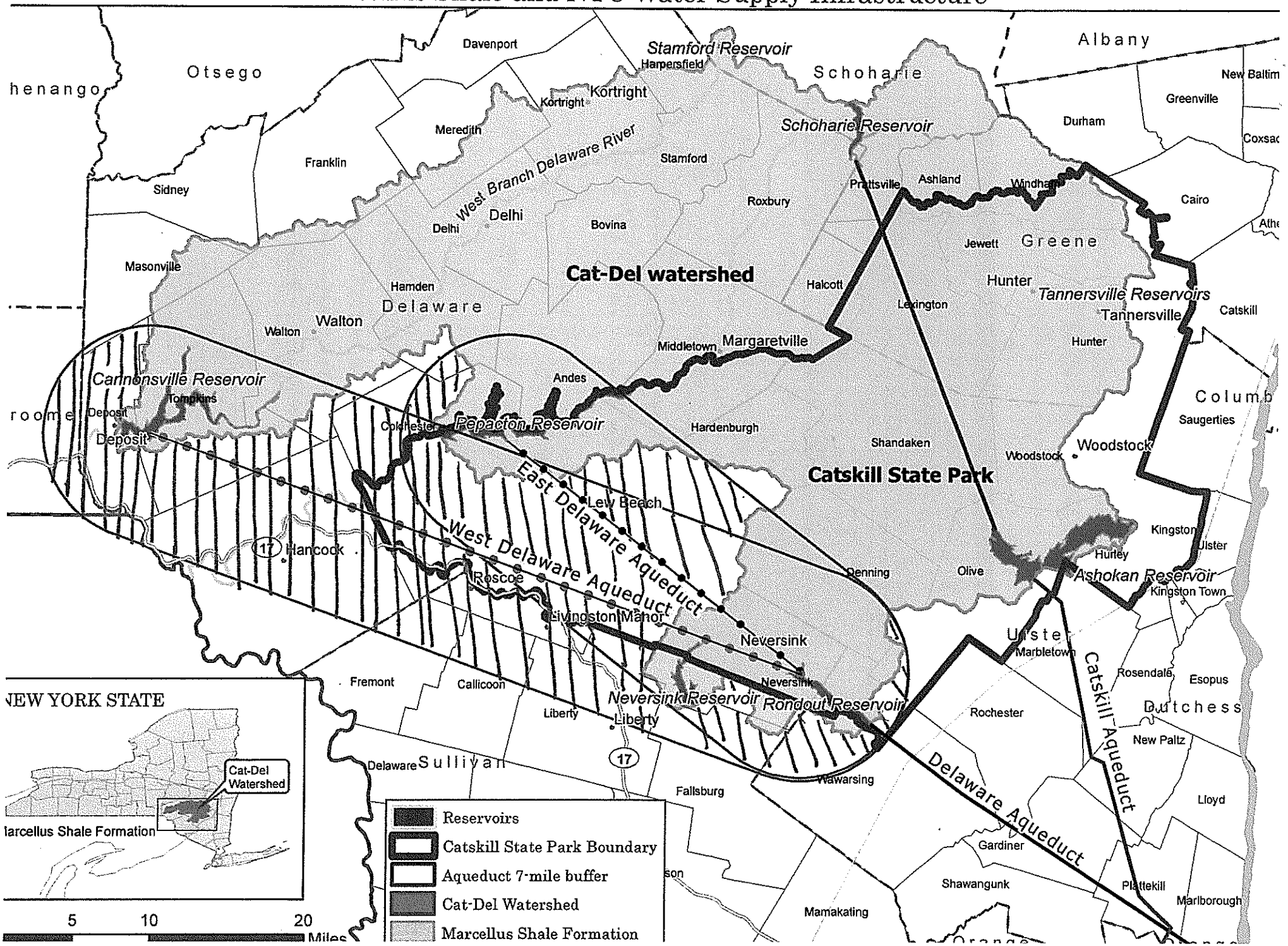
A second major problem with the draft EIS is its failure to place critical water supply infrastructure off limits to drilling, something that is necessary to safeguard multi-billion dollar tunnels and aqueducts from the very real threats posed by fracking operations. The draft EIS proposes a limited "buffer" of 1,000 feet (and drilling could even move forward within that distance following an elevated SEQRA review). In the case of New York City's West Delaware Tunnel, which connects the Cannonsville Reservoir to the Rondout Reservoir, and the city's East Delaware Tunnel, which links the Pepacton Reservoir with the Rondout, the threats are obvious. Since the lands surrounding these tunnels fall outside of the watershed boundaries, they would otherwise be vulnerable to shale gas fracking. But as the New York City Department of Environmental Protection's own consultants have concluded, such drilling would pose unreasonable risks to the city's water infrastructure.

In their December 2009 Final Impact Assessment Report: Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed, the city consultants, Hazen and Sawyer, warned, on page 43 that "the unreinforced linings of NYC tunnels were designed to keep water in, not to withstand external pressures beyond those anticipated in their design." And

in addition to threats to structural integrity, the Hazen and Sawyer study also noted the possibility of contamination if drilling took place too close to the city's water infrastructure. "In summary," the report continued on page 44, " there is sufficient pressure under natural and gas-well enhanced conditions to drive fluids or gas upward from deep formations into tunnels or above grade, via geological faults or fractures, and there is potential for both structural damages to tunnel lines and violations of regulatory limits." Accordingly, the report concluded, in Appendix D, at D-3, that "(b)ased on the preceding analyses, it is recommended that natural gas well construction be precluded within a buffer zone of seven miles from NYCDEP subsurface infrastructure." Nevertheless, as noted above, the draft EIS has retained only the 1,000 foot buffer concept and has failed to respond to New York City's expert report, calling for a seven mile buffer.

We believe the Environmental Protection Committee can play a leadership role in helping to address these two problems, even as it advances its comprehensive review of the draft EIS. Protecting the drinking water supply of all New York residents is a fundamental responsibility of government. And we stand ready to work closely with you once again Chairman Gennaro, and with your colleagues, and of course with Speaker Quinn, in safeguarding the water supplies and the environment of all New Yorkers.

Marcellus Shale and NYC Water Supply Infrastructure



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THE COUNCIL OF THE CITY OF NEW YORK
COMMITTEE ON ENVIRONMENTAL PROTECTION

PUBLIC HEARING

THE REVISED ENVIRONMENTAL IMPACT STATEMENT ON HYDRAULIC FRACTURING AND THE NEW YORK CITY DRINKING WATER INFRASTRUCTURE

September 22, 2011

Testimony of John H. Williams
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Good afternoon. The U.S. Geological Survey appreciates the opportunity to provide comments here today. For those of you who may not be familiar with the USGS, we are a non-regulatory, scientific organization within the U.S. Department of the Interior. In New York State, we conduct a wide range of surface-water and groundwater quantity and quality investigations in cooperation with other Federal, State, and local agencies. We continuously monitor hydrologic conditions at about 300 surface-water sites and 150 observation wells across New York State. We also maintain the USGS National Water Information System (NWIS) data base that contains hydrogeologic information from over 50,000 wells in the State.

I have worked for the USGS for the past 30 years in Pennsylvania and New York. I am currently the Groundwater Specialist for the USGS New York Water Science Center, responsible for technical oversight of the USGS groundwater data and investigation programs in New York State. I also coordinate a USGS-wide training and technology transfer program in borehole geophysics. My educational background includes a BA in Geology from Colgate University and a MS in Geoscience with specialization in hydrogeology from Penn State University. I have provided testimony on shale-gas development previously to the New York City Council and the New York State Assembly. I also have made invited presentations on shale-gas development to the National Ground Water Association, U. S. Environmental Protection Agency, and Department of Energy.

Gas development in the Marcellus and other organic-rich black shales in New York State will involve horizontal drilling and high-volume hydraulic fracturing. Revisions to the draft Supplemental Generic Environmental Impact Statement (dSGEIS) propose many critical measures to help minimize the impact of shale-gas development on the water resources of the State. However, several water-resource characterization and monitoring needs and opportunities related to shale-gas development have not been addressed by the revised dSGEIS.

Protection of the freshwater aquifer during shale-gas development is critical. In upland settings of the Marcellus shale play area, freshwater may occur in fractured Devonian bedrock as deep as 800 feet below land surface with pockets of gas and saltwater zones locally present above and below the base of the freshwater aquifer (Williams, 2011). Methane contamination of domestic water wells has occurred near selected shale-gas development sites in north-central Pennsylvania presumably due to inadequate casing seals (Osborn and others, 2011). Given this methane migration issue, the revised dSGEIS's requirement of the installation and cementing of an intermediate casing, in addition to the surface casing, is prudent. However, the revised dSGEIS does not require the detailed mud logging and geophysical logging of the upper part of gas wells needed to determine the distribution of freshwater, saltwater, and gas and to properly design the casing and cementing program.

The Marcellus Shale is underlain by the Onondaga Limestone and is overlain by the Tully Limestone and Upper Hamilton shales and limestones. These bedrock units are purported to be barriers to fracture propagation from hydraulic fracturing of the Marcellus Shale. Although generally gently dipping and relatively homogeneous in their geophysical properties, the bedrock units display some local and regional variability related to depositional facies changes and structural features (folds and faults). The integrity of the frac barriers can be investigated through geophysical investigations including well logging and seismic surveys. Although geophysical investigations are commonly completed as part of gas exploration, documentation of frac barrier continuity and integrity is not required by the revised dSGEIS.

Microseismic evaluation of hydraulic fracture development is a geophysical method applied by the gas companies to monitor the horizontal and vertical extent of fracture propagation. Data from the gas industry for Marcellus fracs suggests that the upward vertical extent of hydraulic fractures decreases with decreasing depth with frac heights of 2,000 feet at a depth of 8,000 feet and 500 feet at a depth of 5,000 feet (Fisher, 2010). In New York State, the Marcellus shale likely will be fraced at depths between 3,000 and 5,000 feet, a depth interval for which virtually no microseismic data has been collected. Although microseismic is a proven industry technique, mapping the extent of hydraulic fractures using this geophysical method is not required by the revised dSGEIS even during the initial stages of shale-gas development in New York State.

Lineaments observed on remote sensing data have been found to be coincident with zones of fracture concentration (Jacobi, 2002). In the interbedded shale and sandstone bedrock overlying the Marcellus shale-gas play, the fracture frequency within these zones typically is an order of magnitude greater than that in the surrounding area. Zones of fracture concentration have been associated with nearby faults as inferred from outcrops, well logs, and(or) seismic reflection data, and some zones have been associated with methane gas anomalies in the soil (Jacobi, 2002). The revised dSGEIS references the State-wide map of faults and lineaments by Isachsen and McKendree (1977). A more detailed mapping of lineaments in New York's Appalachian basin of New York State was completed by EarthSat (1997) for the New York Energy Research and Development Authority. Through an integrated analysis of lineament, geologic, geophysical, and seismic epicenter data, Jacobi (2002) concluded that there are more faults in New York's Appalachian Basin than previously suspected, and that many of these faults are seismically active.

The revised dSGEIS proposes a buffer zone for Marcellus shale-gas wells of 1,000 ft around New York City water-supply infrastructure including aqueduct tunnels. Fracture zones in the bedrock may potentially provide pathways for the migration of pressurized fluids over significant distances. The possibility of damage to the aqueduct from hydraulic-fracturing operations is an issue of concern given the proposed infrastructure buffer zone. Assessment of the spatial relation of proposed Marcellus wells with lineament features that cut across the path of West Delaware Aqueduct would provide important information for the protection of the New York City West-of-Hudson water-supply infrastructure.

Natural groundwater quality in the aquifers overlying the Marcellus play area is highly variable. Concentrations of contaminants including chlorides, barium, strontium, radium, and methane vary by two orders of magnitude in water sampled from groundwater wells (Williams and others, 1998; Hetcher-Aguila, 2005; Hetcher-Aguila and Eckhardt, 2006; and USGS, 2011). With such natural variability, documentation of water-quality impacts from gas drilling and hydraulic fracturing is extremely difficult. Water-quality sampling of groundwater wells in the vicinity of gas wells prior to development and following drilling and hydraulic fracturing was proposed in the dSGEIS. This water-well sampling program is in the best interest of the private well owners and the gas-development companies, and provides a means to determine short-term, site-specific impacts on the existing groundwater wells. However, no groundwater monitoring is required by the revised dSGEIS if there are no water wells in the vicinity of the gas-well pad or if permission to sample surrounding wells is not granted. In addition, domestic water wells are not sited or constructed to monitor potential shallow and deep groundwater contamination that might be associated with shale-gas development. Well-monitoring networks could be specifically designed and installed at selected gas-well pad sites during the initial stages of shale-gas development in New York State to ensure that the drilling, casing, and fracing practices and operations are adequately protecting the freshwater aquifers.

The water-quality data collected during shale-gas development would provide an important database for understanding and protecting the State's groundwater and surface-water resources if made available to government agencies, academia, and other interested parties. The revised dSGEIS does not propose a mechanism for electronically storing and

sharing for scientific purposes the potentially large amount of water-quality data collected during shale-gas development.

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Lineament Mapping for Protection of the New York City West Delaware Aqueduct during Marcellus Shale-Gas Development, southwestern Delaware County, New York

Horizontal drilling at multi-well pad sites with high-volume hydraulic fracturing will be used to develop natural gas from the Marcellus shale in New York State. The Marcellus shale-gas play in southwestern Delaware County is traversed by the West Delaware Aqueduct, an important subsurface connection of the New York City West-of-Hudson water-supply system (fig. 1). The revised dSGEIS of the New York State Department of Environmental Resources proposes a buffer zone for Marcellus shale-gas wells of 1,000 ft around New York water-supply infrastructure including aqueduct tunnels. Fracture zones in the bedrock may potentially provide pathways for the migration of pressurized fluids over significant distances. The possibility of damage to the aqueduct from hydraulic-fracturing operations is an issue of concern given the proposed infrastructure buffer zone.

Lineaments observed on remote sensing data have been found to be coincident with zones of fracture concentration (Jacobi, 2002). In the interbedded shale and sandstone bedrock overlying the Marcellus shale-gas play, the fracture frequency within these zones typically is an order of magnitude greater than that in the surrounding area. Some of the zones of fracture concentration have been associated with nearby faults as inferred from outcrops, well logs, and(or) seismic reflection data, and some zones have been associated with methane gas anomalies in the soil (Jacobi, 2002). Isachsen and McKendree (1977) published a preliminary brittle-structure map for New York State that included lineaments as well as faults. A more extensive mapping of lineaments in New York's Appalachian basin was completed by EarthSat (1997) for the New York Energy Research and Development Authority.

Assessment of the spatial relation of proposed Marcellus wells with lineament features that cut across the path of West Delaware Aqueduct would provide important information for the protection of the the New York City West-of-Hudson water-supply infrastructure. As an initial phase of this assessment, the USGS proposes to refine and supplement the lineament data sets of Isachsen and McKendree (1977) and EarthSat (1997) with the analysis of 2007 LiDAR data to produce a high-resolution GIS coverage of lineaments for the Marcellus play in southwestern Delaware County, New York (fig.1). This lineament coverage will be integrated with hydrogeologic information from springs, water wells, gas wells, and the West Delaware Aqueduct including reported fractures and faults and records of freshwater, saltwater, and gas flows.

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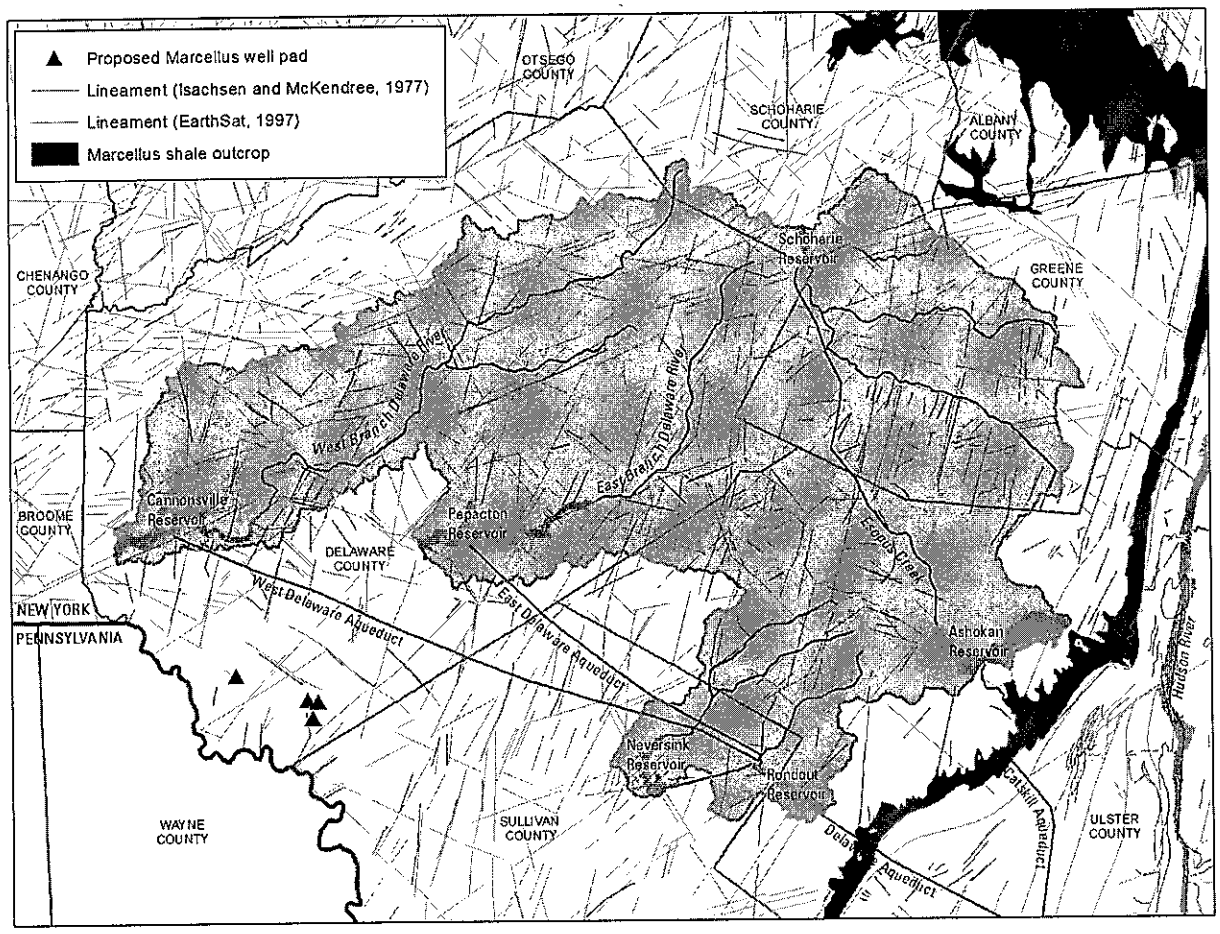


Figure 1. New York City West-of-Hudson water-supply watershed, reservoirs, and aqueducts; Marcellus shale outcrop; proposed Marcellus well pads; and lineaments mapped by Isachsen and McKendree (1977) and EarthSat (1997)

FOR THE RECORD

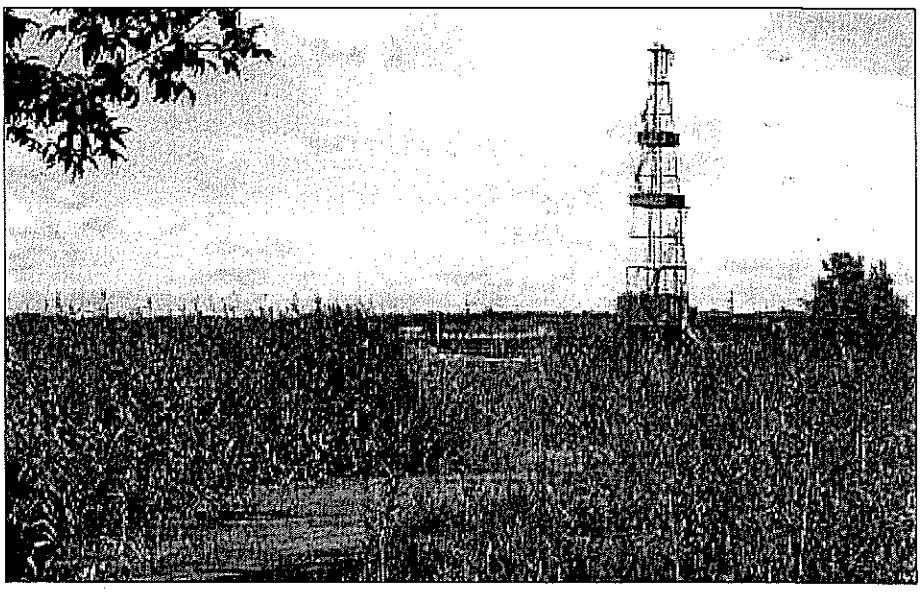
ENVIRONMENTAL WORKING GROUP

Cracks in the Façade

25 Years Ago, EPA Linked "Fracking" to Water Contamination

Dusty Horwitt, Senior Counsel, Environmental Working Group

August 3, 2011



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The opinions expressed in this report are those of the authors and editors and do not necessarily reflect the views of our supporters. EWG is responsible for any errors of fact or interpretation contained in this report.

EXECUTIVE SUMMARY

25 Years Ago, EPA Linked "Fracking" to Water Contamination

In 2006, a Dallas-based company riding a nationwide natural gas boom drilled and hydraulically fractured a gas well in a sandstone and shale formation in Jackson County, W. Va. Just after EXCO Resources fractured the well, area residents said that two nearby water wells became polluted.[1]

"When the water actually went bad was after they fractured," says Paul Strohl, 69, a retired firefighter who lives in Jackson County.

"Even the consistency changed," said his wife Janet, 67. "It was slimy."

After the problems surfaced, Paul Strohl says, Tyler Mountain Water, a company based in Poca, W. Va., began delivering water to the affected residents. "After they fracked, this water truck started showing up delivering water. I don't think it takes more than a third-grade education to figure out what that means."[2]

The landowners whose water wells were involved in the incident have declined to comment, saying they signed confidentiality agreements with EXCO. The Strohls' account bears striking similarities to a report issued almost 25 years ago by the Environmental Protection Agency, which concluded that hydraulic fracturing (colloquially known as "fracking") could – and did – contaminate underground drinking water sources. That all-but-forgotten report from December 1987, uncovered by Environmental Working Group and Earthjustice, contradicts the drilling industry's insistence that there has never been a documented case of groundwater contamination caused by hydraulic fracturing.

Used in more than 90 percent of natural gas and oil wells, fracking involves injecting a mix of water, sand and chemicals into a well under high pressure in order to fracture underground rock formations and unlock trapped gas and oil.

EPA's long-ignored 1987 report found that fracturing fluid from a shale gas well more than 4,000 feet deep had contaminated well water just across the road from the Strohls' home, that the contamination was "illustrative" of the types of pollution associated with natural gas and oil drilling, and that EPA's investigation had been hampered by confidentiality agreements between industry and affected landowners.

Since then, the industry has hydraulically fractured hundreds of thousands of wells and is continuing a historic push into natural gas-bearing shale formations, once considered inaccessible, that lie beneath populated areas in a number of states, including West Virginia, New York, Pennsylvania, Ohio, Michigan, Louisiana and Arkansas. To access these formations, drillers often

use a relatively new combination of horizontal drilling and higher-volume fracturing. As drilling activity has intensified, reports of pollution have sparked a growing national debate over the actual or potential environmental risks, including contamination of groundwater, the source of drinking water for more than 100 million Americans, according to the U.S. Geological Survey.[3] As the West Virginia case and others like it indicate, the risk of groundwater contamination is greatly increased because decades of oil and gas exploration have left many regions of the country riddled with thousands of abandoned and often poorly sealed wells. Government and industry studies show that fracking fluids from new wells can potentially infiltrate these older bores and rise back up to the level of drinking water aquifers closer to the surface.

In the debate over these risks, EPA and Congress have never cited the agency's own 1987 report and have largely exempted fracturing from regulation.

"During the fracturing process," EPA investigators wrote in the 1987 report, which focused on the handling of natural gas, oil and geothermal wastes generally, "fractures can be produced, allowing migration of native brine, fracturing fluid and hydrocarbons from the oil or gas well to a nearby water well. When this happens, the water well can be permanently damaged and a new well must be drilled or an alternative source of drinking water found."[4]

In an introduction to the chapter on contamination cases, including the case in Jackson County, the EPA noted that "within each [geographic] zone, the report presents one or more categories of damages that EPA has selected as fairly illustrative of practices and conditions within that zone."[5]

Industry representatives reviewed EPA's report and appeared to reach different conclusions about the case.

In the EPA docket center in Washington, EWG discovered comments submitted by the American Petroleum Institute (API), the natural gas and oil industry's major trade association. Although API was generally critical of EPA's investigation, calling it "inaccurate" and "careless,"[1] API did not specifically dispute EPA's conclusions about the West Virginia case in several written comments. Indeed, the industry's comments indicate that the association agreed with EPA that the case involved contamination of groundwater as a result of fracturing.

"One case," the API wrote, referring to the West Virginia contamination case, "resulted in a workover operation fracturing into groundwater as a result of equipment failure or accident. As described in the detail write-up this is not a normal result of fracturing as it ruins the productive ca-

pability of the wells." Another document attached to API's comment noted that in the West Virginia case "the damage here results from an accident or malfunction of the fracturing process....The process requires the fractures to be created to be limited to the producing formation. If they are not as is the apparent case here oil and gas are lost from the reservoir and are unrecoverable."[6]

A group of state oil and natural gas associations took a different approach in comments submitted to EPA in 1988. "EPA is incorrect in its statement that the fracturing of a well can result in contamination of nearby water wells...." the associations wrote. "Such a statement is completely without support in the study. In fact, we know of no case where this has occurred given proper casing. The zones which are fractured are several thousand feet below the deepest fresh water zones making contamination of the fresh water zones extremely unlikely."[7]

Environmental Working Group recently conducted its own year-long investigation and concluded that a variety of evidence indicates that the West Virginia case was indeed an example of hydraulic fracturing pollution of groundwater, though it could not rule out that another stage of the drilling process could have caused the problem.

A former EPA official who worked on the 1987 report and asked not to be named said that the agency was aware of other cases of groundwater pollution involving hydraulic fracturing but did not include them in the report because the details were sealed under confidential legal settlements reached between affected property owners and energy companies. The 1987 document noted that such settlements often presented hurdles for the EPA's investigation.

"Private citizens rarely bring cases to court because court cases are expensive to conduct," the EPA reported, "and most of these cases are settled out of court.... In addition to concealing the nature and size of any settlement entered into between the parties, impoundment curtails access to scientific and administrative documentation of the incident."[8]

The former official said the EPA identified other cases of groundwater contamination caused by fracturing but excluded them from the report because they involved pollution by migrating natural gas or oil, not by the chemical-laced fluids injected in the fracking process itself. Contamination by leaking natural gas and oil was considered outside the scope of the report, which focused only on the management of wastes from the natural gas, oil and geothermal industries. The report also noted that because EPA had only three months to collect cases from across the nation, "there was limited time available for damage case review."[9] The former EPA official explained that EPA had to complete the study quickly because the agency

had missed a Congressionally mandated deadline and was working under a court-ordered timetable.

Both the 2006 incidents in West Virginia and the 1987 EPA study, which involved dozens of documented incidents of apparent contamination by fracking, drilling wastewater stored in pits and other drilling techniques, raise new questions about the agency's commitment to protecting the public as it pursues its current two-year study of hydraulic fracturing's risks.

Inexplicably, the EPA failed to mention its own finding when it produced a second report in 2004, a document that an internal whistleblower sharply criticized for its lack of scientific rigor and for relying on a review panel stacked with current or former industry employees.[10] The 2004 analysis concluded that hydraulic fracturing in coal bed methane natural gas wells, a relatively small subset of natural gas and oil wells, posed no risks to underground water supplies. The study set the stage for a Congressional vote in 2005 that legally exempted fracking for all types of natural gas and oil wells from regulation under the federal Safe Drinking Water Act, a law specifically designed to prevent contaminants injected underground from migrating through abandoned natural gas and oil wells.[11]

In its 2004 report, the EPA announced that it was limiting its review to coal bed methane wells in large part because such wells "tend to be shallower and closer to [underground sources of drinking water] than conventional oil and gas production wells" and "EPA has not heard concerns from citizens regarding any other type of hydraulic fracturing."[12]

It made that decision despite the findings of its own 1987 report on the West Virginia case, which found that hydraulic fracturing for natural gas in a shale deposit more than 4,000 feet deep had polluted a water well only 400 feet from the surface.

EWG's investigation also turned up recent industry and government reports that sharpen concerns about fracturing and may help explain the West Virginia case featured in the EPA's report. These documents show that fractures from one well can spread unpredictably and are known to have caused fracturing fluid to migrate into other nearby natural gas and oil wells, sometimes known as "offset wells."

"Fractures are usually enormous features," wrote engineer and drilling industry consultant M.C. Vincent in a paper that he presented at a hydraulic fracturing conference held near Houston in January 2009. "In many reservoirs, fractures are mapped to extend beyond 1,000 feet (half-length) from the wellbore. In some reservoirs, half-lengths exceeding 2,200 feet have been confirmed as treatments have broken into offset wellbores..."[13]

State regulators in Illinois and Texas, as well as Congress' investigative arm, the Government Accountability Office, have also documented contamination problems caused when oil and gas waste fluids injected underground for disposal migrated up nearby older wells and broke out near the surface, where groundwater is found, a phenomenon sometimes called "saltwater breakout."[14] One case in Texas involved fluid that traveled half a mile underground from an injection well and then migrated up through an old, improperly plugged well.[15] There were four abandoned natural gas wells within about 1,700 feet of the gas well and water well involved in the West Virginia case documented by the EPA in 1987.

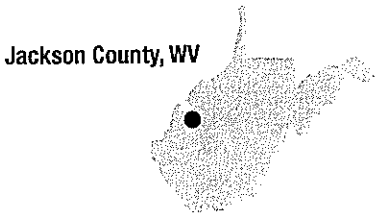
Currently, both EPA and the Department of Energy are reviewing the environmental risks of hydraulic fracturing. These multiple pieces of independent evidence underscore how essential it is that both agencies tackle these issues in a far more thorough way than EPA did in its cursory and deeply flawed 2004 review.

EPA Traced Pollution of Underground Water Supply to Hydraulic Fracturing

In 1982, Kaiser Gas Co. drilled and hydraulically fractured a natural gas well on the property of James Parsons in Jackson County, W. Va. The EPA concluded in a 1987 report to Congress that the process contaminated Parsons' water well with fracturing fluid. It is unclear how the "fracking" fluids may have entered the water well, but four old natural gas wells nearby could have been the conduits for contamination.

Old Well
Drilled 1941-42

New Well
Drilled 1982



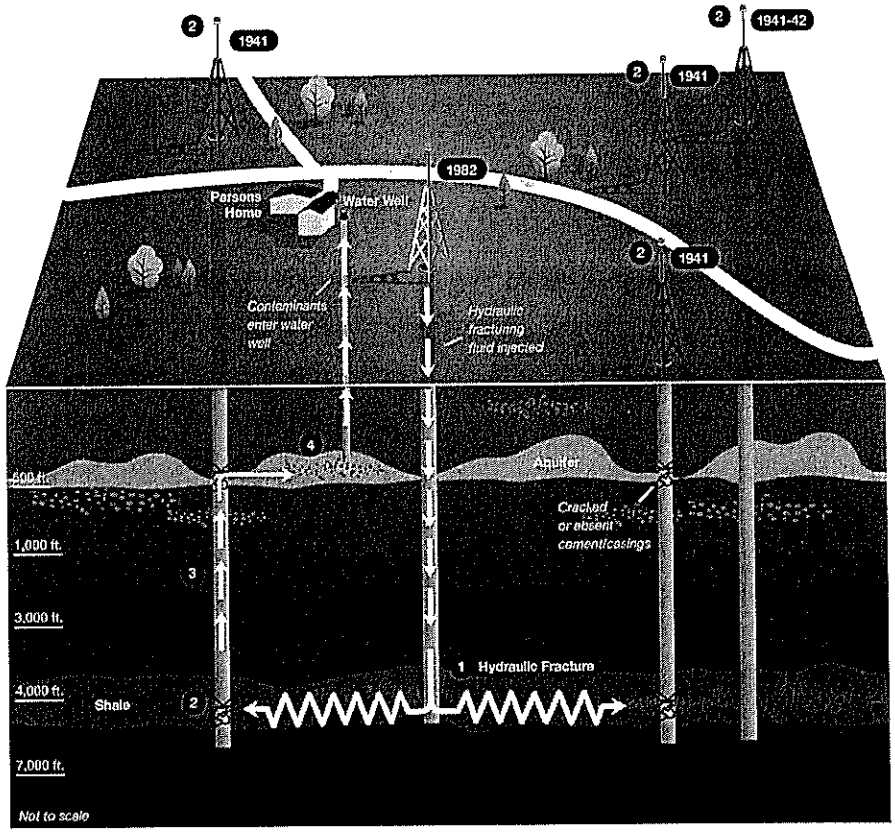


Illustration Aman Anderson, EWG ©2011

1 Hydraulic Fractures
According to industry studies, hydraulic fractures can extend up to 2,500 feet horizontally, well within range of old natural gas wells near Parsons' property. Studies found that fractures have broken into nearby oil and gas wells and that fracking fluid has migrated up old wells to the surface.

2 1940s Wells Nearby
Four old natural gas wells were located within 1,700 feet of the gas well drilled on James Parsons' property. Each of the wells was "shot," an early fracturing process in which companies detonated explosives inside a well to help access gas or oil deposits.

3 Fluid Migration
Government studies have found that oil and natural gas waste fluids injected underground can migrate up old oil and natural gas wells.

4 Breakout into Aquifer
These fluids can break into aquifers near the surface if the old wells have deteriorated casings, lack cement plugs or contain cracked cement. This phenomenon is known as "salt water breakout." It is possible that hydraulic fracturing fluids migrated in a similar way into Parsons' water well.

EPA Report Contradicts Industry Claims

Fracturing in the drilling industry dates to the 1800s, when companies began exploding glycerin or dynamite deep inside their wells to open passages through which natural gas or oil could flow more rapidly into drilling pipes for collection. In 1947, drillers for the first time used hydraulic fracturing on a gas well operated by the Pan American Petroleum Corp. in Kansas, and the process is now used in more than 90 percent of natural gas and oil wells.[16]

In hydraulically fracturing a well today, also known as "stimulating" it, drillers inject a mix of water, sand and chemicals (some of them toxic) under extremely high pressure. The process, which uses anywhere from tens of thousands to millions of gallons of fluid, creates new fractures in the rock or re-opens pre-existing natural fractures. The sand props the fractures open, dramatically increasing production. The chemicals facilitate various aspects of the process, including helping to thicken the fluid so that sand can be carried farther into the fractures.[17]

The industry maintains that hydraulic fracturing has never contaminated groundwater. "To our knowledge, there have been a million wells fracked, and no documented cases of contamination of groundwater from hydraulic fracturing," Exxon CEO Rex Tillerson told the House Energy and Commerce Committee in January 2010, echoing other industry representatives.[18]

"In its 60-year history, hydraulic fracturing has not resulted in a single case of water contamination – a fact reinforced by the Environmental Protection Agency," wrote Lee Fuller, executive director of Energy In Depth, an industry-backed website, and vice president of government relations for the Independent Petroleum Association of America, in a 2010 letter to the Ithaca (N.Y.) Journal.[19]

A 1987 Environmental Protection Agency report tells a different story.

In concluding that hydraulic fracturing can – and did – contaminate groundwater, the EPA detailed its investigation of a contaminated water well on land owned by James Parsons of Ripley, W. Va., a town of 3,300 in Jackson County, halfway between Charleston and Parkersburg. The case summary reads:

> *In 1982, Kaiser Gas Co. drilled a gas well on the property of Mr. James Parsons. The well was fractured using a typical fracturing fluid or gel. The residual fracturing fluid migrated into Mr. Parson's water well (which was drilled to a depth of 416 feet), according to an analysis by the West Virginia Environmental Health Services Lab of well water samples taken from the property. Dark and light gelati-*

nous material (fracturing fluid) was found, along with white fibers. (The gas well is located less than 1,000 feet from the water well). The chief of the laboratory advised that the water well was contaminated and unfit for domestic use, and that an alternative source of domestic water had to be found. Analysis showed the water to contain high levels of fluoride, sodium, iron and manganese. The water, according to DNR officials, had a hydrocarbon odor, indicating the presence of gas. To date Mr. Parsons has not resumed use of the well as a domestic water source. (API states that this damage resulted from a malfunction of the fracturing process. If the fractures are not limited to the producing formation, the oil and gas are lost from the reservoir and are unrecoverable.)

Parsons Well Was Drilled and Fractured

On Aug. 8, 1982, according to records on file with the West Virginia Office of Oil and Gas, the state issued a permit to Ravenswood, W. Va.-based Kaiser Exploration and Mining Co. to drill a natural gas well on the Parsons property. By Aug. 25, Kaiser had bored through ten layers of shale, limestone and sandstone to complete the 4,572-foot-deep well, which reached a Devonian Brown Shale formation that is similar to the shale formations where companies are drilling for natural gas today. The company was seeking to extract gas from a "pay zone" between 4,216 and 4,364 feet underground, nearly 4,000 feet beneath Parsons' water well but less than two football fields away horizontally.[20]

On Aug. 31, Kaiser fractured the well in the pay zone with more than 13,000 gallons of water, 60,000 pounds of sand and 760,000 standard cubic feet of nitrogen injected at a pressure of up to 3,100 pounds per square inch.[21] [By comparison, water generally flows through a fire hose at between 100 and 150 pounds per square inch.[22]]

West Virginia state records show that Kaiser used three layers of casing and cement to seal the new gas well from adjacent rock formations and that Jerry Tephabock, a state inspector, checked the well three years later and found the casing and cement to be in compliance with state standards (State records do not reflect any earlier inspection of the casing and cement).[23] Prior to reviewing documents associated with the case, EWG spoke briefly with Tephabock by telephone, but he did not comment substantively. Tephabock did not respond to two later calls seeking comment.

Parsons' water well was lined with a steel casing, according to a state well inspection form and a lawsuit Parsons later filed.[24]

Gas, Gel in Parsons' Water Well

A year and a half after Kaiser fractured the gas well, Parsons' well water became polluted.

Parsons declined to speak to EWG about the incident, citing privacy concerns, but a well inspection form completed in June 1984 by the West Virginia Department of Mines Office of Oil and Gas reported that a problem first developed in "March-April" 1984 when someone (the form does not say who) smelled a rotten egg odor coming from the water well. In June, there were white fibers and natural gas in the water. "Gas in water well...will burn at vent tube," the state report said.[25]

On Oct. 2, 1984, Michael Lewis, an engineer with the West Virginia Office of Oil and Gas, wrote in a letter to Parsons that "the well drilled on your property by Kaiser could have been a possible source of contamination as you have suggested. The Office of Oil and Gas, however, can not determine fault or liabilities in such a matter. State law does address this matter in Code 22-4-19, which says 'there shall be a rebuttable presumption that any oil or gas well drilled within 1000 feet of a water supply is the proximate cause of contamination or deprivation of such water supply'... I know you are concerned about compensation for your trouble and expenses incurred with the water problems. The Office of Oil and Gas has no means of awarding you compensation. Should you feel that Kaiser's well was indeed the source of contamination to your water and that they, therefore, owe you compensation and will not pay, your only recourse is to file a civil suit for damages. In such an action, Code 22-4-19 is applicable and for your protection."[26]

The West Virginia Department of Public Health's Environmental Health Services Lab collected and tested five samples of Parsons' well water between June and November 1984.[27] On Nov. 8, James E. Rosencrance, chief of the lab, wrote to Perry Merritt, a water official in Jackson County, regarding tests on three of the samples:

> *"... an evaluation of the three reports (copies enclosed) would indicate that this water supply is contaminated from a chemical point of view, which may have resulted from oil and gas drilling operations in the vicinity of the Parsons water supply. It is not unusual to find high alkalinity, high fluoride, high sodium and high total dissolved solids in the underground water in that particular area of Jackson County, but is (sic) would be unusual to find the gelatinous material which we isolated unless it had been used by the drilling industry. This laboratory has identified the presence of hydrocarbons in one of the samples, which is indicative of petroleum type products. The laboratory is not familiar with the chemical characteristics of this well previous to the samples analyzed in July, August and*

> *September of 1984. Any attempt to filter the water would be futile since the gelatinous material would clog the filter in a very short period of time. Such things as sodium, fluoride, high alkalinities and extraneous materials are not easily removed in home type supplies. A new source of water is suggested for the Parsons residence.*[28]

In one of the lab reports, Rosencrance typed, "The gelatinous material in this sample is not of bacterial origin. It does appear to be a gel type material and perhaps used as a sealant in the oil and gas drilling industry. Microscopi[c] exams rule out bacterial populations."[29] In another report, Rosencrance described "dark and light gelatinous material indicative of a gel."[30] In a third report, he noted: "Microscopic examination reveals large glossy gelatinous masses indicative of a gel. There were numerous rod-shaped particles present which were not readily distinguishab[le] as a nuisance bacterial growth. The...odor is of a putrefying description."[31]

According to legal records in the Parsons case, Kaiser commissioned BCM, a company based in Dunbar, W. Va., to conduct its own test of Parsons' well in November 1984. In March 1985 it commissioned a second test by NOWSCO Well Service Ltd., based in Calgary, Canada. NOWSCO concluded that "these results are indicative of very fresh water... no contamination from frac water is evident in the sample from the water well." The BCM report did not draw a conclusion.[32]

BCM, NOWSCO and the West Virginia state lab did not report testing for benzene, toluene, ethylbenzene or xylene (known as BTEX), common pollutants in drilling and fracturing, nor did they report testing the chemical composition of the gel.[33] An employee at BCM's office in Plymouth Meeting, Penn., said the company no longer has a laboratory and she did not know how to reach those who worked for the lab in the 1980s. NOWSCO is now owned by B.J. Services, one of the world's largest hydraulic fracturing companies, according to a representative who answered the phone at NOWSCO's former office in Calgary. A phone message left last November for one of the NOWSCO representatives listed on the lab report was not returned.

On April 3, 1985, Rosencrance wrote to Parsons that "it is our understanding that a gas well was fractured within 600 feet of your water well and may be involved with the pollutants found in the water. There are no funds or programs available within the State of West Virginia which would financially assist you in correcting the pollution problem with your well water."[34] Rosencrance died on June 24, 1999, according to an obituary in the Charleston Gazette.[35]

On Feb. 4, 1986, Parsons and his wife, N. Ruth Parsons, filed suit against Kaiser in the Circuit Court of Jackson County, W. Va., seeking $50,000 (equiva-

lent to $100,000 today) in compensation for damages to their water well, according to court records. Kaiser denied the charges. On May 29, 1987, the parties agreed to an undisclosed settlement and the case was dismissed.[36]

R.A. Pryce, the agent for Kaiser Gas listed in the state records, passed away several years ago, said his son, Lance, in a telephone interview.[37] According to state records, Kaiser has been taken over by a succession of companies since it drilled the well on Parsons' property. It is now owned by Dallas-based EXCO Resources (WV) Inc. Larry Sanders, the regulatory manager for EXCO, told EWG in November 2010, that he had passed questions about the company's past and present drilling operations to EXCO's legal department. The legal department has not responded.

On the same day that the Parsons settled with Kaiser, Ted M. Streit, deputy director of West Virginia's Inspection and Enforcement Division, said in a letter to a lawyer representing several state oil and gas associations, including the West Virginia Oil and Natural Gas Association, that as a result of Parsons' case, the state had discovered a previously unknown source of fresh water underground near Parsons' water well and had implemented tougher requirements for cementing oil and natural gas wells nearby.[38]

Gel in Water Consistent with Fracturing

While the West Virginia lab did not conclude that hydraulic fracturing caused the contamination of Parsons' well, the gel found in the water is consistent with contamination from hydraulic fracturing fluid. Drilling companies have used gels in hydraulic fracturing since the process was first developed in 1947, bolstering the EPA's conclusion that the gel in Parsons' water came from fracturing. In the Stimulation Treatment Handbook, published by PennWell Books in 1985, chemist and industry consultant John W. Ely wrote that, "The first fracturing fluid, utilized in the late 1940s, was war surplus napalm. Napalm is an aluminum gel used to thicken gasoline." In the 1960s, Ely wrote, companies began using guar, an additive found in food, to make fracturing gels. Ely noted that "this material was also marketed as the toy called 'Slime'".[39]

According to the EPA's 2004 study, gels are important in fracturing fluid because they can carry sand or other "proppants" deeper into rock fractures than water alone. Proppants literally prop open the fractures to prevent them from closing. "Diesel fuel has been frequently used in lieu of water to dissolve the guar powder because its carrying capacity per unit volume is much higher," the EPA found.[40]

The fact that Kaiser reported using nitrogen could mean that the company used a nitrogen-based foam, called a "foamed gel" by EPA in 2004. The agency noted that "the most widely used foam fracturing fluids employ nitrogen

or carbon dioxide as their base gas... foaming agents can be used in conjunction with gelled fluids to achieve an extremely effective fracturing fluid."[41] Richard Morris, who inspected the gas well drilled by Kaiser in 1982 when he worked for the West Virginia Oil and Gas Division, said he did not recall details about the well, but that the fracturing mix would likely have contained a gelling agent, along with nitrogen, water, sand and foam. He added that while it is possible that hydraulic fracturing caused the contamination, he believes another explanation is more likely. Morris left the state agency later that year to open his own natural gas and oil drilling company.[42]

The hydrocarbons in Parsons' water could be explained if Kaiser used diesel or other petroleum distillates in its fracturing fluid. Officials in Pennsylvania and New York report that companies currently use a variety of petroleum distillates in fracking fluid.[43] A liquid hydrocarbon called "condensate," which typically comes to the surface with natural gas and contains carcinogenic benzene, could also have accounted for the hydrocarbons and "putrefying odor" in Parsons' well. Marathon, a natural gas and oil company, has reported that "condensate sour" smells like rotten eggs, a smell similar to that reported by West Virginia inspectors.[44]

Aquagel: An Alternative Explanation

Former West Virginia inspector Morris said that while it is possible that the gel in Parsons' water came from hydraulic fracturing fluid, he believes that an underground limestone layer would have prevented the fluid from migrating upward enough toward the surface to enter an aquifer. A more likely explanation for the contamination, he said, is that the material in Parsons' water was Aquagel, a mixture of bentonite clay and water. Companies regularly inject Aquagel into a well bore after drilling is complete to remove loose rock cuttings, he said. These cuttings can prevent cement from forming a tight bond with the adjacent rock when drillers subsequently cement a well's steel casing into place. Morris said the aquagel could have migrated into the underground aquifer before the company installed the layers of casing and cement to protect the aquifer from drilling fluids.[45] Maurice Dusseault, a professor at the University of Waterloo in Ontario who specializes in rock mechanics and is a member of the Society of Petroleum Engineers, said that this explanation is, indeed, possible.

The only way to know the exact source of the gel would have been to test it and compare it to the aquagel and the fracking fluid. However, there is no record that West Virginia's or Kaiser's scientists conducted such testing. If they had, they would have had to know the composition of

Kaiser's fracking fluid for comparison – information that companies have routinely kept secret.

Were Older Wells the Source?

Morris and Dusseault also said, however, that the water contamination could have come from hydraulic fracturing fluid that migrated into nearby abandoned gas wells that had not been properly plugged and cased to seal them off. From there, the fluid could have traveled up the wells, broken out near the surface and migrated into the aquifer serving Parsons' water well. In the 1980s, the EPA, state regulators in Illinois and Texas, and Congress' investigative arm, the Government Accountability Office, all highlighted this type of contamination from the injection of natural gas and oil industry waste fluids into underground disposal wells.[46] There are four old natural gas wells dating to the 1940s within 1,700 feet of the gas well drilled on Parsons' property in 1982 – well within range of hydraulic fractures, according to modern industry and government studies.

In its 1987 report, the EPA noted the risk of contamination via old wells, citing Illinois' investigation of drilling pollution. "To avoid degradation of ground water and surface water, it is vital that abandoned wells be properly plugged," the EPA noted. "Plugging involves the placement of cement over portions of a wellbore to permanently block or seal formations containing hydrocarbons or high-chloride waters (native brines). Lack of plugging or improper plugging of a well may allow native brines or injected wastes [from a waste fluid disposal well] to migrate to freshwater aquifers or to come to the surface through the wellbore."[47]

The EPA did not specifically address the risk of contamination via old wells as a result of hydraulic fracturing, but both hydraulic fracturing and injection disposal wells involve underground injection of fluid under pressure.

In the files for EPA's 1987 report at the EPA headquarters in Washington, D.C., is a 1985 study from the Texas Department of Agriculture (TXDA), which investigated 4,658 complaints related to natural gas and oil production. "When a water well is experiencing an oilfield pollution problem (typically, high chlorides)," the Texas agency found, "the pollution source is often difficult to track down. The source could be a leak in the casing of a disposal well, leakage behind the casing due to poor cement bond, old saltwater evaporation pits, or, most often, transport of contaminants through an improperly plugged abandoned well" (underscore in original).[48]

In 1989, the General Accounting Office (now the Government Accountability Office) found that "if these abandoned wells are not properly plugged – that is, sealed off – and have cracked casings, they can serve as pathways for injected

brines [waste fluids from natural gas and oil drilling] to enter drinking water. Because groundwater moves very slowly, any contaminants that enter it will remain concentrated for long periods of time, and cleanup, if it is technically feasible, can be prohibitively costly."[49]

According to a 1999 report from the Department of Energy, there were then approximately 2.5 million abandoned oil and natural gas wells in the U.S.[50] At least tens of thousands of these abandoned wells are located in states that are home to shale formations that companies have been targeting in recent years for natural gas. According to 2010 data supplied by the West Virginia Geological and Economic Survey, there are nearly 39,000 documented abandoned wells in that state.[51] New York's Department of Environmental Conservation estimates that 75,000 wells have been drilled in the state since the 1820s and that about half are undocumented.[52]

The Pennsylvania Department of Environmental Protection estimates that 325,000 natural gas and oil wells have been drilled in that state since 1859. Of these, about 130,000 are currently operating, 47,000 are known to be plugged and about 8,500 are unplugged. The status of the remaining estimated 185,000 wells is either partially documented or unknown.[53] In Ohio, according to 2011 data from the Ohio Department of Natural Resources, there were about 64,000 documented plugged or abandoned natural gas and oil wells and 40,000 wells of unknown status.[54]

Dusseault said that, in general, it is "highly improbable" that hydraulic fractures could intersect with an abandoned well and cause contamination, noting that it would take a complex series of events for this to occur. First, companies would have to have used enough fluid to create a fracture that extended as far as an adjacent well. The odds of such long fractures are probably greater in shale formations such as the one involved in Parsons' well, he said, because shale has few pores into which fluid can leak off; all or most of the fluid is channeled into the fracture. Second, fractures tend to spread in just one direction, depending on the formation in which a well is located, reducing the odds that a fracture would spread in the very direction of an abandoned well. Third, the old well would have to be improperly plugged, enabling fluid to migrate and break out into an aquifer. And last, the fracturing fluid or other contaminants would have to have enough force to make it from the bottom of the old well to the aquifer.

"Those things put together make it improbable," he said. However, he added that in the case of the Parsons well, in which there were multiple abandoned wells in several different directions, "your probability of intersecting those wells has just gone up tremendously."

Four Old Wells Within 1,700 Feet

According to digital latitude and longitude data and satellite maps provided by the West Virginia Geological and Economic Survey (WVGES), when Kaiser drilled its gas well in 1982 on the Parsons' property, there were four abandoned gas wells within 1,700 feet – well within the documented distance that hydraulic fractures can spread. One of the old gas wells was drilled in 1941 less than 1,100 feet north of the gas well drilled in 1982 and about 700 feet northeast of the Parsons' water well. The old well is in the backyard of Janet and Paul Strohl, located just across the road from the Parsons' home.[55]

The Strohls, who can light a flame from a vent on top of their own salt-tainted water well, suspect that this old gas well is the source of their contamination (salty water is often produced along with natural gas), which they discovered the moment they moved into their home in 2004 and drilled for water. For washing and cleaning, they fill a Volkswagen Beetle-sized plastic tank in their basement with rain water from their gutters and supplement that by paying $106 per truckload to have water delivered. They drink bottled water.[56]

A rusted metal pipe sticking out of the ground, marked as well number 470350160, is still visible at the site of the old gas well next to their fence. According to records on file at the state Oil and Gas Division, United Carbon Co., based in Charleston, W. Va., drilled the well between June 13 and Sept. 21, 1941. On the way down, the company hit gas once and water three times, including "salt water" at 1,455 feet, before it completed the well in a layer of limestone 5,244 feet down, approximately 700 feet deeper than the 1982 gas well drilled on Parsons' property.

On Sept. 21, 1941, United Carbon used the fracturing technique of its day when it "shot" the well by exploding 80 quarts of glycerin between 5,161 and 5,201 feet underground in a sandstone formation.[57]

According to the 2007 edition of the Texas Comptroller of Public Accounts' Oil Well Servicing Tax Manual, "in the years between 1890 and 1950, the oil industry used liquid and later solidified nitroglycerin to stimulate wells by detonating an explosive charge in the wellbore. The object of shooting a well was to fracture the oil or gas bearing formation in order to increase both the initial flow and the ultimate recovery of oil... Shooting of the formation with explosives was very hazardous to those working with the explosives and frequently damaged the well casing, preventing subsequent selective treatment of the producing zone. Then with the advent of commercial hydraulic fracturing in 1948, shooting an oil or gas well was practically eliminated."[58]

State records show that United Carbon

removed most of the casing when it plugged the well between Sept. 28, 1945 and Oct. 12, 1946, including all seven-inch casing above a depth of 4,800 feet. This casing might have protected the well at the 4,216 foot-to-4,364 foot depth where Parsons' 1982 gas well was fractured. The company installed four plugs above this level with red clay, wood plugs and cement, beginning at 2,360 feet down and at several shallower depths.[59]

Dusseault said that removing casings has been a relatively common cost-saving technique in the industry, because they can be reused on subsequent wells. He said that plugging a well with cement in the absence of steel casing probably creates a more effective seal because the casing can corrode over time, providing a pathway for gas and other contaminants to rise up the well and potentially contaminate aquifers. The 1987 EPA study, citing the state of Illinois' research, indicated that casings could corrode and lead to fluid migration.[60]

Dusseault has also noted in a published paper that vertical pathways are likely to develop due to shrinkage and fracturing of cement placed between the casing and rock wall. The upward pressure of natural gas likely exacerbates the fractures, he wrote. Both Dusseault and the EPA's 1987 study also indicated that cement alone would not necessarily guard against the upward migration of contaminants.[61]

Dusseault said that it is virtually impossible to know whether a company had properly sealed a well.

"Was the cement high-quality cement?" Dusseault asked in an interview with EWG. "Was it properly placed or did they just fill out the forms? The records from [old] wells are so bad," he said. "Ninety-five percent of these things that are done [to plug a well] are done without the presence of a regulator," he said. He added that perhaps the only way to know whether an old well was properly sealed would be to drill out the old cement and seal it again. "It's a nightmare to try to fix up those old wells," he said.[62]

Because of their own contaminated water well, the Strohls persuaded the state Department of Environmental Protection to re-plug the old gas well in their backyard with cement in 2005. "No casing in the well," the Office of Oil and Gas inspection and release form read. The agency re-plugged the well to a depth of 900 feet, but the Strohls have continued to see gas in their water and showed EWG researchers in June 2010 that they could light a flame from their well.[63]

Oil and Gas Division records show that United Carbon Company drilled a second gas well near Parsons' property in 1941, this one approximately 1,500 feet southeast of the gas well drilled in 1982 and about 2,000 feet southeast of Parsons' water well. United Carbon drilled the well between Jan. 22 and May 13, 1941 to a depth of 5,210

feet, approximately 640 feet deeper than the well drilled in 1982. On the way down, the company hit water at four different depths. On May 13, United Carbon "shot" the well at a depth of 5,113 to 5,150 feet, using 75 quarts of glycerin. United Carbon plugged the well between July 28 and August 18, 1949. The company pulled out much of its casing, but left some of it in the well at a depth of 4,216 to 4,364 feet, where Parsons' well was fractured. The company plugged the well using alternating placements of cement, clay and "clay and stone."[64]

According to WVGES records, in 1941 the Columbian Carbon Co. also drilled a gas well at a spot about 1,150 feet northwest of the 1982 gas well on Parsons' property and about 850 feet northwest of his water well – the third documented well within 1,700 feet of the 1982 gas well. The Columbian Carbon Company drilled the old well between Sept. 16 and Dec. 13, 1941 to a depth of 5,125 feet, 550 feet deeper than Parsons' gas well. Like United Carbon, Columbian Carbon also "shot" this well, this time on Dec. 14, 1941, at a depth of 5,051 to 5,106 feet. State records are unclear on exactly what substance Columbian used to shoot the well, but it appears to have been 550 pounds of explosive, 80 percent of which was gelatin or, in the terminology of the state form, "550# 80% gelatin." The Bureau of Alcohol, Tobacco and Firearms publishes an annual list of explosives that includes "blasting gelatin," "explosive gelatins," "gelatinized nitrocellulose" and "nitrogelatin explosive," suggesting that the company used one of these types of explosives.[65]

According to the Oil and Gas Division records, Columbian Carbon plugged the well between July 3 and July 13, 1944. The company left in place the bottom 2,310 feet of seven-inch casing, which spanned the 4,216-to-4,364 feet depth at which Parsons' 1982 well was fractured, and extracted the rest along with portions of other casings. Records indicate that the company set several cement plugs in the well and injected aquagel between them – potentially an alternative source of the gel in Parsons' water if it persisted underground for 40 years.[66]

Paul and Janet Strohl near their contaminated water well.

Columbian Carbon drilled the fourth documented gas well near the Parsons' property in 1941-1942 at a location about 1,700 feet northeast of the 1982 gas well and 1,600 feet northeast of the Parsons' water well. The company drilled the well between Aug. 13, 1941 and Feb. 18, 1942 to a depth of 5,160 feet, about 600 feet deeper than the 1982 gas well. Columbian Carbon shot the well between 5,073 and 5,133 feet deep with what appears to have been 600 pounds of explosive, 80 percent of which was gelatin or, in the terminology of the state, "600# 80% Gelatin."[67]

According to Oil and Gas Division records, Columbian Carbon plugged the well between June 28, 1945 and July 9, 1945. The company removed the casing at the depth of 4,216 to 4,364 feet at which Parsons' 1982 well was fractured, along with some of the other casing, and set a series of cement plugs throughout the well. The company used aquagel both in drilling and plugging the well, another potential source of the gel that later appeared in Parsons' water well.[68]

Fractures Can Extend up to 2,500 Feet

Recent industry and government studies show that fractures can spread unpredictably underground, have broken into adjacent oil and gas wells and can travel up to 2,500 feet horizontally, approximately 800 feet farther than the distance between the gas well fractured on Parsons' property in 1982 and the most distant of the nearby older gas wells.

On May 20, 2010, the British Columbia Oil and Gas Commission issued a safety advisory after hydraulic fracturing caused a large "kick," or unintended entry of fluid or gas, in an adjacent gas well. The commission reported that it was aware of 18 incidents in British Columbia and one in Western Alberta in which hydraulic fractures had broken into adjacent gas wells. "Large kicks resulted in volumes up to $80m^3$ [about 100 cubic yards] of fluids produced to surface. Invading fluids have included water, carbon dioxide, nitrogen, sand, drilling mud, other stimulation fluids and small amounts of gas." These incidents occurred in horizontal wells with a distance between wellbores of up to 2,300 feet, the commission reported. "It is recommended," the commission advised, "that operators cooperate through notifications and monitoring of all drilling and completion operations where fracturing takes place within 1000m [3,280 feet] of well bores existing or currently being drilled."[69]

Engineer and drilling industry consultant M.C. Vincent echoed the British Columbia commission in a paper published by the Society of Petroleum Engineers that he presented at a hydraulic fracturing conference held near Houston in January 2009.

"Contrary to common expectations," he wrote,

"there are numerous examples of fractures intersecting offset wells [existing oil or natural gas wells near the well being fractured] but subsequently providing little or no sustained hydraulic connection between the wells. There is an understandable reluctance to publish reports documenting the intersection of adjacent wellbores with hydraulic fractures. Such information could unnecessarily alarm regulators or adjacent leaseholders who may infer that well spacing or fracture treatments are allowing unexpected capture of reserves."[70]

EWG asked Vincent about his findings by telephone and email, but he declined to comment on the record.

According to his paper, fractures have intersected with offset wells in the Piceance field in Colorado and Utah, Wyoming's Jonah field, Alaska's Prudhoe field, Texas' Barnett Shale, the Middle Bakken formation in Montana and North Dakota, and the Dan Field in the North Sea. Vincent noted that in one case in the Barnett Shale near Fort Worth, Texas, fracking fluids entered the wellbores of five adjacent vertical wells, temporarily halting gas production.[71]

"In the design of hydraulic fractures, it is necessary to make simplifying assumptions," Vincent wrote. "Although computing tools have improved, as an industry we remain incapable of fully describing the complexity of the fracture, reservoir, and fluid flow regimes."[72]

Another paper highlighting the complexity of hydraulic fractures, co-authored by M.K. Fisher, vice president of Business Management at Pinnacle, a service of Halliburton "specializing in the optimization of hydraulic fracturing," referred to the "highly complex fracture behavior in the Barnett shale" and the shale's "extremely complex fracture network." In the paper, published by the Society of Petroleum Engineers in 2005, Fisher and his coauthors noted that in one well drilled in the Barnett Shale, a fracture spread approximately 2,500 feet horizontally in two directions. The authors include the case cited by Vincent in which fractures from a well in the Barnett Shale broke into five adjacent wells.[73]

"Because of several factors, including the presence of natural fractures," the authors wrote, "a fracture treatment in the Barnett is more likely to look like the 'very complex' fracture description than the 'simple' case. This allows a fracture fairway to be created during a treatment with many fractures in multiple orientations, resulting in large surface areas potentially contributing to production."[74]

"Natural fractures may be activated (i.e. opened) during a hydraulic fracture treatment," they added.[75]

In a telephone interview, however, Fisher said it would be unlikely for fracturing to contaminate underground water supplies. He said his

firm has collected microseismic data on thousands of hydraulic fracturing operations in Texas' Barnett shale and the Marcellus shale beneath Eastern states and has found that the fractures remain thousands of feet below underground water supplies, a conclusion that he published in July 2010 in the American Oil & Gas Reporter, a Wichita, Kan.-based publication that serves the independent sector of the natural gas and oil industry. He said his firm has not conducted water testing, and the possibility of fractures contaminating water supplies by intersecting with abandoned wells was outside his area of research.[76]

Monte Besler, a consulting petroleum engineer who specializes in hydraulic fracturing, co-authored a 2007 paper that raised concerns about the unpredictability of fracturing behavior in Montana and North Dakota's Middle Bakken Formation. "Several operators have reported difficulty keeping fractures contained within the target Bakken horizon," Besler and his coauthors wrote. They delivered the paper at the Society of Petroleum Engineers' Annual Technical Conference and Exhibition in Anaheim, Calif.[77]

Like Fisher, Besler said that despite some unpredictability of fracture spread underground, there is little chance that fracturing would contaminate underground water supplies, in large part because fractures would not rise high enough to contaminate underground water sources that lie thousands of feet above.

He said, however, that there are three scenarios in which fracturing could potentially contaminate water supplies: 1) if a well is drilled in a shallow formation within several hundred feet vertically and horizontally of a water source – the distance most fractures are likely to travel, 2) if a well is improperly cemented, allowing the escape of fracturing fluids or hydrocarbons up the well bore, where they could pollute water closer to the surface; or 3) if the hydraulic fracture intersects with an old natural gas or oil well that was improperly plugged and cased, allowing fluid to migrate up the well and burst out near the surface. He said that he has personally fractured hundreds of wells and has never seen water contamination from hydraulic fracturing.

"We don't want produced water," he said. "We want oil and gas; we go out of our way to avoid fracking into water."[78]

West Virginians Say Problems Persist

West Virginia residents who live near the Parsons' property believe that drilling companies there are not doing enough to address water contamination problems that may have been caused by hydraulic fracturing. In these cases, old wells may have played a role, too.

In the case of contamination that the Strohls say they witnessed in 2006, state records show

that when EXCO drilled and fractured its gas well, there were five old gas wells within 2,500 feet, including one within 440 feet and a second within 1,000 feet. Each of the older wells was deeper than the well EXCO drilled, meaning that a horizontal fracture from EXCO's well could have intersected with the old wells if it traveled far enough.[79] EXCO's gas well was less than 1,000 feet from the water wells that the Strohls said became polluted.

A "Well Operators Report of Well Work," filed with the West Virginia Office of Oil and Gas, shows that EXCO began drilling the well near two Jackson County homes on July 20, 2006. On July 22, according to handwritten notes on an inspector's permit form filed with the Office of Oil and Gas, EXCO "hit water could not continue – had to cement to shut off." The next day, the company "started drilling – hit water again – cemented to surface with expanding cement."

On July 31, after boring through 17 layers of shale, sandstone and limestone, EXCO finally completed the well at a total depth of 4,426 feet. EXCO used three layers of casing and cement to seal off the well from the surrounding formations.[80]

The company then hydraulically fractured two formations where it intended to extract natural gas, a berea sandstone between 2,560 and 2,564 feet deep and a brown shale formation between 3,936 and 4,380 feet deep. EXCO fractured the sandstone with 6,174 gallons of "gelled water," 29,500 pounds of sand and 340,000 cubic feet of nitrogen. The company fractured the shale with 7,812 gallons of "gelled water," 49,000 pounds of sand and 608,400 cubic feet of nitrogen. State records do not indicate when the fracturing occurred, but it is likely that it was before Aug. 28, when David L. Cox, manager of geology, completed the well operator's form for EXCO.[81]

Shortly thereafter, the Strohls reported that water wells for the two homes became polluted. The Strohls had a keen interest in the residents' water because they wanted to compare it to their own polluted well.

Before the 2006 drilling, "they were actually bragging about their water being good," Janet said of the other residents. "It *was* good," said Paul. Tyler Mountain Water, the company that began delivering water to the two homes according to the Strohls, did not return two phone calls requesting comment.

The Strohls have petitioned the Southern Jackson County Public Service District, on which Paul Strohl serves as a board member, to extend public water lines to their home and other homes with contaminated wells, including some wells that they believe were polluted by natural gas drilling. In November 2010, the district submitted an application to a clearinghouse for federal infrastructure funds to extend public water lines

to the Strohls' general area. The project would cost approximately $3.6 million for 60 users. In April 2011, the clearinghouse said that the project was technically feasible and forwarded it to a funding committee for review to determine the most cost effective and environmentally sound alternative to address the area's drinking water needs.[82]

Couple Says Home Became Unlivable

In June 2010, at a board meeting of the public service district, Paul Strohl introduced EWG researchers to Dennis and Tammy Hagy of Sandyville, W. Va., both in their early 50s, who said that the area near Route 33 East is not the only part of Jackson County impacted by drilling and fracturing.

The Hagys, who once lived in nearby Romance, said drilling and fracturing ruined their water and left their home, set on 80 wooded acres, unlivable. In this case, too, previously drilled wells nearby may have played a role.

Records from the West Virginia Department of Environmental Protection show that between Nov. 15, 2007 and June 11, 2008, Equitable Production Co. of Charleston, W. Va., drilled three horizontal wells in a Devonian shale formation about 1,000 feet north of the Hagys' home and water well. At least part of the formation is in the Marcellus Shale, which holds one of the nation's largest natural gas deposits. Equitable drilled through several layers of sandstone, salt sand, limestone and shale to depths between 3,410 and 4,712 feet. Then, inside each well, the company steered the drill bit to bore horizontally another 3,000 to 4,000 feet before hydraulically fracturing the wells.[83]

Equitable fractured the first well in the Lower Huron Formation seven times on Feb. 19, 2008 at a depth of 3,410 feet, using a total of 7,388 gallons of water, 7.1 million cubic feet of nitrogen and 7,152 gallons of acid at a maximum pressure of 5,692 pounds per square inch.[84] Equitable fractured the well in the Marcellus Shale six times on Feb. 22, 2008 at a depth of 4,712 feet, using a total of 6,817 gallons of water, 4.8 million cubic feet of nitrogen and 6,018 gallons of acid at a maximum pressure of 5,798 pounds per square inch.[85] Equitable fractured a third well three times on Feb. 23, 2008 at a depth of 4,153 feet, using a total of 974 gallons of water, 1.4 million cubic feet of nitrogen and 2,030 gallons of acid at a maximum pressure of 5,498 pounds per square inch.[86] There is no record that Equitable completed a fourth well that was permitted for the site, but the Hagys say the company began drilling a fourth well and then stopped.[87]

The Hagys said that their water, which had been pristine, started turning brown in July 2008, five months after Equitable fractured its third well. Dennis Hagy said they experienced "weakness, headaches, nausea, eyes burning."

"You'd get in the shower and when you got out, you'd be sick," he said. Tammy Hagy said she developed a rash. She added that she stopped bottling water from their well for her son to take back to his home in Columbus, Ohio.

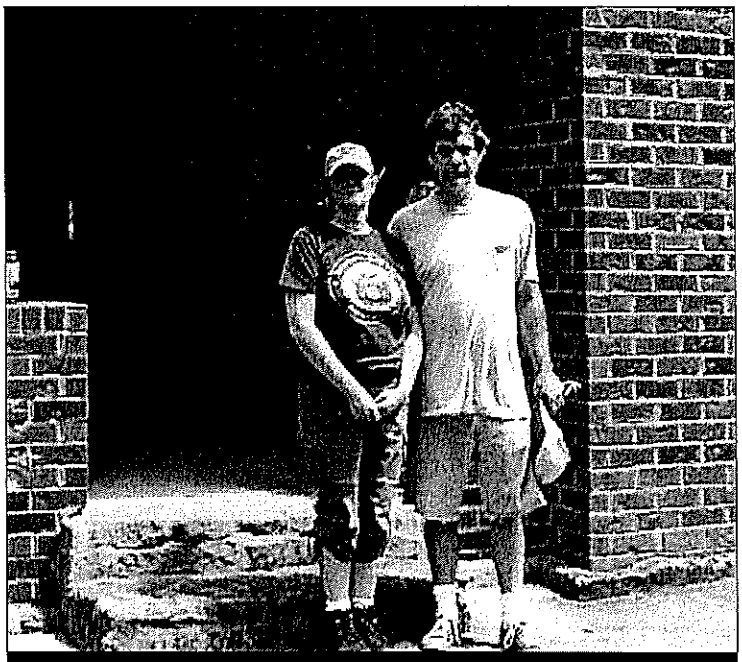
"My son called and said I'm going to have to stop drinking your water because I've got some problems with my throat," she said. The amount of water in the Hagys' wells and springs has declined significantly, they said.[88]

According to a "Complaint Information Form" dated Feb. 12, 2009, on file with the West Virginia Department of Environmental Protection's Office of Oil and Gas, Dennis Hagy first complained to the agency about water quality on Nov. 17, 2008, approximately nine months after Equitable fractured its third well. "He and his wife have been sick for over a year with Nausea (sic) and cramping stomach, etc. Silver flakes and black goo in well water," the form said. "DEP/ OOG Inspector Jamie Stevens made inspections on several occasions. No violations were written."[89]

Stevens referred questions to James Martin, the chief of the Office of Oil and Gas. Martin told EWG that he had no more information than what appeared in the state's files.[90]

The state Department of Environmental Protection file included several tests of the Hagys' water on behalf of the department, Equitable Production Co. and Dennis Hagy. The tests were conducted both before and after Equitable drilled. However, none of the tests looked for common drilling-related contaminants benzene, toluene, ethylbenzene and xylene.[91]

According to the West Virginia Code of State Rules, drilling companies must conduct tests of water supplies if they are within 1,000 feet of a natural gas or oil well; the Hagys' water well was just outside this distance, according to the Hagys.[92] The rules require testing only for pH, iron, total dissolved solids, chloride, detergents and "any others (sic) parameters as determined by the operator [drilling company]."[93] Martin said that the state might require additional tests



Dennis and Tammy Hagy in front of their former home.

based on the nature of a particular complaint and, indeed, in October 2010, the state rested the Hagys' water for benzene, toluene, ethylbenzene and xylene (BTEX), among other contaminants. The state detected no BTEX. However, the state conducted the tests more than two years after the Hagys first noticed contamination. The EPA has found that volatile organic compounds such as BTEX can biodegrade over time, so it is possible that the chemicals were once present and biodegraded by the time of the state's test.[94]

The Hagys said that on Nov. 13, 2008, Jeremy White, an Equitable "landman" who negotiates drilling leases with landowners, told them that the company had contaminated their water. The next day, the company brought bottled water to their home, and it later paid for them to stay in a local motel for two months. But when Dennis refused to sign a form releasing Equitable from legal liability and retained an attorney, the Hagys said company officials stopped paying for the motel and denied that Equitable had contaminated their water. In November 2010, in a telephone interview, Kevin West, Equitable's managing director of external affairs, said he would look into the Hagys' case. Three days later, EWG left a voicemail for West, but he has not responded.

Next door to the Hagys, Ben Thornton, 23, said his family's water well also went bad after the drilling and fracturing. "We had some black stuff coming out the well that wasn't there before," he said. "Everybody got sick there for a while" before the family began buying bottled water.

Thornton added that farm animals that had drunk the well water began to die after the drilling. He said he lost 70 chickens, eight or nine goats and 15 rabbits.

"I don't know if it was from the water, but they was doin' fine" before the drilling, he said, adding that he now waters his animals with rainwater collected from the roof of a shed. Thornton said he complained to Equitable, but the company did not offer help. "They ain't never give me nothing," he said.

State records show that existing wells in the area were close enough that they could have acted as conduits for the spread of contaminants from the hydraulic fracturing on the Hagys' land. In 1940, Godfrey L. Cabot, Inc. of Charleston, W.Va. drilled a gas well approximately 2,000 feet northeast of Equitable's wells.[95] The company drilled the well between June 8, 1940 and November 18, 1940 to a depth of 5,256 feet, more than 500 feet deeper than the deepest of the three wells drilled on the Hagys' property, meaning that a horizontal fracture from one or more of Equitable's three new wells could have intersected with the old well. Godfrey L. Cabot "shot" the old well twice on Nov. 19, 1940 – once with 20 quarts of explosive between 5,196 and 5,206 feet deep and

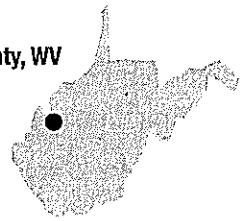
Families Say Drilling, Fracturing Polluted Their Water

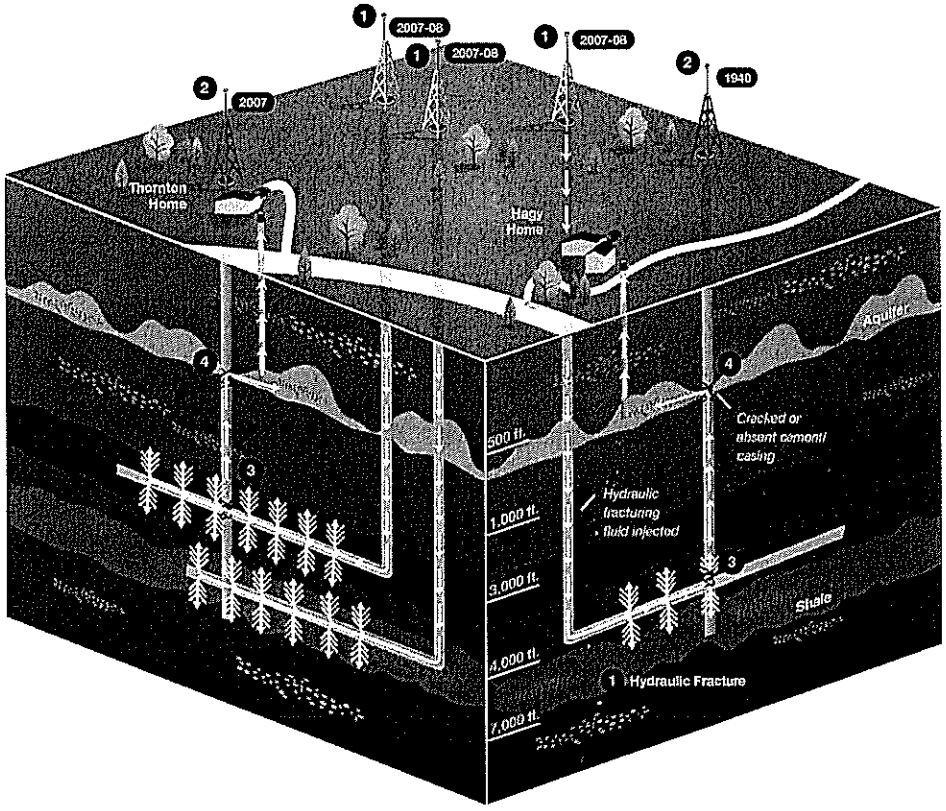
In 2007 and 2008, a Charleston, W.Va.-based natural gas company, Equitable Production Co., drilled and hydraulically fractured three natural gas wells on the property of Dennis and Tammy Hagy in Jackson Co. W.Va. In July, 2008, five months after Equitable fractured its third well, the Hagys say their water started turning brown and they became sick. A neighbor, Ben Thornton, said his family's water also became polluted and that he and his family got sick until they switched to bottled water.

Old Wells
Drilled 1940-2007

New Wells
Drilled 2007-08

Jackson County, WV





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1 Hydraulic Fractures
According to industry studies, hydraulic fractures can extend up to 2,500 feet horizontally within range of two preexisting natural gas wells near the Hagys' and Thortons' homes. Studies found that fractures elsewhere have broken into nearby oil and gas wells and that fracturing fluid has migrated up the old wells to surface.

2 Two Preexisting Wells Nearby
Two natural gas wells, one drilled in 1940, the other in 2007, were located within 2,300 feet of the wells drilled near the Hagys and Thorntons.

3 Fluid Migration
Government studies have found that oil and natural gas waste fluids injected underground can migrate up old oil and natural gas wells.

4 Breakout into Aquifer
These fluids can break into aquifers near the surface if the old wells have deteriorating casings, lack cement plugs or contain cracked cement. This phenomenon is known as "salt water breakout." It is possible that hydraulic fracturing fluids migrated in a similar way into the Hagys' and Thorntons' water wells.

then a second time with 15 quarts of explosive between 5,243 and 5,250 feet deep.

The company sealed the well between Sept. 13, 1948 and Oct. 1, 1948 using several cement plugs. The company removed some of its casing from the well, including almost all of the casing below 2,019 feet, which would have been adjacent to the depths at which Equitable fractured its three nearby wells.[96]

Equitable drilled a well in June and July of 2007 approximately 2,300 feet west from the three wells it later drilled on the Hagys' property.[97] Equitable drilled this preexisting well between June 23 and July 26 to a depth of 5,130 feet, about 400 feet deeper than the deepest of the three wells drilled on the Hagys' property. Equitable fractured the preexisting well three times, once with 900,000 standard cubic feet of nitrogen and 750 gallons of acid at a maximum pressure of 3,135 psi, a second time with 900,000 standard cubic feet of nitrogen and 600 gallons of acid at a maximum pressure of 2,155 psi, and a third time with 247,226 standard cubic feet of nitrogen and 350 gallons of acid with a maximum pressure of 2,145 psi. There is no plugging data for the well in the public record; the state lists it as active.[98]

The Hagys said nearly 70 people in their community have signed a petition to the Southern Jackson County Public Service District requesting public water by an extension of public water lines. At least some of their neighbors signed because they believe natural gas drilling had polluted their water, they added. As of February 2010, the estimated project cost was $1.7 million, according to the Southern Jackson County Public Service District, though there is no guarantee that this project will be funded.[99]

In October 2010, the Hagys filed suit against four drilling companies, including Equitable, in Jackson County Circuit Court seeking damages for impacts to their property and health. In December 2010, the case was moved to U.S. District Court for the Southern District of West Virginia, where it is now pending before Chief Judge Joseph R. Goodwin.[100]

Summary and Recommendations:

Contrary to industry's insistence that hydraulic fracturing is safe for underground water supplies, EWG's investigation established that hydraulic fracturing poses significant risks to the drinking water sources on which more than 100 million Americans depend. The EPA's 1987 report, combined with industry and government papers showing that fractures can spread unpredictably and can intersect with adjacent wells, strongly indicate that hydraulic fracturing puts these water supplies in danger. Fracturing involves the use of toxic chemicals and is designed to open underground passages for natural gas and oil, which often come to the surface with naturally occur-

ring toxics such as benzene. The prevalence of abandoned wells that could serve as conduits for contamination, current allegations of fracturing contamination, a lack of rigorous water testing and the industry's secretive practices all intensify the concern. Local, state and federal governments should take the following steps to protect water supplies and human health, recognizing that hydraulic fracturing is only one part of the drilling process and that other components of drilling carry their own risks:

1. Implement a moratorium on hydraulic fracturing near drinking water supplies until rigorous scientific investigation establishes the risks of fracking. Before fracturing is allowed near water supplies, citizens and policymakers must know the risks so that they can make informed decisions about when and how it should be permitted. Industry and government studies show that fractures can spread up to 2,500 feet underground and that hydraulic fracturing can open natural fractures, suggesting that the moratorium should apply to a considerable margin around water sources.
2. Repeal the exemption for hydraulic fracturing under the Safe Drinking Water Act. The act is specifically designed to protect underground drinking water from the spread of contaminants through underground injections. It already covers tens of thousands of disposal wells into which the drilling industry injects wastes, including fracturing fluid. The law should apply to hydraulic fracturing, too.
3. Require pre-drilling surveys to identify and remediate old abandoned and deteriorating wells and conduct seismic testing to locate and avoid natural fractures.
   Mandate testing of water supplies within 2,500 feet of drilling operations:
   a. before drilling begins
   b. after drilling and before fracturing, to determine if the drilling process itself has an effect on water supplies, and
   c. after fracturing, to determine if fracturing is having an effect on drinking water supplies.
   Labs should conduct tests for benzene, toluene, ethylbenzene, xylene and other likely contaminants from natural gas and oil operations. Tests should use standard test methods and should be designed to determine whether chemicals exceed established safe levels.
4. Require companies to publicly disclose the contents of their fracturing fluids so that the public can know whether the fluids are safe and researchers can know

what chemicals to test for. Disclosure should occur before and after fracturing and should be accessible to the public, including mailing notices to nearby residents and identifying each chemical by its unique Chemical Abstracts Service (CAS) registry number. CAS numbers would allow scientists, regulators and citizens to know precisely what substances are being used and would facilitate accurate testing of potentially contaminated water sources such as wells and springs.

5. Require all drilling companies to use non-toxic tracers in their fracturing fluid and require testing of nearby water supplies for these tracers after fracturing. The presence or absence of the tracers months or years later would enable scientists to link contamination to fracturing — or determine that there is no link.

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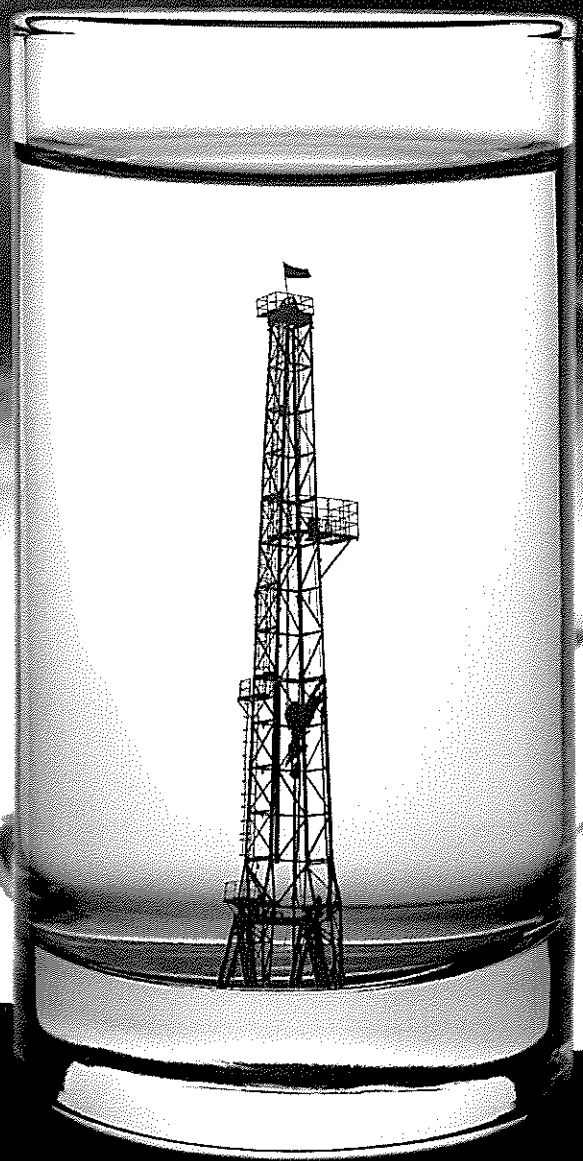
The Case for a Ban on Gas Fracking



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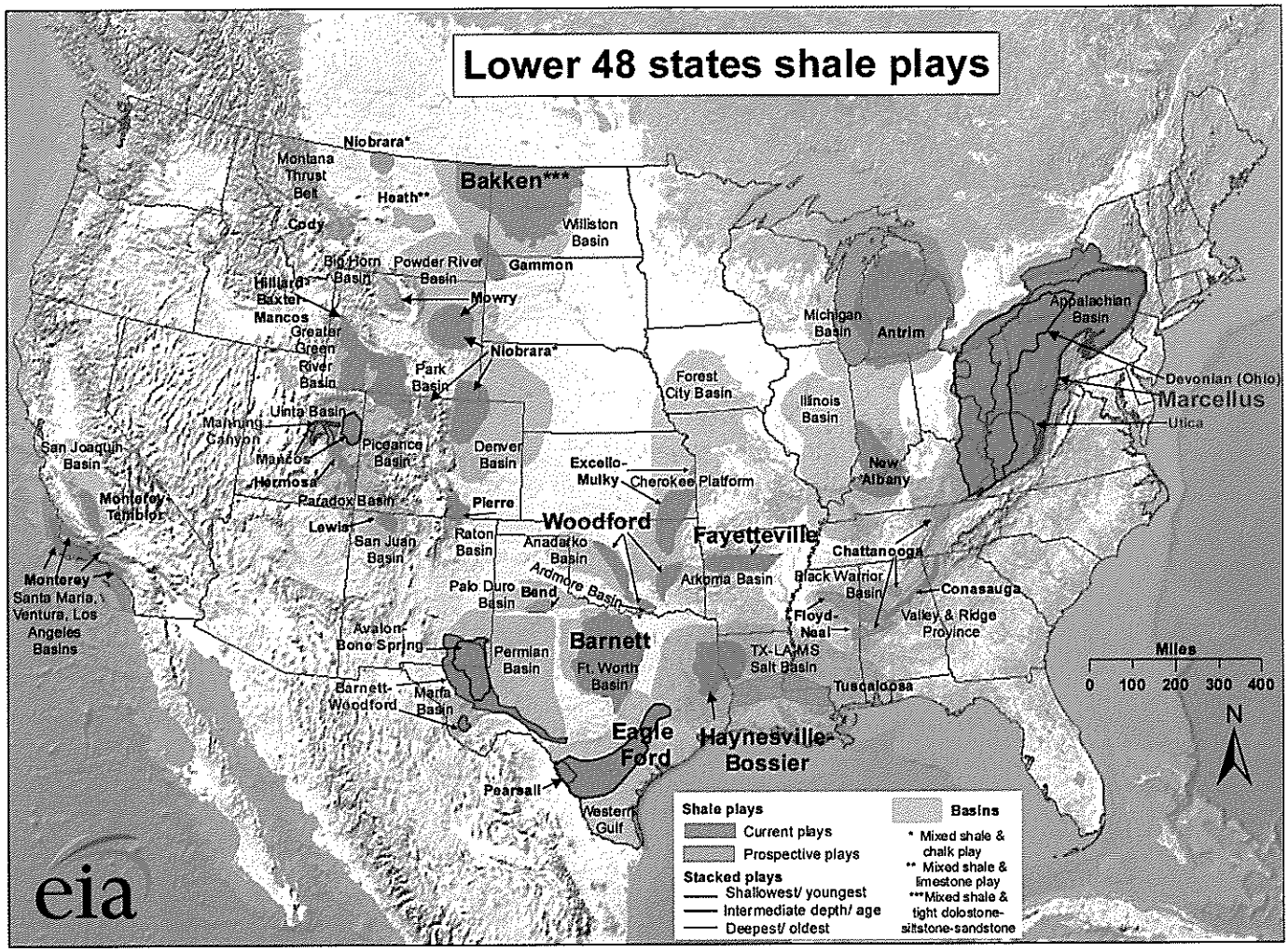

Source: Energy Information Administration, based on data from various published studies. Updated: May 9, 2011

About Food & Water Watch

Food & Water Watch works to ensure the food, water and fish we consume is safe, accessible and sustainable. So we can all enjoy and trust in what we eat and drink, we help people take charge of where their food comes from, keep clean, affordable, public tap water flowing freely to our homes, protect the environmental quality of oceans, force government to do its job protecting citizens, and educate about the importance of keeping shared resources under public control.

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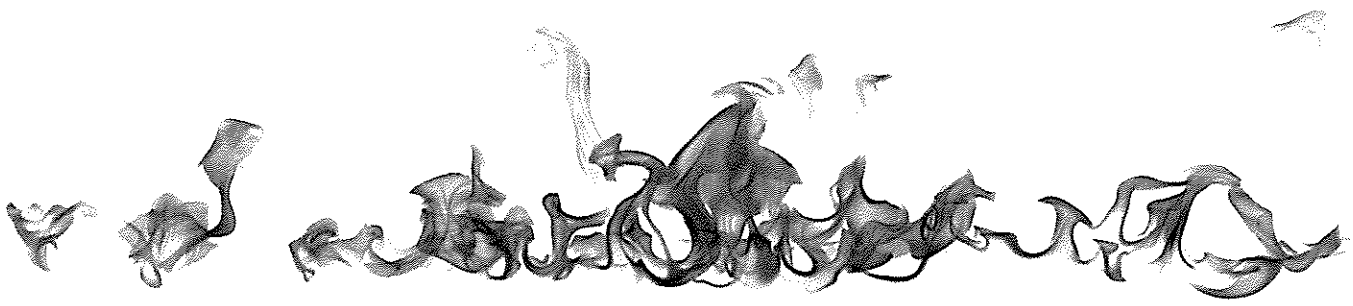
The Case for a Ban on Gas Fracking



Executive Summary

Over the past decade, there has been a rush for new natural gas across America using a controversial — and often polluting — drilling method. Hydraulic fracturing, known as fracking, injects a mixture of water, sand and chemicals under high pressure into dense rock formations — shale, tight sandstone or coal beds — to crack the rock and release natural gas. Fracking has been around for decades, but the techniques, technologies and chemicals used to reach new, remote gas reserves are more intensive and riskier than conventional gas drilling.

The rapid expansion of this new form of fracking has brought rampant environmental and economic problems to rural communities. Tens of billions of gallons of water are used for fracking each year, and that amount would only grow if proposed drilling moves forward. Accidents and leaks have polluted rivers, streams and drinking water supplies. Regions peppered with drilling rigs have high levels of smog as well as other airborne pollutants, including potential carcinogens. Rural communities face an onslaught of heavy truck traffic — often laden with dangerous chemicals used in drilling — and declining property values. The "bridge fuel" of fracking could well be a bridge to nowhere.

Over the past 18 months, at least 10 studies by scientists, Congress, investigative journalists and public interest groups have documented environmental problems with fracking. Findings include:

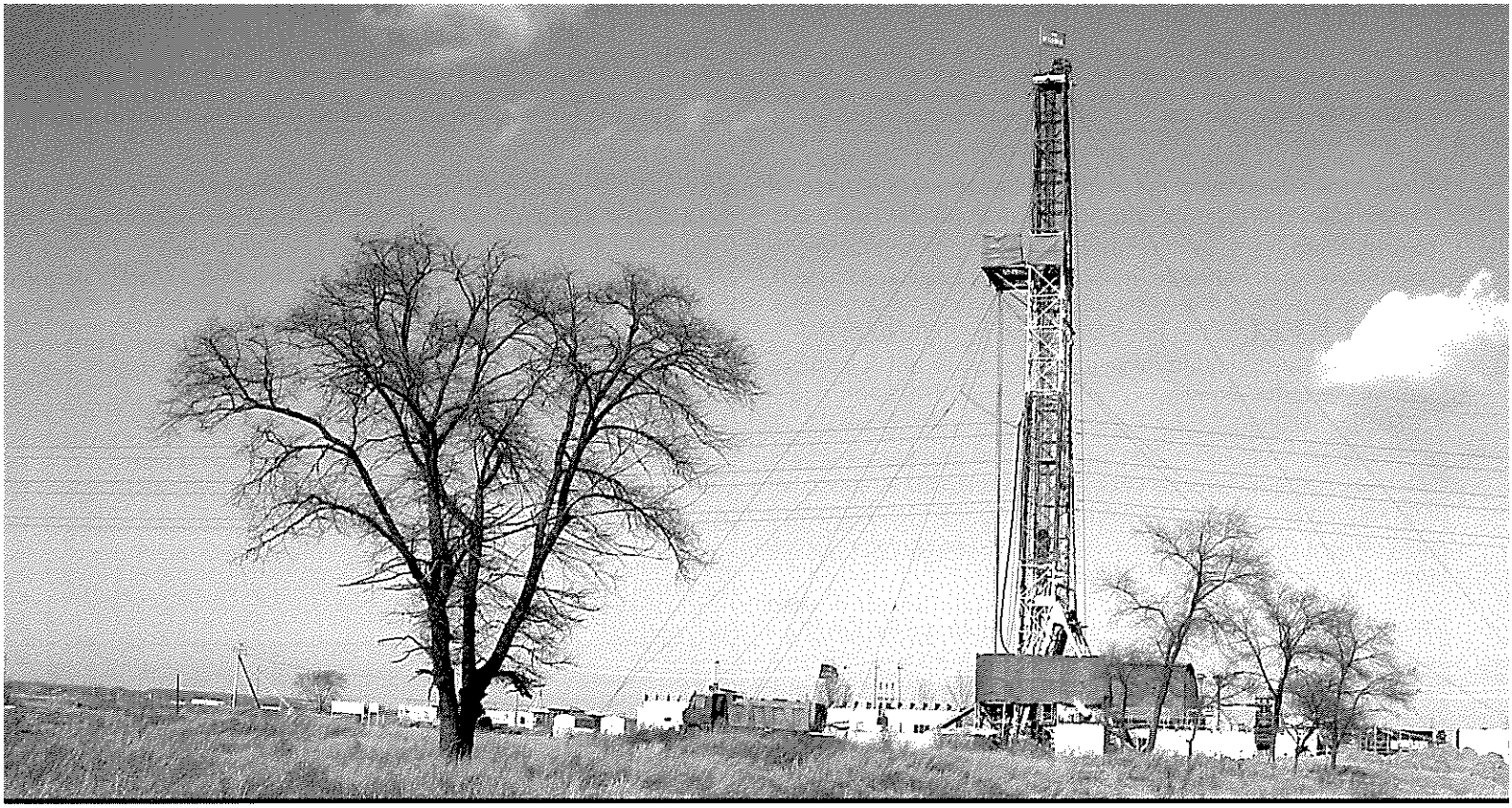
- Toxic chemicals present in fracking fluid could cause cancer and other health problems.[1]
- Fracking wastewater contains high levels of radioactivity and other contaminants that wastewater treatment plants have had difficulty removing; this potentially contaminated wastewater can then be discharged into local rivers.[2]
- In Pennsylvania, more than 3,000 gas fracking wells and permitted well sites are located within two miles of 320 day care centers, 67 schools and nine hospitals.[3]

Fracking is exempt from key federal water protections, and federal and state regulators have allowed unchecked expansion of fracking, creating widespread environmental degradation. Overwhelmed state regulators largely oversee the practice. Even if the laws on the books were strengthened, fracking poses too severe a risk to public health and the environment to entrust effective and rigorous regulatory oversight to these officials. Both state and federal regulators have a poor track record of protecting the public from the impacts of fracking. Congress, state legislators and local governmental bodies need to ban shale gas fracking.

The lax regulation and technological advances spurred a fracking gas rush across America that some industry insiders called a "natural gas revolution" and a "game changer."[4] Energy analysts and oil tycoon T. Boone Pickens bolstered this rush by promoting natural gas as a promising "bridge fuel" for the United States to transition from dirty fossil fuels to clean, renewable sources of energy. However, fracking itself may release enough of the greenhouse gas methane to counterbalance the lower carbon dioxide emissions from burning the natural gas.[5] To safeguard public health and the environment, the federal government should ban shale gas fracking.

Recommendations

- Ban shale gas fracking in the United States.
- Close loopholes that exempt fracking from key federal air and water environmental regulations.
- Aggressively invest in energy efficiency and renewable energy sources that would result in a sustainable energy future for the country.



Introduction

Billionaire oil tycoon T. Boone Pickens is a major natural gas proponent.[6] Pickens has invested millions of dollars promoting natural gas and has a 45 percent stake in a natural gas filling station company.[7] He is pushing for federal subsidies for vehicles that use natural gas — including ones that would fill up at filling stations built by the company he partially owns.[8] He promotes natural gas as a promising "bridge fuel" for the United States to transition from dirty fossil fuels to clean, renewable sources of energy.[9]

Some energy analysts, including the MIT Energy Initiative and the Center for American Progress, believe that natural gas is a better fossil fuel alternative than coal or oil, especially if the gas is domestically produced.[10] While Pickens' energy policy proposal, known as the Pickens Plan, originally called for large wind energy investments to supplant natural gas power plants, his current plan focuses primarily on natural gas, and he has cancelled the bulk of a $1.5 billion wind turbine order.[11]

Natural gas seems like it could solve many of America's energy problems. Natural gas combustion is less polluting than coal for electricity or oil for vehicle fuel.[12] Moreover, if enough natural gas could be found in America, it could reduce dependence on imported oil.[13] But the promise of this bridge relies on freeing natural gas locked deep inside rock formations using a controversial and environmentally risky drilling technology called hydraulic fracturing, or "fracking."

U.S. conventional gas fields — including large pockets of natural gas and porous rock fields that do not require aggressive fracking to release the gas — are insufficient to meet the added demand for a bridge fuel. For example, the Center for American Progress estimated that powering 3.5 million additional trucks and buses with natural gas would require an additional 2.7 trillion cubic feet of natural gas.[14] Conventional gas reserves have been stagnant and are projected to decline.[15]

But over the past decade, oil and gas companies have expanded U.S. gas reserves by using improved fracking methods to extract gas from rock sources that were previously uneconomical to access — especially shale.[16] The Potential Gas Committee reported that the potential shale gas reserves tripled in just five years, from about 200 trillion cubic feet in 2006 to nearly 700 trillion cubic feet in 2010.[17] The biggest energy companies shifted their exploration and investments to capture these new gas reserves. In June 2010, an article in *The Wall Street Journal* called shale gas "one of the hottest investments in the energy sector."[18] Even companies from China and India have begun investing in U.S. shale gas.

China's state-owned energy company has a one-third stake in Chesapeake Energy, including a piece of the Eagle Ford shale play in South Texas, and India's largest company, Reliance, bought a 45 percent stake in another firm's Eagle Ford field.[19]

This rush to fracking has been facilitated by millions of dollars in advertising and in lobbying Congress to sell "clean" natural gas to the American public. Between 2005 and 2010, the 10 largest natural gas producers and two trade associations spent more than $370 million lobbying for their interests.[20] Meanwhile, Pickens alone committed to spend $82 million to promote his natural gas plan, which includes government subsidies to help shift most commercial vehicles from gasoline and diesel to natural gas.[21]

The promise of natural gas has been a nightmare for the neighbors of fracking gas wells. Hydraulic fracturing injects a mixture of water, sand and chemicals underground under high pressure to crack dense rock formations — shale, tight sandstone or coal beds — and release natural gas. Fracking has been around for decades, but the techniques, technologies and chemicals used to reach these new, remote gas reserves are more intensive and riskier than those used on conventional gas wells.

Drilling accidents can and do occur, spilling the often-dangerous chemical slurry into waterways. The natural gas and chemicals can migrate from wells into aquifers and pollute the water table. Fracking may also release enough of the greenhouse gas methane during extraction to counterbalance the lower carbon dioxide emissions from burning the natural gas.[22]

Over the past 18 months, at least 10 studies by scientists, Congress, investigative journalists and public interest groups have documented environmental problems with fracking. *The New York Times* reported high levels of radioactivity and toxics in wastewater from fracking and the inability of most wastewater treatment plants to address these contaminants.[23] The *Associated Press* found that Pennsylvania had failed to account for one-fifth of its fracking wastewater and that treatment plants struggled to remove contaminants that can pose cancer risks with long-term exposure.[24] The U.S. House Energy and Commerce Committee, the Environmental Working Group and the Endocrine Disruption Exchange found toxins in fracking fluids.[25] A Duke university study published by the National Academy of Sciences demonstrated that methane levels in shallow drinking water wells were 17 times higher near active gas drilling areas than inactive areas.[26] Other reports demonstrated the potentially high levels of greenhouse gas emissions from fracked gas wells; the large number of day care, school and hospitals near gas wells in Pennsylvania; the lobbying efforts by the oil and gas industry to prevent stronger federal regulatory oversight of fracking; and an extensive case-study review of the environmental impacts of fracking. (See box on page 3.)

Top 10 Natural Gas Producers, 2010

Company	Millions of Cubic Feet/Day
ExxonMobil*	2,596
Chesapeake Energy	2,534
Anadarko	2,272
BP	2,184
Devon Energy	1,960
Encana	1,861
ConocoPhillips	1,777
Chevron	1,314
Royal Dutch Shell plc	1,153
EOG Resources	1,133

Source: National Gas Supply Association, Top 40 Producers. March 23, 2011. *Does not include Exxon's 2010 acquisition of XTO Energy.

The neighbors of fracking have experienced these significant risks firsthand. In 2009, fracking fluids had so polluted wells in Dimock, Pennsylvania, that some families could no longer drink from their taps.[27] An Ohio house exploded after a fracked gas well leaked large volumes of methane into the home's water supply.[28] Texas neighborhoods near fracked gas wells have high reported levels of airborne neurotoxins and the carcinogen benzene.[29]

Millions of Americans all across the country face these environmental calamities. Natural gas companies could employ fracking in any of the shale, tight sand or coalbed rock formations that lie under the majority of states. Federal and state regulators have allowed unchecked expansion of fracking, causing widespread environmental degradation. Fracking is exempt from key federal water protections and is largely overseen by overwhelmed state regulators.

Citizens, scientists, local businesses, healthcare professionals, government officials and ex-industry executives are standing up to stop fracking. In April 2011, a record 30,000 public comments were submitted to the Delaware River Basin Commission opposing fracking in the river basin.[30] In spring 2011, thousands of people rallied against fracking.[31] By June 2011, at least 58 municipalities had passed resolutions or ordinances against fracking.[32] Even Secretary of Interior Ken Salazar noted at a 2011 hearing that the problems with fracking were "the Achilles' heel that could essentially kill natural gas."[33]

This type of drilling poses unacceptable risks to the American public and it is ultimately a misguided energy policy direction for the United States. Fracking has the greatest impact on communities near the gas head and downstream from the wells, where residents face the largest threat of air and water

pollution, but concerns over widespread fracking extend beyond individuals' backyards. The bridge fuel of fracking could well be a bridge to nowhere, relying on polluting and risky fossil fuel extraction and sidestepping more promising and genuinely renewable alternative energy solutions.

To safeguard public health and the environment, the federal government should ban shale gas fracking and invest in a sustainable energy future for the country.

Ten Studies and Investigations, January 2010 to May 2011

New York Times (February 2011):[34] The investigative report highlighted fracking's severe environmental risks, including the radioactivity in drilling wastewater that is sometimes hundreds to thousands of times the U.S. Environmental Protection Agency (EPA)'s drinking water standard. Three-quarters of the gas wells reviewed in Pennsylvania and West Virginia produced wastewater with high levels of radiation.[35] Pennsylvania wells produced more than 1.3 billion gallons of wastewater over the past three years and most of it was sent to treatment plants that were unequipped to remove many of its toxic materials — at least 12 plants in three states discharged this partly treated waste into rivers, lakes and streams.[36]

House Energy and Commerce Committee (January 2011, April 2011):[37] The congressional investigations found that fracking fluids contained 750 chemicals, some of which were very hazardous to human health, including benzene and lead. Fracking fluids even included diesel fuel, which contains carcinogens such as benzene and toluene and is the only fracking chemical that requires a permit to inject into wells under Safe Water Drinking Act.

Riverkeeper (September 2010):[38] The report presents hundreds of environmental fracking case studies from Pennsylvania, Ohio, West Virginia, Texas, Arkansas, Colorado and Wyoming. It documents well blowouts, surface water spills, groundwater contamination, air pollution, permit violations and improper waste management.

Cornell University (March 2011): The published study found that shale fracking could have a greater effect on climate change than coal and oil over the life cycle of its production.[39] While natural gas combustion releases less carbon dioxide, drilling in shale and tight sand formations releases considerable volumes of the greenhouse gas methane. The EPA estimates that methane traps 21 times more heat by weight than carbon dioxide, the most prevalent and well-known greenhouse gas.[40]

Environmental Working Group (January 2010):[41] An investigation of the chemical disclosure records of drilling corporations found that some fracking fluids contained up to 93 times more benzene than diesel. The amount of benzene from a single fracked well could contaminate more than 100 billion gallons of drinking water.

PennEnvironment Research and Policy Center (May 2011):[42] The study examined Pennsylvania's more than 3,000 gas fracking wells and found permitted well sites within two miles of 320 day care centers, 67 schools and nine hospitals.

Duke University (April 2011):[43] The study, published by the National Academy of Sciences, found that average methane concentrations in shallow drinking water in active gas drilling areas were 17 times higher than those in non-active areas. The methane concentrations of drinking water closest to active gas wells were considered potential explosion hazards.

Endocrine Disruption Exchange (September 2010):[44] Scientists conducted a study accepted for publication in the *International Journal of Human and Ecological Risk Assessment* that found that 25 percent of fracking chemicals could cause cancer; 37 percent could disrupt the endocrine system; 40 to 50 percent could affect the nervous, immune and cardiovascular system; and more than 75 percent could affect the skin, eyes and respiratory system, resulting in problems like skin and eye irritation or flu-like symptoms.

Associated Press (January 2011):[45] The review of Pennsylvania's fracking water treatment revealed the state could not account for the disposal method of 1.28 million barrels of wastewater (one-fifth of the annual total) due to faulty reporting. Some drinking water utilities downstream from fracking wastewater facilities have struggled to sufficiently treat or remove trihalomethanes, which can cause cancer with chronic exposure. A lack of adequate oversight has allowed wastewater from fracking to contaminate the Delaware River Basin, which supplies drinking water for 15 million people in four states.

ProPublica (2011):[46] An ongoing investigation into fracking since 2008 found court and government documentation of more than 1,000 cases of water contamination in Colorado, New Mexico, Alabama, Ohio and Pennsylvania.[47] Reporters have unearthed gas and oil company campaign donations to members of Congress opposed to fracking disclosure requirements and catalogued individual and community case studies on the dangers of fracking, including environmental violations and contamination.[48]

The History and Next Wave of Fracking

Hydraulic fracturing is not a new technique, but its recent application to hard rock formations and the tremendous scale of the current rush for more gas is a radical departure from the conventional wells of the past. Hydraulic fracturing injects hydraulic fluids — a mixture of water, chemicals and sand — into wells to create pressure that cracks the rocks, allowing the gas to escape and flow out of the wells.[49] Drilling companies have used fracking in limited applications since the 1860s for oil and water well production,[50] but Halliburton is credited with the first commercial application to produce natural gas in 1949.[51] By the 21st century, hydraulic fracturing was used in 90 to 95 percent of all oil and gas wells.[52]

The gas industry insists that hydraulic fracturing has been safely used in thousands of wells for decades. The vice chairman of the Oklahoma Corporations Commission, which regulates gas and oil wells, testified before the Senate in 2011 that the state's 100,000 fracked wells have operated for more than 60 years without contaminating groundwater.[53] The president of the U.S. Energy Development Corporation, a company that operates more than 500 gas wells in New York, nearly all of which were fracked, told the *Buffalo News*, "It is completely safe — it's been proven to be completely safe."[54] But this next generation of horizontal fracking into hard rock is significantly different from traditional vertical well fracking. It is far more powerful — and more dangerous — than drilling methods used in the past.

Up until just the past decade, most on-shore natural gas production came from porous "conventional" rocks such as limestone and sandstone,[55] where loosely held gas flows into vertical wells drilled straight into the ground.[56] Fracking was used to stimulate the soft rock around the vertical shaft to release the gas. Other rocks such as shales, tight sands and coal beds contained gas, but it was locked tightly in the rock formations, making it uneconomical to extract.[57] According to a paper by ALL Consulting, many early shale wells "were never able to produce a marketable quantity of natural gas."[58]

Economically releasing gas from these tighter hard rock deposits requires more force, new techniques and a potentially toxic brew of chemicals to access the gas. This new generation of fracking involves curving "horizontal" wells into the rock formation to increase the extraction of gas from each well.[59] Then, the drillers inject a mixture of water, sand and chemicals (often toxic ones) known as "slickwater" fracking fluid to suspend the sand and prop open the fractures, as well as lubricants to speed the fluid into the well.[60] In 2011, the EPA estimated that 70 to 140 billion gallons of water are pumped into 35,000 fracking wells annually.[61] Fracking fluid is injected into the wells in stages that apply high pressure to crack the length of the horizontal well.[62] The pressure created by these techniques has been compared to exploding a massive pipe bomb underground.[63]

Some of the fracking fluid remains in the well, but some of it is discharged back up the well (creating what the industry calls "produced water"), a waste product that may include toxic chemicals and pollutants leached from the rock.[64] Much of this liquid may be made up of fracking fluids, although part of it is water from the rock formation,[65] which can be saltier than seawater.[66] The Groundwater Protection Council estimates that anywhere from around 30 percent to more than 70 percent of the injected fluids are discharged from the well; other estimates run as high as 100 percent of the fracking fluids.[67] Unconventional gas wells need to be re-fracked with additional high-pressure chemical-water injections to maintain their productivity, meaning the risk of contamination or accidents is long-term; for some shale gas wells, this must happen about every five years for decades.[68]

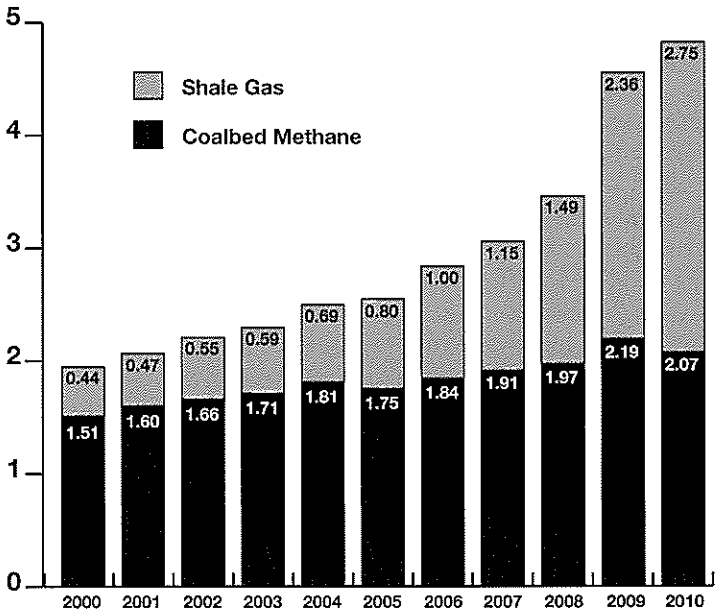
Fracking America: Coming to a Rock Formation Near You

These technological advances spurred a fracking gas rush across America that some energy analysts and industry insiders have called a "natural gas revolution" and a "game changer."[69] Gas companies first developed the Barnett shale reserves in Texas and gas production there skyrocketed more than 3,000 percent between 1998 and 2007.[70]

Drillers then targeted other shales as well — the Fayetteville Shale in Arkansas, the Woodford Shale in Oklahoma, the Haynesville Shale in Louisiana and the Marcellus Shale, which underlies parts of Pennsylvania, New York, Ohio, West Virginia, Virginia, Maryland and Kentucky.[71] A professor of geosciences at Penn State said that the Marcellus has the potential to be a "Super Giant gas field."[72] In Pennsylvania, the number of Marcellus gas wells jumped nearly six-fold from about 280 in 2008 to 1,600 in 2010.[73] Nationally, the number of fracking wells increased 41 percent from 37,239 in 2004 to 52,616 in 2008, according to data compiled by ProPublica.[74]

The fracking rush spurred U.S. production of natural gas, which had been stagnant since the 1990s.[75] Unconventional production, from coalbed methane and shale gas fields, increased nearly 150 percent from 1.95 trillion cubic feet in 2000 to 4.82 trillion cubic feet in 2010.[76] Shale gas alone increased from 1 percent to 20 percent of the U.S. supply between 2000 and 2010, according to the energy consulting group IHS CERA.[77] Between 2006 and 2010, shale gas production rose an average of 48 percent annually.[78] But the rapid escalation of production with little federal or state oversight has exposed neighboring residents and the environment to unacceptable risks.

Fracked Natural Gas Production Surges, in Trillions of Cubic Feet



Source: U.S. Energy Information Administration.

The pressure created by fracking techniques has been compared to exploding a massive pipe bomb underground.

Asleep at the Switch, Cops off the Beat

Federal and state regulators have largely turned a blind eye to the environmental degradation caused by next-generation fracking and the rapid rise of drilling in new areas. The EPA under the George W. Bush administration declared fracking safe, and Congress exempted it from clean water laws. Regulators that monitor fracking are underfunded and understaffed.[79] The oil and gas industry have stepped into this regulatory vacuum to prevent any sensible environmental oversight. The vice president of public and government affairs for the ExxonMobil Corporation warned, "Government policies did not cause the shale gas revolution in this country — but they could stop it in their tracks."[80]

In 2004, the Bush administration EPA released a study focused on coalbed methane reservoirs that concluded fracking posed "little or no threat" to underground drinking water sources.[81] It has been widely discredited for ignoring case studies of fracking contamination.[82] An EPA environmental engineer, Weston Wilson, catalogued the study's scientific shortcomings: It failed to independently collect data and demand industry disclosures, it did not know the contents of fracking fluids, and the EPA terminated the investigation after finding evidence that toxic and carcinogenic substances were being injected into underground drinking water sources, among other findings.[83] Ben Grumbles, who was EPA's assistant administrator for water at the time the report was released, later claimed, "EPA, however, never intended for the report to be interpreted as a perpetual clean bill of health for fracking or to justify a broad statutory exemption from any future regulation under the Safe Drinking Water Act."[84] Yet, that's exactly what happened.

The flaws of the study were effectively enshrined in law when fracking was exempted from provisions of the Safe Drinking Water Act. The Energy Policy Act of 2005 exempted the oil and gas industry from a wide range of federal environmental

and public health regulations.[85] It explicitly excluded hydraulic fracturing from the Safe Drinking Water Act's regulations of underground injection wells.[86] This exemption has been called "the Halliburton loophole" because of the ties between Vice President Dick Cheney and the company credited with the first commercial-scale application of fracking.[87]

This exemption allowed gas companies to inject almost any chemical, including toxics and carcinogens, into fracked wells. Companies do not even disclose what chemicals are in the fluid they inject into wells, claiming they are proprietary trade secrets.[88] One Halliburton executive told the Colorado Oil and Gas Commission that disclosing the chemicals in fracking fluids was "much like asking Coca-Cola to disclose the formula of Coke."[89] In April 2011, a few companies voluntarily disclosed the chemical composition of their fracking fluids in an apparent effort to stave off regulatory oversight.[90]

Oil and gas exploration and production activities are also exempt from Clean Air Act requirements to aggregate emissions from small sources. Fracking companies are subject only to the Clean Air Act rules for individual wells that emit more hazardous air pollutants than the regulatory threshold.[91]

Efforts are underway to close the fracking loopholes. Since new water contamination reports have surfaced, Congress has commissioned a new study by the EPA to reevaluate the impact of fracking on drinking water resources.[92] Industry groups attacked the project as too broad in scope.[93] Congress has also introduced legislation (the Fracturing Responsibility and Awareness of Chemicals Act, known as the FRAC Act) to close the Safe Drinking Water Act loophole and require firms to disclose the contents, but not recipes, of their fracking fluids.[94] Other legislation (the Bringing Reductions to Energy's Airborne Toxic Health Effects Act, or BREATHE Act) would close the energy industry's exemption from the Clean Air Act.[95]

These measures only require the gas exploration industry to comply with the same environmental laws as everyone else. Nonetheless, industry has battled even these limited steps forward. In January 2011, bipartisan congressional members of the Natural Gas Caucus (whose 83 members received a combined $1,742,572 in campaign contributions from the oil and gas industry between 2009 and 2010) opposed proposed U.S. Department of Interior rules to disclose fracking chemicals used on public lands.[96] Industry representatives claim that EPA oversight of fracking under the Safe Drinking Water Act would unleash environmental lawsuits that would force the agency to enact even more stringent regulations.[97] The Independent Petroleum Producers of America attacked the BREATHE Act for imposing a "permitting burden" for reporting well emissions.[98]

The current void in federal regulation has left oversight to the states.[99] The director of state policy at Duke University's

A family in Albany, New York, protests fracking in their community. Photo courtesy of April Hawthorne.

Nicholas Institute for Environmental Policy Solutions noted, "The industry has started drilling in most states, and regulators have struggled to keep up."[100] A *New York Times* investigation demonstrated the inadequacy of current regulatory oversight and the difficulty of understaffed state authorities to effectively monitor the booming fracking industry, finding: "Gas producers report their own spills, write their own spill response plans and lead their own cleanup efforts."[101] Even when violations are reported, Pennsylvania regulators, for example, are twice as likely to issue warnings than to impose fines.[102]

States also are conflicted about coming down hard on fracking pollution — they receive revenues from drilling permits, taxes and royalties. This is especially true during economic downturns. Pennsylvania attributed $1.1 billion in state revenue from 2006 to 2011 to natural gas drilling.[103] Fracking revenue is attractive to a state facing an $866 million budget cut for 2011-2012.[104] This may have contributed to lackluster oversight. For example, in March 2011, the Pennsylvania Department of Environmental Protection issued a memo requiring that political appointees in the state capital preapprove all field enforcement actions against gas drilling operations in the Marcellus Shale.[105] This requirement was removed after loud public outcry.[106]

Some state efforts to curb fracking pollution have been met with stiff lobbying resistance. Gas industry lobbying ramped up significantly once fracking moratorium bills were introduced in New York.[107] In 2010, natural gas and energy companies spent $1,204,567 lobbying against these bills in New York.[108] The current loophole-ridden laws and haphazard enforcement leave communities and the environment vulnerable to fracking pollution.

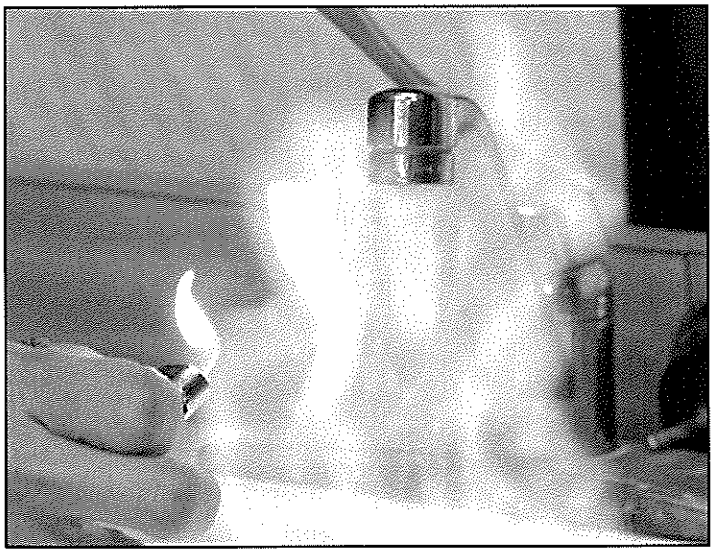
Airborne Pollution

Natural gas fracking extraction emits greenhouse gases, smog-inducing compounds, and potential carcinogens causing dangerous health and environmental effects. A 2011 Cornell University study found that shale gas has a greater greenhouse gas footprint than conventional gas or oil.[109] While natural gas combustion releases less carbon dioxide than oil, gasoline or coal combustion, breaking shale and tight sand formations releases considerable volumes of the greenhouse gas methane, which according to the EPA, is a greenhouse gas that is 21 times more powerful an agent of global warming than carbon dioxide, the most prevalent and well-known greenhouse gas.[110] The EPA uses the estimate provided in the Second Assessment Report by the Intergovernmental Panel on Climate Change from 1996.[111] A more recent study from 2009 suggests that methane has as much as 105 times the global warming potential as carbon dioxide by weight over the first 20 years after its emission and as much as 33 times the global warming potential over 100 years.[112] Using these updated estimates about the warming effect of methane, the Cornell researchers found that shale gas could have a greenhouse gas footprint that is twice that of coal over 20 years and a comparable footprint over a century.[113]

Methane is also highly flammable and a serious safety hazard.[114] Methane is the primary component of natural gas and can leak out of drilling casings into shallow water wells or be present in pipelines used to transport natural gas from the drilling site.[115] When methane saturates drinking water wells, a home's tap water can become explosive. The documentary *Gasland* depicted homeowners setting the water from their kitchen faucets on fire.[116]

A 2011 National Academy of Sciences paper found that methane concentrations in several shallow drinking water wells close to active gas wells exceeded the action level for potential fire hazard recommended by the U.S. Department of Interior.[117] In 2008, an Ohio house exploded after methane infiltrated its water source, largely because of fracking.[118] In 2010, after the EPA instructed Wyoming residents not to drink their water because of contamination from a common fracking fluid, some residents also used fans while bathing to reduce the likelihood of explosions.[119] In 2010, the EPA determined that two homes in Texas were at risk of explosion because of high levels of natural gas found in their water from nearby fracking operations.[120]

A Texas hospital serving six counties near drilling sites reported asthma rates three times higher than the state average; one quarter of young children in the community had asthma.



The film *Gasland* shows homeowners setting contaminated water from their home faucet on fire. Photo copyright Josh Fox/*Gasland*.

Other airborne pollutants from fracking sites threaten the health of people living nearby. Methanol, formaldehyde and carbon disulfide are known hazardous air pollutants found near fracking sites.[121] Residents of Dish, Texas, located near 11 natural gas compression stations became concerned about the odor, noise and health problems they were experiencing, which included headaches and blackouts. They also observed neurological defects and blindness in their horses.[122] Their mayor fruitlessly reported these accounts to Texas regulators and eventually hired a private environmental consultant, who in 2009 found that air samples contained high levels of neurotoxins and carcinogens.[123] The Texas Commission on Environmental Quality (TCEQ) found airborne benzene, which can cause immune disorders and cancer, near Barnett Shale wells at levels of 500 to 1,000 parts per billion — more than five times higher than allowable limits.[124]

Some of the airborne pollutants from fracked gas wells, like volatile organic compounds, can react with sunlight to create smog.[125] Many areas around Texas, for example, have been affected. The natural gas and oil industry in the Barnett Shale area produced more smog-forming emissions during the summer of 2009 than produced by all motor vehicles in the Dallas-Fort Worth metropolitan area, with annual greenhouse gas emissions equivalent to those of two coal-fired power plants.[126] In 2009, Wyoming failed to meet federal air

standards for the first time, partly because 27,000 gas wells, most of which were drilled within the previous five years, were emitting toluene and benzene.[127] Sublette County, a rural Wyoming community with a high concentration of gas wells, has recorded higher ozone levels than those in Houston and Los Angeles.[128] Air pollution is associated with significant adverse health effects. A Texas hospital serving six counties near drilling sites reported asthma rates three times higher than the state average; one quarter of young children in the community had asthma.[129]

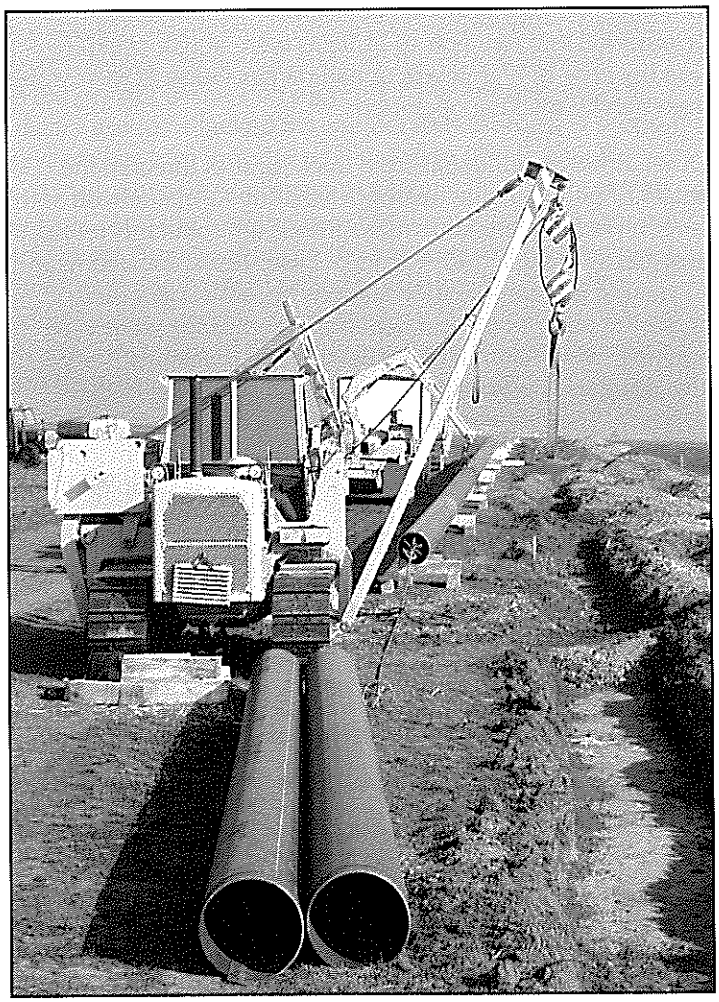
Water Pollution from Fracked Gas Wells

The rapid increase in fracking wells has polluted drinking water supplies and waterways. The wells can experience a rupture or blowback under tremendous pressure, spilling chemical-laden water into surface water or groundwater. Natural gas and chemicals can migrate into aquifers and wells.

Spills, leaks and accidents on the surface can pollute waterways. A gas industry attorney admitted in a *Pittsburgh Post-Gazette* column, "If improperly handled, used fracking fluid can contaminate surface water just like other liquid waste from drilling operations."[130] Chemicals in fracking fluid have contaminated water supplies near gas wells. Livestock have died from drinking water tainted with spilled fracking fluids.[131] West Virginia authorities were investigating whether fracking fluids caused fish kills that left the Dunkard Creek lifeless.[132]

Despite these problems, the industry maintains that fracking is safe, frequently using the discredited 2004 EPA study to bolster this claim.[133] Many proponents suggest the fracking fluid injections occur so far underground that it cannot affect drinking water. In congressional testimony, the executive vice president of Devon Energy Company reiterated that regulators have never found that fracking caused groundwater contamination.[134] He implied that since thousands of feet and many layers of rock separate gas wells from aquifers, and because of the casing and sealing around gas wells, fracking could not pollute drinking water.[135] Some gas energy apologists even deny that fracking fluids themselves are dangerous. One former lobbyist for the Colorado Oil and Gas Association told a *Denver Post* columnist, "There's nothing more dangerous in that fluid than what's in your makeup, honey, or your toothpaste or what you use to clean your hot tub."[136]

Fracking fluids include diesel fuel, which contains the known carcinogen benzene, among other toxic chemicals.



But the chemicals in fracking fluids are far from safe. Three recent studies have documented the human health risks from commonly used chemicals in fracking fluids. In 2011, the U.S. House Energy and Commerce Committee found that between 2005 and 2009, 14 oil and gas companies injected 780 million gallons of fracking chemicals and other substances into wells,[137] including 10.2 million gallons of fluids containing known or suspected carcinogens and 11.7 million gallons containing chemicals regulated under the Safe Drinking Water Act.[138] Fracking fluids even included more than 30 million gallons of diesel fuel, which contains the known carcinogen benzene, among other toxic chemicals, and is the only fracking fluid that requires a permit to inject into wells under Safe Water Drinking Act.[139]

A 2010 Environmental Working Group investigation into the chemical disclosure records of drilling corporations found that some fracking fluids contained other petroleum products with as much as 93 times more benzene than is in diesel.[140] The amount of benzene from a single fracked well could

contaminate more than 100 billion gallons of drinking water.[141] Scientists at the Endocrine Disruption Exchange found that 25 percent of fracking chemicals could cause cancer; 37 percent could disrupt the endocrine system; 40 to 50 percent could affect the nervous, immune and cardiovascular systems; and more than 75 percent could affect the sensory organs and respiratory system, likely causing problems such as skin and eye irritation and flu-like symptoms.[142]

The dangers are more than just theoretical. These chemicals have contaminated water supplies across the country. ProPublica identified more than 1,000 cases of water contamination near drilling sites documented by courts, states and local governments around the country prior to 2009.[143] Pennsylvania cited 451 Marcellus Shale gas wells for 1,544 violations in 2010 alone.[144] Some notable affected communities include:

- **Pavillion, Wyoming:** In 2010, the EPA released a preliminary study that found possible drinking water contamination near fracking wells and recommended that residents avoid drinking their tap water.[145] The EPA investigated 39 rural water wells and found benzene and methane in wells and groundwater.[146] The wells were also contaminated with the fracking chemical 2-butoexythanol phosphate, which has harmful health effects.[147]

- **Dimock, Pennsylvania:** In 2009, Pennsylvania regulators ordered the Cabot Oil and Gas Corporation to cease all fracking in Susquehanna County after three spills at one well within a week polluted a wetland and caused a fishkill in a local creek.[148] The spills leaked 8,420 gallons of fracking fluid containing a Halliburtan-manufactured lubricant that is a potential carcinogen.[149] Fracking had so polluted water wells that some families could no longer drink from their taps.[150] Pennsylvania fined Cabot $240,000, but it cost more than $10 million to transport safe water to the affected homeowners.[151] In December 2010, Cabot paid $4.1 million to 19 families that contended that Cabot's fracking had contaminated their groundwater with methane.[152]

- **Garfield County, Colorado:** The county's 8,000 natural gas wells have inched closer to residential areas.[153] A hydrological study found that as the number of gas wells in the heavily fracked county increased, methane levels in water wells also rose.[154] State regulators fined EnCana Oil and Gas for faulty well casings that allowed methane to migrate into water supplies through natural faults.[155]

- **Parker County, Texas:** In 2010, the EPA determined that fracked gas wells had contaminated a drinking water aquifer with methane, benzene and other natural gas chemicals that were chemically fingerprinted to the gas well.[156]

Fracking Routes of Water Contamination

Fracking well casings can leak and equipment failures can cause blowouts. Fracking wastewater can spill from storage pits. In 2008, a wastewater pit in Colorado leaked 1.6 million gallons of fluid, which migrated into the Colorado River.[157] When injected into the ground, the fracking fluids can contaminate underground water sources.[158] Groundwater contamination could be permanent because it happens slowly and can easily go undetected; cleanup can be expensive and is sometimes impossible.[159]

Leaks and Blowouts

The high-pressure injection of fracking fluids can cause leaks in well casings and blowouts of well equipment, where the underground pressure overpowers the drilling rig. Leaky well casings at shallow depths can allow fracking fluids to leach into groundwater.[160] A National Academy of Sciences study found that average methane concentrations in shallow drinking water wells in active gas areas were 17 times higher than those in non-active areas, possibly due to leaky gas-well casings.[161]

The massive pressure and multiple fracks used during a gas well's lifetime increases the likelihood that well casings will fail and pollute aquifers.[162] In 2010, a malfunctioning "blowout preventer" at a Pennsylvania gas well failed to prevent a 75-foot tall geyser of gas and drilling fluid that spilled 35,000 gallons on the ground before it was contained.[163] (A faulty blowout preventer also contributed to the BP Gulf oil spill of April 2010.[164]) In January 2011, 21,000 gallons of fracking fluid and flowback water spewed from a Tioga County well when a valve was erroneously left open, releasing hazardous chloride, sodium, barium and strontium, as

well as hydrochloric acid used in the fracking fluid.[165] Two months after a fire in the company's fracking liquid storage tanks injured three people, a Chesapeake Energy well spurted thousands of gallons of fracking fluid in Bradford County due to a cracked well casing.[166] Local families were forced to evacuate their homes.[167] Pennsylvania had cited Chesapeake Energy 284 times for violations and taken 58 enforcement actions since 2008.[168]

Aquifer Migration

Fracking fluids and gases can leak into aquifers through well shafts or rock faults. High-pressure horizontal fracking disturbs natural underground rock formations and can have unintended consequences, even after the drilling is complete. Horizontal wells are more likely than vertical wells to encounter pre-existing cracks in the rock formation where the gas can migrate and enter aquifers.[169] A 2011 Duke University study demonstrated that groundwater near fracking operations has higher methane concentrations.[170] If methane can migrate, it is likely that other chemicals can as well.[171]

Underground gas well leaks can contaminate nearby water sources if the cracks in the shale caused by fracking overlap with natural faults and fractures in the rocks.[172] Through these fracture and fault networks, toxic chemicals from the fracking fluids, the gas itself, or naturally occurring radioactive chemicals and salts can migrate into nearby aquifers that provide drinking water.[173] These natural faults and geological fractures are common in places like New York state.[174] For example, New York City's water supply is drawn from a region with prevalent geologic faults. The city opposed fracking near its pristine watershed, since the impact of fracking on these geological structures has not been studied sufficiently.[175] A New York hydrogeologist observed that the interconnection of natural faults and fractures would make fracking dangerous even if the fluids were not toxic because it could allow underground saline or radioactive fluids to mix with freshwater sources.[176]

Fracking Wastewater Pollutes Waterways

Although some fracking fluid remains in the well, about 30 to 70 percent of the injected fluids are discharged as wastewater.[177] For example, in 2009, Pennsylvania's oil and gas wells produced 9 million gallons of wastewater a day; by 2011, the wells were expected to create 19 million gallons.[178] The waste can be so toxic and concentrated that it is very difficult to dispose of safely. One method to get rid of fracking waste is to inject it in disposal wells in rock formations underground.[179] This method is common for most shale plays except the Marcellus Shale because Appalachian geology is unsuitable for underground injection.[180] Only a few injection wells exist in Pennsylvania.[181] Drillers near population centers can send fracking waste to local wastewater treatment plants, which treat and dilute the wastewater and release it into surface waters.[182]

Standard wastewater treatment cannot handle the chlorides, total dissolved solids, organic chemicals, bromide and fracking fluid chemicals.[183] The water also contains substances, including possibly radioactive elements, picked up during its journey underground.[184] A 2011 *New York Times* investigative report found that nearly three-quarters of the more than 240 Pennsylvania and West Virginia studied gas wells produced wastewater with high levels of radiation, including at least 116 wells with levels that were hundreds of times the EPA's drinking water standard, and at least 15 wells with levels thousands of times the standard.[185] According to ProPublica, no Pennsylvania wastewater treatment plant was expected to be able to remove total dissolved solids from the water until 2013.[186]

In Pennsylvania, at least half of the waste went to public sewage plants between 2008 and 2009.[187] A 2011 *Associated Press* report found that Pennsylvania could not account for the disposal method of 1.28 million barrels of its wastewater (one-fifth of the annual total) due to faulty reporting.[188] In August 2010, despite industry backlash, Pennsylvania strengthened its fracking wastewater regulations, but treatment plants that had already accepted fracking waste were allowed to continue to do so under the same treatment standards.[189] As of April 2011, 15 of those 27 plants were still accepting fracking wastewater.[190] Pennsylvania does not require all sewage plants to test for radioactivity; regulators and industry officials discount the risk of radioactivity in the waste.[191] After the *New York Times* study was released, the EPA urged Pennsylvania to require community water systems near plants that treat Marcellus Shale wastewater to test for radiation and reevaluate discharge permits of wastewater treatment plants that dispose of fracking waste.[192] The Center for Healthy Environments and Communities (CHEC) at the University of Pittsburgh tested the wastewater of a treatment facility in Indiana County, Pennsylvania, and found barium at rates 14 times the EPA drinking water standard, strontium at 746 times the standard, benzene at twice the standard and total dissolved solids at 373 times the standard.[193]

Much of this fracking wastewater ends up in rivers after its incomplete treatment. These discharges have already been a major problem. The Monongahela River in Pennsylvania might be one of the most endangered rivers in the country, partially due to the large portions of pollution from Marcellus Shale fracking waste.[194] Even after 2010 rules reduced fracking pollution, the Pennsylvania Department of Environmental Protection estimated that gas wastewater was causing 5 to 10 percent of the pollution in the river.[195] Pennsylvania's rivers have higher levels of bromides, which react with treatment plant chlorine disinfectants to create potentially cancer-causing chemicals called trihalomethanes.[196] Wastewater facilities have not been able to treat or remove trihalomethanes.[197]

Drillers have tried to mitigate this problem by recycling wastewater. Almost two-thirds (66 percent) of fracking waste was recycled in the six months before March 2011, up from 20 percent the previous year.[198] However, reusing water does not make it go away; it still needs to be disposed of eventually.[199] Some wells sell the waste to nearby communities that use it for dust suppression or road de-icing, where it can run off into surface water.[200]

Economic Costs

The shale gas rush is not just a danger to public health, but also to local economies. While industry promotes job creation and local investment, proponents typically do not account for the long-term economic damage and the significant erosion of communities' quality of life that can outweigh any benefits.[201] Many economic benefits may be a mirage — distant energy companies typically do not buy from local businesses and out-of-town roughnecks fill short-term jobs.

New wells bring fleets of trucks that crowd and damage rural roads and carry potentially hazardous wastewater. Cacophonous drilling rigs operate 24 hours a day, 7 days a week.[202] Scenic vistas are replaced with a landscape of gas wells, which lowers property values and harms tourism and recreation industries like hunting and fishing. In Wise County, Texas, properties with gas wells have lost 75 percent of their value.[203] Natural gas rigs not only devalue the property where they are located, but also the value of neighboring properties.[204]

Every energy boom comes with a bust. Most economic gains are short-lived — employment, construction, housing demand and even royalty payments are large at first, but diminish quickly after the initial investment.[205] Locals do not always fill drilling jobs. In Pennsylvania, 70 percent of drill rig workers are from out of state.[206] In New York state, the top gas-producing counties have lower household incomes and higher levels of poverty than nearby non-gas-producing counties.[207]

During construction and drilling, gas wells significantly increase heavy truck traffic, and locals bear the cost of repairing wear and tear on local roads. Pennsylvania Department of Environmental Protection estimates that building and fracking a well requires 1,000 heavy truck trips.[208] Increased truck traffic damages local infrastructure and can increase the risk of truck accidents on small, rural roads.[209] Fracking also requires pipelines to transport the gas, which can pose safety hazards from explosions.[210] In 2011, a pipeline explosion in Allentown killed five workers; other explosions have occurred in Ohio, Pennsylvania, California, Michigan and Texas, some fatal.[211]

Farmers, whose livelihoods depend on the health of the land, face especially stark choices. Persistently low milk prices have threatened dairy farms in Pennsylvania and New York, and the prospect of gas royalty payments is tempting. Farmers lease their land to gas companies with the promise of minimal impact.[212] However, livestock have died from drinking water tainted with spilled fracking fluids. In 2009, 16 cattle died after apparently drinking fluid that escaped from a Louisiana fracking well.[213] In 2010, Pennsylvania quarantined 28 cows that may have consumed water tainted by a fracking spill that could contaminate their meat.[214] Organic farmers could lose their premium prices if industrial fracking fluid pollutes their crops or livestock.[215] Farm sales could be destroyed if pollution threatens livestock, crops or farmland.

Conclusion and Recommendations: Fracking Is a Step in the Wrong Direction

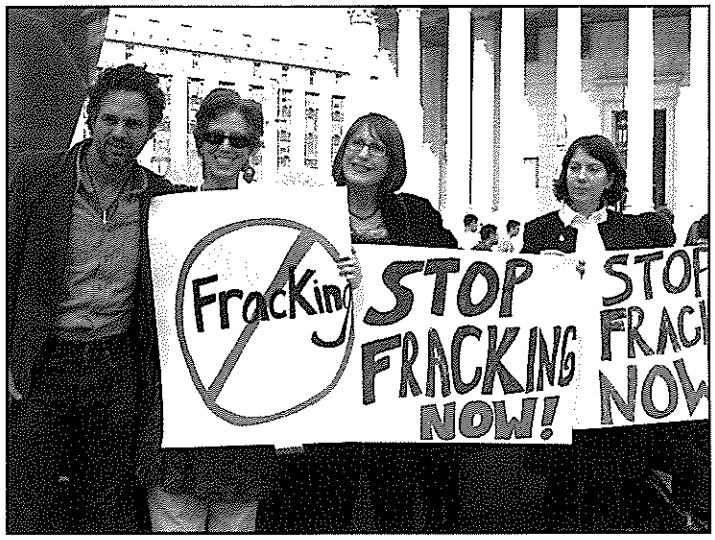
The rapid expansion of horizontal hydraulic fractured drilling for natural gas has been disastrous. Federal and state regulators have been asleep at the switch as gas companies pollute the air and water of communities living in the path of the fracked gas rush. Even if the laws on the books were strengthened, fracking poses too severe a risk to public health and the environment to entrust effective and rigorous regulatory oversight to overwhelmed regulators. Both state and federal regulators have a poor track record of protecting the public from the impacts of fracking. Congress, state legislators and local governmental bodies need to ban shale gas fracking.

Rather than taking a strategic pause in the face of the demonstrable problems with fracking, President Barack Obama's administration is pursuing fracked natural gas full speed ahead.

In an April 2011 speech, President Obama said that "the potential for natural gas is enormous" and promoted proposed legislation to shift from oil to natural gas — the same legislation endorsed by T. Boone Pickens to subsidize natural gas vehicles.[216] The public opposition to fracking prompted the administration to launch a committee to figure out how to make fracking safe.[217] This attempt is misguided — fracking is not safe.

The energy industry is spending more private money to develop controversial sources of fracked gas than the U.S. government and private sector are investing to transition to a clean energy economy.[218]A 2011 Intergovernmental Panel on Climate Change report found that with sufficient development, renewable fuels could deliver almost 80 percent of the world's power needs by 2050.[219] More than a bridge fuel, renewable energy is a bridge with a destination. Nonetheless, London's *Guardian* reports that, "senior executives in the fossil fuel industry have launched an all-out assault on renewable energy, lobbying governments and business groups to reject wind and solar power in favor of gas."[220]

Many municipalities around the country are already banning fracking to protect their citizens from the consequences from this type of drilling, but we need a national ban to protect the entire country.



Activists in New York protest fracking in their state, including (from left to right) actor Mark Ruffalo, Sane Energy Project Co-Founder Denise Katzman, Food & Water Watch Executive Director Wenonah Hauter and Frack Action Executive Director Claire Sandberg. Photo by Food & Water Watch.

America's fracking fad is poised to go global. China fracked its first horizontal shale gas well in April 2011 and some European countries are considering following suit.[221] But South Africa and Quebec, Canada, have imposed fracking moratoriums, and popular opposition in France and the United Kingdom have slowed development.[222]

Shale gas fracking poses unacceptable risks to the American public. Today, many municipalities around the country are banning fracking to protect their citizens from the negative consequences of this type of drilling. These local resolutions are a good idea, but they won't protect the entire country. Shale gas fracking should be banned on the national level. It is time to stop destroying public air and water in the interest of oil and gas company profits, and instead seek energy solutions that will provide a long term, renewable energy future for the United States.

Recommendations

- Ban shale gas fracking in the United States.
- Close loopholes that exempt fracking from key federal air and water environmental regulations.
- Aggressively invest in energy efficiency and renewable energy sources that would result in a sustainable energy future for the country.

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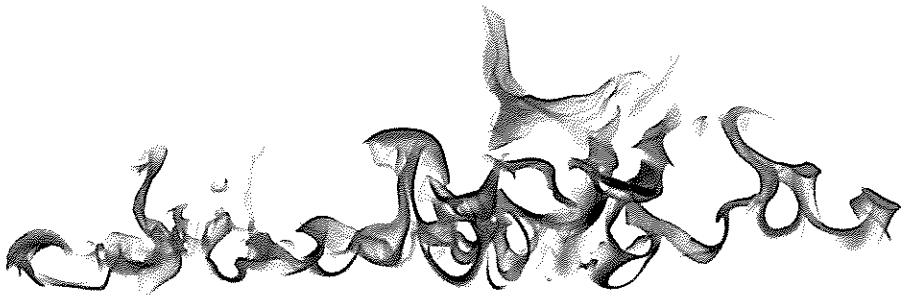

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READ INTO RECORD

SUSAN S. BINGER . 25 EAST 94TH STREET #1 . NEW YORK, NY 10128-1906
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September 22, 2011

To the Environmental Protection Committee Regarding Hydraulic Fracturing :

Protecting the high quality of our drinking water is a major concern for all residents of this city. Of equal concern is the threat to wildlife, domestic animals and agriculture caused by the run-off of contaminated waters by the millions of gallons used to wrest natural gas from the shale deep below the Earth's surface. The toxic products which are added to the water used in fracturing include known carcinogens and other undisclosed ingredients. Furthermore, this industry was specifically exempted from all the federal legislation that is designed to protect the environment: Toxic Waste, Clean Air, Clean Water, etc.

For all these reasons, hydraulic fracturing should be prohibited not only within range of the water shed for the City of New York – one of the few major population centers that does not have to filter its water, but in the entire State of New York until federal law is amended to include this industry in all aspects of environmental legislation.

Our water, agriculture, fish, game. rivers, matchless scenery and the health of the people who live in New York are paramount. Ours is a beautiful and productive state; let's not destroy it.

I recommend viewing the documentary, "Gasland."

Respectfully submitted,

Susan S. Binger

Susan S. Binger

READ INTO RECORD

TESTIMONY BEFORE THE CITY COUNCIL ON SEPTEMBER 22, 2011

Commentary regarding hydrofracking has typically become fraught with hedge words like "risks," "potential dangers," and so on that simply dilutes and diminishes the reality resulting from this most invasive practice. Simply put, there are, well beyond mere "risks," inevitable consequences that will result from hydrofracking:

1. It was reported in the Winter, 2009 edition of the magazine of Trout Unlimited that 3 to 9 million gallons of water *per well* are required to release the gas from the shale. Considering that thousands of wells have been contemplated, even if hydrofracking is prohibited within the NYC Watershed itself, this requirement is bound to decimate water sources well beyond and outside of the NYC Catskill Watershed. Water resources must be recognized as the result of networks of countless springs, aquifers, freshets, streams, brooks and rivulets on that do not observe man-made boundaries of watersheds or even state parks as they converge into larger and more accessible rivers and waterways. THE CATSKILLS' WATER RESOURCES WILL BE DECIMATED.

2. Notwithstanding the most rigorous amount of environmental regulation, the volume of discharge of contaminated water from the fracking process on the scale contemplated cannot effectively be treated or contained—even if such regulations are followed to the letter (which is at least questionable) --and will return to the aquifers and streams from which drinking water had been drawn as poisonous and inflammable liquid, as evidenced in the documentary film ,"Gasland," in which ordinary tap water was easily able to be ignited by a single match held to a homeowner's kitchen faucet. Councilman Jim Gennaro deserves kudos for his part in bringing this film to the attention of the public.

3. With the decimation of the water supply and the inevitable pollution of the water resources will come the degradation of the Catskill Mountains ecosystem, as has happened in Pennsylvania and elsewhere, again as documented in "Gasland." The wells, the detention pits, and the makeshift roadways that will be carved into the landscape to access the wells will be ruinous to an area that has been a historic haven for agriculture, woodlands, flora, fish, and fauna that have been the essence of the Catskill region.

4. The above are the inevitable dire consequences that will result from an effort to extract an enormous amount of an energy resource in what has been a virtual juggernaut of effort in pursuit of great wealth. The problem is that, the juggernaut notwithstanding, the New York Times reported in its June 26, 2011 that some energy company executives themselves, even while touting their bullishness on the riches natural gas exploration and extraction will create, are internally expressing reservations and doubts about the vaunted huge returns fracking will bring as wells expire quicker than anticipated, among other concerns. Who will clean up the mess that energy companies will leave when their return on investment fails to materialize?

The message to the Council, the State Legislature, and the Governor should be clear and unmistakable: Do not permit hydrfracking anywhere in the Catskill Region. We can live without gas; we cannot live without water.

Respectfully submitted,

Raymond J. Irrera, AIA

Testimony of Paul Rush
Deputy Commissioner, Bureau of Water Supply
New York City Department of Environmental Protection

Committee on Environmental Protection
Council of the City of New York

Oversight - The Revised Environmental Impact Statement on Hydraulic Fracturing and the New York City Drinking Water Infrastructure
Thursday, September 22, 2011, 2 pm
250 Broadway

Good afternoon, Chairman Gennaro and Members. I am Paul Rush, Deputy Commissioner of Water Supply at the New York City Department of Environmental Protection (DEP). Thank you for the opportunity to testify today on the Revised Draft Supplemental Generic Environmental Impact Statement (draft SGEIS) on hydraulic fracturing and the New York City drinking water infrastructure.

Mayor Bloomberg has consistently held the position that New York City (the City) is opposed to drilling for natural gas in the City's watershed using the technique known as horizontal drilling and high-volume hydraulic fracturing (hydrofracking). The Administration based this position on, among other things, the Final Impact Assessment Study, commissioned by DEP, which concluded that current technologies and practices used in natural gas drilling and exploration are incompatible with the operation of New York City's unfiltered water supply system and pose unacceptable risks for the more than nine million New Yorkers in the City and State who rely on the City's water supply system. Until the technical assessment was complete, the Administration had deferred taking a stand on the advisability of drilling, preferring instead to be guided by science and technological expertise. Then, based on that assessment, the Administration called for a prohibition on any drilling in the New York City west-of-Hudson watershed.

On July 1st, the New York State Department of Environmental Conservation (DEC) released a summary of its Revised Draft Supplemental Generic

Environmental Impact Statement (draft SGEIS) and made it available on its website a week later; however, the comment period was not triggered until an additional report completing the document—a Socioeconomic Impact Analysis Report—was incorporated into the draft SGEIS, which was released on September 7, 2011. Comments are due by close of business on December 12th. At this time DEP and its consultants are reviewing the document and preparing comments.

The City welcomed the news that high-volume hydraulic fracturing and horizontal drilling would not be allowed within the water supply watersheds of the two large cities in the state that have Filtration Avoidance Determinations —New York and Syracuse. This ban eliminates or reduces many of the previously identified risks to the water supply. However, some potential impacts to the water supply still exist—the most serious ones are related to the water supply infrastructure.

When the draft SGEIS was released two years ago, several risks to the water supply infrastructure were identified in the technical assessment. These include risks from:

1) direct penetration of a tunnel;
2) damage from microseismic events;
3) differential pressures on the tunnels; and
4) contamination from subsurface migration of fluid and/or gas.

The draft SGEIS proposes a setback of 1,000 feet from the aqueducts where drillers would need to conduct a site-specific analysis to identify whether drilling poses significant adverse environmental effects. If any potential effects are identified, the driller would need to initiate a full environmental impact study before drilling could be approved. DEC has offered assurances that it would not approve drilling unless the City is satisfied with a study's results, but authority over whether drilling would then be allowed to proceed remains with the State. Another significant concern is how the setback or buffer distance is measured. Horizontal drilling adds a new complication to traditional regulatory setbacks. If the setback is measured from the well pad as specified in the draft SGEIS, then horizontal drilling may occur directly beneath critical infrastructure. Instead we plan to recommend that the setback be measured from the end of the nearest

horizontal drill leg to the resource in question or even to the edge of the spacing unit.

The reservoir dams are all at the edge of the watershed and therefore have 4,000 feet of setback protection. But if a horizontal drill leg extends 4,000 feet and the setback is measured from the well pad instead of from the termination of the horizontal leg, hydrofracking could occur directly underneath a dam.

Microseismic events can occur either from the fracturing of the rock or from injection of fluids subsurface (underground). The hydrofracking fluid acts as a lubricant along the surface of the fault and the reduction in friction can result in very small earthquakes at depth. The draft SGEIS concludes that the magnitude of microseismic events, typically less than 1 – 2 on the Richter Scale, is too small to be an issue. This is likely true with respect to surface structures like houses but the City's risk assessment concluded that this is not necessarily the case for the water supply tunnels. Repeated microseismic events over the course of years could have a detrimental effect on the concrete tunnel liners. DEP is in the process of obtaining an expert in seismology to help assess this risk to the infrastructure.

Hydrofracking operations are anticipated to involve pressures in the range of 5,000 - 10,000 psi. The structural analysis using tunnel specifications indicated that differential pressures as low as 20 psi could have a detrimental impact on the unreinforced concrete liners of the Delaware tunnels. These tunnels were not designed to withstand this type of subsurface activity (and indeed, the Rondout-West Branch Tunnel has already demonstrated a susceptibility to cracks under certain conditions). The risk from elevated pressures increases as more wells are drilled and hydraulically fractured (fracked).

Migration of fluids or gas was identified as a serious risk in our natural gas technical assessment. The fluids may be the salty formation water, left from the shallow sea that formed the shale, or the flowback water, essentially residual fluids from the hydrofracking process. This migration may be laterally from the well bore (e.g. well-casing failure) or vertically through pre-existing fractures in the bedrock. The probability that fluid and/or gas could migrate through inter-connected

fractures increases over time as several hundred wells are drilled and fracked—every year for decades.

Unlike risks from surface events such as turbid runoff or chemical spills, the risk to the tunnels cannot be easily monitored and the situation is analogous to groundwater contamination—by the time you know there is a problem, it is already too late to avoid serious impacts. Given these identified risks to the City's water supply infrastructure, the 1,000 foot setback proposed in the draft SGEIS is inadequate to protect the water supply. Based on the technical assessment, DEP took the conservative position that a seven-mile buffer would be sufficiently protective of the City's water supply infrastructure. This distance was based on the length of mapped fractures and the likelihood of migration of hydrofracking fluid from wells or defective drilling casings through fissures in the geological substrate in the region. DEP is currently hiring additional geophysical expertise through our joint venture consultant to more thoroughly analyze and evaluate this issue.

The City is discussing its concerns with the state ahead of submitting formal comments on the draft SGEIS during the public comment period. We will continue to rely on science and technical expertise to inform our position on these issues of concern to protect the integrity and safety of the water supply infrastructure and the system as a whole.

Thank you for the opportunity to comment. I would be glad to answer any questions.

THE FOR THE RECORD

New York COMMON CAUSE
Holding Power Accountable

Testimony by
Deanna Bitetti, Associate Director of Common Cause/New York
to the
Committee on Environmental Protection

RE: Oversight: The Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure.
September 21, 2011

Good morning Chair Gennaro and members of the Committee on Environmental Protection. Thank you for the opportunity to speak today. My name is Deanna Bitetti, and I am the Associate Director of Common Cause/New York. Common Cause/NY is a non-partisan, non-profit citizens' lobby and a leading force in the battle for honest and accountable government. Common Cause fights to strengthen public participation and faith in our institutions of self-government and to ensure that government and the political processes serve the public interest, and not simply the special interests.

Good governance requires a thoughtful and deliberative approach whenever we are looking to create or implement public policy decisions, instead of a precipitous rush to decision. The hydro fracturing debate is a complex issue with extraordinary economic and environmental consequences for New York State.

In a previous reports put out by Common Cause/NY entitled "Deep Drilling, Deep Pockets: Expenditures of the Natural Gas Industry in New York to Influence Public Policy," we provided a detailed analysis of the natural gas industry's lobbying expenditures in New York State. We showed that as New York State determines whether to permit natural gas exploitation using the controversial hydraulic fracturing technique, industry has poured millions of dollars into lobbying the Governor and the New York State Legislature. The influence of private interest money on the part of the natural gas companies stands to unduly tip the balance.

On September 7th Governor Cuomo officially released the revised draft Supplemental Generic Environmental Impact Statement (rdSGEIS) for high volume hydraulic fracturing (fracking) in New York State. The comment period will end December 12, 2011 and will include only four public hearings in NYC and other Marcellus Shale area regions. In addition, DEC has not committed to wait to begin permitting until regulations have been finalized. By issuing draft regulations before the environmental review process is complete, DEC is depriving New Yorkers of the opportunity for their comments to be considered in the development of those draft regulations. From a good government perspective this is anathema to any notion of a transparent and accountable process.

Over the past few months, Common Cause/NY members and supporters have joined with environmental advocates from across the state to call on Governor Cuomo and the NYS Department of Environmental Conservation to extend the public comment period to 180 days. Members have written 100's of emails, as well as participated in a virtual rally where 1000's of comments were posted on the Governor's Facebook and Twitter page. The reasons for the extension ranged from the desire of constituents to have adequate time for review of the document to skepticism about the ability of the DEC to properly regulate the natural gas industry given budget constraints, as well as apprehension over hydrofracking in NYS because of the large amounts of money industry has injected into this debate to influence elected officials. Common Cause/NY believed an extension is integral to ensuring that the process by which regulatory oversight will be conducted is properly vetted and that the process includes adequate opportunities for public participation.

Some of the reasons Common Cause/NY supported more public hearings and a 180 days extension:

- The gas has been there for a thousand of years and it's not going anywhere. We have one chance to get this right and ensure that the proper regulatory mechanisms are put in place. New Yorkers deserve a deliberative approach to this process.

- The document is complex and highly technical and will take New Yorkers time to sift through to ensure that the environmental, economic and health impacts of their communities are protected. Common Cause/NY recently signed on to a letter asking the NewYork State Department of Environmental Conservation (DEC) provide the Revised Draft Supplemental Generic Environmental Impact Statement (RDSGEIS) on the Oil, Gas, and Solution Mining Regulatory Program in a format that clearly highlights the changes made between the July 2011 preliminary draft and the complete draft released in September 2011 to avoid forcing the public if it must undertake the difficult task of identifying the changes from July. According to environmental organizations and groups that have analyzed these reports deeply, the DEC has made changes to every chapter of the September 2011 SGEIS, including both major deletions and additions to the text. We were informed that an initial request for a response to this request from one of our coalition partners was met with the response by DEC "there have been no changes to the rdSGEIS" We are still waiting for a response to this request.

- The $223,000 study of the impacts of hydrofracking on NYS was conducted by Ecology and Environment Inc., a global environmental and consulting firm that counts oil and gas companies among its clients and that could potentially gain business from increased drilling in the state, as first reported by the New York Times. The State is spending

almost $1000 a page to have an outside consultant study the impacts of hydrofracking. The mere perception of a conflict of interest between the company that is writing this report and the opportunity for them to gain off of an expedited permitting process for fracking begs for a more thorough vetting of the report by community groups, advocates and constituents across NYS.

- In a state as large as NYS, New Yorkers deserve to have the DEC host more than just 4 public hearings. In NYC with a population of about 8 million people, the state has planned to host just one hearing. In addition Central New York and other areas where drilling will have a direct impact on quality of life and communities have been completely left out of the process.

In order to be sure that the document that will regulate how fracking is conducted in NYS is seen as legitimate and assures New Yorkers that it contains the proper regulatory oversight mechanisms and procedures, it is imperative that the process is transparent and engages as many stakeholders as possible. In the process of determining our state's policies towards the use of hydrofracking to extract natural gas from shale formations, New York's elected representatives and appointed officials, must strike the right balance, weighing potential economic benefits against potential environmental catastrophe. This means taking as much time as possible to ensure regulatory oversight and mechanisms are in place and that as much public and expert input as possible is garnered.

We once again ask the City Council to support a deliberative process within the State by urging the Department of Environmental Conservation and Governor Cuomo to provide as much time as possible for public review and to increase the number of hearings to more than just 4 hearings across a state as big as New York and to provide as much information as requested by groups and individuals prior to the current public comment deadline.

Thank you for the opportunity to speak before you today. We look forward to working with the Committee to ensure a regulatory review process that is open, participatory and responsive to the needs of all New Yorkers.

FOR THE RECORD

NYC Drinking Water Infrastructure and Fracking: 9/22/2011 City Council Hearing

It is important for the City council to do all it can to protect the watersheds that provide urban New Yorkers with clean unfiltered drinking water – but a ban on drilling in the Catskill watersheds is not enough to protect NYC from the negative effects of Hydraulic fracturing elsewhere in the state.

- The "food shed" that spans the southern Catskills to Lake Erie is enormously important to the health and security of NYC. The vast agricultural soils will be compromised and subsequent meat, milk, and produce will be contaminated as a result of expanded drilling. The SGEIS provides inadequate analysis of the impact of drilling on our food supply.
- The SGEIS fails to consider a substantive cumulative impact assessment of gas well development that they anticipate could surpass 1,600 wells a year for the next 30 years. Toxic airborne emissions from gas drilling have a 200 mile radius and must be considered in an aggregated or cumulative frame work – something the DEC refuses to do. With clear examples from Texas and Wyoming- where air emissions from natural gas exploration and infrastructure have overwhelmed regional air quality--NYC will not be spared the eastern migration of air pollutants that are already compromised by Midwestern coal plants. The SGEIS fails to make public health risk assessments associated with this new wave of drilling – there will be known air emissions and we need to do adequate modeling to understand the consequences in terms of projected illnesses and deaths.
- Without NYC taking a strong stand on fracking, this new wave of drilling will take hold in other parts of the state. It will be difficult to stop its advancement once permitting begins. The sole factor protecting NYC's water from drilling is the Filtration Avoidance Determination (FAD). It has become clear that the EPA will rescind the order if the POSSIBILITY of drilling is presented for the watershed, rather than waiting for the first instance of contamination. Rescinding the FAD will mean the immediate construction of filtration plants for NYC's water that would cost tens of billions of dollars--with no guarantee of effectiveness. For example, how would radioactive elements be filtered out and where would the filtered toxins be stored? The DEC felt it had no choice but to ban drilling in the watershed or else incur the immediate costs of filtration. BUT IF FOR ANY REASON THE FAD IS LIFTED IN THE FUTURE, THE DEC IS SURE TO REVISIT DRILLING IN THE WATERSHED IF FILTRATION IS MANDATED ANYWAY. Using NYC influence now to stop this dangerous form of drilling STATEWIDE may serve the City well in the future if drilling pressures override a compromised FAD.
- With drilling allowed just outside of the watershed areas, there are no proposed regulations that will prohibit the movement of trucks, containing fracking

chemicals or wastes, through sensitive roadways within the watershed. One accident could cost the city billions.

- The DEC's public messaging on the ban in FAD drinking watersheds is essentially that they have no choice – the EPA is making them do it. But the rdSGEIS tells a different story – namely that the construction of roadways, pipelines and well pads will create too much surface disturbance and subsequent erosion to be safe for an unfiltered drinking water source. This admission is true for the rest of the state – where most people's drinking water wells are unfiltered – but do not have the benefit of EPA oversight and protection. It will be eventually true for NYC and Syracuse watersheds.

In Summary, with Governor Cuomo and the DEC poised to embark on wide scale methane mining across the state, it is time for the NY City Council to take a stand and protect *all* New Yorkers from the hazards of fracking. A two-tiered system, which forsakes the watersheds of residents living outside NYC or Syracuse is unacceptable and will not ultimately protect anyone---fracking poisons will reach NYC via our food, our water and air. No manner of regulation will make fracking safe. It is therefore imperative that the precautionary principle be applied to preserve the health, environment and livelihood of *all* New Yorkers equally. The time to act is now--ban it outright and unequivocally and shift New York to renewable energy resources and conservation and efficiency programs.

- Key areas of the rdSGEIS for review (most are July numbers so give or take a page)
  - Executive Summary Page 5 Allows for the possibility (through a separate SEQRA review) of drilling within 1,000 feet of the NYC subsurface drinking water supply infrastructure. (unacceptable)
  - 1-6 history of Fracking and FADS
  - 1-19 4,000 foot buffer around NYC watershed boundaries.
  - 6-41 thru 6-50 (description of entire FAD process) 6-50 has the important conclusion that fracking is too risky for NYC water supply.
  - 7-55 (sept 2011) nice summary conclusion of watershed protection proposal
  - 7-68 (sept 2011)best description of inadequate infrastructure set backs. (1000 ft) if 4000 is the bare minimum for the watershed, it should at least be the same threshold for the aqueduct. The proposed regulations suggest that drilling could even go closer than 1000 ft. to the aqueduct, but it would require a site specific SEQRA determination.

Gusti Bogok, Chair
The Green Sanctuary Committee, the Community Church of New York, UU
Member: NYH20, Sane Energy Project, Frack Busters NY

Testimony

New York City Council
Committee on Environmental Protection
September 22, 2011
James F Gennaro Chairperson
Testimony

MARGARET A. RAFFERTY DNP, MPH, RN

Thank you for inviting me to testify today. As a nurse educator academically trained in nursing and public health with over 35 years experience, I find the recently released DEC report to be glaringly deficient in protecting our City's enviable water quality and the health of our eight million fellow New Yorkers. I am particularly concerned about the shrinking buffer zone of 1000 feet between the aging tunnels and aqueducts in our water system and the drilling sites. Drilling at this close range has the potential for catastrophic health consequences. Contaminating our water supply with the toxic chemicals used in high volume horizontal hydraulic fracturing would set the stage for a public health disaster for every New York City resident. Pregnant women, infants, children and the elderly would be especially vulnerable.

Today over half of the world's population lives in cities and we live in what is considered a megacity. Designing healthy cities is an important public health responsibility that involves coordination among health agencies, government, and public planners. Clean air and clean water are essential to the design of healthy cities and together they provide a foundation for our health. We must prevent toxic chemicals from contaminating our City's water supply. Many health professionals are concerned about the potential effects of hydraulic fracturing (Covey, 2011; Duggan, 2010; Goldstein, 2011; Law, 2011; McKenzie, Witter, & Adgate, 2011; Texas Medical Association, 2011).

Fracturing fluid is a mixture of water, chemicals and sand (*Public Hearing on the Health Impacts of Hydraulic Fracturing Techniques*, 2011). According to the DEC report, drilling

companies have disclosed the use of 322 unique chemicals in 235 products in our state. Fracturing products, with names like Unislik ST50 and Fracsal III, are highly diluted when used to fracture shale rock, but when combined with other potential toxins are harmful at the part per billion leve l (Bishop, 3/28/2011; Colborn, Kwiatkowski, Schultz, & Bachran, 2011). Chemicals used in the process are known neurotoxins, carcinogens and endocrine disruptors (Pediatric Environmental Health Specialty Units [PEHSU], 2011). Dr. Theo Colborn, the author of one of the few peer-reviewed articles on natural gas drilling, cited a broad range of potential toxicity of the chemicals: over 75% of the chemicals could affect the skin, eyes, other sensory organs, respiratory system and gastrointestinal systems; 25% of the chemical were carcinogens; 37% of the chemicals could affect the endocrine system and almost 40-50% could affect the nervous, immune or cardiovascular system and the kidneys (Colborn, Kwiatkowski, Schultz, & Bachran, 2011). Some examples of these chemicals are benzene, toluene, ethyl benzene, xylene, ethylene glycol, glutaraldehyde, hydrochloric acid and hydrogen-treated light petroleum distillates (Pediatric Environmental Health Specialty Units [PEHSU], 2011). Pediatricians who are environmental health experts were concerned enough to issue the attached statement (PEHSU, 2011). Materials that exist naturally in the shale rock include arsenic, barium, chromium, lead, uranium, radium, radon, benzene, bacteria and highly corrosive salt. The synergetic effects of mixing hundreds of chemicals with shale rock components has not been studied. One chemical byproduct of synergic--reaction is 4-nitroquinoline-1-oxide (4-NQO)-- is often used to induce cancer in laboratory animals (Bishop, 3/28/2011).

Further, the identity of some of the fracturing chemicals that will be used in New York State remains unknown. Several prominent physicians, including Dr. Bernard Goldstein, a member of

the National Academies of Science Institute of Medicine, have demanded full disclosure (Goldstein, 2011).

Not enough has been done to study the impact of hydraulic fracturing on the health of Americans. People who live near drilling sites report symptoms that they attribute to contaminated air and water. When they seek help from clinicians, a diagnosis is often elusive because the chemicals to which the patients have been exposed are a closely guarded trade secret. These symptoms include headaches, malaise, nausea, rash, vision problems, nosebleeds, and respiratory problems (Law, 2011). Some even attribute cancers to their proximity to drilling. Whether these symptoms have an environmental etiology or not, we simply do not know because the research is scant (Subra, 2009; Wolf Eagle Environmental, 2009).

Over a century and a half ago, Florence Nightingale, the founder of modern nursing, recognized that clean water and air are essential to human health. Yet today, the lessons she taught us seem lost on the proponents of shale gas drilling. As a result, the abundant safe water supply that we enjoy in New York City is currently threatened. In 2005, the United Nations General Assembly overwhelmingly adopted a resolution that recognizes "the right to safe and clean drinking water and sanitation as a human right that is essential to the full enjoyment of life and all human rights." Let us not sacrifice New York's treasured clean water in the haste to drill for new energy resources. Instead let us pause and heed the timeless African proverb "Filthy water cannot be washed." Chairman Gennaro, I want to thank you and the committee for your leadership on this issue. I ask the City Council to support a ban on hydraulic fracturing until scientists deem this activity to be medically safe and its impact on human health is better understood.

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PEHSU
Pediatric Environmental Health Specialty Units

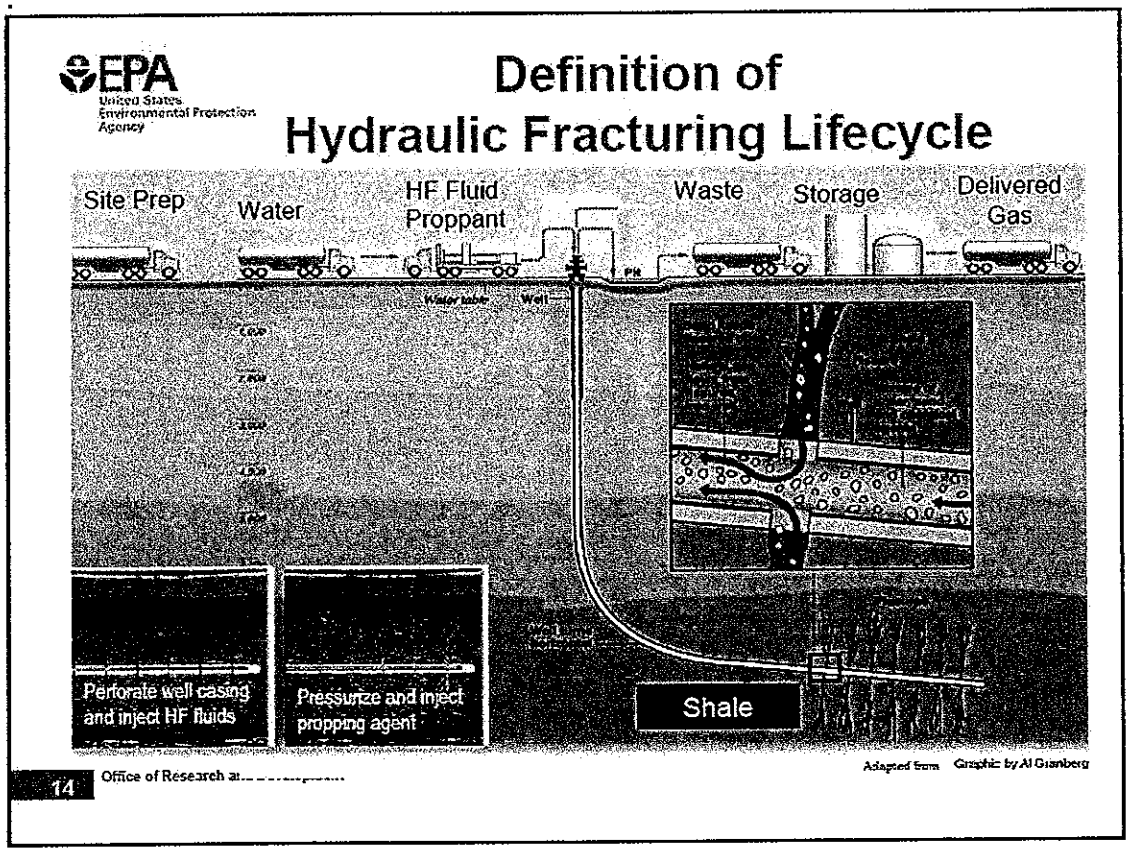
PEHSU Information on Natural Gas Extraction and Hydraulic Fracturing for Health Professionals

The Pediatric Environmental Health Specialty Units (PEHSU) Network encourage families, pediatricians, and communities to work together to ensure that children are protected from exposure to environmental hazards.

Background

Natural gas extraction from shale is a complex process which includes: 1) building access roads, centralized water and flowback holding ponds and of the site itself ; 2) construction of pipe lines and compressor stations; 3) drilling ; 4) hydraulic fracturing; 5) capturing the natural gas; 6) and disposal (or recycling) of, flowback water and drill cuttings.

Hydraulic fracturing, also known as hydrofracking or fracking, uses a combination of water, sand, and chemicals injected into the ground under high pressure to release natural gas. The HF process is also used in some parts of the country for extracting oil. This process has become much more common in the US over the last decade. It was first used for natural gas in Colorado, Wyoming, and Texas. The practice has recently spread into other states, including West Virginia, Pennsylvania, and New York. The figure below is a diagram of the process:



August 2011

Health Issues

Questions regarding the possible health effects of Natural gas extraction/Hydraulic fracturing (NGE/HF) have been raised about water and air quality. To ensure that children's health is part of the ongoing evaluation of possible human health effects of NGE/HF, the Pediatric Environmental Health Specialty Unit (PEHSU) network, which consists of experts throughout the country dedicated to preventing adverse pediatric health outcomes from environmental causes, developed this fact sheet. A distinct challenge in discussing these possible health effects is the lack of research regarding the human health effects of NGE/HF. Most of the research to date focuses on ecosystem health. Because many questions remain unanswered, the PEHSU network recommends a precautionary approach to toxicants in general and to the NGE/HF process specifically.

Water Contamination

One of the potential routes of exposure to toxics from the NGE/HF process is the contamination of drinking water, including public water supplies and private wells. This can occur when geologic fractures extend into groundwater or from leaks from the natural gas well if it passes through the water table. In addition, drilling fluid, chemical spills, and disposal pit leaks may contaminate surface water supplies. A study conducted in New York and Pennsylvania found that methane contamination of private drinking water wells was associated with proximity to active natural gas drilling. (Osborne SG, et al., 2011). While many of the chemicals used in the drilling and fracking process are proprietary, the list includes benzene, toluene, ethyl benzene, xylene, ethylene glycol, glutaraldehyde and other biocides, hydrochloric acid, and hydrogen treated light petroleum distillates. These substances have a wide spectrum of potential toxic effects on humans ranging from cancer to adverse effects on the reproductive, neurological, and endocrine systems (ATSDR, Colborn T, et al, U.S. EPA 2009).

Air Pollution

Sources of air pollution around a drilling facility include diesel exhaust from the use of machinery and heavy trucks, and fugitive emissions from the drilling and NGE/HF processes. These air pollutants are associated with a spectrum of adverse health outcomes in humans. Increases in particulate matter air pollution, for example, have been linked to respiratory illnesses, wheezing in infants, cardiovascular events, and premature death (Laden F, et al, Lewtas J, Ryan PH, et al, Sacks JD, et al). Since each fracturing event at each well requires up to 2,400 industrial truck trips, residents near the site and along the truck routes may be exposed to increased levels of these air pollutants (New York State DECDMR, 2009).

Volatile organic compounds can escape capture from the wells and combine with nitrogen oxides to produce ground-level ozone (CDPHE 2008, CDPHE 2010). Due to its inflammatory effects on the respiratory tract, ground-level ozone has been linked to asthma exacerbations and respiratory deaths. Elevated ozone levels have been found in rural areas of Wyoming, partially attributed to natural gas drilling in these locations. (Wyoming Department of Environmental Quality, 2010). In an air sampling study from 2005 to 2007 conducted in Colorado, researchers found that air benzene concentrations approached or exceeded health-based standards at sites associated with oil or gas drilling (Garfield County PHD,

2007). Benzene exposure during pregnancy has been associated with neural tube defects (Lupo PJ, et al), decreased birth parameters (Slama R, et al., 2009), and childhood leukemia (Whitworth KW, et al., 2008).

Noise Pollution

Noise pollution from the drilling process and resulting truck traffic has not been optimally evaluated, but since drilling sites have been located in close proximity to housing in many locations, noise from these industrial sources might impact sleep, and that has been associated with negative effects on learning and other aspects of daily living (Stansfeld SA, et al., 2003, WHO 2011).

Special Susceptibility of Children

Children are more vulnerable to environmental hazards. They eat, drink, and breathe more than adults on a pound for pound basis. Research has also shown that children are not able to metabolize some toxicants as well as adults due to immature detoxification processes. Moreover, the fetus and young child are in a critical period of development when toxic exposures can have profound negative effects.

Recommendations

In light of the lack of research investigating the potential adverse human health effects from gas and oil well operations located in close proximity to human habitation, as well as considering the unique vulnerability of children, the PEHSU network recommends the following:

- Continuing the surveillance of water quality, noise levels, and air pollution in areas where NGE/HF sites are located near communities.
- Monitoring the health impacts of persons living in the area, preferably with cohort studies.
- Increasing the awareness of community healthcare providers about the possible health consequences of exposures from the NGE/HF processes, including occupational exposures to workers and the issue of take-home toxics (e.g., clothing and boots contaminated with drilling muds).
- Disclosure of all chemicals used in the drilling and NGE/HF and product dewatering to ensure that acute exposures are handled appropriately and to ensure that surveillance programs are optimized.
- Given the short half-lives of volatile organic compounds and the fact that many of the NGE/HF chemicals have not been disclosed, biologic testing should not be pursued unless there has been a known, direct exposure.
- In addition to the annual testing for coliforms and nitrates recommended by the U.S. EPA and the American Academy of Pediatrics (AAP), the AAP guidance recommends that families with private drinking water wells in NGE/HF areas should consider testing the wells before drilling begins and on a regular basis thereafter for chloride, sodium, barium, strontium, and VOCs in consultation with their local or state health department.

- As invaluable resources for their local, state, and regional communities, health professionals should advocate for human health effects to be a part of the discussion regarding NGE/HF.

For further information, please contact your regional Pediatric Environmental Health Specialty Unit, available at www.pehsu.net.

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Statement Submitted to the New York City Council Hearing on September 22, 2011
Regarding the New York State Department of Environmental Conservation's Revised Draft Supplemental Generic Environmental Impact Statement (SGIES) on Hydraulic Fracturing of the Marcellus Shale

As an environmental health non-profit focused on the relationship between environmental toxins and human health, we write to express our grave concerns about high-volume slickwater hydraulic fracturing for natural gas extraction ("fracking") and the effects its widespread use will have on the people of New York State. Irreversible contamination of our water and air are inherent risks in the fracking process, and therefore, are unacceptable by any standard.

The New York State Department of Environmental Conservation's Revised Draft Supplemental Generic Environmental Impact Statement (SGEIS) on the Oil, Gas, and Solution Mining Program released earlier this month is deeply flawed and inadequate.We are especially concerned about the exclusion of an analysis of health impacts related to the development of natural gas using high volume hydraulic fracturing. The SGEIS should include a complete assessment of the public health impacts of gas exploration and production including but not limited to analysis of the existing documentation of the baseline health status of the population of the State of New York, thorough identification and analysis of direct and indirect health effects, a cumulative health impacts assessment, and any potential steps to eliminate these impacts. Such an assessment should include critical information regarding increased costs for health care, as well as mitigation of air, water and soil, and if mitigation is even possible. A comprehensive health impact assessment should be conducted by independent public health experts who would also lead an open public hearing and documentation process with the New York State Legislature.

The public comment period for the SGEIS is insufficient and requires a minimum of 180 days so that public health experts can review and comment on the current Revised Draft SGEIS. Furthermore, the High Volume Hydraulic Fracturing Advisory Panel appointed by Governor Cuomo does not include a public health professional and should include an independent medical expert with public health expertise.

Fracking requires the use of large amounts of highly toxic chemicals mixed with water and sand (fracking fluid or slickwater) that are forced into the shale under high pressure. Some of this mixture is returned to the surface with additional contaminants, including brine, radioactive elements and heavy metals that have been drawn from deep below the surface. This material, "flowback fluid," is then removed to evaporation pits or ponds or to municipal wastewater treatment plants. But accidents happen. Humans make mistakes. Containment methods fail. Carelessness and "corner cutting" are commonplace in any industry. Fracking operations around the country have been beset with contamination issues. People living near areas of widespread fracking are experiencing health effects, families are leaving their homes, and local economies are suffering.

A single fracking operation requires an access road, 2 to 8 million gallons of fresh water, between 10,000 and 40,000 gallons of chemicals, and at least 1,000 diesel truck trips. Between 34,000 and 95,000 wells are envisioned for New York State. Add to this the typical use of heavy equipment at these sites requiring generators and fuel. When you multiply the numbers, it is staggering.

The people of New York State understand the consequences of air pollution, the human health impacts of toxic chemicals and the dangers posed by degradation of our natural resources, and they are beginning to understand the multitude of threats posed by fracking. And it's not just the residents on whose properties the fracking will take place. Ozone and combustion byproducts from a fracking operation can pollute the air up to 200 miles away. Almost no area of New York State will be unaffected.

New York State has experienced great success where environmental health issues are concerned. We have adopted no-idling regulations for diesel vehicles in our communities and schools. We have worked with other states to our west to protect our air and our land from their air-polluting industries. We have protected our clean drinking water sources, and we have developed programs to encourage homeowners to employ non-chemical management of their lawns and landscapes. At significant expense we have restored our great rivers and smaller waterways that have been polluted by industries. We fine industries that illegally dump toxic chemicals into lakes and other bodies of water.

These efforts have been undertaken to protect the health and safety of the people of New York State, and they have been effective. This is the kind of environmental protection the people of New York expect from their leadership in Albany. But fracking operations don't play by many of the rules we have so painstakingly put into place. They are exempt from the regulations of the Clean Water Act, the Safe Drinking Water Act, the Superfund Act and the Clean Air Act. It is therefore absolutely imperative that the leaders of New York State step in where the Federal government has failed, and protect its own citizens.

It would seem that among the most fundamental responsibilities of any elected official is the protection of the safety and health of citizens. I strongly recommend that you urge Governor Cuomo and the New York State Department of Environmental Conservation to take whatever measures are necessary to carry out this most basic responsibility by expanding the public comment period and including a health impact assessment by independent public health experts.

Respectfully submitted,

Patricia J. Wood

Patricia J. Wood
Executive Director

PJW:nl

Testimony
By
Robert V. Cassara
September 22, 2011

For the record

New York City Council
Oversight Hearing on Hydrofracking

Good afternoon Mr. Chairman, Committee members, ladies and gentlemen.

My name is Bob Cassara. I live in Bay Ridge, Brooklyn, a community not normally thought to be associated with environmental causes but there are pockets of environmentally friendly to be found everywhere nowadays and growing.

By now we are well aware of the immediate dangers involving hydraulic fracturing. Millions of gallons of waste water laced with a wide variety of carcinogenic chemicals. Much of it will remain in the wells for years with the potential of eventually seeping out and the rest of it coming to the well head, which will be pumped into large temporary holding ponds surrounding the well pads.

I would like you to consider what I think of as the three critical dangers of hydro- fracking. They are:

1. The cement sealing of the well bore that goes through the aquifer;
2. The storage ponds & eventual disposal of the spent fluid;
3. Finally the most important and long term impact of the sequestered fossil fuel that is being drilled and will be burnt to power our economy.

We have all witnessed in the past year the dangers and risks involved in our quest for fossil fuel:

1. Most recently- hurricane Irene and the abundant rain that has caused a devastating attack on the upstate environment.

Imagine hundreds of temporary holding ponds of water with carcinogenic chemicals being overrun by millions of gallons of water. Then imagine all of it heading down stream and flowing into our reservoirs and rivers. Can it be cleaned up? I don't think so. Can it be prevented? The chemical part can be. Just don't drill.

2. And then this past summer we had an unheard of earthquake in the north east. Are the wells' cement casing designed to withstand a 6 or higher magnitude on the Richter scale. Probably not, because we are not thinking earthquake in this region, but we should be and better be now!
3. Most important and probably least being given attention is the burning of fossil fuels. We should not be burning anymore fossil fuel. Abundant new natural gas (shale gas) present and unfair competitive edge to alternative fuels, such as solar and wind power. As a nation and as a state we say we are in favor of alternative fuels but we do not walk the talk. We do just the opposite. If you want alternative energy and we should, then fossil fuels need to be taxed to the point at which they no longer have the competitive edge over alternative fuels.

The carbon load in the atmosphere in my mind is the most dangerous outcome of mining and drilling for fossil fuels. We need to take steps now to reverse this before we hit the point of no return and that is coming soon.

Folks, if you think the likes of hurricane Irene is just of fluke of nature, it isn't. It is the new norm. You best get use to it if we don't change our ways. Any short term revenues and jobs that our state derives from this gas play will be short lived and dwarfed by the billions of dollars that will be spent to offset the future results of climate change.

Thank You.

FOR THE RECORD

Comments to the Committee on Environmental Protection, NYC Council

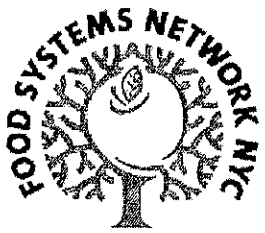
September 22, 2011

Good afternoon. My name is Arnold Frogel, and I live at 340 West 28th St., Manhattan

This latest revision of the Draft Supplementary Generic Environmental Impact Statement for High Volume Horizontal Hydraulic Fracturing of the Marcellus Shale Formation has been rushed to completion, apparently responding to political pressure, and without due consideration of the technical details by impartial scientific authority, or, as some conservative and special interest spokespeople like to phrase it, "sound science".

Knowing that a drill bore may penetrate up horizontally to two miles into the shale rock, it seems pretty facile to set a protective buffer of only 1000 feet from any subsurface water supply infrastructure. Furthermore, there is apparently no consideration of the effect on that infrastructure that might be caused by the huge, bomb-like explosion of fracking, with measurements of 3 to 4 on the Richter Scale, nor of the extent of pollution of surface waters of the New York City Watershed by the high levels of methane rich smog, which is known to move as much as 150 or 200 miles through the atmosphere from its original source.

Thank you.



Testimony submitted by: Hilary Baum 5454 Palisade Ave, Bronx 10471
hilarybaum@baumforum.org

My name is Hilary Baum. I would like to thank the Environmental Protection Committee, especially Council Member Koppell who represents my district, for the opportunity to present this testimony.

I am testifying on behalf of Food Systems Network NYC (www.foodsystemsnyc.org), of which I am a founding board member. The Network is a not-for-profit organization dedicated to ensuring universal access to nutritious, safe food and the viability of our regional farm and food economy. Founded in 2004, our organization's members are from business, government agencies and organizations involved in all phases of the food system.

I was also an advisor to the Speaker's FoodWorks initiative; I am a member of the Bronx Food and Sustainability Coalition, and director of Baum Forum (www.baumforum.org), a not-for-profit producer of public programs on critical food and farming issues including a conference in May on food, fracking, and the green economy.

We want to draw your attention to a glaring omission in the state's SGEIS on fracking. The state has failed to adequately consider the impact of fracking on the food and farming economy of New York State, and, by extension, the food supply to New York City residents. We fear the widespread use of fracking will endanger farmland through environmental degradation, fragmentation, and lease of dwindling farm acreage. Additionally, high volume water use and potential for water, soil and air pollution are in direct competition with sustaining our farming economy. The 28 counties that overlie the Marcellus shale currently boast over 20,000 farms, 4 million farm acres, and $2.4 billion in farm revenue, more than half the statewide farm economy.

We are concerned that this critical omission in the SGEIS will continue the misapprehension that fracking and farming can somehow be compatible. The impacts on agriculture – including the health of farm families, crops, animals, and wild life –have been described and documented by farmers, scientists, retailers and advocates. There is also widespread concern that fracking in NY's food producing areas will result in creating a damaging and irreversible stigma to the food sourced from this area, and the loss of hard won organic and other certifications. I will provide some resources and references for the record along with my testimony.

New York City has made tremendous strides in linking our upstate farmers to the city. This Council just passed legislation to help agencies procure more local food, provides funding for residents to use their food stamp benefits and NYC Health Bucks at farmers markets throughout the city, and has even started a weekly CSA. There are countless organization doing similar efforts – through farmers markets, csa's, bringing produce and other products into schools, pantries and soup kitchens, restaurants and stores. This has been good for both NYC and upstate communities, providing access to affordable and nutritious food, supporting farmers and food producers, and securing our regional food system. We can't afford to let these advances in the ag and food economy slip away.

We urge the City Council to not just think about protecting NYC's watershed but also NYC's regional foodshed that extends further through NY's threatened southern tier; our regional food and farming economy; and the future of our food system. We ask that you pass a resolution and lobby the state to:

- Extend the comment period and not fast track the rulemaking process.
- Withhold any permits until a comprehensive impact study on the effects of fracking on our regional food supply and agriculture be undertaken and published as part of the SGEIS.

And we ask you to consider several weaknesses in the state policy which our organization will outline in a forthcoming paper. We would be pleased to provide assistance in educating council member and staff about this subject and making materials available.

Selected Resources

Fracking and Farming

http://www.catskillmountainkeeper.org/node/2657

What Will Fracking Do to Your Food Supply?
http://www.gilttaste.com/stories/327

Farmer's Get Fracked
http://www.valleytable.com/article.php?article=002+Features%2FFarmers+get+fracked

Fracking Cattle

http://markbittman.com/fracking-cattle

Fracking in The Foodshed

https://acrobat.com/app.html#d=RF-gWpS33h7fE1A5ic0iwg

Committee on Environmental Protection Sept 22, 2011 Hearing

RE: **Oversight: The Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure**

Testified by Mrs. Shiuho Lin, 75-55 183 Street, Fresh Meadows, NY 11366

My name is Shiuho Lin. I am a Taiwanese (not Chinese) American, a retired hospital laboratory quality control supervisor, an advocate, an active member of the Gray Panthers, and the Gray and Green Coalition. It is my pleasure to testify the same subject second time, first time on March 1st, this year. It is also my pleasure to see some of my previous suggestions have been adopted in this revised draft. After reviewing the Revised Draft SGEIS (September 2011), my comments are as following:

I still stand strongly on banning hydrofracking although the September 2011 Revised Draft SGEIS shows much more restrict regulations than previous version.

(1). The impact of Hydrofracking natural gas drilling threatens NYC water supply:

Water depletion: With estimates of 2,462 active wells per year, DEC calculated a peak annual fresh water usage of 9 billion gallons for drilling. Total daily fresh water withdrawal in New York has been estimated at about 10.3 billion gallons. The timing and location of drilling water withdrawal needs to be regulated to avoid extra water stress. SGEIS notes that the cumulative impact of these additional water withdrawals could "potentially be significant" – especially during droughts or when water sources are stressed.

Water contamination: DEC recommends No High-Volume Hydraulic Fracturing Operations 4,000 foot buffer area around the New York City and Syracuse watersheds, within 2,000 feet of Public Drinking Water Supplies, 1,000 feet of tunnels and aqueducts, 500-foot buffer area around aquifer, and 500 feet of Private Water Wells. New York City daily consume 1.2 billion gallons water t hat flows through reservoirs, aqueducts, and tunnels, stretching from the Delaware River watershed to the Connecticut border. The tunnels and aqueducts are almost 70 years old. DEP plans $1 billion to fix 20 million gallons a day leaking in the tunnel. The revised SGEIS proposal allows fracking with 1000 foot buffer area around the tunnels and aqueducts. Vibrations, fracking explosion, or contaminant migration near tunnels and aqueducts could present dire risks to water system. Drilling nearby could shift the earth, exerting pressure on tunnel walls that they weren't designed to withstand. On September 15th, 2011, Dr. Howarth and fifty-nine physicians, scientists, and engineers (PSE) from around the world wrote a letter to Governor Cuomo to express concern that existing municipal drinking water filtration systems are not designed to adequately remove chemicals and other contaminants such as benzene, toluene, heavy metals, and radioactive compounds in hydraulic fracturing fluid and flow-back fluids, should such hazardous substances migrate to lakes, reservoirs, or groundwater used for municipal water supply.
We need more buffer zone around water system and its infrastructure and aquifer.

Disastrous flooding: Hurricane Irene alarmed us the power of disastrous flooding. If the flood water carries the hazardous fracking waste, we not only need to deal with the flooding disaster, but also hazardous chemicals and radioactivity.

(2). Disposal of Wastewater and Solid Waste

With hydrofracking, a well can produce 2.7 million gallons of wastewater that is often laced with highly corrosive salts, carcinogens like benzene and toluene, and radioactive elements like radium, and other chemicals used in the hydrofracking. The waste water should be processed in a special treatment plant to remove salts and hazardous substances before dumping into traditional sewage treatment plant because the contaminants in the wastewater can kill microbes or interfere with their functions during treatment process.

Spills or releases can occur and risk the surface and subsurface soils and aquifers contamination as a result of tank ruptures, equipment failures, overfills, improper operations, flowback water storage, transport and disposal. The air pollutants including carcinogens such as nitrogen oxide, carbon monoxide, benzene, toluene, volatile organic compound, sulfur oxide are also emitted in this process.

(3). DEC claims natural gas production in New York Marcellus Shale could create estimate 60,000 jobs and increase revenue by $11.4 billion. Gas drilling well is only good for 4-20 years. The job creation is temporary and might not be for New Yorkers. If factoring in potential health threat, environmental damage, and road, land and infrastructural damage, there might not be any revenue increase at all.

(4). DEC Revised Recommendations on Hydrofracking includes almost all phases of controls. It calls for permits and proposal reviews approval before drilling. It does not, however, call for periodical analyses of soil contamination in order to prove no leaking through casing. It also does not include disaster plan and the mandate of unproductive well closure and landscape restoration. The revised proposal looks very good on the paper. The important thing is to implement and oversee strictly. We need professional inspectors, carrying instrument, with news reporter(s) on drilling site to observe, record, and/or even "supervise" the operation. We need prove of no leaking through casing and no contamination in air, surface, and subsurface soil. We need to be sure the drilling companies have special waste water treatment plant to remove their contaminants before dumping into our waste treatment plants. We call for strong penalty on violation.

Most accidents are caused by human errors. Workers have tendency to take shortcut and the industry always puts profit over safety. **In order to safeguard human health and protect environment, we must ban hydrofracking completely**. Renewable energy, like solar and wind power, is strongly recommended.

Comments to the DEC for the rdSGEIS
Ruth Hardinger, 20 N Moore St., NYC 10013

I am a real estate broker, and have discussed with other brokers how regions where fracking occurs would suffer devaluations, estimating as much as 75% upstate. Although this will have a more immediate impact Upstate, I am concerned that our extraordinary City will suffer health impacts which will compromise our real estate if people choose to leave the region for health issues. Furthermore, chemicals and toxins released by fracking can not be filtered out of the water. If New York City's water is contaminated by fracking, the billions of dollars spent on a filtration system (required by law) would not be able to filter out all of these toxins. We loose big time.

Fracking will harm our health and devalue real estate both upstate and in New York City if our water is polluted and our air quality is compromised by methane releases that flow over us. Do you remember how acid rain travelled from the mid west to upstate a few years ago? Toxic releases from wells, mists from processed water (frack fluid) sprays to the holding ponds, and other procurement processes could contaminate air; the EIS does not address that.

New York City residents who would like to purchase second homes upstate ask me "where is it safe to buy?". I can't answer that question.

It is impossible for horizontal or vertical here high volume swift water hydrofracking for gas to be safe in New York State. In 2009 the Hazen and Sawyer study conducted for NYC discusses geology of rock formations above shale layers. The rock above shale has too many natural fissures and fractures "therefore, it is likely that migration of frack fluids will travel up to aquifers - and can travel thousands of feet in a short time."

The 4,000 foot setback requirement in the rdSGEIS from our NYC watershed is not a distance capable of protecting our springs, streams and reservoirs. There is no way to determine how far migration will travel, or in what direction. Who will guarantee that 50 miles would be safe? To be clear, fracking in the area of Binghamton could migrate to the Hudson River.

This should be a show stopper! The geology around NY State is similar. This impact should be a concern to all New York, in addition to New York City.

Although industry is claiming it has fixed the problems of leakage from cement casings, it has not. On average of eight different wells a month, in our neighbor state of PA, have been cited for casing, cement or leaking gas violations this year. This state's geology is like New York, neither uniform or predictable. Read more: http://thetimes-tribune.com/news/dep-inspections-show-more-shale-well-cement-problems-1.1205108#ixzz1YeH2mucR

http://thetimes-tribune.com/news/dep-inspections-show-more-shale-well-cement-

problems-1.1205108#axzz1YP35xh3M

Fracking will affect New York City and State's precious organic local food (as well as all food). An organic farmer told me that the methane mists and frack fluid sprays settling on their crops would mean that they can no longer certify that their produce is organic -- there goes that farm. Who wants to eat a tomato or green bean that's been dusted with frack spray which has migrated in the air, captured in clouds.

New York City residents who would like to purchase second homes upstate ask me "where is it safe to buy?". I know someone who purchased near Woodstock because he was afraid of regions more west. A broker in the watershed told me he lost a customer for a house for fear that fracking could occur. If residential or farm real estate is devalued, the consequences will reach across many professions including: real estate brokers, attorneys, contractors, carpenters, architects, engineers, gardeners, arborists and ground keepers, and farms for food and animals, among many other professions. Communities will loose business and population due to faltering real estate values, because people don't want to live in a region where frack explosions occur 24/7 and 1500 trucks parade up and down the highways making it impossible to drive anywhere. These circumstances caused by fracking will have a negative impact on real estate values and businesses upstate. Its negative impact will spread to NYC because 2nd home owners will not purchase in regions where fracking occurs in New York State.

There's evidence of devalued real estate in Pennyslvania, ie: A farm in PA where fracking occurred was valued in the $300,000 and reappraised at $39,000 after its well water was contaminated. I spoke with brokers in the Fayetteville shale regions of Arkansas who said that it is hard to determine price there since the market is already slow because of the economy – which is evidence that fracking has not improved their real estate values. Further, these people are not happy living in the regions where fracking occurs and will not continue to live there for much more time. Degeneration of towns is occurring.

In spite of considerable information that fracking is not safe for human or environmental health, Gov. Cuomo and Commissioner Martens seem intent on permitting fracking in New York State. Although some jobs are created – it does not bring substantial long-term new jobs to a region (in PA less than 10,000 jobs were created 2007-2010). Many existing jobs or forms of business will be compromised or put out of business including recreation/tourism, fishing and organic farming. It collapses real estate values because of the unsightly, very noisy surroundings in drilling rig vicinities, the damage to water wells and the impositions and complications created by hundreds – if not thousands – of trucks hauling equipment or fluids 24/7 across state and local roads. Devalued real estate will also have negative financial implications for contractors, architects, attorneys, brokers and all of a town's economic structure. Fracking permanently contaminates our

diminishing quantity of fresh water, decelerates the growth of renewable energy, and does not get us off foreign oil. A study recently released by the US Geological Survey reports there is 80% less Marcellus gas reserves than industry claimed -- barely enough Marcellus gas for 11 years of extraction.
http://www.nytimes.com/2011/08/25/us/25gas.html?scp=2&sq=ian%20urbina&st=cse/; http://protectingourwaters.wordpress.com/2011/06/22/numbers-game-marcellus-shale-industry-created-less-than-10000-jobs-in-pa/; http://thetimes-tribune.com/news/penn-state-study-shows-more-modest-economic-impact-from-shale-gas-1.1195154#ixzz1WWT1V6fL/ http://www.youtube.com/watch?v=KZZQxe6FiGA&feature=youtu.be
Part of that damage cannot be remediated, particularly water contamination by carcinogens and endocrine disruptors which cause cancer and birth defects. Eradication of ecosystems, forests and wildlife is another area of major destruction.
http://www.endocrinedisruption.com/chemicals.videoplayer.php
http://www.damascuscitizens.org/Durand_shale_gas_faults.html
http://www.nyserda.org/publications/narrative-response-hazen-sawyer.pdf/

Upstate farmland could become unsuitable for organic farming – or perhaps any farming -- which will have a negative impact on the NYC food supply.
http://www.foodandwaterwatch.org/pressreleases/consumer-advocates-businesses-farmers-doctors-and-scientists-join-elected-officials-to-call-for-a-ban-on-fracking-in-new-york/

Drilling for gas has negative social and economic impacts.
http://www.theecologist.org/trial_investigations/687515/us_natural_gas_drilling_boom_linked_to_pollution_and_social_strife.html/

In New York State, not only are gas companies trying to drill in the Marcellus Shale, but the Utica Shale as well – which is deeper and spreads to the Hudson River. At least 85% of New York State could be fracked, accompanied with pipelines, injection wells for frack waste (injection wells have caused earthquakes in Arkansas) and processing plants, turning the gorgeous Catskill region into an industrial wasteland. Think New Jersey's oil industry-laiden ports or see photos of PA on Damascus Citizens.org.

Please understand that fracking is not just an issue for a few counties upstate, but something that will have serious impacts for all New Yorkers. Throughout New York State, including here in New York City, there are over 72 non-profit, grass roots groups whose missions are to protect the environment and/or prohibit fracking. These groups are vigorously engaged in a Herculean effort to spread the word about fracking's far-reaching impacts including not only short and long term environmental problems but also the social and economic costs. Attempting to mitigate impacts, over three-dozen towns Upstate have either banned or placed moratoriums on the industry.

If NYC's watershed becomes contaminated from fracking then New York City will be forced to purchase a filtration system for $20-30 Billion – which will NOT be able to filter out all the toxic chemicals. NYC air quality also will likely be degraded because of hydrocarbon and toxic frack fluid releases travelling through the air. (remember acid rain)

On a national front, gas companies assert that the US has enough gas supply for the next 100 years. The industry is bent on convincing us to spend billions of dollars - much government subsidized - on new infrastructure like pipelines, truck fleets to run on natural gas, natural gas filling stations, and gas-powered electrical plants. In addition to industry inflating the number of years the gas supply will last, gas companies have also been using a Ponzi scheme financial practice as a business model to inflate their predicted profits.
http://my.brainshark.com/Ponzi-Gas-Frackers-8298212
http://damascuscitizens.org/NYTimes_three_articles_ponzi_scheme.html

Industry claims natural gas is a clean-burning fuel. Natural gas is not clean. It is a fossil fuel. While burning it emits about 112 parts per billion of carbon compared coal which emits 208 ppb – YET - when the entire procurement process of hydrofracking is taken into account, natural gas produces more greenhouse gas emissions than does coal.
http://www.insurereinsure.com/blog.aspx?entry=3357
http://coalseamgasnews.org/?p=655;

The industry says natural gas is a bridge to sustainable energy, yet in truth, industry's every actions are aimed to insure our society remains dependent on fossil fuels for decades to come. We could transition to clean, renewable energy, now. We have the knowledge but not the political will.
http://news.cnet.com/8301-11128_3-20029784-54.html#ixzz1ClUeLdjn

Sincerely yours,

Ruth Hardinger

Marjorie I. Hochman
67-71 Yellowstone Blvd. Apt. 2N
Forest Hills, NY 11375

FOR THE RECORD

NYC Council Hearing
DEC Revised Draft SGEIS
250 Broadway
New York, NY

September 22, 2011

Dear Sir or Madam:

To put it simply, fracking will destroy our water supply and watershed; and therefore, it is not an option for obtaining gas as an energy source.

Thank you for taking action to protect our watershed.

Respectfully yours,

Marjorie Hochman

FOR THE RECORD

Testimony of Arnold Gore, Consumers Health Freedom Coalition on Fracking dangers to NYC Water Supply

The use of hydrofracking technology to recover natural gas has greatly understated the dangers to the surrounding water supply in New York State.

This technology has been used in Pennsylvania in the Marcellus Shale was studied by the US Forest Service that found that the residue of high salinity caused complete destruction of surrounding vegetation within days.
The chemicals used can migrate from the site and the barrier of 1,000 feet proposed by the State is insufficient, when dealing with the possibility of chemical pollution of the water supply and the huge cost of a possible filtration plant, the risk is not worth the slight benefit of increasing natural gas supplies.

The overwhelming health problems of third world countries are the scarcity of clean drinking water. We do not want to fall into that same difficulty.

There are also reports according to ABC News that Fracking in Guy, Arkansas may be related to the increase in Earthquakes. With Indian Point nearby the dangers of an earthquake and Fukushima type meltdown, makes fracking a very dangerous risk that we should not have to bear.

FOR THE RECORD

September 22, 2011

Mr. James Gennaro, Chair of the Committee on Environmental Protection
New York City Committee on Environmental Protection

Dear Mr. Gennaro,

Thank you for holding this hearing and giving the residents of New York City a chance to make public comments on DEC's revised draft SGEIS.

The revised draft SGEIS has many flaws, too many to cover in a two-minute testimony. I would like to comment on just a few points.

While proposing to put the New York City and Syracuse watersheds off limits to drilling, critical water supply infrastructure would not be protected.

The DEC proposes a buffer around New York City drinking water infrastructure in which only an additional review would be required and upon which projects could be permitted—not a formal ban. The proposed buffer is only one-quarter as long as a typical horizontal wellbore, too close to the sensitive, aging infrastructure that provides the city with drinking water. There are no proposed buffer requirements for Syracuse.

Drinking water supplies inadequately protected

DEC proposes that no surface drilling will take place in the NYC and Syracuse watersheds. However, the buffers set forth are insufficient to prevent horizontal drilling underneath these sensitive watersheds. Water knows no boundaries. Toxic fracking fluids can easily contaminate these watersheds.

All New Yorkers Deserve Equal Protection

By giving the NYC and Syracuse Watersheds special protections, the DEC is implicitly admitting this process is inherently unsafe, and denies many New Yorkers Equal Protection of the Law. The distinction that the NYC watershed is an unfiltered water source is disingenuous. There are many people in upstate who are using unfiltered water from wells. Moreover, municipal water filtration systems are not sufficient to remove the range of toxins found in typical hyrdofracking water contamination such as methane, volatile organic compounds (VOCs), heavy metals, naturally occurring radioactive materials.

Fracking is an industrial process that threatens our water, air, land and our health. State after state, from Wyoming to Pennsylvania, has documented its dangers. New York cannot afford to put short-term gas profits ahead of the long-term health of our water and our communities. We therefore demand a ban to fracking in New York State. It's time we move away from fossil fuels and invest in renewable energy.

If fracking, with all its dire consequences, is allowed to start in New York State under the Cuomo administration, the people of New York will remember and will hold Governor Cuomo accountable for his action.

Sincerely,

Ling Tsou

Ling Tsou
80 Beekman Street (Apt. 5K)
New York, NY 10038
United for Action http://www.unitedforaction.org/

RIVERKEEPER.
NY's clean water advocate

Testimony of:
Katherine Hudson, Watershed Program Director, Riverkeeper, Inc.
Mackenzie Schoonmaker, Staff Attorney, Riverkeeper, Inc.

New York City Council
Committee on Environmental Protection

Oversight: The Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure

September 22, 2011

Thank you to the New York City Council Committee on Environmental Protection for giving Riverkeeper an opportunity to testify on the New York State Department of Environmental Conservation's ("DEC's") revised draft Supplemental Generic Environmental Impact Statement ("SGEIS"), the document that it has prepared to guide shale gas extraction by means of horizontal drilling and hydraulic fracturing or "hydrofracking" in New York.

Riverkeeper is a member-supported watchdog organization whose mission includes safeguarding the environmental, recreational and commercial integrity of the watershed that provides New York City its drinking water. Riverkeeper is actively involved in advocacy and public education surrounding the issue of shale gas extraction via horizontal drilling and hydrofracking, in particular because of its potential impacts on New York's water supply.

As you know, DEC issued the complete version of its 1,000+ page revised draft SGEIS on September 7, 2011. Riverkeeper has not yet had an opportunity to review this document in full; it will be doing so in the coming months with the assistance of a team of technical experts. Accordingly, we have focused our testimony today on our criticisms to DEC's procedure and a few of our preliminary reactions to the document itself.

I. DEC's Rush to Fracking

Chief among our concerns is that DEC continues to rush this process, seriously limiting the public's opportunity to express their legitimate concerns and have those concerns actually influence DEC's decision-making regarding hydrofracking in New York.

DEC indicated in its press release for the SGEIS that it will issue draft regulations governing shale gas extraction and fracking sometime in October, with Commissioner Martens stating that: "It makes sense to move forward with [the SGEIS and regulations that codify these measures] together and hold simultaneous public comment periods and hearings." DEC Begins 90-Day Public Comment Period on Draft Hydraulic Fracturing Study (Sep. 7, 2011), *available at* http://www.dec.ny.gov/press/76892.html. However, a core principle of the state's environmental review process is that DEC finalizes impact statements such as the SGEIS after incorporating

public input, and prior to drafting regulations so that the impact statement findings inform the regulatory process. By issuing regulations before the environmental review process is complete, DEC is depriving New Yorkers of the opportunity for their comments to be considered in the development of those draft regulations.

Equally disturbing, DEC has still not committed to wait to begin permitting until regulations have been finalized. If DEC is truly committed to the principle that mitigation measures and the regulations that codify them must go "hand in hand," then why move forward with issuing permits before regulations are in place? This is a backwards approach – DEC should process permit applications only after it promulgates detailed regulations that adequately protect against the environmental, public health and safety risks associated with horizontal drilling and fracking.

Finally, Riverkeeper remains concerned with the length of the public comment period, which began September 7, 2011 and will conclude December 12, 2011 – less than 90 days from now. This is an improvement over the original 60-day period for public review proposed by DEC, which Riverkeeper, its members, and its environmental colleagues, pushed DEC to extend. However, DEC now expects the public to, at the same time, review and comment on draft regulations that will not be released until sometime in October. Riverkeeper believes this rush to complete the regulatory review process to pave the way for permitting as soon as possible is unfair and unreasonable to the public. The public deserves a separate comment period to review and comment on this critical update of 40-year-old drilling regulations. DEC should offer a comment period for the SGEIS first and then issue draft regulations giving those their own comment period and hearings.

II. DEC's Staffing Needs

DEC declares in its August 16, 2011 report to the State Advisory Panel on High-Volume Hydraulic Fracturing that shale gas extraction in this state will only be successful, i.e. safe, environmentally protective, and economically beneficial, through a "vigilant environmental regulatory program" backed by staff and other resources to ensure "rigorous permitting, inspections and compliance." Advisory Panel on High-Volume Hydraulic Fracturing: State Resource Needs, at 2 (August 16, 2011). In that same report, DEC admits that it does not have the necessary resources to accomplish those goals, and presents in significant detail its staff needs: 140 new positions in the short term, and over 200 new positions in the first 5 years. DEC also admits that it does not have the funds to hire new staff and, is therefore, counting on the next state budget process. DEC projects that even if it is completely successful in achieving its budget request in this fiscal climate, it will likely not have the necessary staff in place before January 2013, at which time it will begin the time consuming process of training that new staff.

In light of DEC's own statement of its staff needs and the time required to meet those needs, how can it possibly be ready to begin issuing permits in the spring of 2012? DEC should not rush the permitting process and begin accepting permit applications until it has the necessary resources in hand and fully trained staff in place. To do otherwise invites duplicating Pennsylvania's failure to adequately regulate hydrofracking.

III. Preliminary Flaws with the SGEIS

Riverkeeper will work over the next few months to develop a comprehensive set of formal comments on the SGEIS, while advocating DEC to address the procedural flaws identified above. In the meantime, our two preliminary criticisms are:

- **DEC proposes inadequate protections for water supply infrastructure.** Much of New York City's water supply infrastructure is west-of-the-Hudson and falls outside of the City's watershed itself. Despite the well-known susceptibility of this aging and already leaking infrastructure, DEC has proposed virtually no protection – the revised SGEIS still calls for only a site-specific review for any well pad proposed within a 1,000-foot wide corridor surrounding a water tunnel or aqueduct. Riverkeeper fears that these tunnels will be threatened by vibrations and shaking from drilling activities and susceptible to contamination from migrating fracking fluids. The City's Department of Environmental Protection ("DEP"), which is responsible for this infrastructure, has previously called for a buffer of seven-miles to protect this water supply infrastructure, based on analysis of its own scientists. It is crucial that DEC prohibit drilling anywhere near all infrastructure that falls outside watershed limits to adequately protect the drinking water supply of the citizens of both these cities.

- **New York currently does not have any wastewater treatment plants equipped to treat wastewaters from fracking operations.** The SGEIS remains unacceptably vague on how the tens of millions of gallons of toxic wastewaters that will be produced in New York if fracking operations move forward will disposed of without contaminating New York waters in the same way that Pennsylvania's have been.

In conclusion, it remains Riverkeeper's position that DEC should not move forward with permitting fracking unless and until it can demonstrate that health and environment of New Yorkers will be protected.

Riverkeeper thanks the City Council for the opportunity to participate in today's hearing and for the important role that the City Council continues to play on the issue of hydrofracking in New York State. We look forward to continuing to work with the Council on this area of significant environmental concern.

Contact:

Katherine Hudson, Riverkeeper, Inc., 914-422-4410, khudson@riverkeeper.org

Mackenzie Schoonmaker, Riverkeeper, Inc., 914-422-4228, mschoonmaker@riverkeeper.org

Testimony of Dusty Horwitt, JD

Senior Counsel
Environmental Working Group

Oversight Hearing on The Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure

Before the
New York City Council Committee on Environmental Protection
Thursday, September 22, 2011 at 2:00 p.m.

Chairman Gennaro, distinguished members of the committee:

Thank you for the opportunity to testify today on the Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure. My name is Dusty Horwitt, and I am Senior Counsel at Environmental Working Group, a nonprofit research and advocacy organization based in Washington, D.C., with offices in Ames, Iowa and Oakland, California. This is my fifth appearance before the council on this issue.

Gas drilling poses great health risks – and financial risks – to New York City and much of the rest of New York State. We have reviewed the revised plan of the New York State Department of Environmental Conservation. Some of its provisions could make drilling safer. But we are not convinced that if the state allows high-volume hydraulic fracturing and horizontal drilling, it can sufficiently protect New York City's drinking water supply – or the drinking water of rest of the state's population.

The state's environmental conservation department says that the gas drilling industry is unlikely to create many new jobs for New Yorkers. "Given the newness of the industry," the plan says, "it is assumed that, in Year 1, 77% of the total workforce would be transient workers from outside the state." It goes on to speculate that eventually, 90 percent of workers would be local – but not until year 30 of shale gas development.[1]

A handful of jobs in the drilling industry could cost New Yorkers billions of dollars they don't have. That's why it is especially important for New York to proceed carefully.

The state plan does not put enough distance between hydraulic fracturing operations and the water supplies for New York City and other cities and towns. There is not yet enough scientific understanding of the implications of fracking to establish what these safe distances should be. Regulators will be forced

[1] New York State Department of Environmental Conservation, Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs, Revised Draft, September 7, 2011, at 6-233 and 6-234 [hereinafter NYDEC SGEIS 2011].

to wrestle with the natural gas industry, which has recently engaged in a massive violation of the Safe Drinking Water Act but has yet to be held accountable. In the face of this industry that has made clear it will push the legal envelope, the state has just 14 inspectors to enforce regulations effectively for thousands of wells.

These 14 overworked inspectors stand between New York City and a multi-billion-dollar disaster.

If upstate drilling causes contamination, the state estimates that building a filtration plant to clean up New York City's drinking water is $8 billion AT MINIMUM.[2] The state does not guarantee that the city's water can, in fact, be cleaned at any cost. The state's revised environmental impact statement acknowledges as much, saying "once polluted, it [is] very difficult and very expensive to return these water supplies back to their original condition."[3]

As we have testified before, natural gas drilling is an inherently risky activity that can pollute water in a variety of ways, from gas migration to spills of fracking chemicals to leaking waste pits. As we noted in a recent report, *Cracks in the Facade*, cited in the *New York Times*, the federal Environmental Protection Agency concluded in 1987 that hydraulic fracturing can contaminate underground sources of drinking water through the underground migration of fracturing chemicals. Because of these inherent risks and the great cost of cleaning up polluted water, natural gas drilling should not be allowed near the public's water supplies.

Setbacks too close for comfort

We believe that the state plan's setbacks are too close to water supplies for New York City and upstate communities. According to a study of 68 water wells in Pennsylvania and New York, published earlier this year by the National Academy of Sciences, water wells within about 3,300 feet of active shale gas wells had concentrations of methane higher than those farther away. Some water wells between 1,500 and 3,000 feet from shale gas wells had elevated concentrations of methane.[4]

In 2004 a natural gas company called Encana improperly cemented and fractured a natural gas well in Garfield County, Colorado. The company's carelessness caused natural gas from deep underground to migrate about 4,000 feet laterally, where it contaminated a stream known as Divide Creek and nearby groundwater with unsafe levels of benzene. Benzene is a known human carcinogen. It is toxic in drinking water at levels greater than five parts per billion.[5] The Colorado Oil and Gas Conservation Commission fined Encana a then-record $371,200 for the incident.[6] This summer – seven years later –

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[2] See id., at 6-47.
[3] See id., at 6-45.
[4] Osborn, Stephen G. et al. Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing, Proceedings of the National Academies of Science, May 17, 2011, vol. 108 no. 20 at 8172-8176. Accessed online September 20, 2011 at http://www.pnas.org/content/108/20/8172.
[5] URS Corporation, Phase I Hydrogeologic Characterization of the Mamm Creek Field Area in Garfield County, Prepared for Board of County Commissioners, Garfield County, Colorado, March 13, 2006, at 5-10. Colorado Oil and Gas Conservation Commission, Order No. 1V-276, September 2004.
[6] See id. Chakrabarty, Gargi. Commission Oks Record Fine for Natural Gas Seep, Rocky Mountain News, August 18, 2004, at 3B.

two groundwater monitoring wells near the creek still showed unsafe levels of benzene.[7]

In 2007, natural gas migrated from a poorly cemented and hydraulically-fractured well in Bainbridge, Ohio, causing a home to explode and contaminating at least 23 water wells.[8] A state investigation showed that one of the affected water wells was more than 2,300 feet from the gas well; another was more than 2,200 feet from the gas well, and at least four others were more than 1,000 feet away.[9]

In *Cracks in the Facade*, we cited a report from regulators in British Columbia which found that fracturing fluids from shale gas wells traveled up to 2,300 feet horizontally underground, broke into adjacent gas wells and in some cases surged all the way to the surface.[10] Drilling experts have said that hydraulic fractures could connect with nearby abandoned or improperly sealed natural gas or oil wells, sending fracking fluid, natural gas and other contaminants up these wells toward the surface, where they could pollute aquifers.[11]

The state plan recommends permitting natural gas wells within 1,000 feet of underground aqueducts that carry water to New York City. It suggests that safety can be assured if site-specific analyses are conducted.[12] But the experiences in British Columbia, Colorado, Ohio and elsewhere show that contaminants have traveled up to 4,000 feet. We think 1,000 feet is entirely too close a distance in which to allow drilling at all. As the city's Department of Environmental Protection points out, the water aqueduct linings have cracks that could be infiltrated by fluids or gas.[13] The city says that a system of brittle geologic features runs underground for up to seven miles horizontally near the city's water aqueducts and watershed. These brittle zones could allow contaminants to seep into the city's water supply from even farther away than 4,000 feet.[14]

The state plan proposes to bar drilling in New York City's watershed (and Syracuse's watershed) plus a

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[7] Olsson Associates, West Divide Seep Area Second Quarter Monitoring Status Report for June 2011, Table 1. Accessed online September 21, 2011 at http://cogcc.state.co.us/.
[8] Ohio Department of Natural Resources. Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio, September 1, 2008, at 6. A later report by Bair et al. found that following the incident of gas migration, 26 water wells had to be disconnected and temporary water tanks installed. See infra note 8.
[9] Bair, E. Scott et al. Expert Panel Technical Report, Subsurface Gas Invasion Bainbridge Township, Geauga County, Ohio, Submitted to Ohio Department of Natural Resources Division of Mineral Resources Management, June 2010 at 3-113. Accessed online September 21, 2011 at http://www.ohiodnr.com/mineral/bainbridge/tabid/20484/default.aspx. Ohio Department of Natural Resources, Order Number 2009-17, April 14, 2009 at Attachment A, Attachment B. Accessed online September 21, 2011 at http://www.ohiodnr.com/mineral/bainbridge/tabid/20484/default.aspx.
[10] British Columbia Oil and Gas Commission. Safety Advisory 2010-03, May 20, 2010. Accessed online December 19, 2010 at http://www.ogc.gov.bc.ca/.
[11] Environmental Working Group. *Cracks in the Façade*, August 4, 2011, at 14, 16, 22.
[12] NYDEC SGEIS, supra note 1, at 7-68, 7-69.
[13] New York City Department of Environmental Protection, Final Impact Assessment Report, Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed, December 2009, at 43-44. Accessed online September 21, 2001 at http://www.nyc.gov/html/dep/html/news/natural_gas_drilling_dep.shtml [hereinafter NYDEP 2009].
[14] See id., at 15.

4,000-foot buffer zone.[15] But the setback appears to start at the edge of the well pad.[16] The state plan goes on to say that horizontal wells could extend 4,000 feet or more from the vertical opening.[17] In other words, some wells that begin outside the 4,000-foot buffer could extend horizontally underneath the buffer right to the edge of the watershed. Some might penetrate the watershed. If a drilling company's intended footprint is 4,000 feet and then fissures of an additional 2,300 feet open through hydraulic fracturing, as happened in British Columbia, the underground disturbance would reach deep inside the watershed.

New York state has about 75,000 abandoned oil and natural gas wells – half of them in unknown locations. What happens if a fracture intersects with one of those old holes? Contaminants could move toward the surface, polluting ground or surface water as they rose.

Inadequate research

Not enough scientific research has been done to establish truly safe margins for setbacks. In response to a Freedom of Information Law request in 2009, the state environmental conservation department told us that it had not conducted or commissioned studies of hydraulic fracturing chemicals. As far as we know, this situation has not changed. The U.S. Environmental Protection Agency is conducting a study of the impacts of hydraulic fracturing on drinking water supplies. At the very least, New York should wait for the results of the federal study before moving forward with a gas drilling process that could cost taxpayers billions of dollars.

The state could conduct its own scientific testing to determine more precisely whether and how high-volume hydraulic fracturing and horizontal drilling can be conducted safely. The state has proposed some thoughtful regulations, for instance, a requirement to test water near drilling operations before, during and after drilling.[18] Such testing should be done in Pennsylvania, Texas or other areas with intensive shale gas drilling – before drilling proceeds in New York, not after the fact.

Few inspectors

New York must increase the number of inspectors assigned to monitor natural gas operations before allowing drilling to proceed. According to a recent *Reuters* story, the state has only 14 inspectors to oversee 13,000 active natural gas and oil wells.[19] (We contacted several staff at the Department of Environmental Conservation, including the public affairs office but could not confirm these numbers. They do not appear to be in the 1,500-page environmental impact statement.) The department expects about 1,600 applications annually for high-volume horizontal drilling and hydraulic fracturing operations. That's about 100 applications per inspector per year, on top of each inspector's current load of about 1,000 active wells.

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[15] NYDEC 2011, supra note 1, at ES-20.
[16] NYDEC SGEIS 2011, supra note 1, at ES-20, 7-71.
[17] NYDEC SGEIS 2011, supra note 1, at 5-22.
[18] NYDEC SGEIS 2011, supra note 1, at 7-44 and 7-45.
[19] McAllister, Edward. Insight: NY Water at Risk from Lack of Natgas Inspectors?, Reuters, July 29, 2011. Accessed online September 21, 2011 at http://www.reuters.com/article/2011/07/29/us-newyork-shale-drilling-idUSTRE76S5FA20110729.

As the 1,500-page environmental impact statement illustrates, natural gas drilling is a highly technical business. To its credit, the department has measures to make the process safer – at least on paper. In reality, how can inspectors with staggering case loads ensure that every well operator abides by all the rules?

The oil and natural gas industry does not have the best reputation for following the law. In January of this year, investigators for the U.S. House of Representatives energy and commerce committee reported that from 2005 to 2009, oil and gas service companies injected more than 32 million gallons of diesel fuel, or fluids containing diesel fuel, in hydraulic fracturing operations in 19 states. Diesel contains benzene and other toxic chemicals. They found that no state or federal regulators had issued the required permits for diesel fuel, an apparent violation of the Safe Drinking Water Act. The act exempts hydraulic fracturing except for fracturing with diesel.[20]

Industry officials did not deny the charge. They said they could not comply with the law because the Environmental Protection Agency had never issued regulations implementing it.[21]

The law, however, is clear. It says that companies may not inject diesel in hydraulic fracturing operations without a permit. Yet this is exactly what they have done – to the tune of 32 million gallons in 19 different states, including Pennsylvania. This record of willfully ignoring a federal law on a technicality shows that regulators will need to keep a close watch on the industry. We doubt that a handful of overworked state inspectors can scrutinize thousands of new drilling and fracturing operations as closely as they – and the public – would like.

Natural gas drilling is an inherently risky process that could have serious impacts on New York City's drinking water and water supplies in the rest of the state. The state's proposal indicates it is not taking the risks as seriously as it must. The citizens of New York City and the rest of the state should demand more rigorous research and a greater commitment to oversight before shale gas drilling can proceed.

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[20] Letter from U.S. Reps. Henry A. Waxman, Edward J. Markey, and Diana DeGette to Lisa Jackson, U.S. Environmental Protection Agency Administrator (Jan. 31, 2011).
[21] Tom Zeller Jr. A Gas Drilling Technique Is Labeled a Violation, *New York Times*, Feb. 1, 2011 at B1.

FOR THE RECORD

The City of New York

Manhattan Community Board 1

Julie Menin CHAIRPERSON | Noah Pfefferblit DISTRICT MANAGER

The New York City Council Committee on Environmental Protection
Oversight Hearing on
The Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure

Testimony by Michael Levine,
Director of Planning and Land Use,
Manhattan Community Board 1

Thursday, September 22, 2011 at 2 p.m.
250 Broadway, 16th Floor

Good morning. I am Michael Levine, Director of Planning and Land Use for Manhattan Community Board 1. Thank you, for the opportunity to testify on behalf of the Community Board regarding the use of hydraulic fracturing to drill for natural gas in New York State.

Our Community Board has passed numerous resolutions regarding this issue. On May 26, 2009, we first passed a resolution calling on the New York State Department of Environmental Conservation (NYSDEC) to prohibit the use of hydraulic fracturing in the New York City watershed. Our concern then and now was that hydraulic fracturing involves the injection of carcinogenic chemicals into the earth at extreme pressures. The composition of these chemicals is not publicly disclosed, and there has not yet been sufficient public review of the effects these chemicals can have on public drinking water. Without more information, we are greatly concerned that hydraulic fracturing in the New York watershed poses a serious risk of contamination to the drinking water of millions of residents in the greater New York City area.

Our concerns are founded on real evidence that natural gas drilling techniques have the potential to contaminate our drinking water. As recently as August 2, 2011, *The New York Times* published a graphic that analyzed how a water well in Jackson County, West Virginia, had been contaminated with fluid used in hydraulic fracturing.[i] The graphic described how the well could have become contaminated because of the extreme pressures with which chemicals are injected into the ground during hydraulic fracturing, creating underground fractures that extend as much as *2,500 feet horizontally*. Given that hydraulic fracturing could result in contaminated water over such a large area, the Community Board is concerned that the revised environmental impact statement does not include strong enough safeguards to protect our drinking water.

A New York State legislature bill (A08748 and S6244 in the Assembly and Senate, respectively) co-sponsored by State Senator Daniel Squadron was introduced with the aim of amending Environmental Conservation Law to protect the New York City watershed by prohibiting drilling for natural gas within five miles of the watershed boundaries and in the Delaware River watershed, and by increasing regulation of hydraulic fracturing in general. Community Board 1 passed a resolution strongly in support of this bill on November 24, 2009. At the time, we

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recommended broadening the legislation to include (italics denote suggested amendments): "Natural gas drillers, *gas aggregators and gas companies* are responsible for *any and all damages, including, but not limited to property and* environmental damage which occurs in the process of drilling *and transporting* natural gas. DEC *shall* require financial security to ensure that landowners are protected from any contingent liability." We still strongly believe that of such a law is essential to the protection of one of New York State's most vital natural resources, its clean, gravity-fed, drinking water.

The U.S. Environmental Protection Agency (EPA) Region 2 submitted comments the day before the comment period ended on December 30, 2009. The comments stated the need for the dSGEIS report to include a broader consideration of the impacts of hydraulic fracturing projects significantly proximal to the New York City watershed. At the time, the EPA also suggested that the New York State Public Service Commission (PSC) and the New York State Department of Health (DOH) needed to become more involved in evaluating the public safety implications of hydraulic fracturing. The EPA expressed strong reservations about the potential impacts the natural gas extraction process could have on human health and the environment.

In response to the EPA's comments we passed resolutions on February 23, 2010 and on April 27, 2010 calling for the Governor and the DEC to withdraw the dSGEIS. We passed these resolutions because DEC had not adequately addressed safety issues associated with hydraulic fracturing, which it should do before hydraulic fracturing is even considered.

On August 5, 2010, Governor Cuomo released a new energy policy book "Power NY" that focuses on maximizing energy efficiency, building the smart grid, improving the environment through renewable and clean energy, and reforming New York's energy bureaucracy. Governor Cuomo's energy plan says regarding Marcellus Shale Horizontal Drilling and Hydraulic Fracturing:

> *"Any Drilling in the Marcellus Shale must be Environmentally Sensitive and Safe: We need to explore how drilling can be done in a way that is consistent with environmental concerns. The State's Department of Environmental Conservation, as well as the federal Environmental Protection Agency, are currently studying the effects of drilling in the Marcellus Shale region. Through that assessment, New York State must ensure that, if and when the Shale's natural gas is obtained, it does not come at the expense of human health or have adverse environmental impacts. In particular, it is critical that no drilling be conducted that might negatively affect any existing watershed and that best practices in drilling are adopted and enforced by the State."*[ii]

Once elected, Governor Cuomo nominated Joseph Martins as Commissioner of the Department of Environmental Conservation. Commissioner Martins testified at a Legislative hearing on February 8, 2011 that he intended to finish reviewing comments on the dSGEIS in the next several months and release a revised draft around June 1, 2011, instead of expanding the scope of the SGEIS. Community Board 1 was outraged by this decision, and passed a resolution on March 22, 2011 reminding Governor Cuomo that on August 5, 2010 he stated that New York's "... existing watersheds are sacrosanct and Andrew Cuomo would not support any drilling that would threaten the State's major sources of drinking water."[iii]

Now that DEC Commissioner Joe Martins has released the Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure, Community Board 1 has again responded with a resolution.[iv] This resolution, which was passed on July 26, 2011, called for both a public hearing to be held in New York City and a 30-day extension on the 60-day comment period to review the Impact Statement more thoroughly. The Board believes that this Revised Environmental Impact statement represents the first steps toward lifting the New York State moratorium on hydraulic fracturing, and we are gravely concerned that this process is moving too rapidly.

Community Board 1 strongly believes that it will take more than 60 days to adequately review this report, which exceeds a thousand pages in length. While we recognize that hydraulic fracturing will be prohibited in the New York City (and Syracuse) watersheds, primary aquifers and state lands, we still have many concerns about protecting New York City's drinking water. Our concerns include, but are not limited to:

1. Contaminated hydraulic fracturing wastewater
2. Wastewater treatment plants currently designed for sanitary waste
3. Limited DEC staff resources (including funding and inspectors) and regulatory enforcement
4. Specific funding for corrective action
5. Identification of source of water to be used during the hydraulic fracturing process,
6. Vulnerability to earthquakes due to hydraulic fracturing
7. Inadequacy of prohibiting surface drilling within 2,000 feet of public drinking water supplies and 1000 feet of primary aquifers
8. Cumulative impacts, including air quality
9. Same liability for both domestic and international companies
10. Reliability of shale reserve estimates

In addition to these concerns, we also feel this revised environmental impact statement fails to take into account the recent extreme weather events that resulted in many upstate communities being flooded. Places that used to flood sporadically or not at all now experience three or four floods a year. This flooding makes hydrofracking an even greater environmental risk as drilling pits may overflow and spill their toxic contents into flooded creeks, streams and rivers that feed watersheds. Given these recent events, we need more time to update the floodplains maps and to allow communities affected by flooding to recover and then participate in the public review of the proposed hydrofracking rules.

Community Board 1 is also aware of the fact that in May 2011, New York State Attorney General Eric Schneiderman sued the federal government for failure to study hydraulic fracturing in the Delaware River Basin when drilling would affect the New York City watershed.[v] Additionally, federal law makers, including our own Representative Jerrold Nadler, have sent letters to several agencies, including the federal Securities and Exchange Commission, calling on them to reconsider recent rule changes that allow companies to avoid disclosing details about their proprietary technology used to predict future gas production and to avoid some third party audits of those predictions.[vi] These federal lawmakers asked the commission to investigate

whether the natural gas industry has provided an accurate picture to investors about the long-term profitability of their wells and whether third-party reserve audits should be mandatory.

Another issue we have is that the wastewater from natural gas drilling operations containing high levels of chloride, toxic metals, petroleum hydrocarbons and radionuclides, are already being used by several upstate municipalities as part of their road and highway maintenance programs on thousands of miles of roads for dust control, winter de-icing or roadbed stabilization.[vii] This DEC-sanctioned maintenance practice should be of grave concern to all New Yorkers since this is yet another way that the contaminants from the hydrofracking process may enter the drinking water supply. We still do not know how we will store and treat these millions of gallons of wastewater laced with potentially toxic chemicals. The question of how we will treat this wastewater is a central issue in this debate as wastewater facilities, such as the Auburn facility, one of two in New York State that currently accepts gas drilling waste water, announced that it will no longer treat gas drilling water.[viii]

Water that is clean, safe and affordable is in the interest of every New Yorker. New York City is one of the few world-class cities that do not get water from the nearest river; the city water system is one of mankind's great achievements in civil engineering, turning rainwater and gravity into the very lifeblood of our metropolis. The DEC's proposals in this revised environmental impact statement could destroy this great achievement. The proposal places an unnecessary and unconscionable risk on New Yorkers, as it only limits drilling to within a thousand feet of tunnels and aqueducts that deliver water to our city, despite the fact that New York City requested a seven-mile buffer zone. The lack of an adequate buffer zone between the drilling and New York City's aqueducts, combined with the lack of wastewater treatment plants that accept gas drilling wastewater, underscore the importance of holding more public hearings and extending the period we have to review this long and complex document.

Thank you for the opportunity to testify today.

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[i] The New York Times, "Contamination from Drinking," by Frank O'Connell and Haeyoun Park, August 3, 2011
[ii] http://www.andrewcuomo.com/system/storage/6/89/e/798/andrew_cuomo_power_ny.pdf, page 124
[iii] http://www.andrewcuomo.com/system/storage/6/89/e/798/andrew_cuomo_power_ny.pdf, page 92
[iv] http://www.dec.ny.gov/docs/administration_pdf/sgeisppt072011.pdf
[v] The New York Times, "N.Y. Natural Gas Fracking Lawsuit Raises NEPA Questions," by Lawrence Hurley, June 1, 2011

[vi] The New York Times, "Lawmakers Seek Inquiry of Natural Gas Industry," by Ian Urbina, June 28, 2011
[vii] The Ithaca Journal, "Wastewater from Gas Drilling Being Used for Area Road Maintenance," by G. Jeffrey Aaron, July 20, 2011
[viii] CNYCentral.com, "Auburn Wastewater Facility Will No Longer Treat Gas Drilling Water," by Chris Shepard, July 7, 2011

FOR THE RECORD

COMMENTS BEFORE THE NEW YORK CITY COUNCIL COMMITTEE ON ENVIRONMENTAL PROTECTION HEARING ON SEPTEMBER 22, 2011

REGARDING HYDRAULIC FRACTURING OF MARCELLUS SHALE IN NEW YORK STATE

Natural pas powers our machines but food powers us and water is needed for all. We are responsible for protecting our food sheds in NY State. That requires us to ban hydrofracking in the State so that our food will not be contaminated by chemicals used in the fracking process, brine, heavy metals radioactive elements and more that will come up along with the methane.

The 59 doctors and scientists from Physicians , Scientists and Engineers for Healthy Change in their letter sent to Governor Cuomo on September 15, 2011 said it much better than I am able and so I copy them here and plead with you to abide by what they say.

They warn Governor Cuomo that municipal drinking water filtration systems are not equipped to handle chemicals and contaminants resulting from hydrofracking.
"We the undersigned scientists write to you regarding the ability of municipal drinking water filtration systems to adequately remove contaminants of the sort found in return fluids from hydraulic fracturing, should they somehow enter the water system. The State has proposed that hydraulic fracturing not be allowed in the watersheds of NYC and Syracuse water systems (where no filtration occurs), but be allowed in watersheds where drinking water is filtered before use. The presumption appears to be that municipal water filtration plants provide protection from potential contaminants. The best available scientific information does not support this presumption.

Most municipal water filtration systems are designed to remove potentially dangerous microorganisms from water, which they do efficiently. The typical filtration system would also remove some hazardous substances. However, there simply is not an adequate knowledge base to conclude that filtering would remove all, or even most, of the hazardous substances found in flow-back fluids from hydraulic fracturing. Potential contaminants of concern known to be in some flow-back fluids include benzene and other volatile aromatic hydrocarbons, surfactants and organic biocides, barium and other toxic metals, and soluble radioactive compounds containing thorium, radium and uranium. Municipal filtration systems were not designed with such hazards in mind, and the ability of the filtration systems to remove such hazardous substances has received little, if any, study. We believe, however, that best available science suggests that some of these substances would pass though the typical municipal filtration system.

We urge the state to re-consider its position that existing water filtration systems provide adequate protection against the risk of hydraulic fracturing, should materials from flow-back fluids migrate to lakes, reservoirs, or ground-waters waters used for municipal water supplies."

Physicians, Scientists and Engineers for Healthy Change –www.psehealthyenergy.org

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FOR THE RECORD

COMMITTEE FOR ENVIRONMENTALLY SOUND DEVELOPMENT
PO Box 20464, Columbus Circle Station, New York, N Y 10023-1492
Telephone (212)877-4394; Fax (212)712-0486
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Testimony NY City Council Environmental Protection Committee

September 22, 2011

Olive Freud, Vice President, Committee For Environmentally Sound Development

212-877-4394

Fracking

There is no doubt that the process of obtaining natural gas by hydraulic fracturing, used harmful chemicals, contaminates drinking water and that natural gas is a fossil fuel producing CO2 which is causing climate change. The contaminated water then must be sent to wastewater treatment plants. The question is then should we be contaminating water, make use of wastewater facilities in order to obtain energy? Which is more important water or gas?

Then the next question. Is there an other way of obtaining energy? The answer, of course is harnessing solar and wind power. We should be investing heavily in the production and use of solar panels and windmills. It is wasteful for society to be spending millions on exploration and drilling of a product that is harmful. Unfortunately there are corporations that are profiting from the production of gas and oil. Other countries have understood the trade off and are investing their resources in renewables. We are still engaged in discussions of transitional sources of energy. That time is over. We need an effort like the Manhattan Project in the 1940s to supply our energy needs with renewables.

To: New York City Council
Environmental Protection Committee
Chairman James Gennaro
Special Hearing on Drilling in the NYC Watershed
September 22, 2011

From: Joseph Levine
NYH2O / DCS / Citizens for Water
561 Broadway, New York, NY 10012
212.219.1038
jlevine@bonelevine.net

Good Morning Chairman Gennaro and Committee Members,

I thank you for holding this Hearing and appreciate the opportunity to speak on the subject of hydraulic fracturing gas extraction related to the NYS DEC DSGEIS.

On page 11 of the Executive Summary of the Revised Draft SGEIS 2011, it reads; **"Chapters 5 and 6 contain analysis that demonstrate that no significant adverse impact to water resources is likely to occur due to underground vertical migration of fracturing fluids through the shale formation.** The developable shale formations are vertically separated from potential freshwater aquifers by at least 1000 feet of sandstone and shales of moderate to low permeability. ....That shales must be hydraulically fractured to produce fluids is evidence that these types of rock formations do not readily transmit fluids. The high salinity of native water in the Marcellus is evidence that fluid has been trapped in the pore spaces for hundreds of millions of years, implying that there is no mechanism for discharge of fluids to other formations. Hydraulic fracturing is engineered to target the prospective hydrocarbon-producing zone. The induced fractures create a pathway to the intended wellbore, but do not create a discharge mechanism or pathway beyond the fractured zone where none existed before. **Accordingly, there is no likelihood of significant adverse impacts from migration of fracturing fluids."**

This statement is proof of only that the DEC and their consultants have not read the scientific reporting done by a wide range of geologists and hydrogeologists on the subjects of fracture mechanics and migration of fluids, who have come to the opposite opinion, that migration of fluids through natural and manmade (hydrofracking) faults, a defined characteristic of the naturally fractured bedrock called the Marcellus (in this case), is not only predictable but proven.

There are numerous detailed studies about fracture mechanics, faults, joints and fissures and migration pathways that prove that contaminated liquids and gas can and will migrate in a variety of ways and can find their way to fresh water aquifers. Attached are reports from the following experts that substantiate this position; The grouip includes Hazen & Sawyer for NYCDEP, Arcadis US for the NY Watershed Inspector General, Paul Rubin,

Geologist/Hydrogeologist - HydroQuest, Garfield Co Hydrogeological Study , Jeffrey Thyne, and Marc Durand, Geologist.

This DEC statement is provided by industry in order to eliminate this issue as a point of discussion. The reason being is that there is no way to change the physics of this condition. These maps show the natural faults, joints and fractures of the geology within the Marcellus play. Please note the map that DEC is using that show the faulting patterns.

- *Thyne, Geoffrey.* Review of Phase II Hydrogeologic Study, Prepared for Garfield County. December 20, 2008

- Conventional Gas vs Hydrofracturing Gas Shale . By *Shale Gas Info.* Saturday, March 12, 2011.

- Facts and Data On Environmental Risks - Oil & Gas Drilling Operations *By S. Rana, M.Eng.*, P.E. / S. Rana, Enviromental Consulting. Society of Petroleum Engineers, 2008.

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- Socioeconomic Report—Hype In / Hype Out, Socioeconomic Study Is Premised On Incorrect Reserve Estimates. Scribd.com - SGEIS Socioeconomic Hype
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Other Relevant Documents

1. *General Comments on the 2011 Revisions*
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7. *Prohibition on Well Pads in 500 foot Buffer Around Private Water Wells*
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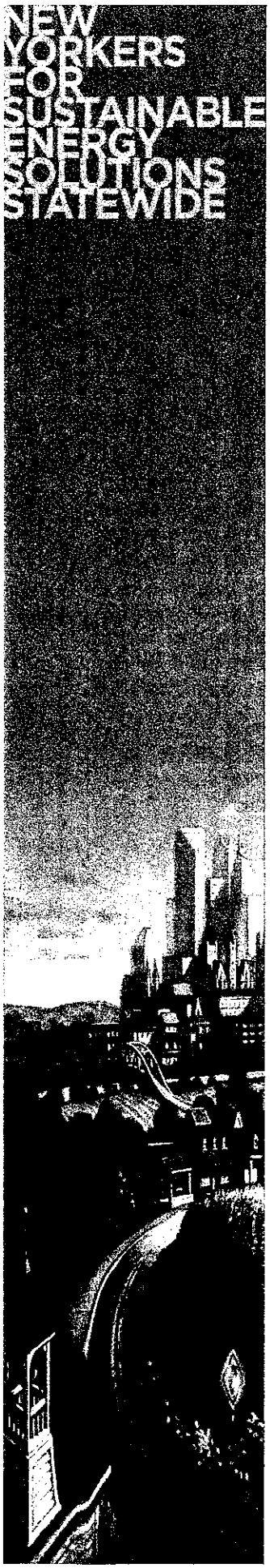


New York City Council — The Committee on Environmental Protection

Thursday, September 22, 2011 — 2:00 P.M.
The 16th Floor Committee Room, 250 Broadway, New York, NY

Oversight: The Revised Environmental Impact Statement on Hydraulic Fracturing and New York City's Upstate Drinking Water Supply Infrastructure.

To the Honorable James F. Gennaro and fellow City Council members:

My name is Michael Lebron. I am a board member of Damascus Citizens for Sustainability and a principal of New Yorkers for Sustainable Energy Solutions Statewide.

In the late fall of last year, I called the Williamsport office of the Pennsylvania Dept. of Environmental Protection, asking them for information on the number of private water wells that had been contaminated by gas mining activity in Bradford County, the most heavily drilled county in Pennsylvania. To my surprise, I was told that PADEP did not keep systematic records of that information, but that I was welcome to come down and take a look at what they had by looking at each gas well file. Furthermore, I was told that landowners and gas companies did not have to report this information if they were able to come to a resolution of the problem that was satisfactory to the landowner.

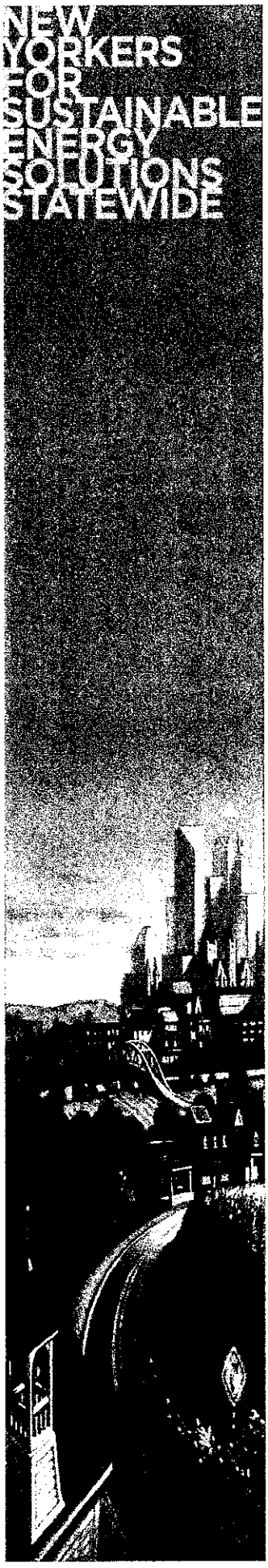
I felt that the public had a right to know about potential migratory patterns and pathways of contamination in Bradford. I set out to produce a map of known or reported contamination. The data on drilled and productive gas wells is from Bradford County's own web site which they update quarterly. The data on contaminated water wells is gathered from personal observation, that of community members, and newspaper reports.

Of particular concern to this committee are a group of gas wells drilled by Chesapeake on the Welles property in Terry Township over a year ago that are responsible for contamination of nearby water wells and are the source of methane bubbling from the riverbed of the Susquehanna. The migratory pathway distance from the nearest well to the point of contamination of the riverbed is about 2 miles. A contaminated water well of a private residence that sits maybe 500 ft. high on top of a mountain with a spectacular view of the Susquehanna is about another mile farther out.

There are migrations elsewhere in Bradford that are suspected of being as long as 5 miles.

As we can see, in Bradford County, multi-mile migration is not an academic fear, it is reality, as it is elsewhere in the country, and also in the Hazen and Sawyer study.

I spoke to Scott Perry, director of Mineral Resources in PADEP early this week about remedial action. He said that Chesapeake has been ordered to perforate the casing and re-cement it[1]. If that fails, then they will have to do a "wash-over"[2], but he was confident that they will not have to take that extreme step. I asked him whether or not the drilling activity could have stimulated fractures, joints or faults in a way that created migratory pathways autonomous to the well bore. He did not answer this question, but instead insisted that the remedial actions ordered will be successful. Dr. Ingraffea, however, says that these actions are not guaranteed to work, and that when taken by Cabot in Dimock were unsuccessful, requiring them to plug the wells. It needs to be noted that instead of remediating the problem, many Dimock residents found contamination to be exacerbated after plugging. Note also that Chesapeake claims they were following the NEW PA regs to the letter on these wells, and still had a failure.



I asked about Crystal Stroud, the woman who, after her hair started falling out, found that she had levels of barium and strontium in her system at about 10 times the federal standard. He said their investigation showed that there are naturally occurring high levels of barium and strontium in groundwater there. I tried to ask if drilling the gas well could have caused referred disturbance to the aquifer, but he simply said that the well hadn't been fracked yet, even though I asked about drilling, not fracking. I asked for the investigation study, he said a press release had been issued. I asked for the investigation study again, he said "I would have to look for it, that it is on the DEP web site", but then added "Maybe you should submit an FOIA".

I asked Scott "Why would they abandon their home?"

"I am not aware that they abandoned their home."

"I just told you they abandoned their home; besides, it has been all over the news."

I surmised that Scott's inexcusable efforts to dismiss the risks of the reality of this totally new technology must be rooted in an institutional inclination to continue to think of these gas wells as your grandma's gas wells. If this institutional mentality pervades the NYS DEC, this may be the reason why NYC will not have completed the job of protecting its watershed unless it does the job itself. Unless we have a regulatory scheme, and regulators, that recognize that this new era has brought a host of new problems and needs new standards, we will continue to get the kinds of human misery it has inflicted on families like the Strouds and we will continue to take risks for resources like the watersheds not only of New York, but of those throughout the State, that are totally disproportionate to any gain we will get from gas fracking.

I am submitting on CDs additional information regarding cementing, casing, faults, and fractures - particularly in regard to the situation in Terry Township, as well as the Army Corps decision on a 3,000 ft. buffer and other information.

Thank you.

Michael Lebron
Damascus Citizens for Sustainability
New Yorkers for Sustainable Energy Solutions Statewide

1- also known as a squeeze job.

squeeze n: 1. a cementing operation in which cement is pumped behind the casing under high pressure to re-cement channeled areas or to block off an uncemented zone.

squeeze cementing n: the forcing of cement slurry by pressure to specified points in a well to cause seals at the points of squeeze. It is a secondary cementing method that is used to isolate a producing formation, seal off water, repair casing leaks, and so forth. Compare plug-back cementing.

squeeze job n: a remedial activity whereby a cement slurry is pumped into open perforations, split casing, or a fractured formation, to effect a blockage.

2- wash over v: to release pipe that is stuck in the hole by running washover pipe. The washover pipe must have an outside diameter small enough to fit into the borehole but an inside diameter large enough to fit over the outside diameter of the stuck pipe. A rotary shoe, which cuts away the formation, mud, or whatever is sticking the pipe, is made up on the bottom joint of the washover pipe, and the assembly is lowered into the hole. Rotation of the assembly frees the stuck pipe. Several washovers may have to be made if the stuck portion is very long.

washover pipe n: an accessory used in fishing operations to go over the outside of tubing or drill pipe stuck in the hole because of cuttings, mud, and so forth, that have collected in the annulus. The washover pipe cleans the annular space and permits recovery of the pipe. It is sometimes called washpipe.

washover string n: the assembly of tools run into the hole during fishing to perform a washover. A typical washover string consists of a washover back-off connector, several joints of washover pipe, and a rotary shoe.

FOR THE RECORD

STATEMENT BY JEFF ZIMMERMAN, counsel to Damascus Citizens for Sustainability:

Earlier this week we learned that one of the vertical test wells that were allowed to be drilled in the Delaware River Basin under the ASEDD was issued a violation notice in August by the Pennsylvania Department of Environmental Protection for improper cementing that was allowing methane to escape from the well. Data available from PaDEP shows that cementing and casing violations have been found at 65 well sites out of 456 inspections completed in the first 8 months of this year. That is a cementing and casing failure rate of greater than 14%.

It ought to go without saying that there is no industrial of commercial process where 14% would be considered an acceptable failure rate. Secretary Krancer of PaDEP has been quoted as saying, "One case of methane migration or well contamination is one case too many." If you agree with Secretary Krancer, then what are you going to do to achieve his zero failure rate goal?

It is important to remember that the well (the Davidson 1v well) most recently found to be leaking methane because of a bad cementing job was a vertical test well. There was no horizontal drilling; there was no production activity; there was no fracking; there was no other well stimulation. Yet methane found a pathway, probably because of the faulty cementing of the well, to be released into the environment.

My question to each Commissioner and to Commission staff is this: Of the 15,000 to 18,000 wells you project may be drilled in the Delaware River Basin, where would you want to have the 2138 to 2566 bad-cement-job leaking wells located?

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition against fracking

Date: 9/22/11

(PLEASE PRINT)

Name: Ling Tsou

Address: 80 Beekman Street, NY, NY 10038

I represent: United for Action

Address:

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: DAVID BRAUN

Address: 37 Grand Ave Brooklyn

I represent: GASLAND / UNITED FOR ACTION

Address: 37 Grand Ave

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Arnold Froyel

Address: 340 West 28th St. #21J, NYC 10001

I represent:

Address:

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Kimberlea Kane

Address: DEP Special Assistant to the Dep. Comm.

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Paul Rush Deputy Commissioner

Address: DEP Bureau of Water Supply

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: STEPHANIE LOW

Address: 1215 5 AVE

I represent: NY-H2O

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Dina Publon

Address: 590 Parkside Ave 2BN Brooklyn 11226

I represent: unitedforaction.org

Address: N/A

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: ROBERT CASSARA

Address: 973- BAY RIDGE PKWY, BK, NY 11228

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. fracking Res. No. _____

☐ in favor ☒ in opposition

Date: 9/22/2011

(PLEASE PRINT)

Name: Ann Seligman

Address: 235 E. 46 St C, NYC 10017

I represent: /

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9-22-11

(PLEASE PRINT)

Name: Cathleen Breen

Address: 9 Murray St, NY NY 10007

I represent: NYPIRG

Address: 9 Murray St, NY NY 10007

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

9/22/11

I intend to appear and speak on Int. No. _____ Res. No. _____

☑ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: A. Wiseman

Address: 1145 Morrison

I represent: MFSC

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9.22.11

(PLEASE PRINT)

Name: Aviva Shimoni

Address: 214 Riverside Dr Apt 10D

I represent: Tax Payers

Address: Self

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. ________ Res. No. ________
☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: ALEX TUFFEL

Address: 69-02 B 186 LANE FRESH MEADOWS NY 11365

I represent: UNITED FOR ACTION

Address: MAY I BE PLACED SOMEWHERE UP IN THE ORDER I NEED TO LEAVE FOR WORK BY 5:00.

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. ________ Res. No. ________
☐ in favor ☑ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Eric Weltman

Address: 489 Hicks St, Brooklyn, NY

I represent: Food & Water Watch

Address: 155 Water St, Brooklyn, NY

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. ________ Res. No. ________
☐ in favor ☑ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Jean Gale [illegible]

Address: [illegible] 18[illegible] St

I represent: FGG Food + Nutrition [illegible]

Address: [illegible] W 11th St NYC NY 100[illegible]

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: 9/22/2011

(PLEASE PRINT)

Name: Dusty Horwitt

Address: 1436 U St, NW, Suite 100, Washington, DC 20009

I represent: Environmental Working Group

Address: Same as above

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition of hydraulic fracturing

Date: 9/22/2011

(PLEASE PRINT)

Name: Margaret Rafferty

Address: 530 E 23 St Apt 2G NY NY 10010

I represent: private citizen

Address:

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition TO HYDROFRACK.

Date: 9/22/11

(PLEASE PRINT)

Name: BUCK MOORHEAD

Address: 236 West 27TH ST NYC 10001

I represent: NYH2O

Address:

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition to hydrofracking

Date: 9/22/11

(PLEASE PRINT)

Name: Mackenzie Schoonmaker

Address: Riverkeeper, E House 78 No. Broadway, White Plains, NY 10603

I represent: Riverkeeper

Address: Same as above

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Brad Brooks

Address: 40 River Rd HY HY 10044

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9-22-2011

(PLEASE PRINT)

Name: MICHAEL LEBRON

Address: 36 COOPER SQ #7F NY

I represent: DAMASCUS CITIZENS

Address: DAMASCUS PA

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. SGEIS Res. No. _____

☐ in favor ☑ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: JOE LEVINE

Address: 561 BROADWAY

I represent: NYH2O/DCS/Citizens for Water

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9/22/2011

(PLEASE PRINT)

Name: Olive FREUD

Address: 305 West 72nd st

I represent: Committee for Environmentally Sound Decisions

Address: P.O. Box 20464 Columbus Circle Station 10023

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: PANIELE GERARD

Address: 355 RSD, 7W 10025

I represent: THREE PARKS INDEPENDENT DEMOCRATS

Address: PO Box 1316 NYC 10025

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: SEPT 22, 11

(PLEASE PRINT)

Name: DAVID FISCHER

Address: 533 18 ST BROOKLYN 11215

I represent: MY SELF

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Tony Gebalie

Address: 34 E 4th St. NYC

I represent: No Frack NY

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Deanna Bitetti

Address: 74 Trinity Place. 9th fl NYNY

I represent: Common Cause/NY

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9-22-11

(PLEASE PRINT)

Name: Richard Lind

Address: 66-22 108th St Forest Hills NY

I represent: People who live in my

Address:

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Tim Woodcock

Address: ~~the~~ 117 Stanhope St.

I represent: Myself

Address:

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: 9/21/2011

(PLEASE PRINT)

Name: SANDRA M KOPONEN

Address: 147 W 14th St #10 / NY, NY 10011

I represent: myself

Address:

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____
☐ in favor ☒ in opposition of fracking

Date: _____

(PLEASE PRINT)

Name: Anne Bassow

Address: 271 19th St

I represent: myself

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____
☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Alice Alcala

Address: 333

I represent: United For Action

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____
☐ in favor ☑ in opposition

Date: _____

(PLEASE PRINT)

Name: MICHAEL LEVINE

Address: 49 CHAMBERS ST.

I represent: MAN EBJ

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. 922
☐ in favor ☒ in opposition OF FRACKING

Date: _____

(PLEASE PRINT)

Name: MARJORIE HOCHMAN

Address: FOREST HILLS, NY

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____
☐ in favor ☒ in opposition

Date: 9-22-11

(PLEASE PRINT)

Name: Marilyn Stern

Address: _____

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____
☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: SHIUHO LIN

Address: 75-55 183 ST. Fresh Meadows, NY 11366

I represent: Gray Panthers

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: ARNOLD GORE

Address: 720 FORT WASHINGTON AVE

I represent: Consumers Health Freedom Coalition

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: Alex Tobias

Address: 2015 E. 7th Brooklyn, NY

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: 9/21/11

(PLEASE PRINT)

Name: ERIC GOLDSTEIN

Address: 40 W 20 ST NY NY

I represent: N.R.D.C - Natural Resources Defense Council

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9-27-11

(PLEASE PRINT)

Name: Mrs Gillingham

Address: 669 Cattail Rd

I represent: Catskill Mountain keeper

Address: Po Box 391 Youngsville NY

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☑ in opposition

Date: _____

(PLEASE PRINT)

Name: Chris Michaels

Address: 234 E. 25th St., #18

I represent: NRDC

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: Sep. 21, 2011

(PLEASE PRINT)

Name: [redacted] Sara Valenzuela

Address: _____

I represent: Scott Stringer

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: Sept. 22 2011

(PLEASE PRINT)

Name: Hilary Baum

Address: 5454 Palisade Ave. Bronx NY

I represent: Food Systems Network NYC

Address: Hanson Place, Brooklyn

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: ALBERT F. APPLETON

Address: 1623 3rd AVE - 36F

I represent: _____

Address: NYC P/28

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: MARY BONNIE WEBBER

Address: 1155 PARK AVE, NYC

I represent: GRASS-ROOTS

Address: 1155 Park Ave, NYC

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☒ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: RAYMOND J. IRRERA

Address: _____

I represent: _____

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 9/22/11

(PLEASE PRINT)

Name: GUSTI BOGOK

Address: 130 W. 16th St. #41 NY NY 10011

I represent: _____

Address: _____

Please complete this card and return to the Sergeant-at-Arms