CITY COUNCIL
CITY OF NEW YORK

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TRANSCRIPT OF THE MINUTES

Of the

COMMITTEE ON ENVIRONMENTAL PROTECTION

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April 23, 2018
Start: 1:00 P.M.
Recess: 3:31 P.M.

HELD AT: 250 Broadway, Committee Room
16th Floor

B E F O R E: COSTA G. CONSTANTINIDES
Chairperson

COUNCIL MEMBERS: Adrienne Adams
Rafael L. Espinal, Jr.
Steven T. Levin
Donovan J. Richards
Eric A. Ulrich
Kalman Yeger
Jimmy Van Bramer

A P P E A R A N C E S (CONTINUED)

Angela Licata
Deputy Commissioner for Sustainability New York City's Department of Environmental Protection

John McLaughlin
Managing Director, Office of Ecosystem Services, Green Infrastructure and Research
Department of Environmental Protection

John Lee
Deputy Director for Green Buildings and Energy Efficiency
Mayor's Office of Sustainability

Michael Shaikh
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Mayor's Office of Recover and Resiliency, Mayor's Office of Sustainability and the Mayor's Office of Environments Coordination

Philip Orton, Scientist
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Catherine McVay Hughes
Former Chair of Manhattan Community Board 1

Mike Dulong, Staff Attorney
Hudson Riverkeepers

William Sweet, Oceanographer
The Center for Operational Oceanographic Products and Services - NOAA

DEAN HOGE: Pretest recording on Environmental Protection. Today's date is April 23, 2018. Today's hearing is on EPA and is being recorded by Dean Hoge.

CHAIRPERSON CONSTANTINIDES: [gavel] All right. Good afternoon and welcome. I am Council Member Costa Constantinides, Chair of the Committee on Environmental Protection. Today the Committee will hear an oversight hearing on the threat to Jamaica Bay, a case study of flooding and sea level rise in New York City. Jamaica Bay's future is in severe jeopardy as 50% of the Bay's land surface area of its marshy islands have vanished from 1900 to 2000 and sea levels continue to rise. Further, increased precipitation, with increased precipitation it is likely that the groundwater table will rise even more in the watershed resulting in a variety of consequences that could potentially affect the 500,000 people who live in the Jamaica Bay watershed adjoining Jamaica Bay. At a City Council hearing on April 12, 2018, the Mayor's Director of Recovery and Resiliency testified by the 2050's average temperature is projected to increase between 4.1 to 5.7 degrees Fahrenheit. New York City's annual

precipitation is projected to increase between 4 and 11% and sea levels are projected to rise between 11" and 21" on top of a foot of sea level rise already witnessed since 1900. For New York City's waterfront communities adjoining Jamaica Bay, this a life threatening reality. Further extreme weather events could cost $90 billion in damages by 2050 compared to the $19 billion caused by the catastrophic events of Super Storm Sandy. A recent report by the National Oceanic and Atmospheric Administration NOAA finds that by 2100 high tide flooding will occur every other day. That's 182 days a year and more often under the intermediate low scenario within the northeast and southeast Atlantic, the eastern and western Gulf and the Pacific islands. The report also projects that flood frequency along the coast of the northeast Atlantic will reach an on average about 235 and 365 days per year within 95 and 100% from the tides. In the future we can expect increased flooding in New York City. Intro #628 will require a study that will help identify areas within the study most susceptible to flooding and thereby enable the City and its residents to better prepare for extreme weather events such as flooding. Intro 749 requires

the office of long term planning and sustainability in consultation with the Commissioner of Environmental Protection to develop a pilot program for the institutionally used, City owned or sub-science buildings located in the groundwater supply area. Ideally the pilot will be located in a building that already uses electricity to pump ground water out of its buildings much like York College or IS8 in Jamaica. Finally, Intro 750 establishes a Jamaica Bay task force to provide recommendations to the Commissioner and the Speaker of the Council on the cleanup of Jamaica Bay, the process by which combines sewer overflows are managed for the Bay including long term control plans and the effects of climate change on the Bay. I had the opportunity to tour the communities with my colleague, Council Member Daneek Miller on Friday and we saw the groundwater continuing to rise in the basements of buildings of our schools, of our, of York College itself and I'm looking forward to hearing about the radial study as well and also looking at how we can turn that water into energy as we're gonna pump it out into our sewer systems, how we can utilize that to create energy so we don't have to use as much

fossil fuels as well to help decrease the effects of climate change on these communities that are already overburdened. The pumps having to be changed every year are pretty significant so with that I think I want to recognize my colleague, Jimmy Van Bramer, who's not a member of our Committee but we welcome him just the same and I think at this point we'll hear from the Administration. Before that I just want to thank our staff, our attorney, Samara Swanston [phonetic], our policy analyst, Nadia Johnston and our finance analyst, Jonathan Seltzer, as well as my counsel, Nick Wazgowski [phonetic]. Samara, if you could swear in the administration. Thank you.

SAMARA: Could you please raise your right hand. Do you swear, affirm to tell the truth, the whole truth and nothing but the truth today?

[crosstalk]

ANGELA LICATA: Good afternoon Chairman Constantinides and Council Members and Staff. I am Angela Licata, Deputy Commissioner for Sustainability at New York City's Department of Environmental Protection. I'm joined by my colleagues, John McLaughlin, Managing Director of the Office of

Ecosystem Services, Green Infrastructure and Research at DEP and John Lee, Deputy Director for Green Buildings and Energy Efficiency at the Mayor's Office of Sustainability. Thank you for the opportunity to testify in relation to flooding and sea level rise in New York City, specifically Jamaica Bay and southeast Queens. In April 2015, Mayor de Blasio released the groundbreaking One New York, the plan for a strong and just OneNYC, a strategic plan for inclusive growth and climate action. OneNYC addressed the challenges that we face as a city with growing population and inequality crisis, aging infrastructure as well as the risks of climate change. Among the climate risks we face today is how we adapt our stewardship of our land, resources and waterways which are central to DEP's mission. Last Friday the city released the OneNYC 2018 progress report which shows that since 2015 the city has made significant progress towards OneNYC's goals. Today, water quality in New York Harbor is better than it has been in over a century. Habitats are being restored and New Yorkers are able to use our waterways for commerce and recreation. These improvements to New York Harbor, water quality and

direct response to the over $12 billion dollars in investment over the last several years to upgrade wastewater treatment plants, sewer systems, combined sewer, overflow abatement, green infrastructure, marsh land restoration, nutrient removal from wastewater amongst other initiatives. Jamaica Bay is one of the largest coastal wetland ecosystems in New York State. Encompassing 12,000 acres, Jamaica Bay is a beloved network of marsh islands, wetlands, maritime shrub and dune communities, shorelines and open water. Local law 71 of 2005, tasks DEP with developing the Jamaica Bay Watershed Protection Plan, a living adaptive management document that evaluates current and future threats to the Bay as well as the benefits of coordinated research, restoration and water quality projects. To date, DEP has committed $32 million to 26 individual projects and efforts for ecosystem restoration such as the 20,000 square foot oyster bed project at the head of bay in Jamaica Bay, a ribbed muscle water filtration project, eel grass restoration, algae and sea lettuce harvesting and marsh island and habitat restorations. In addition to these ecological improvements, DEP completed $534 million in upgrades mostly related to nitrogen

reduction at the Jamaica and 26 Ward wastewater treatment plants. Due to these upgrades, nitrogen discharges into Jamaica Bay have declined 43% since the year 2000, from 45,300 pounds per day to an estimated approximately 26,000 per day. In additions, upgrades at the Rockaway and Coney Island wastewater treatment plants are projected to be completed by 2020 and 2022 respectively. DEP also has an aggressive water quality sampling program in Jamaica Bay that is serving as a model for the rest of the City. These studies as well as the water quality sampling and analysis conduct for a long term control plans show that the water quality in Jamaica Bay has and will continue to improve dramatically as a result of the critical green and gray investments made by New York City. Since 2010, DEP has committed a little over $1 billion in gray infrastructure projects to mitigate combined sewer overflows throughout the city which have helped CSO's by an estimated 38% in Jamaica Bay alone since 2007. These projects include sewer cleaning and the 26th Ward wastewater treatment plan drainage area, dredging of the Hendricks Canal, upgrades at the Spring Creek auxiliary wastewater treatment plant, construction of

the Patrogit [phonetic] CSO facility and construction of high level storm sewers in Fresh Creek. We have also committed $300 million for green infrastructure projects for neighborhoods a tributary to Jamaica Bay such as Brownsville, East New York and Oxone Park. These green infrastructure projects include rain gardens and city streets and sidewalks and retrofits of parks, schools and New York City Housing Authority developments. This June DEP will submit its Jamaica Bay CSO long-term control plan LTCP to the New York State Department of Environmental Conservation DEC for review and approval. The purpose of the LTCP is to identify further appropriate CSO controls or projects necessary to achieve water body specific water quality standards consistent with federal CSO policy and the water quality goals of the federal clean water act. DEP kicked off the Jamaica Bay long term control plan in 2016 and has held multiple stakeholder meetings throughout its development. Just last week we met with stakeholders to share our proposal which builds on earlier ecological projects to expand green infrastructure, add an additional 50 acres of wetlands or other coastal habit around the Bay's perimeter, install rib muscles for biological

water quality treatment and evaluate the potential for environmental dredging. We strongly believe that an integrated approach to water quality improvements has a wide variety of benefits such as additional storm water management, increased protection against flooding, greater co-benefits for Brooklyn and Queens residents such as urban heat island mitigation, neighborhood greening increased adaptation measures for climate resiliency, increased protection from coastal flooding through wetland creation and restoration, improved overall water quality and increased habitat for wildlife through wetland protection. We are currently scheduling additional stakeholder meetings and we will work with environmental advocates and the State DEC to refine the scope before we formerly submit the plan this June. Clearly we have many good things happening around Jamaica Bay and we work closely with local stakeholders. Introduction 750 looks to formalize that engagement by legislating the Jamaica Bay task force. As you know, there is a community led task force that already meets quarterly and DEP regularly attends these meetings with our colleagues from DEC and the National Parks Service. Over the years, we

have partnered with many of these advocates and fund projects such as shoreline clean up and marsh island restoration that we had mentioned earlier and we will be working with them on a state of the Bay symposium this fall. We are more than happy to work with the Council and all local stakeholders to find the best way to formalize this task force. Introduction 749 would require a study and pilot program related to open loop geothermal applications in southeast Queens. We appreciated the opportunity to speak to Committee staff last week to better understand the intent of this bill. The city shares with the Council a collective enthusiasm for its geothermal energy systems. The geology beneath our feet can be accessed as a clean energy resource. Ground source energy is an essential part of the city strategy to reach our clean power targets and greenhouse gas reduction goals. The city has already deployed seven geothermal projects across the five boroughs in recent years and we are eager to measure the performance and results to prove that these systems work as designed. As with any new equipment, there is a need for commissioning at start up and the calibration in its early days. It is important to

note that not every site is favorable for a geothermal project. Feasibility is a function of geologic conditions and waters beneath the project site. The specific energy demands of the building itself based on how the building is to be used and an understanding of the impacts to the environment from the exchange of heat with a subsurface geology. We share this Council's concerns regarding flooding specific to southeast Queens. Southeast Queens experience rapid residential and commercial growth from the 1920's through the 1960's and many of the natural water courses that previously drain the area were paved over by developers exacerbating flooding. The low lying topography of the area and the enlargement of Kennedy airport significantly complicated the installment of large storm sewers making planned work extremely costly. Major projects have been deferred until Mayor de Blasio authorized $1.5 billion over ten years for the southeast Queens flood mitigation plan. This has since been increased to $1.9 billion. Together with our partners at the Department of Design and Construction and the Department of Transportation, DEP has developed a four point approach to approve conditions in the

area. Construct quick fixes such as storm sewer extensions targeting full-size sewers and green infrastructure to bring near term flooding relief, build neighborhood sewer projects where there is existing available capacity in the existing sewer system, create future capacity for further neighborhood sewer projects by investing in large trunk sewers and evaluating opportunities to reduce ground water flooding. Together these four approaches are starting to deliver both immediate and long lasting relief for many residents of southeast Queens. As required by the Council, our latest update on project delivery and an easy to use map were made available on line just last month. We do understand, however, that groundwater flooding is still a real challenge for some property owners in this community. In July 2017, Mayor de Blasio announced that the city would conduct a feasibility study for a groundwater drainage project aimed at addressing basement flooding in southeast Queens. The groundwater table has risen over the last two decades and a number of residential and commercial properties report water rising up through their basement foundations. DEP leadership has seen this

firsthand in institutions like York College, Allen Senior Housing and Carter Community House where constant pumping is expensive and inconvenient. The study has been measuring how high the ground water table has risen, assessing how much it should be lowered in order to mitigate the basement flooding and determining the feasibility of a radial collection plan. Next month we plan to review these findings of that study with all stakeholders, especially with local Council Members. We agree that we must continue to study this issue diligently and determine proper next steps to help resolve this issue once and for all. It is still unclear whether the feasibility and costs associates with either the radial collection study or the open loop geothermal application included in this bill will deliver the intended results. For example, use of ground water in southeast Queens for geothermal would require treatment and technology that could be really expensive and feasibility would be the first step before implementation of a pilot or demonstration project. That said, we want to work very closely with the Council and local stakeholders to ensure we get to the preferred solution as quickly and cost

effectively as possible. Intro 628 would require the Mayor's Office of Recovery and Resiliency to develop and post publicly a map of areas in the cities most susceptible to increase flooding and a long term plan preventing or mitigating such increase flooding and its effects in those areas. Hurricane Sandy forced the City to consider the risk associated with coastal flooding. However, as the incidence of extreme weather increases, our city faces another type of flood risk that requires attention. Extreme rainfall can cause urban flooding also called flash or inland flooding when storm water surpasses the capacity of our drainage systems and flows over the surface. It can be worsened when it occurs at the same time as coastal flooding. Inland flooding can flood underground infrastructure in basements and physically damage the built environment. In response to these challenges, the city has already begun taking steps to better understand and address urban flooding. One new program led by DEP in partnership with the Office of Recovery and Resiliency is a cloudburst management study and pilots. Cloudburst is another name for an intense rainfall event. These cloudburst mitigation efforts offer a new vision for

dual drainage in New York City demonstrating how streets and green spaces can increase the capacity of our drainage system. This work has benefitted from a close multi-year partnership with the City of Copenhagen, Denmark, DEP's investments in thousands of rain gardens as well as green roof incentive programs. Going forward, ORR's climate resilience design guidelines recommend how new city capital projects retain more storm water on site. Building on this work already done, DEP and ORR have just procured a citywide storm water resiliency study that we expect to complete by the end of 2018. The purpose of this study is to model urban flooding in the city today and in the future and to determine how interventions can help. The study will develop a city wide model based on climate projections from the New York City Panel on Climate Change to test multiple rainfall scenarios and investigate the impact of changing climate conditions on flood conditions and existing storm water management practices. These impacts include changes in sea level, ground water and the intensity, duration and frequency of precipitation events. Result on these analysis will include flood maps, high level analysis

of storm water management options and costs and a prioritized list of proposed interventions. The 2019 OneNYC update will include results from this study and mitigation strategies for addressing urban flooding. We look forward to working with the Council on aligning our work with the goals presented in Intro 628. Again, these are very important issues and we look forward to collectively solving them with the Council. Thank you for the opportunity to testify and we're happy to answer any questions.

CHAIRPERSON CONSTANTINIDES: Thank you for your testimony. We've been joined by Council Member Ulrich and Council Member Kalman Yeger from Brooklyn. Thank you both for being here. So let me begin by asking how does the Jamaica Bay Watershed Protection Plan take into effect sea level rise, water table rise?

ANGELA LICATA: So the Jamaica Bay Watershed Protection Plan was the first of its kind a comprehensive set of strategies to deal with a variety of issues that were threatening Jamaica Bay. Sea level rise was a study that was done outside of that document and we have borrowed from the Office of Resiliency the information that is coming out of the

projections from the New York panel on climate change so there are no specific strategies in the Jamaica Bay Watershed Protection Plan which is looking more at the water quality issues and some of the issues associated with transportation and encouraging use of Jamaica Bay whereas the New York panel on climate change is providing the information that is utilized by the planners.

CHAIRPERSON CONSTANTINIDES: We probably should have that all in one document, right? We probably should be working on these things holistically and not in pieces?

ANGELA LICATA: Yes, that's a fair point. We're updating that document, I believe it's due this October 2018, so we can include that information as part of that plan so that we have everything in one place.

CHAIRPERSON CONSTANTINIDES: And the task force that we were talking about that currently meets, which does a great job, they used to have formalized. They used to be part of the bill that DEP, you know, they'd worked as partnership and then by force of law they were dissolved

[In background – Inaudible]

CHAIRPERSON CONSTANTINIDES: Local Law 71 they were dissolved, correct?

ANGELA LICATA: When, I'm trying to think back now. Local Law 71 did have a committee that was established to oversee the preparation of the first Watershed Protection Plan. Then we needed to do an annual update and then that was turned into a biennial update and the group was not, I don't believe that the legislation required that group to continue meeting after the first installment of the Watershed Protection Plan.

CHAIRPERSON CONSTANTINIDES: They still, but they've still continued on.

ANGELA LICATA: They, they predated

CHAIRPERSON CONSTANTINIDES: Right.

ANGELA LICATA: If I'm not mistaken Local Law 71 at that time. We were interacting with that group even before the Watershed Protection Plan was initiated.

CHAIRPERSON CONSTANTINIDES: I just think it's a good idea for us to continue these partnerships and formalize them, right. When we have, I mean we will have consistent homework that's due. We'll have to look at that homework. We'll

have to have a real partnership and a commitment on both sides to continue to work with one another. Whoever the Mayor, mayoralty is, right. I mean, we all, there will be a different mayor at a certain point. They're will be different Council Members but we want to make sure the things we put in place are formalized. Isn't that the best way to go around policy?

ANGELA LICATA: Yeah, I mean we are very committed to working with that stakeholder group. John McLaughlin to my right is a regular attendee of that group. We see those stakeholders in many instances at our public meetings so we have quite a lot of interaction and we would welcome continued interaction with them.

CHAIRPERSON CONSTANTINIDES: And how are we working with the MTA when looking at increased flooding anticipated relating to city subways?

ANGELA LICATA: Can you answer that John from ORR's perspective?

CHAIRPERSON CONSTANTINIDES: Does it mean, you know, southeast Queens already has many challenges when it comes to being a transit desert and as our subways sort of get sort of more under

siege when it comes to flooding, how are we dealing with the MTA to sort of come up with long term plans?

JOHN LEE: Yeah, I was looking, I can't speak on behalf of the MTA right now but it is a coordinated effort. There is a major deposit of storm waters always in the tunnels and it's a part of an integrated effort to manage our storm water effectively but I'm gonna have to get back to you with more specific answer to your question.

CHAIRPERSON CONSTANTINIDES: All right, cause I mean you look at what's going on with the L train and the shutdowns that are anticipated and so the chaos that's going, that's going to ensue from that and the impact, the real impact on communities. We've already seen impacts in many of these neighborhoods already so that could be a precursor to flooding in other neighborhoods and I think getting out in front of it is a good place to start. How will we address rapid increases in sunny day flooding?

ANGELA LICATA: Well that's what we were talking about in terms of our Cloudburst planning.

CHAIRPERSON CONSTANTINIDES: Right.

ANGELA LICATA: We have been studying what is being done both nationally and internationally. We found that Copenhagen, Denmark has some very interesting strategies that we are trying to replicate here. We have completed some preliminary planning in response to where we believe there are water courses that were filled over time to allow for development, how do we allow for that water to not necessarily run in the same water course because that ship has sailed but in terms of developing a strategy where the land can provide some relief and some storage and slow and detain the water so that the flooding is minimized and attenuated.

CHAIRPERSON CONSTANTINIDES: So what about flooding from high tides as well? I mean there will be situations where, in the future as sea level rises, the sun will be out but high tides will be flooding on a semi-daily basis. What are ORR's thoughts on that and, you know, if climate change is going to be different, right? It may just be that much more flooding every day to the point where communities are gonna be under siege even when it's beautiful outside.

ANGELA LICATA: Right so once again, you know, from the New York City Department of Environmental Protections perspective, we're responsible for loving to alleviate inland, overland flooding so we're responsible for drainage. That's the best way I can put that.

CHAIRPERSON CONSTANTINIDES: Um-huh.

ANGELA LICATA: Where our system would be impacted would be if the tides rise and block our sewers from being able to have positive drainage so that is something that we are studying, that is something that we are looking at with respect to where tide gates are appropriate, where tide gates can be problematic because they affect the hydraulic grate line. We're studying that as well so we have a new office that was created within the DEP called the Office of Storm Water Planning. It's under our engineering group and they are really starting now to initiate a lot of activity around that type of planning for those future sunny day, if you will, type of events.

CHAIRPERSON CONSTANTINIDES: I'd love to meet with them and hear what their thought on how we work forward together. What resiliency measures are

we taking on critical City infrastructure in relation to these types of flooding?

[background talking – Inaudible]

ANGELA LICATA: Yeah, unfortunately, Suzanne Duroche [phonetic] was supposed to represent the Office of Resiliency and she was ill and she was not able to make it today. John Lee is here but his specialty is more on the energy side and green buildings so for some of those questions we may have to defer and get back to you so that we can have the experts attest to the points their activities

CHAIRPERSON CONSTANTINIDES: So I guess the questions I have and either John can answer them or we can get an answer and I will want an answer in writing if that's the case then. What sort of measures are we taking on critical city infrastructure in areas like Jamaica Bay in particular? John, do you have anything that you say now or I guess I'm gonna wait for a letter.

JOHN LEE: With all due respect, sir, you'll have to wait.

CHAIRPERSON CONSTANTINIDES: And there was no one from ORR they could send in their place

JOHN LEE: Sorry, and apologizes on behalf of Ms. Duroche. It was a last minute thing and respectfully, she could not attend but we will definitely get back to you with written responses.

CHAIRPERSON CONSTANTINIDES: I think the Commissioner should give me a call on this. It's unacceptable that this is a committee hearing on resiliency and flooding and I don't have ORR in the room so they should at least give me a call prior and not just tell me on the stand that they are not going to be attending today and if there is someone who was sick, which I completely understand, they could find someone to send. I think they have more than one person who work in the office, right, so that's just completely ridiculous that I'm sitting here at 1:30 and this is the first I'm hearing that there's no one here from ORR. That's just unacceptable.

ANGELA LICATA: And I completely apologize and if we can provide the answers to these questions, we certainly will follow up in writing and we'll have somebody get back to you as to why there was such a last minute change.

CHAIRPERSON CONSTANTINIDES: The Commissioner should give me a call. All right, all

right, so when it comes to, my last question and I'll let it move on to some of my colleagues here. How do we, how does the City define vulnerable populations in relation to flooding risk, flooding risk areas?

ANGELA LICATA: Do you want to answer?

JOHN LEE: Sure, so I mean that's a technical understanding which is risk exposure and that's the waterways management aspect and so whether it be storm surge or flash flood, there's a different risk assessment that comes with that and so there is a technical vulnerability to that but we also look at it from a sort of social vulnerability aspect to it where we intersect understanding of the demographic nature of the communities and their wherewithal to be able to invest in the necessary improvements to build resiliency to that and so it is a sort of a combination of both the technical, scientific understanding and there's also a social, economic understand to a vulnerability assessment.

CHAIRPERSON CONSTANTINIDES: And we're working with these communities, we're making consistent reach outs and speaking to residents?

JOHN LEE: Oh absolutely, yes, we have.

CHAIRPERSON CONSTANTINIDES: I'm gonna actually take two more questions. When it comes to, I took a tour of southeast Queens with Council Member Miller and Jamaica on Friday. One of the things I came to find out is that, how much is the permit that York College is being charged for to pump out their water?

ANGELA LICATA: I don't have that information at my fingertips but I can

CHAIRPERSON CONSTANTINIDES: Is there a reason we are charging York College to pump that water out when we know that it's a City institution, that's monies being taken away from their mission to educate students. Can we not do that anymore?

ANGELA LICATA: I will definitely have to go back and talk to my colleague, Deputy Commissioner for the Bureau of Wastewater, sorry for the Bureau of Water and Sewer Operations. They have enabling legislation. I'll have to look and see what their rules and regulations are with respect and whether or not that fee could be waived but I certainly understand your point.

CHAIRPERSON CONSTANTINIDES: Right, I mean this is something that seems like low lying for,

we can do on behalf of our City institution that educated young people, that's their mission and it shouldn't be to pay to have that water pumped out when we're trying to resolve this issue and we recognize it's an issue not of their making and, you know, it's just not something we should be doing so my other question I have, when it comes to the radial flooding study, I know that's coming out next month and we're looking forward to hearing that. What are the possibilities of using an area like York College or some of these City institutions to do a geothermal pilot?

ANGELA LICATA: So we very much are interested in studying the feasibility for something like that. The questions in our minds are 1) if we're talking about the upper glacial aquifer, is there significant heat exchange that is necessary to allow for the cooling, heating practices. We would like to study, you know, the impacts of utilizing that water in terms of what would be required for pretreatment. The ground water in this area is certainly not pristine and it would probably be some level of cleaning that might be required before that so we'd like to study what that would look like, what

type of technologies, how much would that cost so we think a feasibility study would be the right next step.

CHAIRPERSON CONSTANTINIDES: I agree with you. I'm just curious, I mean, I guess that will come with the particular plan on where the water's actually going, right. That'll depend on how we need to treat the water and if it's going into the sewer line, is it's going into the Baisley [phonetic] Pond, there's different treatments that are needed for both, correct?

ANGELA LICATA: Absolutely, yes. The outlet would determine what type of treatment would be required before we discharged.

CHAIRPERSON CONSTANTINIDES: All right, at this juncture I'll allow myself to recognize first Council Member Espinal, Council Member Espinal from Brooklyn has joined us as well and I'll allow Council Member Van Bramer to ask some questions and then Council Member Ulrich.

COUNCIL MEMBER VAN BRAMER: Thank you very much, Mr. Chair, for having this important hearing and for raising these issues once again. Point of personal privilege, I just want to mention

that my husband, Dan Hendrick, as many folks know who care about the Bay, wrote not only a book about Jamaica Bay but then went, did himself one better and made a documentary film about Jamaica Bay narrated by Susan Sarandon so he couldn't be here today so obviously I had to represent the family and we both care a great deal about Jamaica Bay and I have to say I've learned an awful lot about it through reading my husband's book and seeing the film about 400 times at the various film festivals and so I just had a couple questions cause the story of Jamaica Bay and the improvements that you've talked about in many ways is a story of people organizing and in some ways fighting and demanding these kind of changes that you talk about including the nitrogen discharges declining by 43% and, you know, I know that Council Member Ulrich's constituents in Broad Channel, in particular the Mundies and Don Riepe, so many incredible folks have really pushed this movement along so I wanted to ask all of you to what extent are you continuing to work with the Mundies and Don and all of those folks around the Bay both in Brooklyn and Queens who have really led the way and obviously in previous administrations even forced,

you know, the City of New York to do things that maybe they were not going to do, certainly not going to do as quickly as they wound up doing them so if you can talk a little bit about that interaction and to the extent that those folks are still influencing your work on this.

ANGELA LICATA: Certainly, no absolutely could not agree more that the Mundie's, as they're known, and Don Riepe are truly unsung hometown heroes. They have been stewards of the Bay. They have really increased our interaction with some of the dynamic systems in Jamaica Bay because it's not all about the wastewater treatment and water quality impacts associated with treating the city's storm water and sanitary sewage and what impacts that has but it's truly a dynamic system that has many variables and forces working on that. They were the first to raise to our level the concerns about the Marsh Island losses that were occurring in Jamaica Bay and once again, John McLaughlin to my right has been a scientist dedicated to understanding some of those forces and the interaction among the ecosystems so we really believe and I would attribute to those good people there in that community, the probably

first integrated plan that the city really had with respect to looking at a variety of ways to solve a problem. That we couldn't just look at necessarily end of pipe treatment but that unless we looked at the myriad of factors that were being, you know, really oppressed or were impairments in the Bay, we could not solve this problem so I definitely believe that they are stakeholders that we need to constantly work with. They're our eyes and ears on the Bay I guess is the best way to put it.

JOHN MCLAUGHLIN: I just want to say, you know, we work very closely with Don and Dan. In Marsh Island restoration, you know Dan, Dan Mundy, was part of the advisory committee for the development of the watershed protection plan. We've worked very closely with him. We attend the meetings frequently not only as a participant but as a presenter of the work we're doing within DEP. They help us with many of the pilot projects that we have in the Bay such as our oyster project, Theo Grass. We frequently fund Dan and his group in beach clean ups. We've done probably even in the last ten years, every summer fund to help students earn, you know,

some income and help clean the Bay. We intend to do that again this summer so, you know, we work very

[crosstalk]

JOHN MCLAUGHLIN: I'm sorry, yeah, that's no, that's working with the American Littoral Society. That's Dan's group.

COUNCIL MEMBER VAN BRAMER: Well, Don Riepe does a great job. They are so, with the nitrogen levels declining and some of the other improvements that you outlined because obviously the loss of the marshes is not just about the nitrogen. You know, and there are lots of efforts to both reconstruct or rebuild, replant and such. Are you seeing that returning in ways that are indicative of the health of the Bay?

JOHN MCLAUGHLIN: Yeah, I mean since the release of the watershed protection plan, about 140 acres of interior Marsh Island have been restored both with DEP money and Army Corps money and State DEC as well as volunteer efforts by Dan and Don. They actually got the community together to help plant two islands, Black Wall and Rulers Bar, Jamaica Bay so that is seeing a great return. We've also invested along the perimeter of the Bay. You know,

long time ago Otwild [phonetic] Park was restored with, you know, wetlands which is the head of Bay. Penant [phonetic] Fountain Avenues landfills along the Bay have been restored to a coastal plank humidity. Paddica [phonetic] Basin within ecology park and restoration of those wetlands so yes, we are seeing a great return and those wetlands are now thriving.

COUNCIL MEMBER VAN BRAMER: Well, I'm sure my colleagues have more to say including Council Member Ulrich who represents these fine people but I'll just close by saying, if you haven't seen *Saving Jamaica Bay*, it is perhaps the greatest documentary film ever made in the history of the world and I hope my husband sees this film. Thank you very much, Mr. Chair.

CHAIRPERSON CONSTANTINIDES: Thank you, Council Member Van Bramer. Questions from Council Member Ulrich.

COUNCIL MEMBER ULRICH: Thank you, Mr. Chair and thank you Council Member Van Bramer. You are welcome in my district any time,

[Laughter]

COUNCIL MEMBER ULRICH: Even when you're not welcome in your own so that's a private joke we have. Anyway, I have a few questions sort of follow up to Jimmy Van Bramer's line of questioning regarding the city's engagement with the local stakeholders particularly Dan and Dan Mundy, Jr. and Sr. or Dan squared, however you want to refer to them, the Riepe's along with some other people. Are they going to be on the task force, the city's task force?

ANGELA LICATA: The, maybe I'm a little confused but they currently have a task force.

COUNCIL MEMBER ULRICH: Yeah, they have their own task force but the city, because of the Local Law 77 is in the process of reconvening the city's task force on Jamaica Bay. Is that right? Am I correct?

ANGELA LICATA: Yeah, the, I'm not exactly sure what the intent of the bill is but I think what the bill is looking to do is to legislate the task force as an entity that would continue to advise the City.

COUNCIL MEMBER ULRICH: Right, so will the city be codifying into law the existing task

force that already exists, you know, Mr. Mundy, Mr. Riepe, the folks who have been on the ground and actually like advising the City already in an informal capacity? Are they going to be like, you know, formalized if you? I don't know, I just, what I don't want to see happen is the city set up its own task force or reconvene their own task force with no, you know, involvement or input from the people who have been doing this for free for the past, you know, 20 years. That's kinda concerning to me.

ANGELA LICATA: No, no

COUNCIL MEMBER ULRICH: The city's very good at doing that. Not you personally, but, you know, we often set up these commissions and these committees and these studies. We hire a bunch of kids out of college. They're very meaning. You know, they've never seen it except on a map and then they come in and tell us what needs to happen, you know, or advise the federal government, you know, accordingly with respect to Jamaica Bay so, you know, what I don't want to see is the local folks sort of poo pooed or disregarded or, you know, being made to pay second fiddle to the city's Jamaica Bay task force. We already have a task force. It works well.

They do a great job. It's very nice. The law's great. We're very happy. I want to make sure that the local Jamaica Bay task force is actually like sitting on the city's task force. They should be one and the same. Is that, I mean Mr. Chair is that, am I correct in that? I mean I just want to

CHAIRPERSON CONSTANTINIDES: I think that is the intent of the bill that we have before us today is to reformalize them and make sure that a group that has been meeting and has been doing all this great work for such a long time has force of law behind them as well.

COUNCIL MEMBER ULRICH: That's great and I think that, if that's the intent of the law, that would be phenomenal but sometimes, you know, the intent is not always what is executed and I just want to get that on the record if the city's gonna have a Jamaica Bay task force which I will support, I want to make sure that the people who are already on the Jamaica Bay task force including the Mundy's and others are actually members of the city's task force so that's, you know, to the extent that we have control over that. I know it's limited but that's something that we should very mindful of. They are

very, very protective of the good work and the many years that they have put into saving Jamaica Bay and even at a time when the federal government and the city were really not interested in terms of investing hundreds of millions of dollars, they have, you know, shined the spotlight on the plight of this beautiful estuary in the middle of a big urban city. You know, that competes with federal dollars like, you know, for Yosemite National Park and all these other federal parks that everybody loves. You know, Gateway gets almost pennies compared to the other federal parks so we have an obligation, a moral obligation, as people who care about the environment to make sure that we give it the attention and the love and the dedication and the things that it needs but they have been involved for so long I would just, I don't want to see them side stepped in any way so that's, I just want to put that on the record so.

CHAIRPERSON CONSTANTINIDES: Um-huh, yeah, definitely Council Member and I share your deep concerns about that.

COUNCIL MEMBER ULRICH: The other question I had is with respect to the removal of boats that were dumped in the Bay over the years. I

mean there were literally hundreds of boats. I know when Emily Lloyd was commissioner, she actually came on a boat ride in Jamaica Bay and we took her on a tour. I didn't get on the boat for the record but I was happy to see her when she got back to land but they showed her areas that, you know, historically people were illegally dumping boats in the Bay, not only in Queens but also in Brooklyn adjacent to Council Member Maisel's district and in other parts of Jamaica Bay and the city at one time invested a lot of money in removing those boats. I think it was a joint effort that they contracted out. I think it was Sanitation and DEP, respectively, were contracting out with a licensed professional company that does this for a living but then that money sort of dried up and I recently had to put $12,000 of my New York City clean-up initiative funding into the Department of Sanitation's budget so they could remove derelict boats in Jamaica Bay which I was happy to do but to be honest with you, I should not have had to put that money in. Like the city should already be funding that, the administration, DEP, Sanitation. Why did I have to give Sanitation $12,000 to remove derelict boats in Thorntree Creek

and, you know, parts of Jamaica Bay when the city is patting itself on the back saying we're already doing this. I don't know, it just didn't, and I brought this to the Mayor's attention personally and then I was, you know, very much appreciative that Commissioner Garcia followed up with me but not for nothing. DEP should be paying for this. You know, like why did I have to pay Sanitation to hire a contractor to do something that you say you're already doing?

ANGELA LICATA: Yeah, we'll have to look into the, what the status of the funding is currently if that's your question. What is the status of the current funding?

COUNCIL MEMBER ULRICH: Yeah, I want to know how much funding are we directing towards removing abandoned boats in Jamaica Bay? How much funding is actually needed? We don't need a study to tell us that. I can, you know, ask Dan Mundy how many boats are still in the Bay and then that's something I think maybe the Chair and the Committee would like to know, in particular, is how many abandoned boats are still left in Jamaica Bay and how much will it cost to get them out of there and what

is the city doing to get them out of there? It's very important, you know, from an environmental and a safety and a practical perspective. These boats are leaking toxic chemicals in the Bay and, you know, it sort of defeats the purpose of planting marshes and doing other things when we may have well over 100 boats still, you know, under water, submerged and then when it's low tide, you see them. You actually see the boats sticking out from the shallow areas so I want to get these boats out of there and I know there's a lot of them left and I want to know what the city is gonna do. Is there an action plan? Is there a budget line that maybe we could follow up with the Chair and find out that information.

JOHN MCLAUGHLIN: Absolutely and prior to our May budget hearing, I think we should probably get a handle on that.

ANGELA LICATA: Yeah, I definitely think it's a general obligation cost. It would not necessarily be a rate payer line item but we will check into the source of funding and

COUNCIL MEMBER ULRICH: I paid $12,000 that I could have used to empty litter baskets in my district or fund supplemental sanitation services or

clean up graffiti and do other things. I paid $12,000 to get rid of a couple of boats in Jamaica Bay that the City refused to take and I should not have had to do that but I did it because the work needed to get done.

ANGELA LICATA: Um-huh.

CHAIRPERSON CONSTANTINIDES: Yeah.

COUNCIL MEMBER ULRICH: So I want to find out and I know the Chair is interested in this issue around the budget time. How many boats do we know about? How much does it cost and how are we removing them?

CHAIRPERSON CONSTANTINIDES: [Inaudible], Council Member Ulrich's obviously meet with you about that prior to the budget and we'll definitely discuss it. I look forward to meeting with DEP as well and the Mayor's office to ascertain and get a handle on what it would cost to get this work done.

COUNCIL MEMBER ULRICH: Maybe they want to add something. You can if you'd like to. It's fine.

JOHN MCLAUGHLIN: No, I just said that Don already has, you know the American Littoral Society has produced a map that we've helped work

with them and with our beach clean ups and shore line clean ups we do help remove some of those, you know, that marine debris so, that is, that is known post Sandy had a lot of boats in the Bay but many of those have been removed. There are always new boats that are abandoned but that number is I think, much more manageable that it has been in the past.

COUNCIL MEMBER ULRICH: The last question, Chair, I'm sorry I know I'm going over my time.

CHAIRPERSON CONSTANTINIDES: Go right ahead.

COUNCIL MEMBER ULRICH: This is in my district. It's very important to me. What is the level of cooperation between DEP or the city agencies that care for and help, you know, maintain Jamaica Bay and the National Park Service, our federal partners. I know in the Bloomberg administration they signed this agreement, you know, no borders, no fences, you know. I said no responsibility because nobody wanted to accept responsibility for, you know, conditions, safety, cleanliness, you know what was going on at Charles Park in particular and, you know, some of the other coastal areas along Jamaica Bay

that National Parks has jurisdiction over so how well do you work with the superintendent at Gateway? What type of cost sharing programs are we involved with, you know, in terms of actual maintenance of Jamaica Bay or cleanliness of Jamaica Bay? You know, is there a budget line that we are funding that they are also funding or something that they are funding and we are not funding? I mean, you know, I have some, I'm very, I was always very curious what that agreement actually meant in real life, in dollars and cents. You know, what are they paying for, what are we paying for? What are they responsible for, what are we responsible for? You know, what is being done and what is not being done, you know with respect to Jamaica Bay so I don't know if you could shed some light on that?

ANGELA LICATA: Sure, I can begin to shed some light on that. The agencies do coordinate and we do converse and communicate. We don't necessarily share funding of particular projects unless it's money that we're putting in towards Marsh Island restoration which at some point has been money that has been leveraged between the city and the State of New York mostly for those types of efforts. The

National Park Service and the city both do sampling and data collection in Jamaica Bay so we spend a lot of time comparing and doing analytics together to look at what these data tell us about the state of the Bay. We spend a lot of time at these symposiums on Jamaica Bay conferring with each other and our experts and bringing shared experiences and shared strategies to the table and to the forefront so with respect to a more formalized agreement I think that the former administration's agreement has manifested itself more in a conservancy, in a park conservancy that's more of a private, public partnership. I will also say that we had for the first time several years ago, the Secretary of the Interior visit Jamaica Bay so I definitely think that that is something that could use some additional, you know, highlighting the importance of this local ecosystem to this area, to the national flyway. It's a major migratory fly over for the Atlantic seaboard so it should be potentially I think a little higher on the National Park Service radar with respect to its prominence in the country. The people here at the National Park Service that are working locally do a fantastic job with the resources that they have. That's not my point at all. It's

just that I would love to see a little bit more national prominence for the Gateway recreational area.

COUNCIL MEMBER ULRICH: Well perhaps the city's lobbyists in Washington should be a little bit more aggressive with our federal partners to see how we can direct more resources and funding to Jamaica Bay. I just, I don't see a very aggressive push from the local level, quite frankly to lobby Washington to do what they need to do to support, you know, the maintenance, the safety, the cleanliness of Jamaica Bay, of the Gateway national recreational area as a whole. Not just Jamaica Bay in particular so yeah, we know it's important. Yeah, we have a nice relationship with the folks on the ground, you know, but this has been going on for decades. It's been ignored and dumped on over many administrations from both parties and I just, I would like to see a sense of urgency on the part of the city to light the fire at every level to pump some more money in funding and support for Jamaica Bay and I don't see it. I just, I don't see it. We do these clean ups. You know, we remove a couple of boats. We plant the grass, the marshes. We, you know, we like the photo ops but I

think there's a lot more that needs to happen in Jamaica Bay and I just don't see it. I don't see it as a priority for the city or the federal government for that matter. That's my opinion as the elected official representing Jamaica Bay and the constituents that live in the communities that abut it so we do some good work, we need to do a lot more.

ANGELA LICATA: Well, I realize that that last statement wasn't a question but I'm, from the part of New York City's Department of Environmental Protection we've been spending hundreds of millions of dollars in Jamaica Bay so I don't think that it would be fair to say that the city is not prioritizing Jamaica Bay. I think we have for over a decade and I think that we're seeing some really dramatic results as a result of that investment so we feel really good about that investment. We want to continue to make more investments because we do see the benefits of that happening.

COUNCIL MEMBER ULRICH: That's great but quite frankly those are really, that's restitution fund and the city has caused billions of dollars in damage to Jamaica Bay so the hundreds of millions that we spend in cleaning it up and doing the things

that we're doing there is sort of like money we owe it. We owe that money to Jamaica Bay because of decades or neglect and dumping and things that the city allowed to happen there so it's, it's not like, you know, where there's benevolent oh, we're just gonna come in and, you know, this is our moral obligation. No, yes, we do have a moral obligation but we caused a lot of the damage there or we allowed the damage and the decay to take place for so long so, you know like thank you, I guess, but I think like they were owed it, you know, Jamaica Bay and the communities around Jamaica Bay. We owe it to them to invest this money. We're not doing them a favor. You know, we're sort of paying them back for the damage that we did or that we allowed to happen so it's just a different way of looking at it. Just two different, they may seem semantical but just my point of view. The federal government as far as I'm concerned, they get a D if I'm grading them. The City of New York B+, great job, keep up the good work, Federal government D-, close to an F. F would be nothing at all. It's pretty close to that. The federal government definitely needs to do better by the communities that surround Jamaica Bay and give a

little TLC and funding to the facilities that they have control over. I mean I would almost argue that Charles Park in particular and Howard Beach which is actually in Jamaica Bay, Gateway national recreation area, that that would be better if we even transferred it over to the City parks because the state of disrepair that that place is in, the City would never be able to get away with it but because it's on federal property, we've just allowed that to completely decay and that's, I mean that's right on the Bay. You can't miss it so that's just one example but even the level of personnel. We talk about removing illegal, the dumped boats, how about preventing the boats from being dumped in the first place. Like what is NYPD Harbor Patrol doing? What is the EP doing? What is National Parks doing? Like how many patrols, when does this happen? Where does it occur the most? What are we doing to prevent dumping from happening? It's nice that we're spending money to remove the debris and the boats are derelict there but what we doing to actually like prevent it from happening? I'm just saying, there's no plan. Everybody does their own little thing. Maybe the task force is a step in the right direction

to sort of formalize and bring everybody to the table but, you know, I haven't seen that coordination yet. I just, I haven't seen it so I don't mean to be a downer. I just, I'm there every day. I'm not there for, you know, Earth Day and then I disappear. I'm there all year round. I talk to people year round. You know, it's very, very important to me. I know it's important to the city. It has to be a lot more important to the federal government but, you know, we've got to get our act together and bring people on board and start communicating and coordinating and investing more money if we're really serious about making Jamaica Bay the jewel that it really can be. Thank you, Mr. Chair.

CHAIRPERSON CONSTANTINIDES: Thank you. I have a few more questions. I'm told that someone from ORR is in the room.

[Inaudible] [Laughter]

CHAIRPERSON CONSTANTINIDES: Yes please. Grab a chair, grab a chair. I thought you were more MOS but

MICHAEL SHAIKH: So this goes back I guess to our last hearing

CHAIRPERSON CONSTANTINIDES: You can state your name for the record first.

MICHAEL SHAIKH: I'm Michael Shaikh. I'm the Deputy Director for General Affairs for the Climate Policy and Programs Team at the Mayor's office. The Climate Policy and Programs Team is the Mayor's office of Recover and Resiliency, the Mayor's office of Sustainability and the Mayor's office of Environments Coordination. I handle the external affairs for those three offices.

CHAIRPERSON CONSTANTINIDES: Great now first, I thank you owe an apology to your colleagues in DEP because you left them on the hook for some tough questions so

[Laughter]

MICHAEL SHAIKH: Thank you for handling.

CHAIRPERSON CONSTANTINIDES: So the question I asked that I did not get an answer for but I think we have talked about it in the past but I wanted to reiterate it and so the framework of this particular hearing is what steps is New York City taking to protect our critical infrastructure from sea level rise, particularly and sort of that larger

question and sort of a sub question being the infrastructure around Jamaica Bay.

MICHAEL SHAIKH: Sure. Let me go broad first and then keep it to Jamaica Bay. I think since Sandy the city has taken some pretty unprecedented steps along with our federal and state partners to protect our critical infrastructure and that's really what the city has focused on in these past five years is our critical infrastructure and that is let's talk about schools. A lot of our schools that were damaged during Sandy were back up in record time and have been made more resilient. We've worked really closely with Con Edison and other utilities to invest in hardening critical electric infrastructure. For example, the 13th Street substation which went out and left lower Manhattan in the dark. That has been repaired and hardened and some of that facility has been raised so the lights will stay on. DEP has made some actually incredible investments over the past five years around water and particularly keeping our drinking water safe. The waste water and the waste water treatment plants are currently being fortified and the Staten Island Siphon which went on line, I believe, Climate Week of last year. If we just look

at what happened during Hurricanes Irma and Maria, drinking water was a major issue. We have solved a lot, I wouldn't say solved. I'd say we've improved a lot and some of those big problems that were happening in those areas we've addressed so I think the city's a lot safer, our critical infrastructure is a lot safer since Hurricane Sandy in the past five years.

MICHAEL SHAIKH: Looking at around Jamaica Bay, I think, you know, some of the work that's been going on. We have a program called the Raised Shorelines program which is $100 million of City capital which has done a couple things. It's done an analysis of our 520 miles of coast line and looked at the most vulnerable spots to sea level rise and coastal erosion and then it's prioritized taking that roughly $100 million and investing it in the most vulnerable spots. There's a few spots in Jamaica Bay that we're looking at right now. I think Norton Basin is one, Howard Beach is another. I'd have to go back. I'd have to look at the exact sites but Staten Island as well, there's a couple sites in Staten Island that we're gonna be designing for to get at this issue of sea level rise in particular so

that's one program and then of course, deferring, I have to defer to my Army Corps colleagues but they're looking at Jamaica Bay in a pretty significant and substantial way in looking at what they can do to fortify the edges of Jamaica Bay to sea level rise.

CHAIRPERSON CONSTANTINIDES: As we look at the waste water treatment plants there, what is sort of our plan? What is going on to harden those institutions?

ANGELA LICATA: Yeah, so I can talk about that specifically. We did the analysis. Actually we were starting protype to looking at an analysis of what would happen if a waste water treatment plant was flooded before Sandy hit and then once we, you know, experienced super storm Sandy, we expanded that analysis to all fourteen waste water treatment plants and 90 something pump stations and the analysis was really unique because it looked at the preferential pathways for flooding. It looked at the facilities sites on an asset by asset basis so it said which of the assets on a particular site would be vulnerable to flooding whether it was flooding from precipitation or flooding from storm surge and then we estimated the cost of either elevating equipment

or hardening equipment. We looked at the most cost effective practices and then we submitted for an available federal grant under the storm water mitigation loan program so the SMLP as it's called and the city is benefitting greatly from having taken the initiative to complete that work in a timely fashion so that we could avail ourselves of the available funding under the grant.

CHAIRPERSON CONSTANTINIDES: So under that, we've already received that grant. Those are monies that already have gone into these waste water treatment plants?

ANGELA LICATA: It's underway currently.

CHAIRPERSON CONSTANTINIDES: So it's underway currently and as looking at as these institutions potentially flood, what would be the impact on the Bay is these institutions went down?

ANGELA LICATA: Well, what would, I mean the worst thing that could happen for a waste water treatment plant would be to lose the biological systems, right, because all of our waste water treatment plants are highly dependent on the biological activity. New York City through the entire super storm Sandy did not lose any biological

systems whereas the plant directly to our east, Bay Park I believe, in Nassau County was completely obliterated. I mean, it didn't go back on line for a very long time so New York City's facilities were in pretty good shape to begin with and so that would be the greatest threat to them would be to lose the biological system. Obviously hard wired systems are not a good thing to lose either because they're expensive to replace but they can be replaced.

CHAIRPERSON CONSTANTINIDES: And as far as I looked at your testimony relating to the long-term control plan, so it talks about environmental dredging, so how, how much are we looking to spend on that dredging? What do we get for those dollars? What improvements would we get? What would we get for our dollars there?

ANGELA LICATA: So my understanding is that the dredging is something that is still to be analyzed, to better understand where the dredging makes the most sense and what the benefits would be. That's sort of this last lingering piece. We do, however, know that we would like to do some surgical dredging for purposes of and John could talk about this a little bit more, setting the appropriate title

elevations to do some wetland restoration and to do ecological improvements in certain locations in certain tributaries of the Bay to allow for shellfish or bivalvia suitability and habitat so that they can do the work of additional water quality purification.

JOHN MCLAUGHLIN[?]: At the public meeting held at the VLTCP last Tuesday, as Angela mentioned the location of judging was left somewhat open that we would work with, you know, still study it and working with stakeholders to figure out, you know, the best location for that and then also using bivalvia, particularly rib muscles, as a filtration capacity. That's gaining a lot of attention in many watersheds around the country as a tool to improve water quality. They filter around 5.4 liters, you know, per hour. You know, you put millions of those in the water column and in fact, rib muscles are in decline in Jamaica Bay so adding additional ones would be a great ecological benefit as well as, you know, providing water quality benefits.

CHAIRPERSON CONSTANTINIDES: Is, I mean, I know that this plan hasn't been released yet, but is any chlorination part of the plan here for Jamaica Bay?

ANGELA LICATA: No.

CHAIRPERSON CONSTANTINIDES: No, okay. That's good to hear. That's good to hear and I guess the last question that I'll ask, when it comes to how much would it cost to capture all of the CSO discharge verses the dredging?

ANGELA LICATA: I don't have that information at my fingertips but we're north of a billion dollars I can tell you that for sure.

CHAIRPERSON CONSTANTINIDES: North of a billion dollars, for sure. Just for Jamaica Bay?

ANGELA LICATA: Just for Jamaica Bay and the, where we would need the benefit the most would be Bergen and Thurston Basins and that's been part of the struggle here and really perplexing because if we were to spend that money for additional CSO capture and control, they would be in two of the tributaries where human access is really prevented or prohibited in some cases like where the airport has it completely blocked off with a gate so it would be a lot of money for very limited incremental water quality improvement where people cannot access and enjoy it.

CHAIRPERSON CONSTANTINIDES: All right, so I'll definitely look forward to continue to talk with you all on these issues and working with my colleagues who represent the neighborhoods like Council Member Ulrich and Miller and Adams and Richards as well as Council Member Van Bramer and his husband [laughter] so but thank you for your time and your testimony. Yeah, you guys good?

ANGELA LICATA: Thank you for coming.

CHAIRPERSON CONSTANTINIDES: Next up and definitely you guys owe DEP some apologies and [Laughter] some love. Next up I'd like to call Philip Orton, scientist from the Stevens Institute. Mr. Orton, if you'd begin your testimony please.

PHILIP ORTON: Thank you Council Members and Committee Council also for inviting me. I'm Philip Orton. I'm a research professor at Stevens Institute of Technology in Hoboken, New Jersey and I live in upper east side, Yorkville actually close to the flood zone up there during Hurricane Sandy actually, near 96th Street where they're was flood and I'm gonna speak on Jamaica Bay flood and water quality hazards and solutions. Mostly on flooding, the problem of storm driven flooding, tides driven

flooding and sea level rise. I'm an expert on physical oceanography, coastal engineering and like I said, I'm a professor at Stevens Institute so next slide. So my main topics I'll speak to are first of all to talk about core consensus science of the problem in terms of hazards, flooding hazards, sea level rise and hypoxia. That, what I speak to there will represent sort of the consensus. I'm not here representing New York City Panel on Climate Change or the Science and Resilience Institute for Jamaica Bay but what I'll speak in the first part of my presentation is basically the consensus, expectations for sea level rise and coastal flooding and impacts of global warming on water quality and then I'll speak briefly about what's occurring with mitigation. I think people know about the Corp of Engineers plans and the City plans but I'll briefly summarize those and also talk about some nature based research on nature based solutions like wetlands for flooding that I've been involved with and that's all sort of in the area of consensus science. Then I'll speak, I'll separate my own research that's not really part of a consensus and I'll a few slides on my own research on flood protection and water policy

improvements and then some final recommendations which are also my own recommendations.

Next slide and one more - So the core consensus science this is a plot on the left where I've added three blue bars on the right. The plot on the left is from a peer reviewed paper that was published in 2016 myself as first author and it shows the history of New York City flooding and so Sandy, if you want to put Sandy into perspective and get a sense of what Sandy was in terms of the history, this does it really well so the bars are just the peak flood height from each storm and Sandy was, you know, it caught people by surprise. It wasn't cause people were stupid. It was because Sandy, nothing within four feet of Sandy had happened since 1821. There was no flood anywhere comparable and so that could be a climate change impact but so far the New York City Panel on Climate Change consensus is that it's not that that storm came from climate change. It's that it was a lot of bad luck. High tide at the same time as the peak storm surge, very large storm, made the wrong turn. Instead of going out to sea, it went in New Jersey and that can happen and it could happen again but based on history alone, it's a low

probability event. What's shown on the far right of this plot in blue is the 100 year flood estimated from the FEMA study of 2007 which currently governs our flood zones. It's quite a bit lower than Sandy and the flood zones are smaller than the flooding that Sandy created and then next to that is the more recent FEMA study which the city appealed and won in their appeal but it's a flood height for a hundred year return period flood, a 1% chance per year flood that is being used for planning purposes but not for insurance purposes so those are the two FEMA studies on the first two bars on the right and then the one to the furthest in that panel is my own study, peer reviewed research on the 100 year flood so those are estimates of what could happen any year, a 1% chance so you think of 30 years, a 30 year mortgage, it's almost exactly a 30% chance or about a 20% chance in a 30 year mortgage of having that flood so not a real high probability but significant, you know, and so you can argue whether or not you need protection from the 100 year flood or not but Sandy, only by one of those studies is estimated to be a 100 year flood. By the other two, it's more like a one in 300 year event so very rare and history also suggests that

might be the case since there were only storms back in the 1800's, 1700's, 1800's that were comparable to Sandy.

Next slide, so this is the sea level rise problem. Uh-oh, we're gonna crash so I can speak verbally about the sea level rise problem. The New York City Panel on Climate Change consensus is that we're looking at a central estimate in the 2050's of about a foot and a half more sea level rise and high end estimates, the city's been having the New York City Panel on Climate Change focus more on the high end estimates, 90th percentiles to be more conservative. At the 2050's, that's about two and a half feet so those are the numbers we're looking at, an extra foot. In the past century, there's been about a foot of sea level rise in New York City mainly because of land subsidence actually but we're looking at by the 2050's, in only 40 years, we're looking another foot and a half central estimate, maybe two and a half feet so you can try pulling up the PowerPoint that I gave you too again I mean. We've definitely been having data transfer issues. I don't know if it's the memory sticks we're using or not but so looking out to 2100, we're looking at

somewhere between two and six feet approximately of sea level rise so dramatic so there's an acceleration. That's really the thing that's most concerning. We can deal with slow sea level rise and we have for the past century but to have this acceleration and potentially up to six feet of sea level rise or more could be catastrophic for some of these neighborhoods. Here come my slides again. All right, so that was sea level and we can move on from that. The next slide will be on flood zones from sea level rise. Flood zones for the 100 year flood. Next slide, the 100 year flood is shown in purple and its expansion and that's that FEMA 2014 work. It's not the FEMA 2007 work for which the insurance maps are based on right now. So the 100 year flood as of 2014 FEMA's work is shown in purple and then its expansion in the 2020's in red, 2050's, 2080's and all the way out to 2100 are shown and it really fills up on the flood plain. Sandy mostly filled up the flood plains of areas that used to be wetlands, low lying areas, land fill, etc. Especially Rockaway Peninsula, obviously that's pretty much covered by water just with Sandy without even considering sea level rise so that's one angle on the problem is

there's these huge. If you're unlucky enough to have a 100 year flood, like I said maybe a 20% chance in a 30 year mortgage, then this is your flood zones and they get a lot worse with sea level rise so it's just like piling on, you know, concerning information.

The next slide shows the, something I've mapped for New York City Panel on Climate Change due to New York City's interest and I was told the interest of this panel is how tidal flooding will change in the coming century and so this shows the monthly high tide and how its flood zone grows bigger through the century with the 90th percentile estimate, sort of a high end estimate, conservative estimate of sea level rise and so these are draft results from New York City Panel on Climate Change, not released yet, under review and it shows basically monthly tidal flooding. Billy Sweet's gonna speak later and I think he may raise the issue of, you know how when you get flooded 20 or 30 times, when you get flooded every month or more, that's what starts to drive giving up land or wanting to give up land and so that's another important metric of flooding and it's gonna evolve to where later in the century places like JFK are being flooded every month and

that's the yellow coloring on JFK in the top left, top right there and places like Rockaway will be flooding by around mid to late century, all the areas of Rockaway will be flooding, by monthly tidal flooding and so that's a severe problem. Now, this doesn't take into consideration projects like raising shore lines which is mentioned by ORR. It's a city planning project I believe. These projects can really have a big impact. These monthly tidal floods aren't really high water like Hurricane Sandy so there's a real benefit to raising shore lines in places where there's no, where there's absolutely no protection and having a few foot high sea wall, three foot, four foot high and so I really encourage that to continue and the city's doing some of that but a lot of the city's focus has been on worrying about the next Sandy and I'll come back to that later in my recommendations.

Next slide, so the future of dissolved oxygen I'll just speak briefly about. The consensus over the next 50 years on dissolved oxygen, how it's gonna change. Basically, this is one of the number one metrics of water quality. If there's low dissolved oxygen as there are in some portions of

Jamaica Bay then it's hard for organisms to survive and fish to live there. It's only localized problem, it's generally a localized problem in Jamaica Bay, areas like Grassy Bay that are more stagnant. The consensus is still emerging on whether or not that will worsen significantly with global warming. On one hand, sea level rise leads to deeper water and it leads to better flushing of Grassy Bay and that could actually improve the flushing and improve the water quality and the oxygenation of the water but on the other hand, the warming itself leads to lower solubility of oxygen in the water so that directly reduces the oxygen in the water. A preliminary finding in a study that I've been a part of called the Rand Study led by Jordan Fischbach and others and also interacting with Science and Resilience Institute of Jamaica Bay found that the area of the Bay that's hypoxic will double by 2065 so that's one study which suggests it will make the hypoxic a problem, the oxygen problem worse but those are preliminary results.

Next slide and again, so mitigation options. In terms of what's happening sort of based on the consensus of the city leaders so far and the

Corp of Engineers and a lot of community groups who really don't want there to be any chance of another Hurricane Sandy flood is that they're gonna be protected against Hurricane Sandy type flood and so there's the Corp of Engineers Rockaway Reformulation Study. This plan includes cross inlet storm surge barrier to stop flooding inside the Bay to prevent water from entering the Bay. It includes protections of Rockaway Peninsula, dunes, groins, beach fill, etc. high sea walls and so it's a protection plan more or less. They'll call it a risk reduction plan but the goal is to completely protect to at least a Hurricane Sandy type flood. Overall the Corp concluded and scientists generally do support that this is the most comprehensive approach to, you know, flood risk reduction in the coming 50 or so, maybe even longer years, maybe even century. Construction can begin as early as next year. That was the recent news that came out. New York City and de Blasio and citizen groups are generally on board with it. I'm not but I'll talk about opposition in a moment also. An important factor here though is that the surge barrier is not to be, planned to be closed frequently. I'm not sure this is in the

reformulation report but the word was that it would only be closed in extreme events, not during tidal flooding, so if that's true, that's a really important consideration and it's not really solving the creeping problem of sea level rise. It's solving the extreme storm event problem and so I'm not sure what the final, you know, I don't plans are finalized with management of the surge barrier but that will be a very important area, you know, of guidance is how they really intend to use the barrier. I'm pretty sure that the plan is only to use it in more extreme events like a ten year return period flood or worse so a really severe nor'easter flood or worse.

Next slide, there are some voices that don't support the barrier plan. I'm not aware of them all and I'm not interacting with people so I can't speak for that community but I know one real concern is that the long-term for a surge barrier is that it's not useful if you have your accelerating sea level rise and at some point you need to close it much more frequently to protect people. At that point you have, there's a political decision to be made. Are you gonna only close it once every ten years for the extreme flood or are you gonna close it

every week or even have it stay closed? Maybe 80 years out there may be pressure to keep it closed and then you may have a Jamaica Bay that's a non-tidal salt water lagoon or a lake instead of having tides and really dramatically changing Jamaica Bay and I think that's a real serious concern and I don't think there's strong assurances that that's not going to occur and of course always there is the possibility that politics would change over time and that allowing people to be flooded won't be acceptable and so it will be the future of the surge barrier and so those are some of the concerns. There's a whole public comment period for the Rockaway Reformulated Plan and I'm sure there's hundreds more different opinions on the pro and negative side. I'm not really here to talk a lot about the Rockaway Surge Barrier Plan, however.

Next slide, so a lot of people are very interested with Jamaica Bay in seeing nature based solutions such wetlands to flooding and Jamaica Bay is one of the few places, I was always inspired to look into that and try to contribute new ideas for that because Jamaica Bay is one of the few parts of the City where that you don't have the active

shipping channels. You don't have the port. There are deep channels but they're not used very much, only a few times per day by large ships so a lot of people, and there's a history of declining wetlands so maybe we could restore the wetlands and protect people from flooding. Unfortunately in my research and also work by the Corp and for the SIRR Study that the Bloomberg administration had after Sandy, we are always finding that the wetlands in Jamaica Bay can't reduce the storm surge levels. They can reduce wave heights like breaking waves but they don't reduce the storm surge levels because those deep, there are deep channels that were dug around the circumference of the Bay that just channel those storm surges directly to neighborhoods and the wetlands are in the center of the Bay mostly and so the storm surge will just go around them so they can be useful for reducing wave heights and some of my own research has shown that, cited here *Marcule, et al* and they can also be useful for producing erosion and enhancing deposition on the wetlands which could allow the wetlands to survive better so wetlands can promote their own survival, they can reduce erosion, they can reduce waves which cause impacts during storms so there are some

benefits for storm mitigation and some things that wetlands can do and then beyond that, of course, there's just many environmental benefit of wetlands I'm not really addressing here. I'm just focused on the hazards but most people will agree on there being environmental benefits for people enjoying wetlands for ecosystems for birds, etc.

Next slide, so my own research, in my own research I've looked at some things which are somewhat contentious so I definitely want to package this as not being a consensus research area but I've looked at whether or not you could restore the bathymetry, the water depths in Jamaica Bay, and make it dramatically shallower and if that could be useful for reducing flooding and part of the reason that I was inspired to do that is because I felt like you couldn't restore all the wetlands without having the sediment restored in the Bay. The sediment's critical to the wetlands so that's one thing we can all agree on is it's good to have enough sediment, sand around the wetlands to help them survive but there's definitely people who don't want to see Jamaica Bay's deep channel shallowed so with that caveat, I'll speak about that research and I'm just

gonna share this one slide on that work so we found that it can reduce flooding dramatically basically if you have shallower channels instead of being 30 to 50 feet deep. These old shipping channels that really aren't used much, if you could channel them to 20 feet deep which would allow most boats and then you could reduce floods such as the 100 year flood for example by about 50% in its area so you can't stop flooding with these nature based solutions. They just add friction to the water. They don't block the water so it's limited but it's somewhat effective and you can eliminate a ten year flood today in our present day if you had one of these solutions and some of this is shown on a website I created with Columbia University and Wildlife Conservation Society called adaptmap.info so you can look at flood maps. You can see if you're in the flood zone present day, in the future with sea level rise and if you're not in the flood zone with some of these flood reduction options and then the new research which isn't published yet which we're working on. It's just really exciting that you can also sharply, if you tapered shallow the Bay to where places like Grassy Bay are no longer deep and you shallow these deep

shipping channels, you can also flush the Bay much more actively and you actually reduce the oxygen problem which the city, you know, we already heard the city worried about, the city spends hundreds of millions of dollars on trying to reduce the oxygen problem by building retention basins for CSO's and such so, you can, with changing the bathymetry of the Bay over the next 50 years or some long period of time, one could reduce the oxygen problems and reduce the flooding problems but that you can't necessarily solve those problems completely so it's a nature based solution and it's a new idea that's being studied so, as I mentioned there's people who aren't supportive of changing the deep channels. They're concerned about the striped bass. They're concerned just about changing the Bay in a big way and so I respect those opinions and this is just research that I've been doing and I think it points to some real, the fact that there really hasn't been enough research on nature based solutions in Jamaica Bay for these problems. There really hasn't been. There's been a rush after Hurricane Sandy to help people and I just think it would be nice, it would be useful if there's more time given to looking at these other

alternative solutions that mimic nature and mimic restoration of the Bay.

Next slide so my final recommendations are that a high priority should be on sea level rise adaptation. It's underway with projects like Raising Shorelines in the Department of City Planning, efforts on changing zoning allowing for elevations of buildings. Those are all no brainers that I think everyone can agree upon. There's been a very strong focus on protecting into the next Sandy and I think that may be misguided or at least it's better if we make sure we get the sea level rise protections in place that are undebatable. The Hurricane Sandy protection, it may be protecting against that won't happen for a century and it also takes a lot more time to build 15 to 20 foot protection versus protection against high tides and nor'easters so I'd like to see more effort put on the protecting against these more common floods. With respect to the cross inlet storm surge barrier, the city and the Corp should consider in my opinion giving more time for a) research on nature based solutions that can mitigate both floods and hypoxia and the city is spending a lot of money on both those problems. They should

look at them as one, more holistically I think and 2) more research and modeling on sediment transport. Sediment's a big question mark in a lot, with the surge barrier protection, with erosion of Rockaway Peninsula during storms. It's a big unknown with regard to the future of the Rockaway Reformulation Plan as well as nature based solutions. If you want to restore wetlands but they're eroding constantly because you don't have much sediment and you have deep shipping channels that absorb all that sediment which is what research is shown then you're not going to be able to restore the wetlands and have them naturally survive into the future and then last point, I would like to see there be more outside analysis of the surge barrier solution. I feel like there hasn't been enough and maybe the city or the Corp will correct me but I feel like there hasn't been enough analysis into what the pathway is in 100 years, you know. Is there gonna be, you know, if there's pressure to protect people will a surge barrier be held closed permanently and will Jamaica Bay be transformed into more of a lagoon than an estuary and that concludes my comments. I'd be happy to answer any questions. Thank you.

CHAIRPERSON CONSTANTINIDES: Thank you for testimony. You've answered some of my questions already so I guess, how often do we expect the two foot sunny day flooding in the 2030's under different emissions scenarios?

PHILIP ORTON: If you can go back to about the fourth slide that showed, the one with yellow on it, a lot of yellow. You went past it.

CHAIRPERSON CONSTANTINIDES: There we go.

PHILIP ORTON: So there's two stories here with this map. One is that you don't see a lot of dark blue. The dark blue is flooding in the 2020's, monthly flooding in the 2020's. There's almost no dark blue and I'm not even mapping today's monthly flooding. There's just very little, it's just some very small areas that aren't captured in this map and, you know, the ends of streets, etc. and so some localized areas have monthly flooding and that means 20 to 30 times per year in total and even in the 2020's it's not yet a severe problem. As sea level rise accelerates, it could become a much more widespread problem so if you look at Rockaway Peninsula you see there's some areas that already flood once in a while that in the 2050's they'll have

monthly flooding and so that, like to me this is a map of where you won't be able to live unless you have protection or something. You know, the streets will be impassable 20 times a year so parts of the Rockaway Peninsula it hits in the 2050's, widespread Rockaway Peninsula by the 2080's. Howard Beach is very similar and then JFK it's not until around 2080's, 2100 when you start to have that monthly tidal flooding so it's a good map. It kind of gives you the timeframe of when and this is also the highest, the high end sea level rise of 90th percentile so it could be, if anything, it's a little bit of a pessimistic map.

CHAIRPERSON CONSTANTINIDES: All right, and how about infrastructure like schools, nursing homes, we looked at vulnerable communities, will it be safe for them to still reside in these communities as we move along later on into the century?

PHILIP ORTON: I encourage you to look to the RAND study that I mentioned. We can point you to that afterward. It's a study about Jamaica Bay that's interacting with the Science and Resilience Institute in New York City and they have an analysis of buildings that are in harm's way over time into

the future. I would say that if you're in these areas that would flood monthly then that's a severe problem for running a school. Even if it's elevated, you'd have to elevate the roads or else there will be transportation problems so it really becomes impassable at these stages in the future when you have monthly flooding.

CHAIRPERSON CONSTANTINIDES: So by 2030 some of these communities and really by the 2080's, 2090's, we're talking about just complete and utter

PHILIP ORTON: Many, many communities by the later part of the century, yes, and this is by the high end sea level rise estimate. If it's a median sea level rise estimate, you still have two or three feet of sea level rise and so it would still be, you know, a lot of Rockaway Peninsula will have a severe problem. The lowest lying area within the century are guaranteed, almost guaranteed to have encroaching monthly flooding by the later part of the century.

CHAIRPERSON CONSTANTINIDES: Do you think we're going far enough as a city to sort of stave off some of these effects?

PHILIP ORTON: The Raising Shorelines project is a great way to stave off the tidal flooding and nor'easter flooding, etc. It won't stop Hurricane Sandy level flooding so I think this, and there's a lot of effort in City Planning and I meet with them at least once a year just to talk to them about what they're doing and try to be helpful and I'm always impressed with what City Planning's doing but it's challenging to change a city, you know, to change a zoning. It's challenging to raise buildings that are concrete or brick, big challenge, impossible so if sea level rise happens slowly enough then I'm optimistic that we can just be evolving the city as we rebuild things but there still will be an expense.

CHAIRPERSON CONSTANTINIDES: Thank you. I want to recognize that we're joined by Council Member Donovan Richards and Council Member Adrienne Adams both from Queens and Council Member Richards has some questions for you as well.

COUNCIL MEMBER RICHARDS: Thank you for this intense study and I represent the Rockaway so thank you and I wanted to be sure you are aware of several things going on as well so I think these areas that are reflected here in blue are Edgemere so

we obviously have a lot of Raise Shoreline projects coming online, I think $145 million commitment from the Mayor on at least Edgemere, well $400 million plan actually eventually that will come into fruition and then we're actually doing a drainage study now which the city is actually in the process of completing now and something the federal government also recognized, you know, in this community is we need to push homeowners inland more so and build out features along the shorelines so we're actually relocating families further inland as much as we can without eminent domain or anything of that nature to ensure that we can build protective barriers at least in Edgemere right now. I wanted to know, I had a few questions for you. So should we be building in Rockaway or should we build in these communities and that's a question I'm always tasked at asking or being asked at least by the community so do you see a conflict between building efforts and resilience or I just wanted to get sort of your opinion on that.

PHILIP ORTON: It's gonna be an opinion because that's a really tough problem. One side of me and I can give both opinions, both sides. You know, people sometimes say I can't believe they're

building up the flood zones around the city with high rises and all this and I think you can, you know, the ferry system was the most resilient transportation during Hurricane Sandy so. There's a reasonable argument that if you build things that are meant for water or just plan for what's gonna happen, maybe they're more elevated, then you can still have a city that's resilient to water. You can allow water into certain places but as long as it's not going to the places where people are living then it might be acceptable so you can, maybe with innovation we can do it. Rockaway Peninsula, on the other hand, it's, I really support having buyout funds that are available and give people a good deal if they get flooded instead of having to wait a year or two like some of the programs that we've had. New York State's buyout program was just getting set up and so it really was not a great deal for people and there were people who actually said they would have taken a buyout in some places. Not as much Rockaway, people really want to be there but in some placed people wanted something like that but it wasn't, they didn't like the deal and they didn't take it so having good buyout programs is useful so that people are in flood

zones only if they want to be there. If people want to be there and they probably will want to be there in 100 years on Rockaway still because it's a great place to be then maybe we need innovative thinking and we need to plan for these projections of sea level rise.

COUNCIL MEMBER RICHARDS: And if you had to give, I know you gave a series of recommendations so to deal with tidal flooding, what would be your number one priority if you were sitting in this seat?

PHILIP ORTON: To protecting against it?

COUNCIL MEMBER RICHARDS: Yeah.

PHILIP ORTON: The Raising Shorelines type projects. I think those are great. Maybe also another serious issue will be storm water drainage and as mentioned earlier today

COUNCIL MEMBER RICHARDS: Yeah, there is no infrastructure in a lot of places. They're just finally getting that.

PHILIP ORTON: Yeah, New York City, I mean New Orleans is largely below sea level. New York City is nothing like that. We have elevation. In every neighborhood, we're well above sea level. You know, above high tides a few places, not by much

so it's pumps are what New Orleans uses for everything so pumping systems, it's not green at all. I don't love the concept but from your perspective when you have constituents and pumps are very important. In a place like Hoboken where I work, pumps are very important, Jersey City, Hoboken and I presume parts of New York City and coming up with green infrastructure ways to have the rainwater pile up over there and the homes will be over here. Smart green engineering ideas can help a lot too.

COUNCIL MEMBER RICHARDS: Thank you and where can I find a copy of this report?

PHILIP ORTON: I'll write up my comments, try to capture what I said.

COUNCIL MEMBER RICHARDS: And a copy of your report.

PHILIP ORTON: Okay, this the PowerPoint?

COUNCIL MEMBER RICHARDS: Your PowerPoint, I'm sorry.

PHILIP ORTON: I'll include that at the back.

COUNCIL MEMBER RICHARDS: Thank you, thank you for your work. Thank you, Chair.

CHAIRPERSON CONSTANTINIDES: Thank you, thank you Council Member Richards. All right, thank you for your testimony. We appreciate your time and effort, thank you.

PHILIP ORTON: Thank you.

CHAIRPERSON CONSTANTINIDES: Next up we'll have John Reiner if you'll step forward and Paul Mankiewicz, Mike Dulong and Catherine McVay Hughes as well. All right, great, if we can start there on the right. Go ahead.

JOHN REINER: Hi good afternoon. Thank you for this opportunity to present to you. My name is John Reiner. I'm with P. W. Grosser Consulting. I'm the Vice President for the Geothermal Services at the firm. I've been with the firm about ten years. I've had the privilege to speak before the Committee previously on the two geothermal local laws that were passed in 2013 and 2016 so I'm happy to be here again today. My background is I'm a practicing hydrogeologist. I've worked on Long Island and New York City for about 33 years in that capacity, environmental consulting, hydrogeologic consulting and the likes. The last 15 years I've been working as a geothermal consultant in New York City and Long

Island so I have good familiarity with the Long Island geology, the city's geology and the Brooklyn/Queens aquifer which is a subject of this local law regarding the pilot program. My firm, we've done a lot of work in the city. Personally and with my firm, we've worked with the New York City department of design and construction. I was coauthor with the DDC, Alex Posner, for the Geothermal Heat Pump Manual which was published in 2013 and I've worked on several projects with the DDC geothermal projects in the city and my firm also, we designed the wells for the St. Patrick's Cathedral which is now fully heated and cooled, the entire block that St. Patrick's Cathedral sits on as well as the new Bloomberg Center for Roosevelt Island for the Cornell New York City Tech Project so the subject of this Intro, we're fully in support of it to somehow study and look at the viability of using the shallow ground water from the Brooklyn/Queen aquifer for heating and cooling purposes. That's one type of geothermal system you could use. It's called an open loop system. You use the ground water from wherever you get it from, wells or basement sump pumps in this case if you're actually pumping up the water to keep

your basements dry. You run it through mechanical equipment, exchange heat with it and then you have to put it some place when you're done with it. It's either hotter or colder. Typically with an open loop system, you're pumping from wells. You use the water and then you discharge it back into separate wells that are at some distance away. Because the water is gonna be hotter or colder, you don't want to reuse that water so you want to rely on the ambient temperature water. One thing with these geothermal systems are that it's pretty well documented that they're more expensive than a conventional HVAC system. They're very energy efficient. They're all electric. They allow you to eliminate fossil fuel heating systems. They can heat and cool, all electric devices but they are more expensive than conventional systems owing to the drilling, that part of it so the premise of this Intro is that there is ground water being pumped throughout the Brooklyn/Queens area to mitigate flooding. I assume that's the case. It doesn't discretely say that in the bill but there is pumping going on to keep basements dry and the water is going to the sewer. That's the premise so to use that water beneficially

for heating and cooling would be a wonderful thing. It's very unfortunately that that water just gets discharged into the sewer so we're all in favor of that. How it actually happens is, it's easier said than done but we are in support of it. I've done, personally in my firm we've done several studies within the Brooklyn/Queens area where we've documented this rebound of the water table. I'm in private consulting. We have clients, for instance, I did a study at York College too so we were able to demonstrate with historic water level data from the USGS that the water levels are rebounding and that's basically, essentially because the City has stopped pumping the ground water. I think that's demonstrated as well but be that as it may, it's created a lot of flooding in different areas so let me say the aspect of using this water, it reduces the first costs of geothermal systems because you don't have to install the wells. It eliminates that, that first cost of installing the wells. The infrastructure is already in place whether it's from sump pumps or other devices pumping this water up so basically by more widespread adoption of this practice using this pumped water that's being pumped

to mitigate flooding for geothermal, it will allow for more widespread adoption of geothermal system, more buildings can get off fossil fuel and we can kinda accelerate the city's desires to make geothermal heating and cooling more part of the mainstream HVAC system in the city, basically, all electric heat pump systems and these are ground source heat pump systems. Let's see, okay, so I just wanted to bring to your attention. I'm sorry, I don't have any written testimony but I'll get some to you. I'm encouraged that the DEP is looking at the issue of mitigating the flooding. Because of this rebounding effect, several years ago we met with Congressman Scarborough about that, what kind of studies can be done, so it's very encouraging to see the DEP and the city moving forward. I know they were looking at a passive ground water drainage system for a while so two things I wanted to bring to your attention and I think you alluded to the MTA, what is the MTA doing about this. You may or may not be aware of the New York City Transit Authority did a very comprehensive feasibility study and don't quote me but I think it was the Archer Avenue subway system and the Pitcairn Avenue subway and I can send you

copies of that if you'd like. Both of those subway systems have permanent well pumping around them to keep the subways dry and that water is being directly pumped into the storm water system that runs to Jamaica Bay so they did a study where they actually looked at what can we do with this water. It's on the order of 10 to 11 million gallons per day. What can we do with this water? They looked at end users along the pipe routing to Jamaica Bay, different types of end users, all sorts of beneficial reuse, geothermal, you know, truck, car washing, cooling tower, water for evaporative cooling tower so I just wanted to make you aware of that that that study exists and it's an excellent study and I guess regarding the bill, I would say it shouldn't focus just on buildings that are pumping to use that water for heating and cooling in that building. There are other sources of the water that, you know, another city facility could tap into this MTA water. That's my thought and there also could be two facilities next to each other that this one's pumping to relieve flooding. This one doesn't have issues with flooding but maybe this building could use the water because their mechanical system can't be retrofitted for this

one so let's share the water across property lines and let's perhaps look into tapping into the MTA's free water. Ten years ago they called it free water.

CHAIRPERSON CONSTANTINIDES: Thank you.

JOHN REINER: Okay.

CHAIRPERSON CONSTANTINIDES: Next sir. I think the sergeant-at-arms can take that testimony.

CHAIRPERSON CONSTANTINIDES: Great, thank you. Go ahead.

PAUL MANKIEWICZ: Thank you, yeah, good afternoon. Thank you for the invitation. I'm very impressed with the modeler you got to present the material. I've been at this for a fair amount of time. I'm Paul Mankiewicz. I have a doctorate in developmental biology. I'm a founding board member of the Soil and Water Conservation District, founder of the Urban Soil Institute, run something called the Gaia Institute in New York City and I'm a professor at Pratt Institute. I have built a fair amount in New York City and I, in 1989 and starting in 1990, was a expert witness for Bobby Kennedy who was basically suing the city over the Pelican Bay landfill and illegal discharges. After that process, it was fairly clear exactly what you're seeing today

was true then. Let me say that another way. In 1990 I was president of the Troy Botanical Society and Senator Al Gore had all the presidents of the American Geophysical Union and all the biological and ecological groups and he said, he looked at the global warming and sea level rise and he said, you all know this is happening. What can we do to make something happen about it? So this meeting is extremely encouraging because this is something that we can literally do to have some impact on a number of ways, both on shoreline protection and the rest. The initial opportunity I just want to talk about is we make about 2,500 tons a day of glass aggregate, recyclable glass, [Inaudible], and on the little handout there it shows if you were to build, and I have built many in New York about the first 20 or so for New York City, the first dozen for DEB and the Jamaica Bay Watershed, a basically, every square foot of sidewalk or roadway or parking lot, if you had two feet of this glass, you would hold one foot of flood water. It wouldn't go away. It would store it literally and then it would seep out back into the estuary afterwards and the expense of this, we have this in our hands. We also have a huge multiple of

that, something like 19,500 tons per day of waste glass, concrete, and also brick. I'm telling you this because that's an opportunity. Dan Walsh runs the Mayor's Office for Remediation. They pull out of the ground every year 100,000 cubic yards of sand that is so clean that literally passes all environmental tests. It's enough sand to make a dune about 20 feet high and 10 feet long every year so it's true, we need to protect the coastline. We have materials that literally could be creating habitat for piping plover, for lease tern, for black skimmer, dune grasses and also protecting the people with exactly what was here before. It would take some creativity but in the city that actually produced the first great watershed, the first great infrastructure, we could probably do this but I'm saying that we have literally an opportunity in what passes through our hands. All ecological systems work by turning waste into resources. Taking the 11 million gallons of my colleague here, that, if that transpired from either street side planting or green roots or green walls is worth about $7 million in cooling. I've a green roof in Red Hook, New York and he saves, it's a 12,000 building, and he saves 40% of

his air conditioning and about 24% of his heating. Water, I love the other use as well. This is, water is the thermal regulator of planet earth so the, in front of us we have to do something about sea level rise. The incremental change is not a problem. It's already passing through our hands. We had this immense amount of material. One could also build actually deeper storm water capture system than use some heat sinks and sources just as described in the previous presentation. It's just an opportunity and you can look at it piece meal or integrated just as you've heard just now so I'm gonna vote for integrating and I thank God the City Council has taken this interest because we could make a difference. Thank you.

CHAIRPERSON CONSTANTINIDES: Thank you. Ms. McVay Hughes.

CATHERINE MCVAY HUGHES: Hi, nice to see you again.

CHAIRPERSON CONSTANTINIDES: Yes, I apologize for not being there Wednesday. I was a little under the weather so.

CATHERINE MCVAY HUGHES: Oh, that's okay but we would love to get you to our next meeting. A

date has to be determined for the storm surge barrier working group but we'd also love for you, if we can make a presentation for you and your colleagues or even have a hearing on it because right now the U. S. Army Corps is looking at five different options and as you know, option 2 is the regional storm surge barrier so since last Tuesday when I testified, I actually now have a copy of the article that was referenced, *The Environmental Law in New York*. I will be submitting this. I only have one copy because it's a color printout and it's the social justice case for metropolitan New York, New Jersey regional storm surge barrier by Dr. Malcolm J. Bowman, William Golden, myself, Dr. Christopher Sellers and Robert Yaro [phonetic] so I just wanted to point this out. I'll be submitting this officially to the record. In addition, there are two copies in the green folder. We ran out of newsletter one and newsletter two and the conference briefing. We had an all-day conference on May 18 a year ago on protecting New York and New Jersey from future storm surges so what I'm going to be doing today is just reading the note from the chair of the storm surge working group. We are advocates for a layered

defense system encompassing both an offshore regional barrier system and a network of onshore perimeter defenses that would be developed together by the New York City and all the coastal communities surrounding the 1,000 miles of shoreline of New York Harbor, its tributaries and the lower Hudson River. This specifically separates the function of the regional barriers designed to hold back dangerous storm surges from future mega storms but not the slow but insidious rise in sea level. Regional storm surge barriers must be held open 99.99% of the time for the purposes of the navigation, fish migration, fisheries, tidal currents, river discharges, harbor flushing. There's no way they can hold back sea level rise. This then shifts the responsibility of protecting the city and other perimeter Harbor tributary Hat [phonetic] communities in New York and New Jersey from sea level rise through the construction of modesty walls, abutments, and barrier beach renourishment projects in a grand partnership. We don't oppose the city's proposal to build more than a hundred perimeter barriers for its 520 miles of coastal shoreline. We want to partner with them to protect the city and region from both damaging

storm surges and sea level rise. We believe the system of layered defense can protect the whole metropolitan region for more than a century into the future. Only in this way can the essential tasks of protection against both storm surges and sea level rise be accommodated in an advantageous cost benefit scenario plus gain the support of the metropolitan residents who will not accept 20 foot high walls built around their iconic shore line views of New York City, Hoboken, Port Elizabeth, Jersey City and other coastal communities and infrastructure. What I also want to say is I know this Committee is not focused on what causes green-house gas emissions but I did present at last week's hearing a chart, I'm sorry I didn't bring it with me, that there has not, it has been a level off for the last five years of public data so your Committee, you know, is at the crossroads of, you know, trying to limit that and also to protect our incredible neighborhood and congratulations on your city and State profile that just came out Chair Constantinides.

CHAIRPERSON CONSTANTINIDES: Thank you.

KATHERINE MCVEY HUGHES: Thank you so much

CHAIRPERSON CONSTANTINIDES: Thank you, sir.

MIKE DULONG: Good afternoon, Chairman Constantinides and members of the Council. My name is Mike Dulong. I'm a staff attorney with Hudson Riverkeepers. We're a non-profit watch dog organization dedicated to defending the Hudson River and all its tributaries and to protecting the drinking water supply of nine million New York City and Hudson valley residents. Thank you for the opportunity to testify today. We're thrilled by this Committee's attention to Jamaica Bay. I've provided copies of my testimony. I'm not gonna read it just give you the leads. We support Intro 750. The task force proposing a bill we think could help bring additional City Council oversight to Jamaica Bay and to water quality and resiliency issues and there's a lot going on down there right now. As you heard, there is the Army Corps proposal for a $3.7 billion storm surge barrier. We are still concerned that there has not been research done on how the barrier might choke the Bay and that research has to get done. We think this Committee and the Council could help make sure, help ensure that the Army Corps does

that before anything, any decisions are made with that tremendous amount of resources and DEP is also working through plans for storm water both in the separate sewer district. There's a storm water management plan out right now in draft and in the CSO part, which I think makes up about 31% of the drainage area that comes into the Bay, there is the long-term control plan. Both of these are out right now so there is some time pressure to getting this done. The comments would be due on May 15 for the long-term control plan for the CSO's combined sewers and May 15 for the storm water management plan and we expect for that Army Corps proposal, we expect to see another one, a modified proposal some time towards the end of this summer so that said, we want this task force, we think it would be great but as noted by Ms. Licata from DEP and as Council Member Ulrich said earlier, there is already a community driven task force in the area and we think that the Council's task force could work alongside that and not displace it.

CHAIRPERSON CONSTANTINIDES: That is our, that is our goal to just codify the current task force.

MIKE DULONG: Great, that's good to hear that and so we urge the Council to include at least two members from that task force that there could be cooperation, integration and you know what, call up Dan squared as Councilman called him before and see how you can best integrate because they had a meeting last week. There were 70 people there. They've got a good thing going. They have community buy-in and you can translate that to what you're doing here. Now on 628, Chairman Constantinides, I really appreciate your words about climate change to kick this meeting off, to kick this hearing off. Planning and now ensuring for resiliency is essential to save property and to save lives especially in low income communities. I probably don't need to read this off because you know this better than anybody but 43 people lost their lives during Sandy, 51 square miles of New York City flooded. That's 17% of the city. On the flood maps that were put out by FEMA that were in existence at the time and I believe still are, only 33 square miles had advance notice that there would be flooding in those neighborhoods so we acknowledge that flooding and flood insurance maps have a tremendous financial impact on residents and

their ability to live there and afford flood insurance depending on where the line is drawn but we're concerned that if you draw very conservative flood maps, you'll give residents a false sense of security and what that'll do is make residents more likely to shelter in place during a major storm and it will make them more likely to develop new structures in vulnerable areas and potentially structures that aren't resilient against climate change so as part of this bill we urge the Council to inform people of these scientifically based risks, the real risks of flooding, both the current and the future risks which are way worse and so we would urge you to send maps, send mailers with maps and plain language explaining that risk and urging people to get flood insurance, to get covered. If they do get covered now, it's possible they could save money in the long run by grandfathering their rates so we think that information will be crucial for these communities even, no matter where the lines are drawn by FEMA and the city. Thank you.

CHAIRPERSON CONSTANTINIDES: Thank you. Council Member Richards, do you have any questions? All right, I want to thank you all for your testimony

today. We definitely appreciate your input and look forward to working with you as we refine these bills for passage so thank you. [Music] So I think the music is making us Skype in our next witness.

WILLIAM SWEET: Hello?

CHAIRPERSON CONSTANTINIDES: All right. so is this William Sweet?

WILLIAM SWEET: Yes, hi, William Sweet here.

CHAIRPERSON CONSTANTINIDES: I don't think we see you but we can hear you. Give us a moment. There you are, all right. Hang on one moment. There he is. All right, all right so are we good?

WILLIAM SWEET: I can hear you all.

CHAIRPERSON CONSTANTINIDES: We can hear you.

WILLIAM SWEET: Great.

CHAIRPERSON CONSTANTINIDES: All right so we're ready to hear your testimony, Mr. Sweet.

WILLIAM SWEET: Great, super, well I'll share a PowerPoint that I have and walk you all through it. All right, is it showing up?

CHAIRPERSON CONSTANTINIDES: Yes.

WILLIAM SWEET: Great, all right, well I will have about ten slides or so. Take about ten minutes and sort of walk you through some of the latest research and applied research that we are doing here at the group I work with here in NOAA so entitled Projections of Sea Level Rise and High Tide Flooding along the New York City Coastline so to start, I'm an oceanographer. I work with the a group, The Center for Operational Oceanographic Products and Services that is under the National Ocean Service in NOAA and we operate all the tide gauges around the country and this data provides us information about not only high tide and low tide important for shipping but also how sea levels and flood risk have been changing and I will focus more or less on the New York City area. I know you're discussing Jamaica Bay and use The Battery tide gauge in some illustrious and quantitative ways so as mentioned, we have several tide gauges in the region one of which here, this is an old photo of gauge at The Battery before we moved it. Again, we measure not only the astronomical tide but any weather, which storm surge, for instance, Hurricane Sandy. We measured that height at our gauge and really I think

what's important is what does it, high tides and changing high tides at that matter, you know, how does it start affecting and impacting the communities so shown here is just a graphical representation of what a time series of data looks like and, you know, after I show you some graphics on February 8 and 9 during a nor'easter that you all had to show it, what type of flooding I'll refer to so in general minor flooding about two feet above the mean high tide range, moderate more or less three feet, major or four feet or more and I'll focus sort of on the two to three foot range which we're sort of referring to as sunny day. There may be a localized storm but more times than not these types of events are happening from more common tides, common storms or wind events. Maybe they're not local and are starting to spill into the streets so here'd be an example of that February timeframe. You all know these locations better than I but the local weather forecast office of the National Weather Service sort of documents, you know, impacts and where they're happening to sort of give an illustrious example of the types of impacts associated when water levels reach the tide gauge let's say at two feet or three

feet above the mean highest average tide so very quickly some pictures when the tide gauge reached these levels so as you can see and as I'm sure many of you experienced or witnessed, you know, we're talking about some, you know, fairly consequential storm, water levels. This obviously occurred during a nor'easter but again the idea is that we're gonna have these common weather events and we're not talking about the Hurricane Sandys. We're just talking about winds blowing out of the northeast combining with a high, you know, full moon type tide and water's now beginning to spill into the streets more often so with that in a snapshot if we'd say sort of where infrastructure is built currently, two feet or three feet above this high tide average that would be the 0, you know, above the mean high tide and how the daily highest water levels in a over five year spans have just changed through time. You know, it gives you sort of a sense of, you know, you do have those rare events, there are seasonality, but now more common year to year repetitive type of tides and weather events are becoming more impactful and the way that I think it's being shown let's say in the risky business type of documents and just

increasing risk is this idea that if these are bell shaped type curves that represent the highest water level, daily water levels in a given year, so about 365 events underneath this curve. It's very non-linear underneath this curve, there are three time sort of decadal averages let's say due to sea level rise, relative to infrastructure, this is that increasing risk. You know, it's a very clear signal of sea level rise and it's very well documented so with that we can say all right with a three foot flood, the number of days with a three foot flood, you're sort of outside still the curvature of these risks, let's say, but it's increasing though it's still somewhat rare maybe once every other year or so over the last couple decades but when we measured let's say the two foot flood, the number of days now is clearly accelerating and it's because this, as sea level rises, there's less free board or there's less distance between the average tides and let's say a two foot elevation which has some consequence and the number of times, number of days per year, is already on an accelerated trajectory and in time, the three foot flood will be and in time the four foot but I think what you all are debating is when does that

come and I used these metrics because you're sort of remeasure them on an annual basis so it's a little bit different than describing when does the hundred year event become the ten year event or the one year event. That's bit more difficult because the uncertainty of these types of event probabilities. The hundred year event isn't very well sampled. The Hurricane Sandys, it required dynamical models and all sorts of different ways of dynamically or statistically trying to determine what is the one in a hundred year type of event whereas the events that happen on an annual basis are very well sampled and so really the waiting time as we move to the future, just as we've been documenting from the past is really about once, does that become sort of an annual level event. The uncertainty of that event is really not there. You know, on a year to year basis, the event that happens once a year might vary by just a few centimeters so it's very repetitive and it's really about how much sea level rise needs to occur until events now, let's say the three flood until they start becoming very recognizably in the term of a trend, you know, when they become five, ten, twenty days a year kind of thing so with that in mind, a

little background. I was given, you know, a few questions that, you know, maybe I could speak to to as you all go into your deliberation for your proposals. The idea is that, you know, there is going to be a certain assumption, you know a scenario that you'll plan to and in this case a degree temperature increase. I'm not sure when the underlying annual basis was. Is it preindustrial or what have you but it really gets at a increase of somewhere between maybe 4 and 6° Fahrenheit and in terms of characterizing that, you know, it's sort of the trajectory that the emissions that we're currently on as, and that's been documented by the Intergovernmental Panel of Climate Change as it's representative concentration pathways that will then relate to some sea level rise scenario modeling that we've done at NOAA and other agencies in academic institutions to provide this information for all the U. S. including New York City so to future planning guidance so those scenarios which we worked with researchers with the USGS, with Rutgers, Columbia University. We put out a study last year that is being included in the National Climate Assessment, the fourth assessment that's ongoing right now really

started looking at, you know, I'll talk, refer to them as sea level rise by year 2100. There's this low end scenario of .3 meters, this low blue line or it could be as extreme as upwards possibly globally of 2.5 meters. Very unlikely but plausible but we'll focus more on the intermediate low, intermediate high and we'll specifically choose those and again if I back up, those values there were the intermediate lows, the medium blue, sort of royal blue .5 meters globally, intermediate is 1 meter by 2100 and the intermediate high is 1.5 meters by 2100. Again, that global and we'll downscale these and then apply that to a coastal flood risk so again the story lines would more or less be, need to use the intermediate low to really characterize what might happen over the next decade because that's a little bit more along the lines of the trajectory but the intermediate low all the way up to the intermediate really sort of characterizes this annual variability that we're experiencing as well as the trend and the associated story lines with these are the intermediate high is pretty much bound sort of a very likely range of sea level rise under the way that we currently are modeling with current emissions as usual. Again, it

could be higher than that but if those types of scenarios were to unfold, it would be likely much later in the century and so the questions again were sort of focused on what might happen in the 2020's as well in the 2050's so these would be sort of the three scenarios that we present. In terms of that global realization of those sea level rise amounts, we also need to account for changes in land elevation. That region is slowly subsiding partially due to the removal of the ice glaciers. There's gonna be gravitational rotation effects to melting of land based ice of Greenland and Antarctica. It currently once it has exerts a lot of gravitational tug on the water just because of the additional mass there. As that continues to melt, the gravitational attraction will decrease and the water will rise far away from the source of these ice so we calculate that as well, as well as circulation changes. The slowdown of the Gulf Stream system at this overturning circulation in all the models are suggested to cause an additional rise along the New England coast so with that, here's what the scenarios actually look like downscaled for the New York City region and overlaid with annual mean sea level that

we've been measuring at The Battery and again, these are very similar to what you would see at Sandy Hook or Virgin Point. Sea level is a fairly coherent change so the length scales are fairly large so this is more or less your sort of regional sea level rise so you can see that if the focus will be on the sort of the cyan, light blue, green and yellow, is sort of the three bounding potentials right now that will project out into 2020 as well into 2050 to give some sense of, you know, what that outcome would be if sea level rises by that amount during those time periods so with that in mind, we'll start with the number of two foot floods, number of days per year with a two foot flood as measured by the tide gauge. Already at the previous slide I showed you that it was already on an annual flood frequency basis as a linear, a quadratic or non-linear increase in the number of days per year and this is sort of the continuation, the pinks referring, just for a color contrast here. The pink by no means is to say that is not an important factor, just to stand out but that's currently what's been measured whereas the light blue, the green and the yellow would represent those three bounding scenarios and so when you take an

average over the 2020's, those are the numbers that you would expect, the number of days per year. It could be two high tide in a given day but we're just quantifying days per year so that would contrast into currently what you're experiencing now would be more or less lines of six or so if you fit that with the quadratic fit trend line of about 2015 so a very large increase. Again, this is for a two foot flood, above mean high or high water, the highest average tide. If we project that further midcentury on average during the 2050's or an average from 2050 to 2060, excuse me, oops. All right, there we are. Can you see the screen? Are you still with me?

CHAIRPERSON CONSTANTINIDES: Yes, we're here. We can see.

WILLIAM SWEET: Okay, super. When you project out the to 2050's, here's the new numbers so again it's characterizing the fact that again the repetitive nature of sea levels we very well have measured and can quantify those and so really the uncertainty here is not so much on the extreme as how much will mean sea level increase so this would be your characterization by midcentury of a two foot flood. Not as impactful as a three foot flood.

We'll look at that next so by definition the mean high tide line often time what you'll see in some mapping tool such as sea level rise viewer, the zeroes mean high water. By definition that occurs about 180 days per year so when you get beyond 180 days per year, you're saying that the mean high tide line really will be at two feet so to put that into perspective. Now if we look at the number of days per year with a three foot flood, more impactful. Many of those images I showed earlier were closer to a three foot level as measured by The Battery tide gauge simultaneously as flooding was occurring. Currently there's not really an observable trend. It still happens maybe once every other year so we're not really getting enough instances where it forms, you know, a clearer linear or quadratic increase but doing the same sort of analysis going into the 2020's, something that now occurs maybe once every other year over the last few decades under, you know, these three scenarios. For instance, the intermediate high would happen on average seven days per year. The intermediate low maybe one to two days per year going from something that would happen every other year currently so if we project that out to

midcentury in the 2050's, here are the new values and they are a very large difference between the intermediate high and the intermediate low largely due to that bell shaped type characterization of sea levels in New York City and that's similar as elsewhere around the country that shape of the bell shaped curve is slightly different but again there's a remaining amount of free board, you know, between the types of events that cause, you know, fairly, you know, abnormal flooding or once every other year to something that becomes much more routine and, you know, projecting under these three scenarios at least gives you some sort of sense of the flood frequencies that are anticipated if sea level would follow suit accordingly and so we're developing these types of tools to help you track long. Hopefully this is informative in, you know, some of the decision making as to the types of risks that may or may not face this region but to be aware of what is more likely to unfold under these types of scenarios as you plan and move forward so with that, that is the presentation. I will, if you have any questions I'd be happy to answer those now and I can either go live or keep the screens up, the presentation up.

CHAIRPERSON CONSTANTINIDES: Just definitely appreciate your deep analysis here, Mr. Sweet. Thank you for your testimony so what do you think the city could be doing better to stave off some of these large flooding projections?

WILLIAM SWEET: Well, I don't know so much about staving off. I think, ultimately the group that I work with within NOAA, the forefront is really getting the data into the decision maker's hands so they're aware of the patterns that are already ongoing and aware of the future risk. You know, on a local entity, you know, I think it's very customizing your response to what's likely to unfold and often times collectively as a whole, you know, these scenarios do relate back to emissions scenarios but again, not to say that's sort of without the reach of a solo entity of one town versus a collective response globally. The scenarios again being tied to emissions sort of speak to themselves. You know, I think there's groups within NOAA and elsewhere that definitely discuss, you know, as you fortify and defend or come up with mitigative strategies to recognize that, you know, you can build with nature or, you know, sort of open space design

in mind where you afford flood defenses as well as create open space for people to, you know, utilize land that otherwise might, you know, become inaccessible so to directly to gear you towards giving you guidance, policy type prescriptive guidance isn't directly my, you know, that's not the part, the role that I play here but I think really becoming aware of the change and what looks to be, you know, the types of outcomes in the next several decades under, you know, one or two scenarios I think ultimately hopefully will help guide, you know, the decision making process so I sort of answered that indirectly as best I can.

CHAIRPERSON CONSTANTINIDES: All right, I appreciate that. I appreciate that and I'm gonna turn it over at this point to my colleague, Council Member Stephen Levin.

COUNCIL MEMBER LEVIN: Thank you very much, Mr. Chair. Thank you for that presentation. Very alarming, very concerning, horrifying, you know. It's within a lot, you know, a lot of our lifetimes that we're gonna be seeing or potentially, you know, half the year under three feet of flooding. That's horrifying. Do you have, because the trajectory of

your data or your projections are showing, you know, its rapid acceleration. Do you have the empirical data from the last 50 or 75 or 100 years to show what the, whether there's been any variation, you know, prior to the last few years?

WILLIAM SWEET: Well I think in terms of, I guess you gotta, we gotta disentangle two things. I guess mean sea level, you know, what is the, mean sea level does as I showed with the earlier tide gauge, isn't always a nice, clear, you know, curve or nothing seems to follow a nice, simple trajectory. There is that inter annual variability and as you go back specifically to the New York City area and New England for that matter, there are decades where mean sea level rates are higher, then lower and it looks as if now, at least on a global basis it's easier to reconcile global sea level change and make inferences about past decadal rates compared to today's rates. When you're at a local area, there's a lot of variability from other factors of prevailing wind patterns changing to water temperature changes to Gulf Stream influences that kinda hard to disentangle so there is evidence that, you know, that sea level rise rates have varied but the long term trend is

definitely positively and the current rate of change is statistically about in the likely areas of saying that this is different over the last several centuries. In terms of flood risk, you know, then that's another anecdotal or evidence of saying, you know, if you talk about let's say a Hurricane Sandy or these rare events, you know, that sometimes aren't in the tide gauge that I tend to rely more heavily on in these types of presentations. You know, there are sedimentary over wash instances that would say, that we would find seem to be quite rare and you start sampling these rare events with a population the size of one or two, you need to look elsewhere and so the sedimentary over wash would suggest that types of Sandy level surges have occurred several times in the last several centuries so again, there is a, there's patterns and cycles that often times compound the trends as we're looking at them but we're able to generally tease those out and as we project into the future I'm really basing this on sort of 20 year kind of averages so there will be periods where the tide ranges are higher within a 19 year cycle and so in any given year it may not be quite as high or it might be higher but that's why typically as stated

with those averages I'm sort of making by the end of the, let's say 2060, it's an average of what would have occurred over the decade prior to sort of give a more conservative estimate. The underlying scenarios themselves are based on 19 year snapshots working with Bob Kopp and others at Rutgers and other modelers, their output so again it's not so much, it's really trying to characterize the overall state of change and not so much year to year variability.

COUNCIL MEMBER LEVIN: Thank you.

CHAIRPERSON CONSTANTINIDES: Mr. Sweet again thank you for your work. Your projections as Council Member Levin talked about are something that we have to take to heart and do the work and they are sobering so thank you for your efforts. We really appreciate it.

WILLIAM SWEET: Well thank you. I'm glad to be able to help out and good luck with your, your decision making.

CHAIRPERSON CONSTANTINIDES: Thank you. All right, so seeing no other testimony at this time, I want to thank the administration, all those that gave testimony today. I want to thank our staff attorney, Samara Swanston, our policy analyst, Nadia

Johnston and our finance analyst, Jonathan Seltzer. We also have Kent, our intern at the end who's been doing a great job and my legislative counsel, Nick Wazgowski. At this time we will, I will close this meeting of the Committee on Environmental Protection. Thank you [gavel].

C E R T I F I C A T E

World Wide Dictation certifies that the foregoing transcript is a true and accurate record of the proceedings. We further certify that there is no relation to any of the parties to this action by blood or marriage, and that there is interest in the outcome of this matter.

Date May 24, 2018