

**TESTIMONY BY
DAVID BRAGDON
DIRECTOR, MAYOR'S OFFICE OF LONG-TERM PLANNING AND SUSTAINABILITY**

**THE COMMITTEES ON ENVIRONMENTAL PROTECTION & WATERFRONTS
DECEMBER 16, 2011**

Good afternoon, Chairman Gennaro, Chairman Nelson and Committee Members. My name is David Bragdon and I am the Director of the Mayor's Office of Long-term Planning and Sustainability. With me today are Howard Slatkin, Director of Sustainability at the Department of City Planning, and Kelly McKinney, Deputy Commissioner for Preparedness and Planning at the Office of Emergency Management.

On behalf of the Administration, I appreciate the opportunity to discuss New York City's efforts to reduce the city's greenhouse gas emissions and prepare the city for current and future climate impacts. These actions are a motivator behind PlaNYC, Mayor Bloomberg's long-term sustainability plan, which includes goals to reduce citywide greenhouse gas emissions 30% by 2030 and increase the resilience of our communities, natural systems, and infrastructure to climate risks.

New Yorkers already have one of the lowest per capita carbon footprints among major cities and we are taking aggressive action to shrink that footprint further. In 2007, the City of New York committed to a 30% reduction in citywide greenhouse gas emissions below 2005 levels by 2030, and a 30% reduction in City government emissions below fiscal year 2006 levels by 2017. These goals were codified in law under Local Law 22 of 2008 and through an Executive Order, as well as a requirement that the City produce an annual assessment and analysis of citywide greenhouse gas emissions, which we do each September.

New York City's citywide greenhouse gas emissions are largely the result of fossil fuel energy consumed by buildings and transportation. Roughly 75% of our greenhouse gas emissions are related to heating, cooling, powering, and lighting buildings. 20% of our greenhouse gas emissions are caused by transportation. 3% are caused by solid waste operations and decomposition.

Citywide greenhouse gas emissions have decreased 12% from 2005 levels, largely as the result of a significant reduction in the carbon intensity of our electricity supply driven by a shift in the fuels used to generate our electricity. While the change in the city's fuel mix is a major factor putting us halfway toward our goal, our electricity sources in the future are uncertain and somewhat beyond the City's control—such as potential decommissioning of Indian Point. As a result, achieving our goal will require considerable efforts in multiple areas that are in our control in the coming years, even as external factors could impact our success.

PlaNYC includes 37 initiatives to reduce the city's greenhouse gas emissions. To address the critical area of energy use in existing buildings, we worked with the City Council, including many of the members on these committees, to create the Greener, Greater Buildings Plan, which was passed by the Council in December 2009. The Greener, Greater Buildings Plan is the most comprehensive set of efficiency laws in the nation and will decrease emissions by almost 5%—the single biggest action we can take to reduce carbon emissions. It will also reduce citywide energy costs by \$700 million annually by 2030 and create roughly 17,800 construction-related jobs over ten years.

To address energy use in new construction, we partnered with Speaker Quinn to launch the Green Codes Task Force, which brought together over 200 technical experts to review the city's building, construction, and zoning codes. The Green Codes Task Force developed 50 separate code proposals to increase energy efficiency in buildings. 29 have already been enacted, most of them through City Council legislation. The remaining proposals, which will be introduced in the coming months, are roughly estimated to reduce citywide emissions by 7-10%—the equivalent of making Miami carbon neutral.

And on Monday, the Department of City Planning began the public review process for the Zone Green text amendment, which will remove zoning obstacles and give building owners more choices for the improvements they can make to their buildings to save energy and reduce carbon emissions.

In addition, we are providing assistance to building owners who want to increase their energy efficiency. We have utilized \$37 million in Federal stimulus funds to create the New York City Energy Efficiency Financing Corporation, which is creating loan products for energy efficiency retrofits.

The regulations the Mayor signed last spring phasing out the use of heavy heating oils will also reduce greenhouse gas emissions and provide significant air quality benefits.

The City's investments in energy efficiency upgrades to its own buildings, laid out in the *Long-Term Plan to Reduce Energy Consumption and Greenhouse Gas Emissions of Municipal Buildings and Operations*, are also beginning to show results. Greenhouse gas emissions from City government facilities and operations are now below the fiscal year 2006 base year level—and current annual reductions are on track to achieve a 30% reduction by 2017.

Under the leadership of the Department of Citywide Administrative Services (DCAS), the City has completed 129 building retrofits since 2008. These investments have reduced greenhouse gas emissions from government buildings by 16,000 metric tons and save the City almost \$7 million annually in energy costs. The City has another 114 projects in design and construction.

DCAS also benchmarked energy use in 2,790 City-owned buildings this year. The results of this work are available on our website as part of a comprehensive report detailing benchmark information on all New York City government buildings 10,000 square feet or larger.

To reduce emissions from transportation for City operations, the City has added 5,973 alternative fuel vehicles to its fleet—including 422 electric vehicles—making it the largest municipal clean fleet in the nation.

We are also working to reduce the amount of solid waste we export to landfills, where it decomposes and emits methane, a harmful greenhouse gas, and make our solid waste management system more efficient by shifting garbage from long-haul trucks to rail and barge. Together these measures will reduce greenhouse gas emissions by 2%.

Public transportation is an essential component of our strategy and is the major reason that New Yorkers already emit far less carbon per capita than residents of comparable American cities and emit about one-third as much carbon as the average U.S. resident. Everything that we do to increase access to public transit and make biking and walking safer will reduce burning of fossil fuels by automobiles. The current financial instability of the MTA threatens its ability to

maintain and expand the system to accommodate future population growth and poses a risk to our emissions reduction strategy.

In addition to MTA financing, state and federal energy policies are the other major factor beyond our control which will affect our emissions. For example, if Congress were to pass a national carbon tax or foreign oil import fee that would reduce fossil fuel use nationwide as well as in New York, helping us meet our goal. Conversely, federal or state decisions discouraging lower-carbon energy sources like nuclear or natural gas could lead to more burning of coal and increase the carbon-intensity of New York's electricity supply, sending our per-capita emissions up.

Now that I've described our efforts to reduce our *contributions* to climate change, I will turn to what the City is doing to *prepare for the effects* of climate change which are bound to occur. Even if we as a City or even as a nation or world were able to magically cease all our emissions tomorrow, the science is irrefutable that enough atmospheric change has already occurred that will alter our climate and affect future weather patterns.

We must increase the city's climate resilience—our ability to withstand and recover from extreme events and environmental changes.

New York City has always faced heat waves, snow storms, high winds, tropical storms, storm surges, lightning, and torrential downpours – but as our climate changes, these events will become more frequent and severe.

As we increase our resilience to current and future climate risks, we will be guided by a full understanding of the risks we face and the costs and benefits of various potential options. Using a risk-based approach built on hard science will allow us to pursue and implement the most effective initiatives to protect our city and its residents.

In 2008, Mayor Bloomberg convened the New York City Panel on Climate Change (NPCC), composed of leading scientists, social scientists, academics, and risk management experts, to advise the City on climate change. The NPCC projects that by mid-century, New York City's average temperatures will rise by three to five degrees Fahrenheit, and sea levels could rise by more than two feet. By the end of the century, the city's climate may be more similar to North Carolina than present-day New York City and sea levels could rise by as much as four and a half feet. While New Yorkers currently experience an average of 14 days a year with temperatures over 90 degrees Fahrenheit, by the 2080s it could be more than 60 days.

In response, PlaNYC outlines a five-point approach to increasing the city's climate resilience that includes:

- increasing our knowledge and understanding of climate risks,
- changing the design and operation of our built and natural environments to account for current and future climate risks,
- evaluating the public health risks associated with climate change,
- increasing the city's preparedness for extreme climate events, and
- working with communities to increase their resilience.

There is no single "one size fits all" answer to the risks of climate change, because those risks are multiple and varied. That's why New York has taken this multi-front approach, which was

cited by the National Academies of Science's America's Climate Choices committee in 2010 as "one of the most comprehensive approaches so far to adaptation in the United States."

In that first category of assessing risks, we are working to develop accurate knowledge of our current exposure. The Federal Emergency Management Agency's Flood Insurance Rate Maps—known as FIRMs—determine which properties must participate in the National Flood Insurance Program and where new buildings must comply with floodproofing standards. These flood maps have not been significantly revised since 1983. The City is working with FEMA to update the city's FIRMs. The updated maps, which will be released by FEMA in draft form for public review and comment in 2013, will reflect changes to our shoreline, built environment, and sea levels—which have already risen three inches since 1983.

Unfortunately, the FIRMs as conventionally produced only incorporate historic information and do not reflect the impacts of future sea level rise. We are working with a number of academic institutions to develop publicly-available flood maps that incorporate sea level rise projections to be used for planning purposes. These maps will help government agencies, private companies, and communities plan for sea level rise.

In that second category – of altering the design and operation of our city and facilities – we know that our resilience to coastal flooding is a critical concern for a city with 520 miles of waterfront. But our densely populated city does not have the option of picking up and moving to higher ground. Our solutions, again, will be multiple and varied, reflecting the complex nature of the threat and different costs and benefits of numerous approaches. We must consider both structural and non-structural measures to protect buildings and shorelines from erosion, prevent flooding, and reduce wave and tidal action. Working with the Department of City Planning, the U.S. Army Corps of Engineers, and several academic partners, we are evaluating a wide variety of coastal protection strategies, from wave attenuators and soft edges to storm surge barriers, to determine how and where each could play a role on New York City's extensive and varied waterfront at the appropriate proportion of cost and benefit. Reflecting our commitment to a fact-based, science-driven approach to climate change, we are not presupposing the outcomes of this or other studies underway.

We are redesigning infrastructure to reflect the risks. To ensure climate change is incorporated into the design and operation of the city's critical infrastructure, we launched the New York City Climate Change Adaptation Task Force in 2008, which is composed of 40 city, state, and federal agencies and private entities that operate or regulate critical infrastructure in the city. The Task Force's mission is to assess how climate change could impact our infrastructure and to develop measures to increase the city's climate resilience.

The Task Force identified more than 100 types of transportation, energy, water and sewer, solid waste, telecommunications, and natural infrastructure that climate change could impact. The Task Force will use this initial assessment to develop coordinated strategies to increase the resilience of the region's infrastructure. These strategies include changes to standard capital and maintenance processes and will be released next year in a Task Force assessment and report.

In advance of the Task Force report, several City projects are already being built to address climate risks. Parks, such as Brooklyn Bridge Park and Governors Island, include shoreline treatments such as riprap and salt-resistant plantings that can accommodate flooding. The entire Willets Point development site in Queens is being elevated out of the floodplain. Several

wastewater treatment plants include flood gates and plans to raise critical equipment above future flood heights.

To better manage rainfall, which the NPCC projects will increase by 5-10% by the end of the century, the Department of Environmental Protection is investing \$1.5 billion as part of the NYC Green Infrastructure Plan to capture or detain stormwater before it can enter and overwhelm the sewer system.

New York City's air temperature can be more than seven degrees Fahrenheit warmer than in neighboring counties due to the urban heat island effect—a phenomena in which heat is absorbed by dark surfaces increasing surface and air temperatures, particularly at night. To cool the city we are increasing our vegetated surface area by planting one million more trees, constructing green infrastructure, and incentivizing the installation of green roofs. A white or "cool" roof reflects much of the sun's energy, reducing air temperatures and the energy required to air condition the building. Cool roofs can lower air pollution and greenhouse gas emissions by reducing electricity demand, and often save building owners and tenants money through reduced energy bills.

Through the NYC°CoolRoofs program, we have coated more than two million square feet of roofs, largely through the efforts of NYC Service volunteers. We are expanding this effort to coat an additional two million square feet of roofs with cool coating by 2013. We will also pursue a cool roof requirement for existing buildings, resulting in all flat roofs in the city having a cool coating by 2030.

As new buildings are constructed, we can ensure that they are able to better withstand flooding, temperature extremes, and other conditions by updating local laws and zoning regulations.

Our current building code requires that new buildings in the FEMA 1-in-100-year flood zone elevate occupied space above the FEMA-designated flood level (the base flood elevation). Significantly lower federal flood insurance rates are available to buildings that further raise this space by one or two feet—an approach known as "freeboard." We currently require freeboard for critical buildings in flood zones such as hospitals, utility facilities, public safety facilities, and schools.

More extensive use of freeboard can help property owners manage risk, but may also change the character of buildings and the streetscape. The Department of City Planning is conducting a study of the urban design and streetscape implications of freeboard to ensure we can maintain the city's active street life and vibrant character while enhancing our resilience. On the basis of this analysis, we will explore amendments to the Zoning Resolution to encourage better management of flood risks. We will also pursue amendments to the Building Code to require freeboard for a wider range of buildings to reduce risks associated with sea level rise and more intense coastal storms.

New York City's Waterfront Revitalization Program—or WRP—establishes policies for the development and use of the city's waterfront. We are incorporating consideration of climate change within the policies of the WRP, which will be released in draft form for public comment early next year.

The effects of climate change—including rising temperatures and declining air quality—have the potential to significantly affect New Yorkers' health. Recognizing this, the Department of Health

and Mental Hygiene launched a program in 2010 to assess the impacts of climate change on public health, including impacts to our public health system infrastructure.

Through this program, we will evaluate the public health impacts of climate-related events, identify opportunities and gaps in adapting to a changing climate, outline strategies for fostering climate resilience (particularly among vulnerable New Yorkers), and devise outreach strategies to protect communities from the public health impacts of climate change. Our goal is to provide information to agencies describing actions and resources that can protect communities from the health impacts of climate change. This work will build on the City's existing efforts to protect New Yorkers from climate-related events such as extreme heat and coastal storms.

Recognizing that New York City faces climate-related risks today that are likely to get worse, the Office of Emergency Management (OEM) has plans in place to guide New York City's response to weather emergencies, including plans for coastal storms, extreme heat, flash floods, and winter weather. As we saw during Hurricane Irene, these plans are well-developed, practiced, and executed. Each plan describes a coordinated, flexible response to the hazardous weather event, defines agency roles and responsibilities, and guides agencies through key decisions and actions to mitigate effects on people, critical infrastructure, and City operations.

In addition to response plans, the New York City Natural Hazard Mitigation Plan, released in 2009, provides a hazard vulnerability assessment, identifies long-term mitigation strategies, and ensures the City's eligibility for mitigation-related grants from FEMA. OEM will be updating the Natural Hazard Mitigation Plan at the end of 2013 and will include climate change as a hazard assessed under the plan.

Citizen preparedness is a key element of our efforts and is essential to the resilience of our city. Through the Ready New York program, the Office of Emergency Management educates New Yorkers about preparing for emergencies and about personal preparedness. In the past year, OEM distributed approximately 415,000 Ready New York guides and gave a total of 243 presentations. Guides are available in up to 23 languages and many are also available in Braille and audio format.

The effects of climate change will bring new challenges to our city in the coming decades and require that our communities are well-informed and prepared to accommodate and respond to climate change effects. We will incorporate the risks posed by climate change into these outreach efforts and continue to engage New Yorkers to enhance their resilience to extreme events. We will also create an online portal and other materials that will include the latest NPCC climate projections, flood maps incorporating sea level rise projections, and tools to increase the climate resilience of homes and businesses.

Reducing the risks posed by climate change will not be achieved through a single plan or action—it must be achieved through informed decision-making and investments that are responsive to the latest scientific information and an understanding of the costs and benefits.

Thank you for the time and opportunity to articulate the Bloomberg Administration's climate change efforts, both in terms of reducing our contributions to it and preparing for its effects. My colleague and I are happy to address any questions that you may have.

Testimony for New York City Council

12/16/11

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Hi, my name is Phil Aroneanu, and I'm the US Campaign Director for 350.org. 350 stands for the safe level of carbon dioxide in the atmosphere

I just turned 28, which means that when I'm in my 60s, right around the middle of the century, sea levels in New York City could be high enough to cover battery park, flood the docks off of Brooklyn heights and encroach on ground zero. The reason I bring this up isn't to make you feel bad for me--it's to remind us all of the reality of climate change that's already in the pipeline. As President Mohamed Nasheed of the Maldives, a small island chain in the Indian ocean, said last year, "First, it's the Maldives, but New York will be next." His country, comprised of hundreds of island atolls that sit less than 1m above sea level, is literally washing away. Not in the future, but right now.

We had our own taste of what climate change means with this year's Hurricane Irene, which barely missed New York City, but flooded out much of upstate, Connecticut, Vermont, and caused \$3bn in damage. While storms like Irene can't be predicted, scientists attribute Irene's destructiveness to some of the warmest Atlantic waters ever recorded -- about 1.5 degrees warmer than average.

If Irene, along with the extreme droughts in Texas, Typhoons in southeast Asia and flooding in Pakistan, is what we get at just a degree of warming, what can we expect at the 3-6 degrees that world leaders discussed as at the recent UN climate talks in Durban?

I don't know, but I sure don't want to find out. New York City has been on the forefront of carbon reduction efforts, establishing efficiency standards and clean transportation programs earlier than almost any other city in this country. We're leading the way, and we have a responsibility to keep pushing and not rest on our laurels, because it's not just our future that depends on what we do now--it's our present.



For THE RECORD

**NEW YORK STATE SENATE
NEW YORK STATE ASSEMBLY**

**Testimony of New York State Senator Thomas K. Duane and
New York State Assembly Member Richard N. Gottfried
Before the New York City Council
Committees on Waterfronts and Environmental Protection
Regarding Climate Change Impacts and Mitigation Measures in New York City
December 16, 2011**

We are Thomas K. Duane, representing New York State's 29th Senate District, which includes Manhattan's Hudson River waterfront from Vestry to West 70th Street and its East River waterfront from 14th to 30th Streets; and Richard N. Gottfried, representing New York State's 75th Assembly District, which includes Manhattan's Hudson River waterfront from West 14th to 59th Streets. We wish to thank the New York City Council Committees on Waterfronts and Environmental Protection for the opportunity to present testimony at this Oversight Hearing on Climate Change Impacts and Mitigation Measures in New York City.

Last December, we submitted comments to the New York State Sea Level Rise Task Force ("the Task Force") on its draft report addressing the impending sea level rise, how it will affect coastal communities throughout New York State, and ways to protect coastal ecosystems, natural habitats and communities in the face of flooding. We were pleased that the Task Force heeded our and other recommendations and amended its final report ("the Report") to recognize the exceptional measures that may be necessary to protect New York City's coastal infrastructure and communities. The Task Force's findings and recommendations are of upmost importance to us and many of our constituents since significant portions of our districts lie just above sea level and are therefore at risk from rising sea levels and storm surges.

The Report notes that New York has seen increases in sea levels for at least a century and is known to be vulnerable to tropical storms, hurricanes and Nor'easters which produce storm surges. It further describes the devastating combined effects of these phenomena, which will continue to be exacerbated by global warming, including, among others, contamination of freshwater drinking supplies, elimination of ecosystems, disruption of transportation and communication networks, destruction of residential and commercial developments, and loss of shoreline, beaches, barrier islands and other geographical features.

In its recommendations for ameliorating and/or preventing the effects of flooding from sea level rise and storm surges, the Report sensibly focuses on reinforcement of natural systems, proper urban planning and community empowerment, structural and non-structural protective measures and even relocation of inappropriate development, which are relatively low cost and limit

destruction of human and natural systems. Such worthy, common-sense solutions are appropriate for many parts of New York State, but, as the Report notes, are not sufficient for much of New York City. Manhattan and waterfront Brooklyn and Queens in particular not only face a different and compounded set of effects from rising sea levels, but also their established human and infrastructure density and hard shorelines require unique preventive solutions.

When the Report addresses New York City's unique challenges, it notes that shoreline protective structures – manmade structures such as jetties, bulkheads, dikes, rip rap and seawalls designed to lessen or eliminate the erosive effect of waves on property or infrastructure – may be necessary to save crucial infrastructure and communities. Alternative ways to protect Manhattan and waterfront Brooklyn and Queens from mass flooding caused by sea level rise and storm surges are extraordinarily limited. The high density human population, infrastructure and enormous monetary and cultural value of existing buildings make adaptation to or mitigation of flooding impossible. Indeed, some experts and many residents of our districts see storm-surge barriers, which are obstructions at the mouth of a tidal watercourse with adjustable gates that close during flood events or surges, as possibly the only real means to avoid catastrophic damage from such flooding. As such, the Task Force recommends that feasibility and sustainability of such barriers be assessed.

We realize that the potential installation of storm-surge barriers will raise a host of ecological, financial, social justice and other concerns, and these should be investigated thoroughly by the appropriate city, state and federal agencies, but that should not preclude their examination. Indeed, the City's experience this past August when Hurricane Irene bore down our shores only underscores the urgent need for these measures to be implemented.

The Sea Level Rise Task Force did an admirable job in compiling the Report's findings and recommendations, and I urge the New York City Council to heed those recommendations as it evaluates mitigation measures the City should take to prepare for climate change

We thank the City Council's Committees on Waterfronts and Environmental Protection for holding today's hearing on this important topic. We also wish to give special thanks to our constituent and former Manhattan Community Board 4 member Robert Trentlyon for his steadfast attention to the growing climate change threat and the need to protect our vulnerable waterfronts.



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Hearing on Climate Change Impacts and Mitigation Measures in New York City: NYC-EJA Testimony to the New York City Council Committee on Environmental Protection December 16, 2011

Founded in 1991, the New York City Environmental Justice Alliance (NYC-EJA) is a non-profit city-wide membership network linking grassroots organizations from low-income neighborhoods and communities of color in their struggle for environmental justice. NYC-EJA empowers its member organizations to advocate for improved environmental conditions and against inequitable environmental burdens. Through our efforts, member organizations coalesce around specific common issues that threaten the ability of low-income communities of color to thrive and coordinate campaigns designed to affect City and State policies. The impact of climate change and mitigation measures is central to NYC-EJA's agenda.

One example of NYC-EJA's work is the 20-year Solid Waste Management Plan adopted by Mayor Bloomberg and the City Council in 2006. This innovative plan relied for the first time on principles of environmental justice and borough equity. The Solid Waste Management Plan is a sweeping overhaul of the City's waste export system that substitutes a polluting truck-based system confined to a handful of overburdened communities to a water-based, less polluting barge system that relies on a network of equitably sited, City-owned marine and rail transfer stations. The intention of environmental justice advocates was for the infrastructure transition to marine transfer stations to lead to the down-sizing and phasing out of the lowest-performing land-based waste transfer stations, while driving up recycling and waste reduction efforts.

NYC-EJA Waterfront Justice Project

In 2010, NYC-EJA launched the Waterfront Justice Project, New York City's first citywide community resiliency campaign. When the City of New York initiated its overhaul of the Comprehensive Waterfront Plan (Vision 2020) in 2010, NYC-EJA began an advocacy campaign to convince the Bloomberg Administration to reform waterfront zones designated as the Significant Maritime and Industrial Areas (SMIAs.) These are zones designed to encourage the clustering and concentration of heavy industrial and polluting infrastructure uses. There are only six SMIAs in the City – all are located in classic “environmental justice” communities (the South Bronx, Sunset Park, Red Hook, Newtown Creek, Brooklyn Navy Yard & the North Shore of Staten Island) and predominantly low-income communities of color. Development applications in SMIAs are treated differently – and to a lower review standard – than other waterfront areas, thereby easing the siting and clustering of polluting infrastructure.

NYC-EJA discovered the six SMIAs are all in hurricane storm surge zones, and that the City of New York had not analyzed the cumulative contamination exposure risks associated with clusters of heavy industrial use in such vulnerable locations. In collaboration with Pratt Institute, NYC-EJA began a research project to assess facilities that use, transport, or store hazardous or toxic

substances in order to identify community vulnerability for those working and living in and around SMIA's in the event of severe weather.

SMIA Research

The Waterfront Justice Project research analyzes the SMIA's in relation to hurricane storm surge zones. We used the most up-to-date hurricane storm surge zones, a projection created by the NYS Emergency Management Office, to identify the areas that are most vulnerable to hurricane storm surge. These areas are divided in four categories according to the strength of potential storms. In addition, we defined a half-a-mile buffer around the SMIA's to determine the communities located in close proximity to these areas. A half-a-mile is the distance often used to study environmental impact under New York State's environmental regulatory framework. Our research shows that both the SMIA's and the communities located within the half-a-mile buffers are highly vulnerable to hurricane storm surge.

What are the threats?

NYC-EJA has gathered and mapped environmental data from city, state, and federal agencies. This data represents the facilities and sites handling hazardous substances or toxic chemicals in New York City that could represent a threat in the event of hurricane storm surge and extreme weather. Our research shows that there are significant numbers of facilities located in the storm surge zones as well as in the SMIA's and their buffers. Some examples of the facilities and sites we examined include:

- **NYS Department of Environmental Conservation:
Class 2 Superfund Sites in the Newtown Creek SMIA**
Class 2 Superfund sites pose a significant threat to public health or the environment—and therefore require immediate action. Of the 43 Class 2 Superfund sites in New York City, 26 or 60% are located in hurricane storm surge zones. A total of eight, or 19%, of Class 2 sites are both vulnerable to storm surge and located within half a mile of the Newtown Creek SMIA. Among the types of business included in this category, we found a metal fabricator where the presence of trichloroethylene has been documented. This is a special health hazard substance considered to be a carcinogen that needs to be handled with extreme caution, because there may be no safe level of exposure.
- **NYS Department of Environmental Conservation:
Active Chemical Bulk Storage and Major Oil Storage Facilities in the South Bronx SMIA**
Chemical Bulk Storage facilities store hazardous substances and Major Oil Storage Facilities have the capacity to store 400,000 gallons or more of oil. Of the 171 Active Chemical Bulk Storage and Major Oil Storage facilities in New York City, 132 or 77% are located in hurricane storm surge zones. Eighteen of these facilities, or 11%, are both vulnerable to hurricane storm surge and located within half a mile of the South Bronx SMIA. Among the types of businesses included in this category, we found a petroleum bulk station and terminal where the presence of naphthalene has been documented. This is another special health hazard substance considered to be a carcinogen that can be absorbed through the skin damaging vision, kidneys, and the liver.
- **U.S. Environmental Protection Agency:
Emergency Planning and Community Right-to-Know Act Toxic Release Inventory Reporters (TRI) in the Sunset Park SMIA**
TRI reporters are facilities reporting chemicals in the Toxic Release Inventory, which is the primary federal database to inform communities about toxic chemicals in their areas. Of the 234 TRI reporters in New York City, 152 or 65% are located in hurricane storm surge zones. Seventeen, or 7%, are both vulnerable to hurricane storm surge and located within half a mile of the Sunset Park SMIA. Among the types of businesses included in

this category, we found a fossil fuel electric power generator where the presence of n-hexane has been documented. This is another special health hazard substance that can cause reproductive damage where high exposures can lead to unconsciousness and death. In addition this is a flammable liquid and dangerous fire hazard.

Who is affected?

NYC-EJA's research shows high concentrations of population of color in both hurricane storm surge zones and the areas around the SMIA's. In fact, of the total 5.5 million people of color in New York City, 2.8 million live in areas that are subject to hurricane storm surge. A smaller but significant number, 430,000 people of color, live within a half a mile of the SMIA's and are vulnerable to hurricane storm surge.

NYC-EJA has also analyzed the vulnerability of New York City's low-income population in the context of hurricane storm surge and the SMIA's. Of the total 3 million low-income residents, defined as those living below 200% of the poverty level, 1.6 million live in areas that are subject to hurricane storm surge. In addition, 283,000 low-income people are vulnerable to storm surge and live within half a mile to the SMIA's.

NYC-EJA's analysis of data from the NYC Department of Health and Mental Hygiene 2009 Community Health Survey indicates that the SMIA's are located in areas presenting some of the highest levels of uninsured population. This suggests that these vulnerable populations will have limited access to health care if they are exposed to toxic substances.

Hurricane Irene Impacts

NYC-EJA has documented some of the flooding that took place in Red Hook and along the Gowanus Canal after Hurricane Irene. Our work shows that flooding occurred within the half-a-mile buffer to the SMIA's. Given the threats that exist in these areas and the fact that future storms are likely to be more severe and more frequent, it is critical to address potential threats to public health if hazardous substances and toxic chemicals are released. This is a reminder of the importance of implementing pollution prevention strategies now!

Waterfront Justice: Building Resilient Communities & a Diverse Economy

NYC-EJA endorses a balanced approach to waterfront policy that bolsters waterfront communities by promoting economic growth while protecting the environment and advancing equity. We envision innovative waterfront industrial regulations and zoning that set the standard for environmentally conscious development while enhancing community resiliency.

New York City needs a diverse economy that supports working and middle class families. Promoting and preserving industrial jobs and manufacturing zoning in the city is a key component of creating a resilient and thriving economy. The heavy manufacturing zones (M-2 and M-3 zoning districts) that are predominantly located in environmental justice communities on New York City's waterfront provide critical public infrastructure and equally critical industrial jobs.

Unfortunately, New York City's manufacturing zones are vulnerable to climate change impacts and the unique dangers posed by hazardous materials and toxic chemicals used in industrial processes. NYC-EJA believes that New York City can and must create policies that mitigate climate change impacts, minimize negative impacts associated with industrial uses, and foster a healthy economic base for all New Yorkers. We can start by strengthening and streamlining City regulations that apply in the working waterfront and manufacturing zones: the Waterfront Revitalization Program and Performance Standards.

Waterfront Revitalization Program (WRP)

NYC-EJA sees the Waterfront Revitalization Program as mechanism to incorporate pollution prevention strategies to mitigate against the impacts of climate change. NYC-EJA is providing policy recommendations that foster a comprehensive approach to climate change impacts and coastal vulnerability in order to create more sustainable and resilient waterfront and industrial zones. These recommendations identify regulations and best practices that promote the safe and responsible use of hazardous materials and toxic chemicals to protect those who work and live around the SMIA's. In addition, NYC-EJA advocates exploring financial and technical resources to help businesses meet these standards.

Unfortunately, the WRP only applies for new development proposals and has limited or no impact on existing uses. The enforcement of noxious uses in existing manufacturing zones relies on very low, outdated, and uncoordinated performance standards. NYC-EJA's analysis demonstrates that the majority of the SMIA's are zoned M-3 for heavy manufacturing. The types of uses that are allowed as-of-right in M-3 zones permit the presence of hazardous substances and toxic chemicals. For example, uses allowed as-of-right in land use group 18, the use group governing M-3 zones, involve considerable danger of fire, explosion, hazards to public health and safety, as well as other toxics.

Performance Standards

Performance standards are both the technical indicator and the legal threshold to measure the impact of noxious uses, and have not been updated since they were created as part of the 1961 zoning resolution. Current performance standards regulating noxious uses in heavy manufacturing districts are very low, and out of date. This is a real problem because many city regulations refer to outdated performances standards in the zoning resolution as the basis for implementation or consistency, and enforcement. Moreover, the enforcement of performance standards lies under the wing of one single agency: the Department of City Planning. Today, many agencies have regulations that override the zoning resolution on this topic. The NYC Office of Environmental Coordination, the NYC Department of Environmental Protection, the NYC Department of Buildings, the NYC Fire Department, and the NYS Department of Labor, are examples of agencies enforcing regulations that overlap current performance standards—yet there is no coordination among them.

NYC-EJA is advocating for a general acknowledgement that performance standards are not working and need to be revised. It will continue to research the most appropriate planning initiatives and best practices to help city agencies and local businesses protect the health and safety of those who work and live in and around the SMIA's--and today would like to invite the city council to do this too.



DOUGLAS HILL, ENG.SC.D., P.E.

15 ANTHONY COURT
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STATEMENT TO THE COMMITTEES OF ENVIRONMENTAL PROTECTION AND WATERFRONT

NEW YORK CITY COUNCIL

16 DECEMBER 2011

STORM SURGE BARRIERS OPERATED DAILY AS TIDE GATES TO LIMIT SEA LEVEL RISE IN NYC

New York City is vulnerable to two threats from its waterfront: flooding from periodic storm surges from hurricanes and extreme nor'easter storms, and the creeping crisis of accelerated rise in sea level. The projected rise in sea level is conservatively expected to be about 2 feet by the 2080s, but with the possible increase in melting of the ice caps a rise of 4 feet may occur as early as the 2080s. This will require expensive measures to adapt waterfront infrastructure throughout the region and up the Hudson Valley.

Storm surge barriers that would only be closed only in the face of dangerous storm surges have been shown to be hydrologically and technically feasible, with construction costs comparable to other major infrastructure projects. However, properly designed, these barriers could also be operated daily as tide gates to limit high water within the barriers to its present level for many decades – perhaps a century. The gates would be closed at low water before the tide begins to flow into the harbor. They would be opened to allow the water within the harbor to flow out when the water level is again equalized on both sides of the gates. This would work until future low water reaches the level of present high water.

The operation of the set of gates would have to be coordinated. The gates closing the flow through the Narrows and the Arthur Kill would be closed and opened at essentially the same time. However, the tidal reversal occurs later at the upper end of the East River. The operation of this set of gates needs to be coordinated with the others to balance the goal of reducing the water level inside the barriers with the need to maintain satisfactory water quality.

Therefore, it will be necessary to model the operation of the tide gates to determine their effectiveness in reducing high water and maintaining quality under various operating conditions as sea level continues to rise. An aspect of the study would also be to examine the extent to which the salt front in the stratified Hudson River could be constrained from advancing upstream to threaten the intake of New York City's emergency water supply. The hydrodynamic models needed to make this evaluation exist at present. The cost of the study would be on the order of \$100,000 at an academic institution.

This double purpose would reinforce the justification for the construction of storm surge barriers in the waterways surrounding New York City.



CITY OF NEW YORK

MANHATTAN COMMUNITY BOARD FOUR

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www.nyc.gov/mcb4

JOHN VEIS
Chair

ROBERT J. BENFATTO, JR., ESQ.
District Manager

February 4, 2010

Mayor Michael Bloomberg
City Hall
New York, NY 10007

Re: Storm Surge Barrier

Dear Mayor Bloomberg:

One of the greatest natural calamities that could wreak havoc in New York City would be flooding due to the surge from a "100 year storm." This storm could appear at any time – and even many times – within the next 100 years. New York City is particularly vulnerable to storm surges because of the New York Bight, which funnels water and increases the speed of a storm surge moving through the Verrazano Narrows. Storm surges have been known to be as high as 20 feet. As much of Manhattan Community Board 4 lies within the 100 Year Flood Plain, we request that the City petition Congress to appropriate necessary funds to enable the Army Corps of Engineers to begin studying the feasibility of installing sea gates and barriers for protection from the sea.

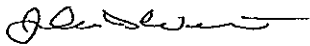
Indeed, Joshua Friedman of New York City's Office of Emergency Management offered sobering statistics about the region's vulnerability to coastal flooding. At a 2009 American Society of Civil Engineers conference, he told scientists, engineers, government officials and environmental advocates that a catastrophic storm surge will affect two million New Yorkers, 740,000 households, 272,000 buildings and 461 miles of roadways. Recognized experts have suggested that sea gates at the Narrows, the mile wide entry to New York Harbor, and lesser gates near Arthur Kill and where the East River meets Long Island Sound (Throgs Neck) would protect much of Manhattan. Gates could also help address issues related to sea level rise due to global warming: even without storm surges, estimated sea level rise in 20 to 40 years will cause potential flooding at certain times of the year having nothing to do with storms.

Other cities have already built sea gates (Rotterdam and London) or are currently building them (Venice). In the case of London, the barrier's purpose is to prevent the city from being flooded by exceptionally high tides moving up from the sea, often exacerbated by a storm surge. It is deployed on average four times a year. In Rotterdam, the Maeslantkering is expected to be closed once every ten years due to a storm surge, but with rising sea

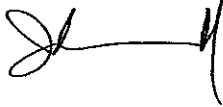
levels, that frequency is expected to rise in 50 years to once every five years. The situation in New York City will depend on the expected frequency of storm surges.

Manhattan Community Board 4 urges you to reach out to our Federal representatives to request funding for a feasibility study to protect our city from potentially life threatening storm surges. The total cost of design and construction for gates at Verrazano Narrows, Arthur Kill and Throgs Neck is estimated at \$10 billion. There is no time to waste; whole communities may suffer irreparable damage if we don't act now.

Sincerely,



John Weis
Chair
Manhattan Community Board No. 4



John Doswell
Co-Chair
Waterfront & Parks Committee

Lisa Daglian
Co-Chair
Waterfront & Parks Committee

CC: CB4 Elected Officials

STORM SURGE BARRIERS: talk before the City Council Joint Committee on Environmental Protection and Waterfront 12/16/12

My name is Robert Trentlyon . I will be reading a resolution on the need for Storm Surge Barriers passed by CB4 Manhattan. I am also representing an informal coalition of groups that are in favor of building storm surge barriers: CB2 Manhattan, Hudson River Park Advisory Council, Save Chelsea, Chelsea Council of Block Associations, and Chelsea Reform Democratic Club.

Robert Trentlyon

212.242.7933, robert.trentlyon@verizon.net

409 West 21st Street

New York, NY 10011



Metropolitan Waterfront Alliance

Testimony of Roland Lewis, President and CEO
on Climate Change Impacts and Mitigation Measures in New York City

Before the Committee on Environmental Protection on
December 16, 2011

Good morning and thank you for the opportunity to submit this written testimony. I am Roland Lewis, president of the Metropolitan Waterfront Alliance. The Metropolitan Waterfront Alliance (MWA) is a coalition of over 570 organizations working together to transform the New York Harbor and its waterways into a world class resource for work, play, transit and education.

MWA believes climate change to be one of the greatest challenges facing our region, New York City, and the New York City waterfront. As we know from this summer, much of the New York Metropolitan area dodged a bullet with limited impact and damage from hurricane Irene. The response to hurricane Irene served as a dress rehearsal for the long term challenge of how we deal with climate change and our rising seas. The hurricane was another reminder of the importance of simultaneously preparing for climate change and preventing it.

While the emergency planning and preparedness tools that were rolled out for Irene predate the more recent warnings over sea level rise, these measures reinforced growing concerns over the potential impacts of melting icecaps for our region. Indeed, so many graphics on television and the Internet showed potential flooded areas of Manhattan resembling something from Al Gore's "Inconvenient Truth." With the precautionary

evacuations and transit shut downs, and warnings about the dangers of low-lying industrial areas being turned into toxic soup, the media, government and the civic community are recognizing that over time water will breach our shorelines and we must develop procedures, designs and strategies that will adapt to this new reality.

The recent work of the New York City Office of Emergency Management, the Mayor's Office of Long-Term Planning and Sustainability and the New York State Sea Level Rise Task Force, along with planning by the Port Authority the MTA and dozens of other private, public and non-profit organizations have infiltrated the public's consciousness and certainly had some effect on the emergency response planning. Even the design community has gotten into the picture with the recent Rising Currents exhibition at the Museum of Modern Art that creatively re-imagined our region as the water rises. From futuristic architectural renderings of an aquatic urban environment to hard-tack engineering solutions to protect our transportation, communication and other systems, all of this work responds to a warming planet and rising oceans.

While climate change has received attention and planning locally and regionally, an aggressive response at a federal level is still caught in political doldrums. Many political leaders still doubt the reality of a warming planet and its consequences. Estimates vary, but sea level could rise as much as 55 inches by 2080 with rapid ice melts. At a minimum FEMA Flood Insurance Rate Maps should be updated to reflect the latest data related to sea level rise.

Our recent 400th anniversary commemoration of the Dutch visit to New York Harbor brings to mind the water management techniques that have for centuries protected the

Netherlands from the North Sea and from river flooding. Best known for the large protective gates protecting Rotterdam, the Dutch employ a variety of methods small and large to protect against storm surge and sea level rise. New York City and others in the region are following suit. PlaNYC, and the Vision 2020, the new comprehensive plan for the New York City waterfront, call for protection and adaptation in how we design our waterfront. Soft edges that can absorb water, dikes and levees, functioning wetlands, even flood gates and barriers to protect certain channels and property could all be part of New York's waterfront future.

While New York City is recognized internationally for its work through PlaNYC on research and planning for climate change mitigation and adaptation, there is far to go. During these tough economic times MWA calls for the City's continued commitment to the Mayor's Office of Long Term Planning and Sustainability by ensuring the Office is fully funded and all staff positions are filled. Advocacy organization such as the New York League of Conservation, MWA, and others must ensure Mayor Bloomberg's sustainability agenda is embraced and a central part of the next administration.

MWA calls for commitments to by the State, City, civic, academic, cultural, private, and nonprofit sectors to dedicate significant attention and resources to developing a variety of strategies for responding to climate change and for reducing green house gas emissions. As a City we need a full tool kit for climate change made up of practical and long term strategies. Such a tool kit includes emergency preparedness measures, intelligent and innovative strategies for waterfront edge design, infrastructure protection measures,

energy saving and greenhouse gas reduction measures, strategies to protect our transportation infrastructure, and strategies to involve waterfront communities in planning and preparing for climate change.

Irene's less-than-anticipated fury was nature's lenient lesson for those in the New York Metropolitan area. We must figure out what worked and what didn't in how we protect and prepare this great City for the new future dawning on this planet.

Thank you for the opportunity to testify today and I'd be happy to answer any questions you might have.



**Paul Reale, CEO
Green Allowance LLC**

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December 16, 2011

New York City Council
Committee on Environmental Protection

**Testimony regarding
“Climate Change Impacts and Mitigation Measures in New York City”**

If global emissions of greenhouse gases continue on the “business as usual” path, deep cuts in New York City emissions alone will not prevent global catastrophic climate change. Given this fact, it is easy to conclude that climate change mitigation measures in New York City are irrelevant, but I do not make that conclusion.

The proceedings of the National Academy of Sciences stated “97 – 98% of the climate researchers most actively publishing in the field support the tenets of ACC (anthropogenic climate change) outlined by the IPCC (Intergovernmental Panel on Climate Change).” Most if not all of these scientists concur that there is an urgent need for dramatic reductions in global GHG emissions in the neighborhood of 90% below current levels by 2050.

Furthermore, most policy makers and scientists believe an ambitious, legally binding, global treaty coupled with aggressive national policies across all major nations is the only viable path to success. Otherwise, climate change will seriously jeopardize societal stability and security by the time today’s teenagers become senior citizens. Failure is not an option, yet the path we are currently on is destined for failure.

For two reasons, I believe that bold environmental initiatives by city governments are also a prerequisite to escaping the worst effects of climate change. First, our energy, transportation and building infrastructure as well as the materials economy and food production now rely heavily on fossil fuels. Thus there is a steep learning curve to maintaining our way of life with a 90% reduction in fossil fuel consumption. City governments must act and learn quickly,



otherwise many cities and countries may fail to meet their eventual and inevitable legal obligations prescribed by national policies and a global treaty.

Second, the global community could benefit greatly from a city that is a leading exemplar of energy efficiency. New York City has made great strides toward becoming such a city. Many of this city's successes associated with building energy efficiency and conservation can be attributed to policies and regulations that have ensued from the Greener Greater Buildings Plan and the Green Codes Task Force. This continuing work is essential.

New York City now has the lowest per capita greenhouse gas emissions of any major U.S. city. Yet a series of additional bold initiatives could catapult this city on the world stage as the first major, modern, industrialized city to even approach the ultimate goal of living within a sustainable carbon budget.

Developing and executing plans with the following five objectives would put New York City on such a path:

1. Power the Metropolitan Transit Authority's subways, buses, trains, stations and operations with 100% renewable energy.
2. Enact congestion pricing and use the revenues to improve and expand mass transit.
3. Power all city buildings and all city operations with 100% renewable energy.
4. Cut the carbon intensity of the materials supply chain for all New York City agency operations in half.
5. Grow fifty percent of the produce consumed in New York City in urban farms within the city's five boroughs.

I have no doubt that most pragmatic lawmakers will see these objectives as laudable goals that our city can ill afford. Yet I believe that if you account for the price volatility of energy including an eventual price on carbon, the improved economics associated with the recent boom in renewable energy technologies, and the avoidance of externalized costs such as preparation for and clean up associated with the inevitably stronger storms such as the recent tropical storm Irene and the reduced need for climate change adaptation measures when we succeed in mitigating the degree of climate change consequences, it is possible to reach these objectives and save taxpayer money too.

I encourage this Committee to pursue these objectives so that New York City may become the standard bearer of responsible environmental living for cities the world over, thus establishing a place in history as a precipitous step in securing the future of children everywhere.

Thank you.

From: Pamela Wolff <pamela@angel.net>
Subject: **City Council Joint Committee on Environmental Protection and Waterfront**
Date: December 16, 2011 9:08:44 AM EST
To: Anthony Wolff <wolff@angel.net>



City Council Joint Committee on Environmental Protection and Waterfront:

Thank you for this opportunity to speak.

My name is Pamela Wolff. I am a manager of residential properties in Chelsea, and a resident of one of those properties for fifty five years.

I'm here today to speak from my own experience.

In the last quarter century I have managed seven antique townhouses in the Chelsea historic district, four of them west of Ninth Avenue. All have historically suffered occasional flooding from storm run-off, those closest to Tenth Avenue more often, and more severely. I learned to prepare these buildings for inevitable inundations of sewage and storm back-ups. In these townhouses parts of the basements are taken up by the building's mechanicals, the rest is living area.

This work involved inventing systems that could handle flooding on short notice. We installed back flow preventers on the sewer connections and doubled-up sump pits in parallel, the pumps connected to separate electrical circuits. Boilers and water heaters were placed on raised concrete pads.

Nothing prepared us for what happened during and after hurricane Irene. The river rose. All our systems worked perfectly. But for three days and two nights, instead of sewer back-ups we had rising ground water, clean and clear, pure rainwater, with nowhere to go, inexorably rising out of the ground like a thousand springs filling the basement of the building. It was biblical. Our sump pumps could not keep up. Our water heaters and gas boilers lost ignition. Electrical outlets went underwater. Furniture floated.

In this scenario pop-up barriers for individual properties will do nothing.

Most of our precious historical buildings - our heritage - are in or nearly in the flood plain, and not just in Manhattan. This is true for Brooklyn and Queens as well.

I have sailed aboard the Clearwater as a volunteer crew member every summer for the last 25 years. What I've learned about the mighty Hudson and it's streams is respect.... Respect for the power of water. Someday, inevitably, we will get a massive storm surge into New York harbor on a full moon high tide. When the tide turns the Hudson will push back. Think about that.

What will we tell our grandchildren about how we prepared our city for the inevitable?

Noah would be at a loss!

Pamela Wolff 223 West 21st Street 917-273-9379 pamela@angel.net

THE CITY THAT PLANS TO BE FLOODED: A guest post by Douglas Hill, a consulting engineer and an adjunct lecturer at the School of Marine and Atmospheric Sciences at Stony Brook University in New York.

Hurricane Irene, remember? Irene, diminished to a mere tropical storm when it struck New York City, came and went, soon disappearing from the news. But think back to August 26 when Irene, a Category 3 hurricane with winds of more than 110 miles per hour, was approaching the North Carolina coast and headed directly for New York City. Mayor Michael R. Bloomberg called a news conference to order 370,000 people to evacuate their homes. Then he stepped aside, and MTA chairman Jay Walder stepped to the microphone and announced that public transportation--buses as well as trains--was being shut down.

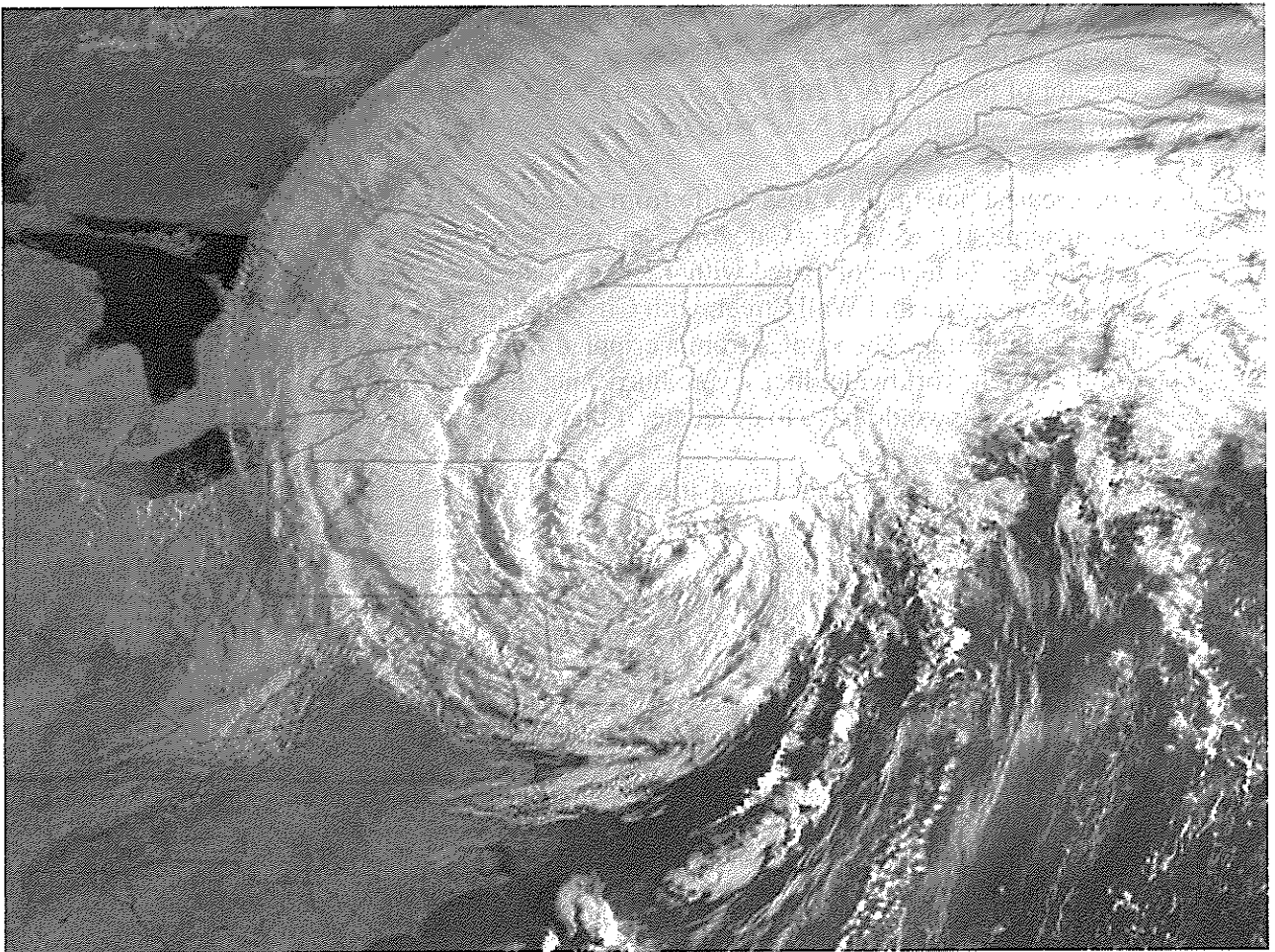


Figure 1. GOES-East visible satellite image of Irene taken at 7:45 am EDT on Sunday, August 28, 2011. At the time, Irene was a tropical storm with 65 mph winds, making landfall on Long Island, New York. Image credit: NOAA Environmental Visualization laboratory.

Evacuation without transportation: a novel concept that the mayor described as "preparing for the worst and hoping for the best." Fortunately, hoping for the best worked.

Unfortunately, the City is still hoping for the best, and it is not preparing for the worst. The coastal storm plan of the Office of Emergency Management (OEM) includes strategies for storm tracking, public information, evacuation procedures, people with special needs, recovery, and restoration, but nothing to prevent flooding.

In other words, New York City is planning to be flooded--and according to the National Hurricane Center, it will be. Based on the historical record, hurricanes of Categories 1, 2 and 3 will strike the New York region on an average of every 17, 39 and 68 years, respectively. The City has been overdue for a Category 1 hurricane--Irene should have been no surprise--and we may expect hurricanes of Categories 2 and 3 within the next decade or two. In testimony to a U.S. Senate committee, Max Mayfield, the former director of the NOAA Climate Prediction Center, said, "It is not a question of if a major hurricane will strike the New York area, but *when*" (his emphasis.)

The greatest potential for loss of life from a hurricane has historically been from the storm surge. If the eye of a Category 3 hurricane crossed the New Jersey shore, the surge could reach 24 feet--compared with 4.5 feet in Hurricane Irene's flooding the World Trade Center site and Wall Street, with City Hall resting on a separate island south of the rest of Manhattan. The ripples from a crippled financial district in lower Manhattan would be felt worldwide. In a severe hurricane, the OEM has estimated that up to three million people would have to evacuate, if that can be imagined.

Other major ports have taken measures to prevent being flooded. After the 1938 hurricane, storm surge barriers were built in New England to protect New Bedford, Providence and Stamford. After a disastrous storm in the North Sea in 1953, the Thames Barrier was built to protect London, and the Delta Plan was started in the Netherlands which includes three such barriers, one protecting Rotterdam, Europe's busiest port. Following Hurricane Katrina, a long-disputed barrier was constructed at the entrance to Lake Pontchartrain along with several others, which are now considered to make New Orleans hurricane-proof to Category 3 storms. Barriers are being completed to protect St. Petersburg, Russia, and Venice, Italy.

The heart of New York City could be protected in the same way. Moveable barriers, closed only when the city is threatened with major coastal flooding, could be placed at the upper end of the East River, across the Narrows and at the mouth of the Arthur Kill. Possibly, the latter two could be replaced with a single, longer barrier extending from

Sandy Hook to the Rockaway peninsula. Modeling studies have demonstrated that the barriers would work. Four major engineering firms have presented conceptual designs and cost estimates for barriers at these locations. The estimated costs for these individual barriers range from \$1 billion to \$4.6 billion, with the total of the two or three needed less than \$10 billion, comparable to other major infrastructure projects planned or underway.

Maximum water depth, Category 2 Hurricane hitting at high tide

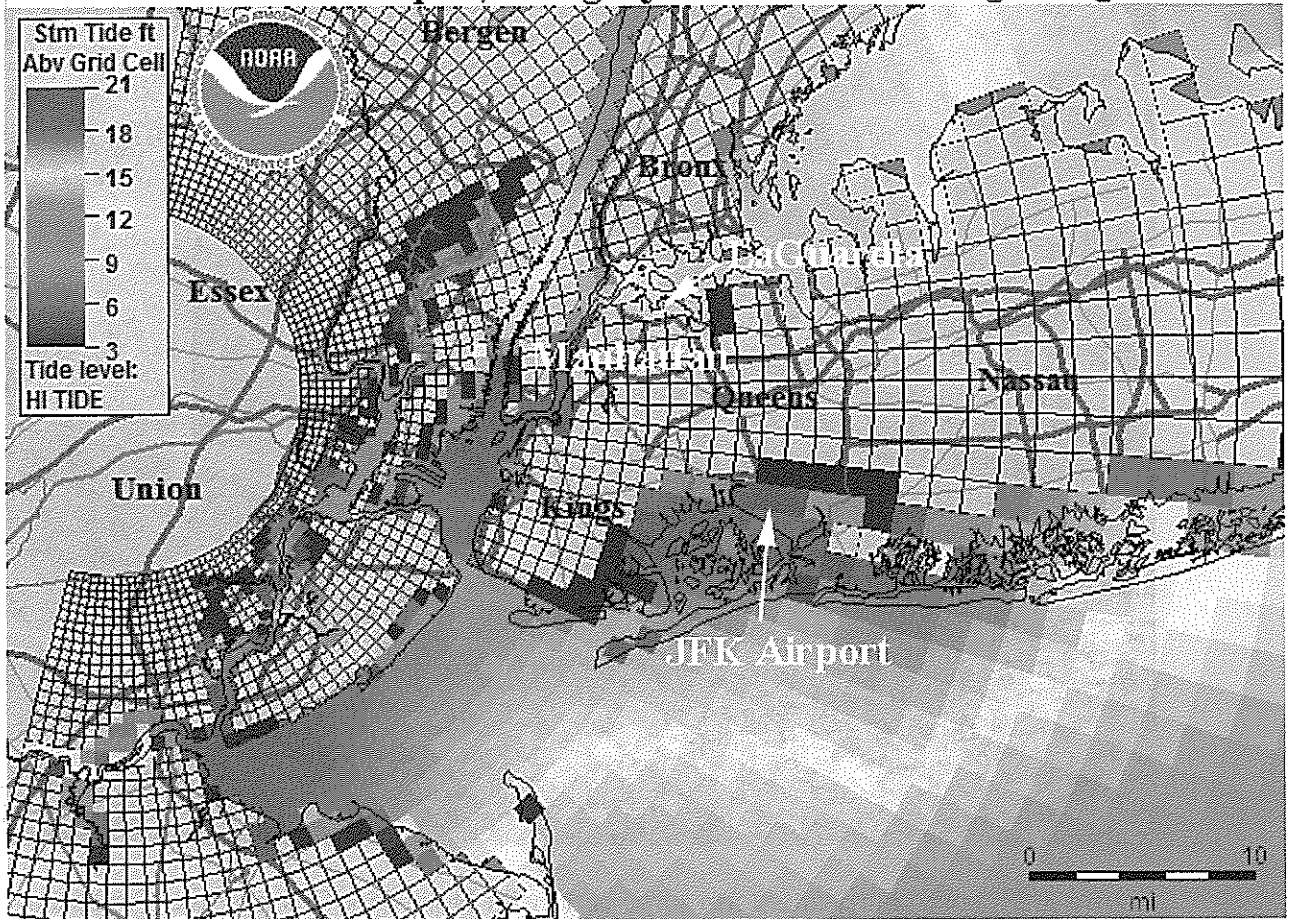


Figure 2. The height above ground that a mid-strength Category 2 hurricane with 100 mph winds would push a storm surge into New York City in a worst-case scenario. The image was generated using the primary computer model used by the National Hurricane Center (NHC) to forecast storm surge--the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model. The accuracy of the SLOSH model is advertised as plus or minus 20%. This "Maximum Water Depth" image shows the water depth at each grid cell of the SLOSH domain. Thus, if you are inland at an elevation of ten feet above mean sea level, and the combined storm surge and tide (the "storm tide") is fifteen feet at your location, the water depth image will show five feet of inundation. This Maximum of the "Maximum Envelope of Waters" (MOM) image was generated for high tide and is a composite of the maximum storm surge found for dozens of individual runs of different Category 2 storms with different tracks. Thus, no single storm will be able to cause the level of flooding depicted in this SLOSH storm surge image. Consult wunderground's [Storm Surge Inundation Maps page](#) for more storm surge images of the U.S. coast.



Figure 3. Proposed hurricane storm surge barrier for New York City near the Verrazano Narrows Bridge. Image credit: Arcadis, Inc.

But unlike the original, the 2010 revision of plaNYC, the City's principal planning document, makes no reference to storm surge barriers. The City's latest plans are seen in the March 2011 Vision 2020: NYC Comprehensive Waterfront Plan, which calls not for protecting the waterfront, but for climate "resilience," the ability to withstand and recover from the disaster. Unfortunately, this may be the best that can be done for those living in the coastal sections of the boroughs that face the Atlantic Ocean.

So the Great Evacuation of August 2011 is a test. In its postmortem on the storm on September 5, the New York Times concluded that "by almost any measure, the evacuation was a success," but it did not report on the principal measure. How many people were left behind? Unlike New Orleans after Katrina, we won't know by counting the bodies. Not this time, anyway.

Douglas Hill, EngScD, P.E.

Testimony New York City Council, 16 December 2011

Malcolm J Bowman, Distinguished Service Professor of Oceanography
School of Marine & Atmospheric Sciences, State University of New York at Stony Brook

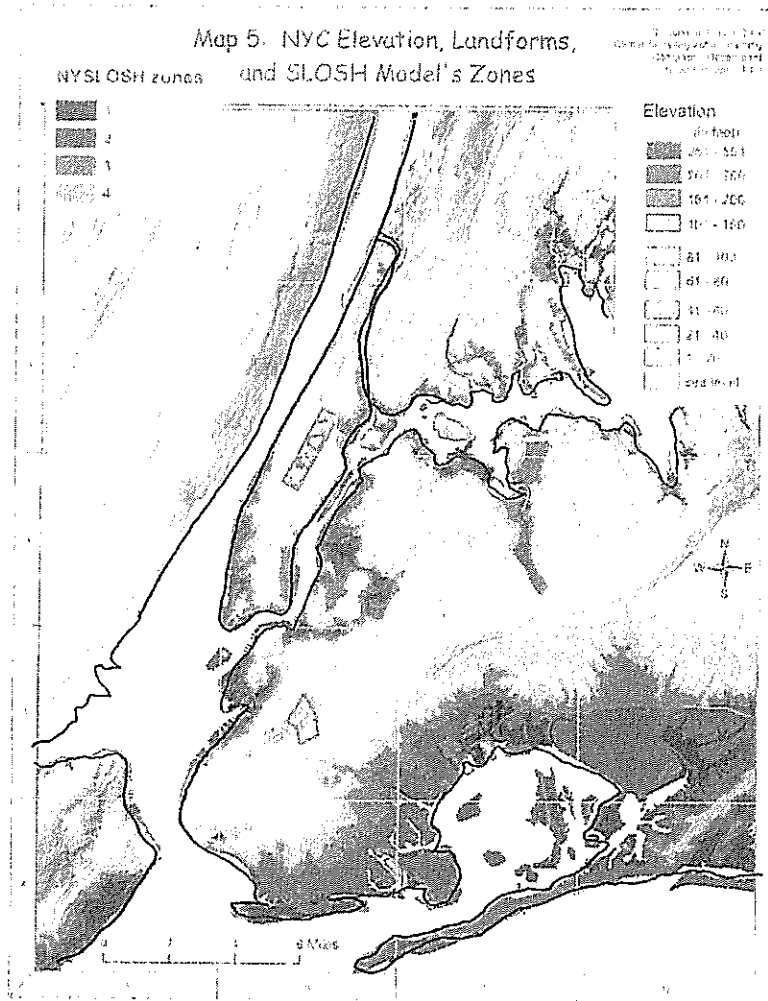


Fig. 1: Metropolitan New York elevations, landforms, and flooding zones for category 1 to 4 hurricanes (courtesy C. Gersmehl).

Metropolitan New York is vulnerable to coastal flooding and widespread damage to urban infrastructure, commercial structures, and residential neighborhoods from both seasonal hurricanes and extra-tropical storms. A significant portion of the metropolitan area lies less than three feet above sea level; in total covering an area of about 80 square miles, supporting about 3,000,000 residents in the outer boroughs (Fig. 1).

Many types of structures are located within this low-lying region, including many commercial properties and financial institutions, apartment buildings and private dwellings, hospitals, police and fire stations, marine transportation terminals,

Many types of structures are located within this low-lying region, including many commercial properties and financial institutions, apartment buildings and private dwellings, hospitals, police and fire stations, marine transportation terminals, three major airports, heliports, numerous underground railroad and subway lines (with associated station entrances and ventilation shafts), highways, bridge access roads, tunnels, power plants, underground steam district heating system, electrical and communication networks, landfills, 14 waste water treatment facilities and 770 combined sewer overflows with their tide gate regulators discharging near or at sea level (Zimmerman, 1996).

Recent storms have already revealed the intrinsic potential for disaster in this region. For example, the nor'easter of December 1992 flooded the entrance of the Hoboken train station with seawater, short-circuiting the electric trains and city subways and shutting down the underground public transportation system for up to 10 days. The Brooklyn-Battery tunnel experienced serious flooding as did the FDR Highway on Manhattan's east side. Fortunately, no lives were lost, but there would have been fatalities if the sea had risen another foot. The storm surge from Hurricane Irene came to less than 2" of the level of the December winter nor'easter of 1992.

During the 21st century, rising sea level will aggravate the effects of storm surges and wave damage along the Metropolitan New York, Long Island and northern New Jersey coastlines, leading to more severe and more frequent flooding. An abrupt acceleration in the pace of climate change would accelerate sea level rise and make infrastructure protection measures and emergency planning imperatives even more urgent.

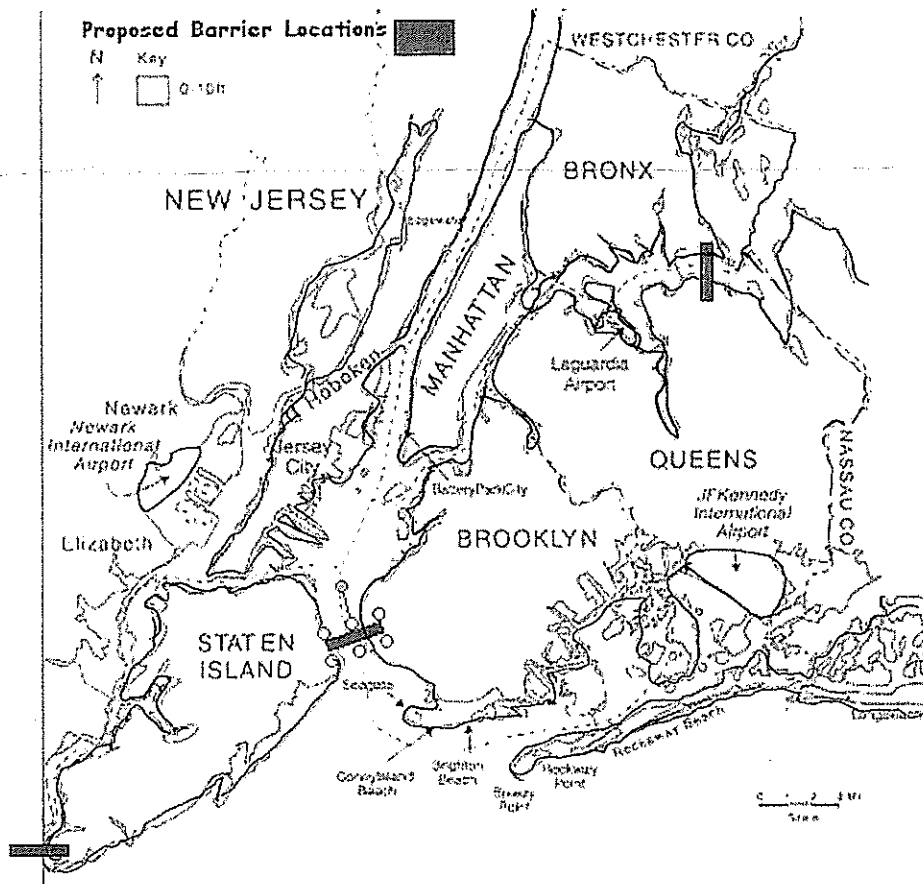


Fig. 2: Locator map of Metropolitan New York with inundation predictions for a 100-year flood. The proposed locations for storm surge barriers are shown as red bars (map adapted from Gornitz, 2001).

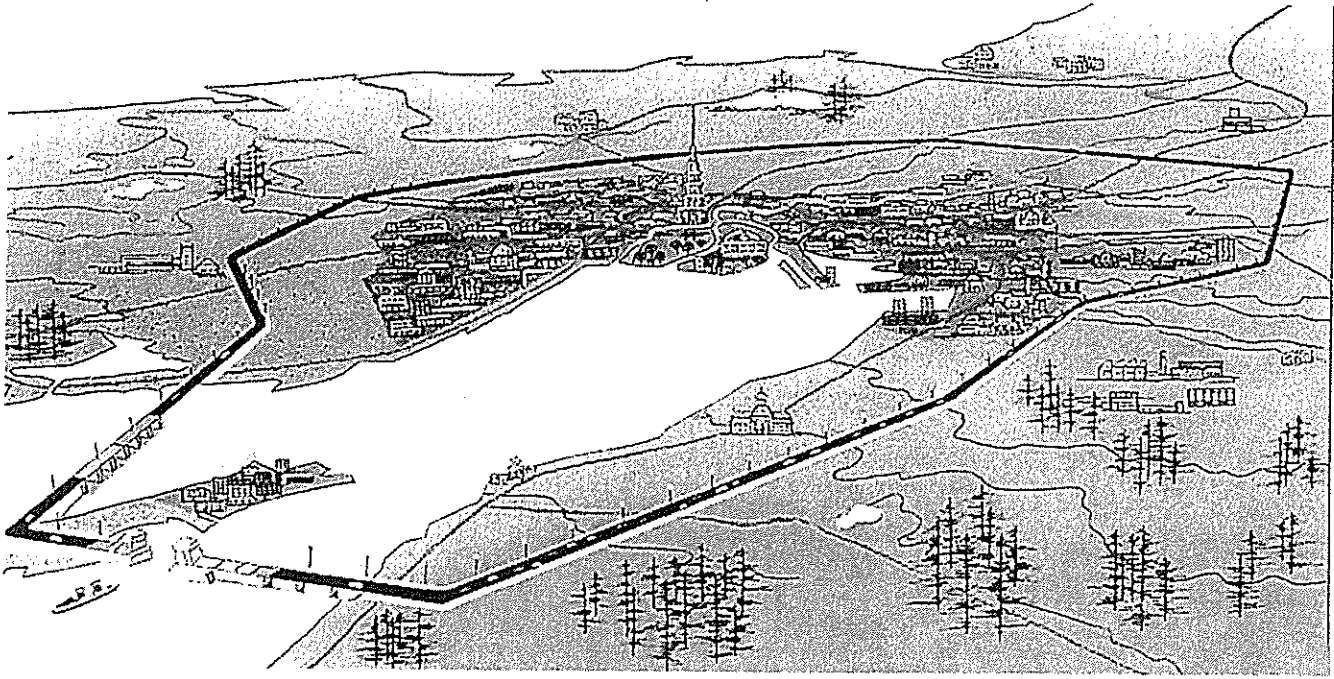


Fig. 3: Ring road and storm surge barriers presently being constructed around St Petersburg, Russia.

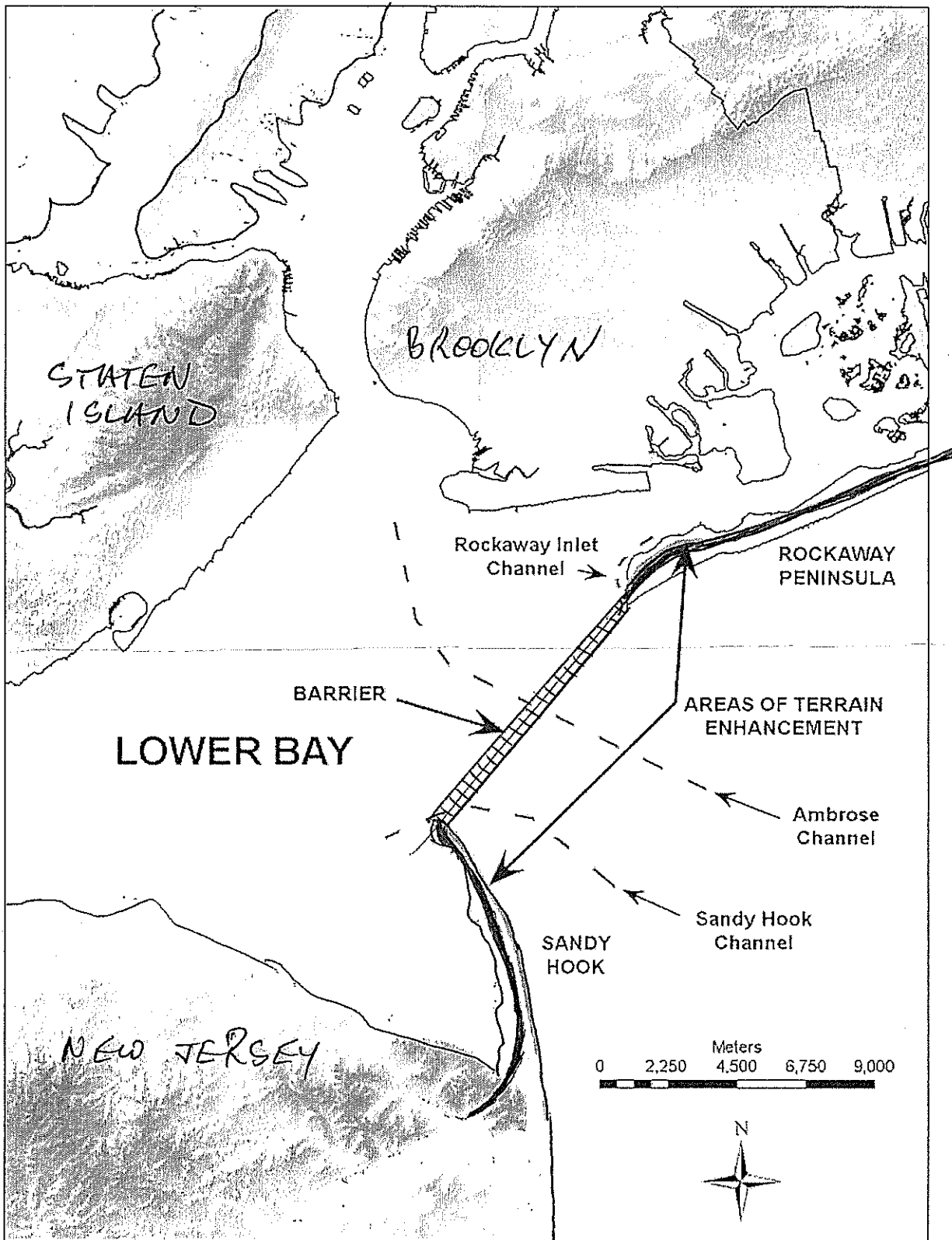


Fig. 4: Proposed Outer Harbor storm surge barrier would protect southern Brooklyn and Queens, plus provide a road/rail link between northern New Jersey and Long Island /JFK airport. Courtesy Halcrow, Inc.

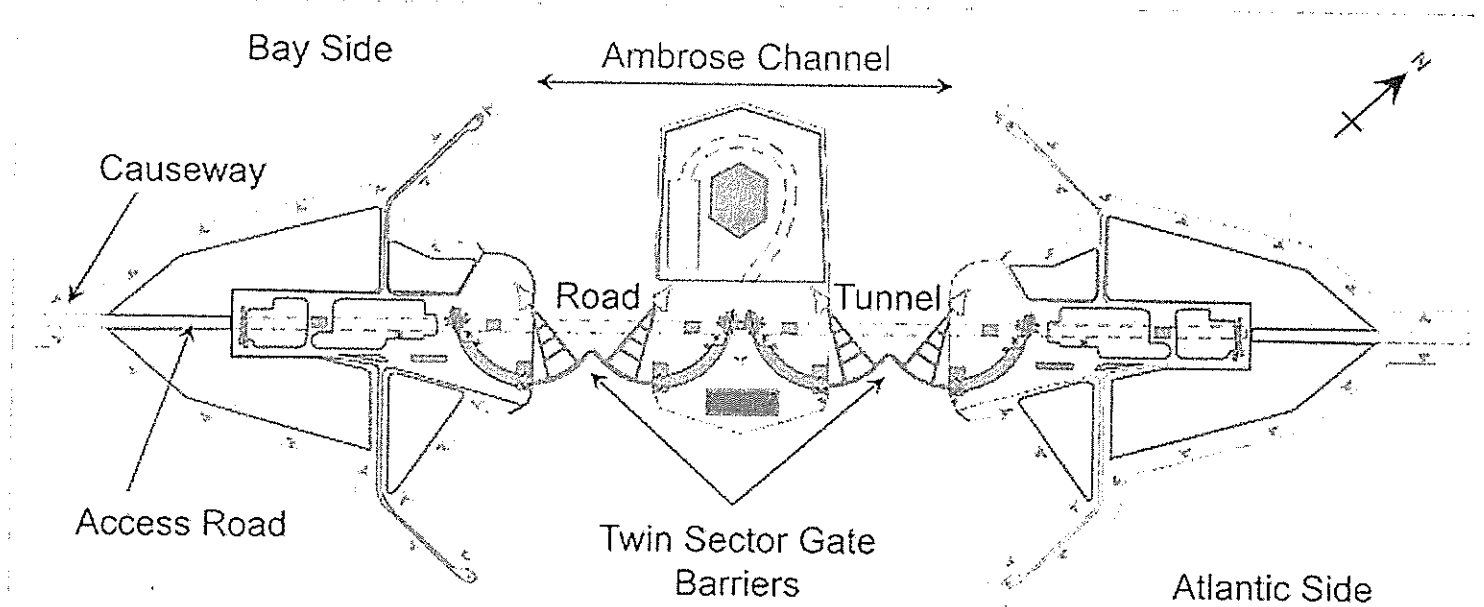


Fig. 5: Sketch of proposed shipping passageway at Ambrose Channel. Courtesy Halcrow, Inc.

There are several conceivable approaches for dealing with the threat of rising sea level:

a) The do nothing approach. The do-nothing approach is based on a wait-and-see attitude by coastal planners in the hope that nothing catastrophic will happen on their watch. Many risk analyses and cost/benefit studies are completed, but in the end, insufficient political will or funds are available to proceed with raising large amounts of money to build regional coastal defenses for catastrophic storm surge events that may never happen. This is the most common scenario for nations without a strong tradition or commitment of spending federal monies for regional coastal protection against natural hazards.

b) The iterative approach, aka resilience. This centers on fixing problems on a case-by-case basis as they arise, e.g., patching up and strengthening leaky seawalls, modifying transportation routes, raising airport runways and building new seawalls around facilities, raising subway entrances and ventilation shafts prone to flooding, protecting other underground infrastructure related to energy and communications, pumping out backed-up sewers, etc. This approach is analogous to patching up potholes on the highway – the basic roadway is in good repair, but weak spots showing sign of wear and upheaval due to adverse weather keep popping up and must be repaired to eliminate or minimize safety hazards. This method is the most responsive to relatively modest amounts of municipal funds becoming available from time to time and which must be spent or be lost from the budget.

c) The regional approach. At times, the iterative approach may become large scale in nature. For example, the Dutch have been busily reclaiming and protecting their lowlands for centuries by creating an intricate network of dikes surrounding low-lying tracts of land known as polders, then pumping out the sea and turning the land into useful pasture and even cities. Amsterdam, the capital city of The Netherlands, whose urban area is home to 1.2 million residents, in places is built on land as much as 18 ft below mean sea level. One half of the country's land area is now reclaimed from the sea.

After a devastating flood that took 3,000 lives in 1953, the Delta Project was begun, and a series of large barriers were constructed around the southeastern coast, connected by high seawalls. Clearly, once a decision has been made to protect a city or state against storm surges and rising sea level with moveable barriers, levies and seawalls, there is no going back. The commitment is forever. The Dutch made that commitment centuries ago and have a highly professional and established engineering, marine hydraulics, and governmental infrastructure dedicated to building, maintaining, and improving the country's coastal defenses against the sea.

New York should do the same. The city should underwrite feasibility studies by engineering firms, city planners, environmental and community groups to investigate what will work and what will not.

Malcolm Bowman

Stony Brook NY

631-632-8669

malcolm.bowman@stonybrook.edu

<<http://stormy.msrc.sunysb.edu>>

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

Name: Clare Donohue (PLEASE PRINT)

Address: Same Engrgy

I represent: _____

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☒ in opposition

Date: 12.16.11

Name: Denise Kofman (PLEASE PRINT)

Address: 270 Madison, NY, NY 10016

I represent: NYH2O.org

Address: Princeton, NYC

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: _____

Name: Roland Lewis (PLEASE PRINT)

Address: 241 Water Street

I represent: The Metropolitan Waterfront Alliance

Address: _____

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: PAUL REALE

Address: 304 W 89TH ST, SUITE 7B 10024

I represent: GREEN ALLIANCE LLC

Address: SAME

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12.16.11

(PLEASE PRINT)

Name: Phil Aroneanu

Address: BROOKLYN, NY

I represent: 350.org US Campaign Director

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: Kelly McKinney

Address: 1105 Cadman PLAZA EAST

I represent: DEM

Address: _____

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/25/11

(PLEASE PRINT)

Name: BUCK MOOREHEAD

Address: 236 W 27 TH

I represent: BUILDING CONSENSUS FOR

Address: SUSTAINABILITY

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/2011

(PLEASE PRINT)

Name: OLIVE FRISVOLD

Address: 305 WEST 72

I represent: Committee for Environmentally Sound Decisions

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: HOWARD SLATKIN

Address: 22 READE ST

I represent: NYC DEPT OF CITY PLANNING

Address: _____

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 16 Dec. 2011

(PLEASE PRINT)
Name: David Brydon

Address: 253 Broadway, 10th Floor

I represent: Mazor Bloomberg

Address: City Hall

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: Dec. 16/2011

(PLEASE PRINT)
Name: CYNTHIA ROSENZWEIG

Address: 2880 BROADWAY

I represent: COLUMBIA UNIVERSITY

Address: SAME

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)
Name: Philip Aronson

Address: 298 DeKalb Ave Apt 3 Brooklyn

I represent: 350.org

Address: 156 Water St. Brooklyn

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Sarah Meier-Zimble

Address: 322 8th Avenue Suite 1700

I represent: Senator Tom Duane

Address: 322 8th Avenue

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: MAIVMOOREHEAD

Address: 2 JANE ST

I represent: NY H20

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☒ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: FRANK EADIE

Address: 310 W 18TH ST 1B, NY, NY 10011

I represent: Myself

Address: _____

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: STEPHANIE LOW

Address: 1215 5 AVE

I represent: SIERRA CLUB ATLANTA CHAPTER

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☒ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: SUSAN LERNER

Address: _____

I represent: Common Cause / NY

Address: 74 Trinity Pl, Ste 901 NY, NY 10006

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: Bruce Traven

Address: 601 W 12th St, NYC 10024

I represent: Self

Address: _____

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☒ in favor ☐ in opposition

Date: Dec 16, 2011

Name: Catherine Skopie (PLEASE PRINT)

Address: 140 West Broadway

I represent: Citizen - Environmental Task Force

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12-16-11

Name: MALCOLM BOWMAN (PLEASE PRINT)

Address: STATE UNIVERSITY NEW YORK

I represent: STONY BROOK, MARINE SCIENCES

Address: STONY BROOK NY 11794-5000

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: _____

Name: Melissa Delmonico, Global Kids (PLEASE PRINT)

Address: 137 E 25th Street

I represent: Global Kids

Address: 137 E 25th Street / NY 10010

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: DOUGLAS HILL

Address: 15 ANTHONY COURT HOLYMAN, NY

I represent: STONY BROOK UNIV

Address: STONY BROOK, NY

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: PAMELIA WOLFF

Address: _____

I represent: CB 4 - CCBA

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/11

(PLEASE PRINT)

Name: Robert Treathen

Address: _____

I represent: CB 4 Manhattan

Address: _____

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

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**THE COUNCIL
THE CITY OF NEW YORK**

DEC 16, 2011

Appearance Card

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

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Professor Lisa DeCaprio

Address: _____

I represent: NYC Sustainability

Address: 7 East 19th Street NY NY 10003

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

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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

☐ in favor ☐ in opposition

Date: 12/16/2011

(PLEASE PRINT)

Name: Juan Camilo Osorio

Address: 694 Metropolitan Avenue

I represent: NYC Env. Justice Alliance

Address: _____

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