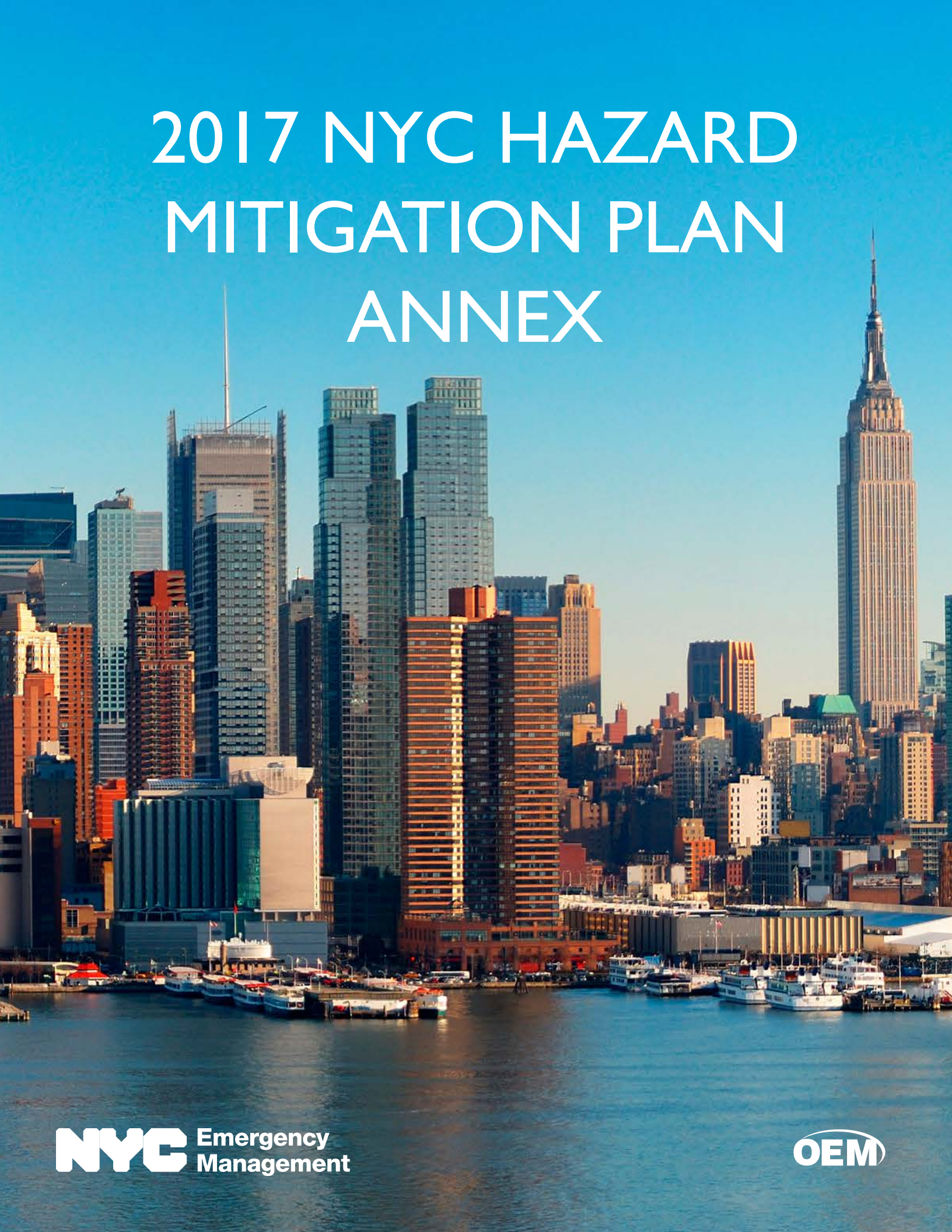
2017 NYC HAZARD MITIGATION PLAN ANNEX



NYC Emergency Management

OEM

EXECUTIVE SUMMARY

The 2017 New York City (NYC) Hazard Mitigation Update is intended to keep the 2014 Hazard Mitigation Plan (HMP) up-to-date and help NYC Emergency Management (NYCEM) monitor activities that occurred since the Plan's FEMA approval in 2014.

Since the 2016 HMP Annex released April 26, 2015, the following updates and changes have occurred:

- **Section 1 - Chapter 2: Planning Process:**
    - NYCEM Hazard Mitigation Unit held a Mitigation Planning Council (MPC) meeting to discuss new mitigation tools the Unit is developing and the mitigation actions update process
    - Agency name changes on the Mitigation Planning Council (MPC)
    - NYCEM Hazard Mitigation Unit served in an advisory role on several resiliency-related projects in the City
- **Section 2 - Chapter 3: Risk Assessment:**
    - Additional resources/reports that increase our knowledge of hazards as well as hazard events that have occurred since the 2016 HMP update
        - Coastal Storms
        - Cyber Threats
        - Disease Outbreaks
        - Extreme Temperatures
        - Flooding
        - Winter Storms
- **Section 3 - Chapter 4: Mitigation Strategy:**
    - Mitigation Actions Database Overview
    - Phase 1-2: Agency Mitigation Actions Update Summary
    - Capability Assessment: New tools, plans, and policy that can increase the MPC's abilities to implement mitigation strategies.
- **Section 4: Hazardous Materials Releases Risk Assessment Profile:** This profile assesses the hazard, the risk and general strategies for reducing the risk to a hazardous materials release incident.

CONTENTS

SECTION 1: PLANNING PROCESS (HMP CHAPTER 2)

The 2017 Hazard Mitigation Plan (HMP) Annex provides updates activities that occurred since the HMP's approval in April 2014. As noted in the HMP's Plan Maintenance section, Chapter 6, NYC Emergency Management will keep track of all changes annually and incorporate these updates into a revised plan document at the end of the five-year plan-update cycle in 2019.This update represents NYC's commitment to keeping the HMP effective and relevant.

In order to enhance the Hazard Mitigation Plan so that it is dynamic resource, the Hazard Mitigation Unit is developing a mitigation actions database to streamline agency updates and centralize city-wide resiliency efforts (see Section 3).

The update process has taken place in a phased approach, phase I was conducted in 2015/2016 with fifteen agencies and phase II was conducted 2016/2017 with ten agencies on the Mitigation Planning Council (MPC).

The Hazard Mitigation Unit held a MPC webinar meeting in November 2016 to discuss the launch of the database, mapping portal, and to go over the process for collecting updates. Eleven agencies on the MPC attended the event including Department of Citywide Administrative Services (DCAS), Department of Design and Construction (DDC), Department for the Aging (DFTA), Department of Information Technology and Telecommunications (DoITT), Department of Social Services (DSS), Housing Preservation & Development (HPD), New York City Housing Authority (NYCHA), Mayor's Office of Environmental Remediation (OER), Mayor's Office of Recovery and Resiliency (ORR), and Small Business Services (SBS).

Following the meeting, NYCEM held one-on-one meetings with each of these agencies to discuss mitigation actions updates, the mapping portal, and new projects that agencies have taken on since the 2014 HMP.

Since the 2016 HMP Update, the Department of Homeless Services (DHS) and the Department of Human Resources Administration (HRA) were merged into one agency now called the Department of Social Services (DSS).

Over the past year, the Hazard Mitigation Unit has served in an advisory role for several resiliency initiatives across the city. The resiliency initiatives include the following:

- Science + Resilience Institute at Jamaica Bay (SRIJB) Public Agency Committee (PAC):
    - SRIJB produces integrated knowledge that increases biodiversity, well-being, and adaptive capacity in coastal communities and waters surrounding Jamaica Bay and New York City.
    - NYCEM is a member of the PAC which is comprised of representatives of public agencies that are involved in the planning, management, and regulatory oversight of Jamaica Bay. The PAC presents the Institute with policy and management issues and priorities and advises on the development of the Institute's research program.
- Hunts Point Resiliency Advisory Working Group
    - HUD Community Development Block Grant Disaster Recovery (CDBG-DR) funds of $45 million are available to the City to advance resiliency in Hunts Point. The Hunts Point Peninsula Resiliency and Evaluation Pilot Project will advance detailed feasibility studies for Resilient Energy and Flood Risk Reduction and select an implementable pilot project to increase resiliency in the peninsula.
    - Since April 2016, NYCEDC and ORR

convened the Advisory Working Group that consisted of City agencies, community groups, elected officials, and Hunts Point businesses including the wholesale markets. The goal of the group is to evaluate potential pilot projects for resilient energy. NYCEM served as a subject matter expert in emergency planning and hazard mitigation.

- Sustainable City University of New York (CUNY) Resilient Solar Project
    - For the past two years, NYCEM has served on the Advisory Board of Sustainable CUNY's Resilient Solar Project, supported by the United States (U.S.) Department of Energy, as well as the CUNY-led Policy and Legal Working Group and the Economics and Finance Working Group. New York State, the federal Department of Energy, Con Edison, Mayor's Office of Sustainability, NYCEDC, DOB, FDNY, NYC Department of Citywide Administrative Services (DCAS), and ORR participate in this project as well. This has had a direct impact on NYCEM's Quick Connect generator project and has the potential to reduce costs on certain hurricane evacuation shelter sites.

      This effort has created a strategic pathway to a more resilient distributed energy system through the NYSolar Smart Distributed Generation (DG) Hub. The project emphasizes the value of resilient solar on critical facilities for emergency use. With NYCEM's help defining these critical facilities, a fire station, a school, and a NYC Housing Authority (NYCHA) development were evaluated as sites for pilot studies. The studies examined how resiliency benefits and electricity bill savings through peak-load reduction make resilient solar a smart investment for critical infrastructure. The partnership's work is ongoing and the growth is expected to continue with Mayor de Blasio's Solarize NYC and Shared Solar NYC programs. Sustainable CUNY has recently created a pathway to solar+storage and recently published the NYC Resilient Solar Roadmap.

- Gowanus Neighborhood Planning Study's Resiliency and Sustainability Working Group
    - This initiative led by the Department of City Planning aims to promote the vibrant neighborhood of Gowanus by encouraging the local economy, creating opportunities for new housing including affordable housing in appropriate locations, and supporting resiliency and sustainability efforts in the long term.

    - NYCEM sits on the Resiliency and Sustainability Working Group to provide information on community emergency planning, preparedness, and hazard mitigation.

SECTION 2: RISK ASSESSMENT (HMP CHAPTER 3)

This section includes new resources, studies, and tools to enhance the understanding of hazards as well as hazard events that have occurred since the 2016 HMP update.

COASTAL STORMS:

Since the last HMP update, the City experienced one coastal storm event (see Table 1) and two close calls with forecasted Tropical Storm Hermine and Hurricane Matthew. In September 2016, the National Hurricane Center forecasted that Tropical Storm Hermine had the potential to make landfall in New York City on Labor Day weekend. NYCEM activated the Emergency Operations Center (EOC) in anticipation of the storm. Mayor De Blasio ordered the closure of beaches to swimming, surfing and bathing due to forecasted storm surge. However, Tropical Storm Hermine did not impact New York City and instead moved east-northeast away from the coast.

In October 2016, the National Hurricane Center forecasted that Hurricane Matthew had the potential to make landfall north of North Carolina. NYCEM held Coastal Steering Committee calls in order prepare for the storm's arrival. Although Hurricane Matthew impacted the southeastern United States (Florida, Georgia, South Carolina, and North Carolina), the strength of the storm dissipated and moved out to sea before reaching NYC. Even though both forecasted storms did not significantly impact the NYC area, it serves as a reminder that the City continues to be at risk from coastal storms.

CYBER THREATS

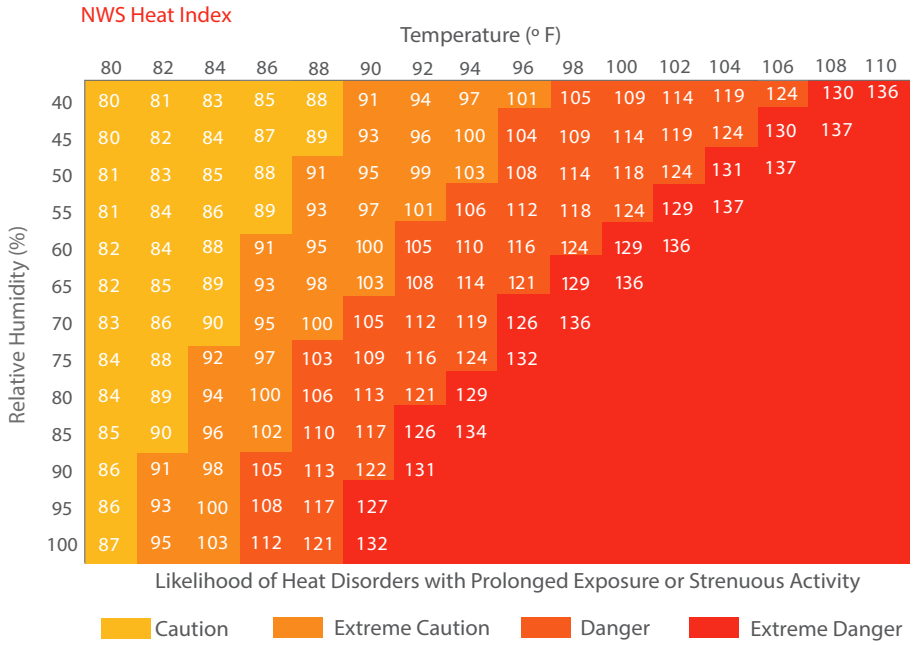
The Department of Information Technology and Telecommunications (DoITT) created the Citywide Cybersecurity Awareness Program to mitigate the risk of cyber-attacks. This risk reduction program educates city employees via training and awareness initiatives including classroom, CBT, anti-phishing simulation testing and training, various media initiatives, and role-based training for users with privileged access.

The rollout of the Citywide anti-phishing testing and awareness is now underway with an expected completion by end of 2017. Several cybersecurity awareness videos have been deployed with more in development for 2017. Online cybersecurity awareness and training vendors are currently being evaluated for specialized compliance needs such as HIPAA and PCI. Lastly, DoITT expects to design and distribute security awareness posters and create an online presence to make all awareness materials available.

TABLE 1: COASTAL STORMS HISTORIC OCCURRENCES APRIL 2016 – APRIL 2017

DATE	EVENT	LOCATION	WATER LEVEL (FEET)	TIDE STATION	DESCRIPTION
1/23/2017 – 1/24/2017	Coastal Storm	Southeast Queens, North Shore of Staten Island, Lower Manhattan	2.0 MHHW** (Moderate Flooding)	East Rockaway Inlet	• High winds. • Rainfall accumulations of approximately 1.5 inches. • Tidal flooding in low laying areas. • Other impacts from the storm included downed trees and flooding on roadways.

Source: Stevens Institute Tide gauges and situation reports. **Event selection based on NYCEM activation. **MHHW – Mean High High Water.*



DISEASE OUTBREAKS

The City regularly monitors infectious diseases that are either present and/or emerging. Since 2015, the City has been monitoring the Zika virus outbreak in Central America, South America, the Caribbean, and Mexico. This virus usually spreads to people through mosquito bites from a specifi c type of mosquito that only lives in certain parts of the world. Most people (80%) who are infected with Zika do not get sick, and the symptoms are typically mild for those that do get sick. However, Zika may cause birth defects. To avoid this risk, pregnant women and women who are trying to become pregnant are advised not to travel to areas affected by Zika.

Although there have been no locally transmitted cases of the Zika virus in NYC, there have been over 500 reported cases of travel-associated cases of Zika as of October 1, 2016. All patients have since recovered. Currently, DOHMH is planning and preparing for the 2017 mosquito season (beginning in April) and will work with the U.S. Centers for Disease Control and Prevention and the state to mitigate the Zika virus should it move to the New York City region.

In addition, DOHMH is continuing to maintain emerging infectious disease treatment capacity at Region 2 Ebola and Special Pathogens Treatment at Bellevue Hospital Center in Manhattan, NYC.

EXTREME TEMPERATURES

According to the National Oceanic and Atmospheric Administration (NOAA), 2016 was the hottest year on record, the third year in a row has been set for global average surface temperatures. Warmer temperatures are projected to be the trend in the near future. According to the New York Panel for Climate Change (NPCC), by the 2050s the frequency of heat waves could increase to seven per year from the pre-2000 baseline of two per year.

The severity of extreme heat events is measured by the combination of temperature and humidity, the duration of the event, and its impact on people's health. The National Weather Service developed the heat index chart to measure the apparent temperature of the air as it increases with relative humidity in addition to the health hazards associated with high heat indices.

In 2016, NYCEM activated its Heat Emergency Plan four times to respond to events with high heat indices; double the amount of times it activated in 2015. All heat events this past summer had heat indices above 100ºF. Although our climate is warming, NYC also continues to experience extreme cold events. For example, there was one extreme cold event that occurred in December 2016.

TABLE 2: EXTREME TEMPERATURES EVENTS APRIL 2016 – APRIL 2017				
DATE	WEATHER STATION	TEMPERATURE	EVENT	DESCRIPTION
July 6 -8, 2016	LGA	Peak Heat Index 103°	Extreme Heat	• There were multiple power outages throughout the five boroughs, but most of the outages were in Queens and Staten Island.
July 14-17, 2016	Staten Island	Peak Heat Index 110°	Extreme Heat	• Multiple power outages throughout the five boroughs.
July 23-26, 2016	Central Park	Peak Heat Index 103-106°	Extreme Heat	• Voltage reductions in several networks affecting traffic signals and some NYCHA developments. • Multiple power outages throughout the five boroughs, but most of the outages were in Manhattan, Queens, and Staten Island.
August 12 - 15, 2016	Queens and Staten Island	Peak Heat Index 124°	Extreme Heat	• Voltage reductions in several networks. • Multiple outages, mostly in Staten Island and Queens.
December 15-16, 2016	Brooklyn and Staten Island	Minimum 10-15°	Extreme Cold	• Wind speeds approximately 15mph • Wind chills in the single digits

Source: NWS weather stations, NOAA via the MADIS Data Application (https://madis.ncep.noaa.gov/index.shtml), and Situation Reports.**Event selection based on NYCEM Heat Emergency Plan activations and Cold Weather monitoring.*

FLOODING:

Because flooding continues to be a hazard that occurs frequently in the NYC area, the City is focused on understanding all sources of flooding, including inland flooding. For example, the Department of Environmental Protection (DEP) is developing an action plan to resolve long-standing flooding conditions that affect over 400,000 city residents in Southeast Queens. The area has more 311 flooding and confirmed sewer backup complaints than any other area of the city, and in certain neighborhoods, experiences recurring flooding conditions. The plan will consist of intensive and accelerated long-term sewer build-out, complemented with innovative, site-specific solutions, such as Bluebelts and green infrastructure. It will serve as a model for other flood-prone neighborhoods of the city.

In 2016, the DEP kicked off a Cloudburst Resiliency Planning Study to assess risks, prioritize response, develop neighborhood-based solutions, and assign costs and benefits for managing extreme rain events, or "cloudbursts," using Southeast Queens as a focus area. The study adapted an approach developed in Copenhagen to manage large volumes of stormwater using streets and open space. By modeling the flow of floodwater over the local topography, the study determines opportunities to slow and safely convey water to minimize damages and maximize co-benefits to the community. Pilot projects identified through the study will complement new sewer build-out and green infrastructure construction in Southeast Queens.

Since April 2016, the following flood events have occurred producing localized flooding as shown in Table 3.

TABLE 3: FLOODING HISTORIC OCCURRENCES APRIL 2016 – APRIL 2017					
DATE	EVENT	LOCATION	WATER LEVEL (FEET)	TIDE STATION	DESCRIPTION
5/6/2016	Coastal Flooding	Staten Island, Bronx and Northern Queens	2.8 MHHW (Moderate Flooding)	Raritan River at South Amboy NJ	• 311 call records indicate clogged catch basins and street flooding.
7/25/2016	Flash Flood	South Brooklyn, and Eastern Queens	2.47 inches at JFK	N/A	• Showers and thunderstorms resulted in flash flooding across portions of NYC and Long Island. • 311 call records indicate clogged catch basins and street flooding.

Source: NWS weather stations, Stevens Institute, NOAA Storm Events Database, and 311 call records.**Event selection was based on NYCEM Flash Flood Emergency Plan Activations*

WINTER STORMS

This past winter season 2016/2017 ushered in approximately 30 inches. Two notable events occurred in February and March and are listed below.

TABLE 4: WINTER STORM HISTORIC OCCURRENCES APRIL 2016 – APRIL 2017					
DATE	EVENT	WEATHER STATION	TOTAL (INCHES)	Northeast Snowfall Impact Scale (NESIS)	DESCRIPTION
2/9/2017 – 2/10/2017	Winter Storm Niko	Fresh Meadows	13.2	N/A	• Winter storm brought moderate to heavy snow and extreme cold temperatures. • Delays on mass transit services. Airports experienced extensive cancellations and delays. • Above average 311 calls for No Heat/No Hot Water.
3/14/2017	Winter Storm Stella	Bronx	10	3	• Schools closed and elevated subway lines were suspended. • Airports experienced some delays. • HOV lanes closed for LIE and Gowanus Expressway. • Slightly above average 311 calls for No Heat/No Hot Water. • Moderate coastal flooding in Northern Queens. • Minor flooding in Staten Island, Rockaways, and Lower Manhattan.

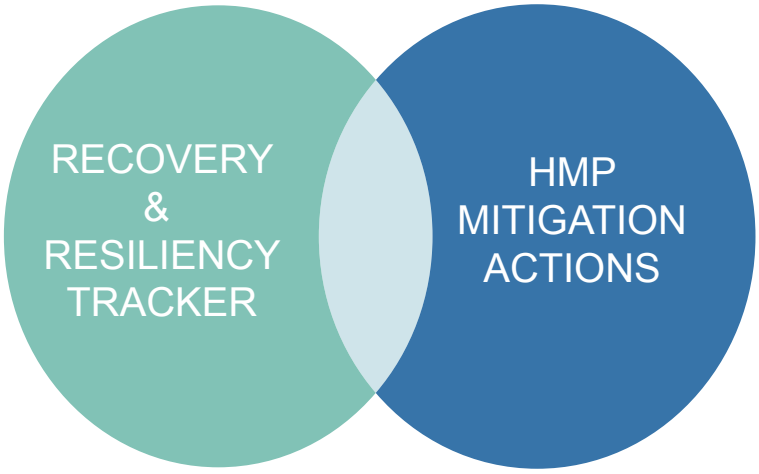
Source: Situational Reports issued during EOC activation, Stevens Institute, NWS Weather Stations, NOAA via the MADIS Data Application (https://madis.ncep.noaa.gov/index.shtml), and 311 call records. **Event selection based on minimum height of snow more than 10 inches.*

SECTION 3: MITIGATION STRATEGY (HMP CHAPTER 4)

Since the 2016 HMP Update, the planning team in coordination with the Mayor's Office of Recovery and Resiliency (ORR) has launched the mitigation actions database to streamline mitigation action updates by leveraging information from ORR's Recovery and Resiliency tracker and identifying new mitigation actions that have occurred since the NYC 2014 HMP. Over the past year, NYCEM completed Phase II of this project that included 10 agencies. NYCEM met with these agencies to discuss updates to the mitigation actions they submitted to the 2014 HMP and asked them to verify the cross-referenced projects with ORR's Recovery and Resiliency tracker.

The summary table on the next page identifies the changes to mitigation actions for Phase I - II of the database. Phase I agencies provided updates on their actions from 2016 -2017. Phase II agencies provided updates on their actions from 2014 – 2017. Phase I-II of the Mitigation Actions Database, showed that 46 projects have moved from potential to existing, 73 projects have been completed, and 15 projects have been added.

The mapping portion of the project started in the winter of 2015 and will continue through the summer of 2017. This tool will help MPC members better localize planning efforts, cross reference their actions with the Risk Assessment Section, work with communities, and leverage grant opportunities.



SBS MITIGATION SPOTLIGHT: The Department of Small Business Services is committed to helping the New York City's small business community be better prepared and more resilient in the face of emergencies and disasters. SBS's Business Preparedness and Resiliency Program (Business PREP) is a $7.51 million dollar investment in economic and community resiliency and is funded through $3 million from the City's CDBG-DR allocation and $4.51 million from the New York State's Governor's Office of Storm Recovery NY Rising Community Reconstruction Program.

In 2015, Business PREP began offering business continuity planning and emergency preparedness workshops and webinars. Businesses come away from the sessions with the knowledge and tools to create a personalized preparedness plan, including a better understanding of how insurance can help protect them in the event of a disruption. As of March 2017, approximately 400 people have participated in a Business PREP workshop or webinar.

In late 2016, Business PREP launched free, on-site risk assessments that recommend customized physical, operational, and financial preparedness and resiliency-related improvements to business owners impacted by Hurricane Sandy. Businesses that receive an assessment are eligible to receive a grant of up to $3,000 to purchase certain resiliency-related items recommended by the assessment. Over 500 businesses will receive an assessment and grant over the life of the program.

TABLE 5: SUMMARY OF MITIGATION ACTION CHANGES PHASE 1 – 2 (DOES NOT REPRESENT ENTIRE MPC)

PHASE II	MA CHANGE FROM 2014 – 2017			CURRENT EXISTING AND POTENTIAL PROJECTS		
AGENCY	NO. OF ACTIONS MOVED FROM POTENTIAL TO EXISTING	NO. OF COMPLETED ACTIONS	NEW ACTIONS	CURRENT EXISTING	CURRENT POTENTIAL	TOTAL
DCAS	2	5	0	6	2	8
DDC	0	0	0	1	1	2
DFTA	2	4	4	3	3	6
DoITT	2	7	8	7	6	13
DSS	1	0	1	3	5	8
HPD	0	4	2	2	3	5
NYCHA	6	1	0	10	5	15
NYPD	2	0	0	2	5	7
OER	4	5	0	8	0	8
SBS	4	0	0	6	1	7
PHASE I	MA CHANGE FROM 2016 – 2017			CURRENT EXISTING AND POTENTIAL PROJECTS		
AGENCY	NO. OF ACTIONS MOVED FROM POTENTIAL TO EXISTING	NO. OF COMPLETED ACTIONS	NEW ACTIONS	CURRENT EXISTING	CURRENT POTENTIAL	TOTAL
Con Edison	0	3	0	6	0	6
DCP	0	4	0	5	1	6
DEP	2	3	0	26	4	30
DOB	3	4	0	13	2	15
DOE	1	4	0	10	7	17
DOHMH	4	3	0	26	11	37
DOT	0	1	0	15	2	17
DPR	2	2	0	6	3	9
DSNY	0	3	0	3	7	10
FDNY	1	3	0	11	3	14
H+H	0	3	0	38	0	38
MTA - NYCT	1	0	0	17	0	17
MTA - Buses	0	6	0	2	3	5
MTA - Bridges and Tunnels	0	2	0	7	0	7
MTA - Metro North	2	2	0	13	4	17
MTA - LIRR	2	1	0	9	0	9
NYCEDC	0	0	0	14	1	15
NYCEM	5	3	0	28	8	36
Total (Phase I-II)	46	73	15	295	88	383

Source: Phase I-II Agency mitigation actions update submissions.

MITIGATION ACTION SPOTLIGHT (HPD)

Rising sea levels, increasing temperatures and precipitation, and the likelihood of more frequent and intense storms threaten New York City's neighborhoods and infrastructure while exacerbating social inequity. The *Resilient Edgemere Community Planning Initiative* aims to pair the City's recovery efforts with a long term vision for a higher quality of life for Edgemere residents. In October 2015, the New York City Department of Housing Preservation and Development (HPD), in collaboration with City agencies, community members, elected officials, and local organizations, launched an 18 month community planning process. This effort placed local residents and stakeholders, who best understand their communities, at the center of developing solutions for Edgemere's future.

Edgemere demonstrates that engaging local residents can result in thoughtful solutions to complex challenges; and, at its best, serves as a model for how communities can build an inclusive vision for a resilient future in the face of climate change. As a result, the *Resilient Edgemere Community Planning Initiative* lays out clearly defined goals, strategies, and 60 concrete projects – **representing hundreds of millions of dollars in planned investments over the next 10 years and beyond**. A few projects that highlight this joint commitment to a stronger, more equitable neighborhood include:

- $14 million for a Raised Shoreline, an elevated berm that will protect Edgemere against 30 inches of sea level rise.
- Resiliency improvements through Build It Back, including construction of new homes, relocation of homes in hazard areas, and elevation and/or repair of homes.
- Improvements to Bayswate r Park, including wetlands restoration and shoreline stabilization (pending FEMA approval).
- Proposing changes in land use for 16 acres of land in Edgemere's most vulnerable areas to be dedicated for use as open space that will provide coastal protection, instead of housing.

CAPABILITY ASSESSMENT

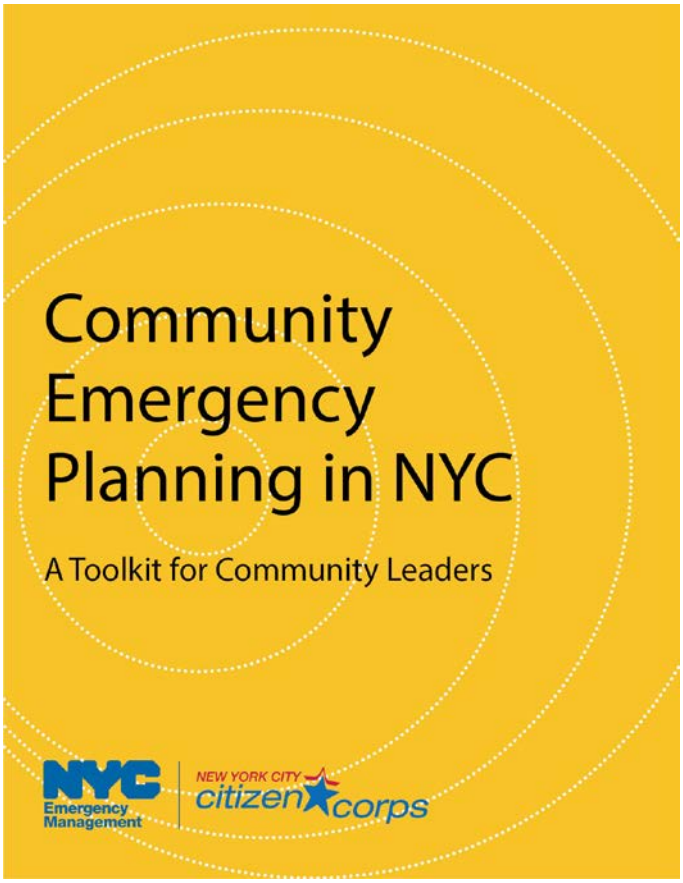
Over the past year, there have been several reports, tools, and working groups that enhance the ability of the MPC to implement mitigation strategies. Below is a summary of recently released tools.

Planning and Regulatory (City Plans):

- *Resilient Industry Study:* Organized by DCP, the Resilient Industry initiative will assess vulnerability to flooding in industrial areas of New York City and propose strategies that individual businesses and the City can pursue to make industrial areas and surrounding communities more resilient. The Technical Advisory Committee consists of city and state agencies, private industrial businesses, and private not for profit organizations. The study will consider both physical changes to protect industrial facilities and operational strategies to prepare for future storms.

Education and Outreach

- *Urban Heat Island (UHI) Working Group:* Organized by ORR, this group consists of City agencies, academics, and non-governmental organizations. The group will inform the City's efforts to mitigate and adapt to the impacts of extreme heat and understanding of the impact of UHI. The past year, the working group worked on developing a strategic framework to inform and guide future capital investments and operational strategies, identify and advise on near-term tactics for the city's most heat-vulnerable communities based on the best available science, and recommend needed monitoring and research initiatives to adapt our city to the increasing impacts of urban heat.



- *Climate Change Adaptation Taskforce (CCATF):* The Taskforce, formed by Local Law 42 (2012), convenes infrastructure operators in New York City to collaboratively identify how critical infrastructure could be at risk from the effects of climate change. The CCATF also facilitates knowledge sharing and develops strategies to reduce the impacts of climate change on these assets. There are five working groups, consisting of the following sectors: energy, social infrastructure, transportation, water, sewer, and waste, as well as telecommunications, which was added to the LL 42 as a sector of interest in July 2015. Working with the City, the sectors developed an updated inventory of at-risk infrastructure and a repository of resilience guidelines in 2016. The results from the inventory are informing an ongoing analysis led by Department of Homeland Security into understanding critical infrastructure interdependencies across sectors. A final report describing system wide asset vulnerabilities and adaptation strategies will be released in fall of 2017.

- *Climate Resiliency Design Guidelines:* The City is also developing Climate Resiliency Design Guidelines which will provide a consistent methodology for incorporating forward-looking climate data into the design of City infrastructure and buildings. The goal is to make City facilities resilient against sea level rise, extreme heat, and extreme precipitation events. The guidelines, which were developed in partnership with city agencies through the Design Guidelines Working Group, will be released Spring 2017.

- *Community Emergency Planning in NYC: A Toolkit for Community Leaders:* NYCEM's Citizen Corps team launched the Community Emergency Planning Toolkit in February 2017, to help communities become more resilient. The toolkit contains information about how New York City plans for hazards and guidance for how communities can create their own emergency plan.

HAZARDOUS MATERIALS RELEASES
SECTION 5

We use hazardous materials in our homes and businesses every day. Many industrial and commercial businesses rely on hazardous materials to produce goods and provide services. Likewise, these materials are transported daily throughout the city by truck, train, airplane, and on the waterways. Hazardous materials spills pose risks to the public health of New Yorkers. Because there are strict federal, state, and local environmental regulations for the transport, handling, storage, and disposal of hazardous materials, large-scale releases are rare. Nevertheless, a moderate-scale release could occur due to flooding, coastal storms, earthquakes, severe weather, accidents, collisions, or acts of terrorism.

WHAT IS THE HAZARD?

A hazardous material or petroleum product (HAZMAT) incident is when a harmful substance is released into the surrounding environment that has been defined and regulated by federal, state, or local statute because it has the potential to cause harm to humans, animals, or the environment. The causes of a HAZMAT release may either be accidental or intentional. Accidental incidents may result from human error, technological failure, or natural disasters. HAZMAT spills can occur at industrial or commercial sites where these materials are stored and used or during the transportation of these materials between these sites or in residential homes that have heating oil tanks. Natural hazard events such as flooding, coastal storms, severe weather, and earthquakes may also cause spills, leaks, airborne releases, or seepage into uncontained areas.

Intentional releases of HAZMATs include criminal acts, such as purposeful dumping by industries to avoid regulatory requirements or terrorist acts that target a specific location, possibly involving the use of a dispersal or explosive device.

HAZMAT releases are often classified as chemical, biological, radiological, or nuclear (CBRN). For the purposes of this profile, we are focused on chemical-related hazardous materials incidents. A chemical is generally considered hazardous if it exhibits toxicity, reactivity, corrosivity, or flammability. The properties of these chemical substances are such that they can react with and cause damage to living cells and tissues. Commercially or industrially used hazardous chemicals that may be accidentally released include petroleum substances (such as oil, gasoline, and liquid natural gas) and those with industrial applications (such as chlorine and pesticides).

WHAT IS THE RISK?

A HAZMAT incident has the potential for grave consequences. The severity of an event depends on the type of material released; the location of the release relative to surrounding communities and environment; the volume and concentration of the release and how quickly the hazardous material disperses, volatilizes, or dilutes.

For chemical hazards, the National Fire Protection Association (NFPA) 704M rating system is commonly used to identify the risks associated with hazardous materials that occur during emergency response (see figure 1). This system uses numbers and primary colors on a label to define the basic hazards of a specific material. For example, the risk is represented using a diamond with four colors: blue for health, red for flammability, yellow for reactivity, and white for special hazards. The categories are ranked on a scale from 0 (no hazard) to 4 (extreme hazard).

Because hazardous materials are subject to regulation by federal, state, and local government, major releases are unlikely; however, smaller incidents are possible and have the potential to endanger public health and contaminate groundwater, surface water, air, and soils. The New York State Department of Environmental Conservation (NYSDEC) receives approximately 16,000 reports of confirmed and suspected chemical releases per year in the State of New

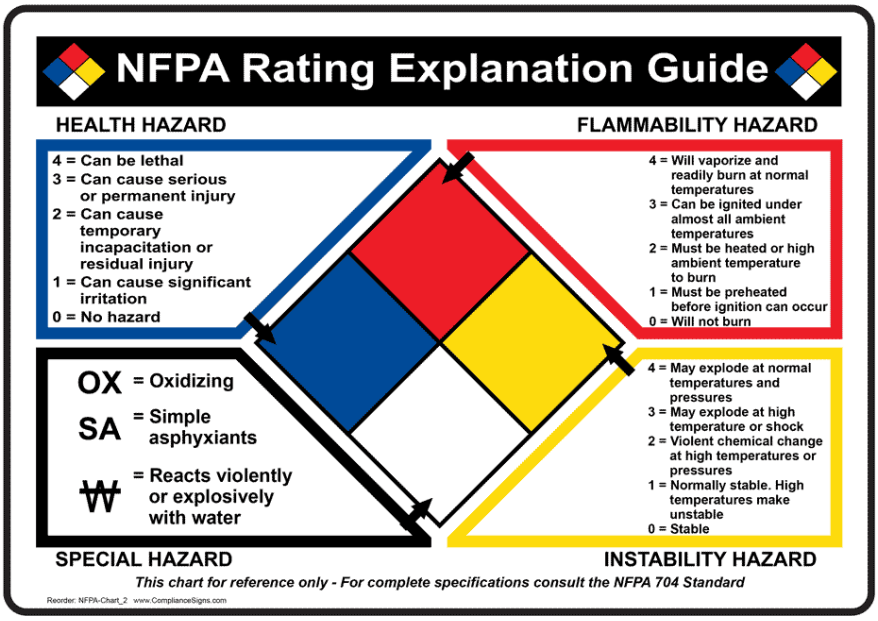


Figure 1: NFPA Rating Explanation Guide

York – a majority of which involve petroleum products. Many of the reports are of small quantities and are contained and cleaned up quickly. In the city, DEP's Division of Emergency Response and Technical Assessment (DERTA) responded to nearly 3,900 incidents in 2016. Only ten percent of these incidents involved abandoned chemicals, while the remaining incidents involved chemical odors (44%), petroleum spills (21%), chemical spills (10%), and responses to special investigations (11%).

Local Law 26 of 1988, also known as the Community Right to Know (RTK) Laws, require facilities that store, use or process chemicals above specified thresholds to report information about these substances. DEP is responsible for enforcing these requirements. In 2016, 11,178 facilities filed such reports. A small percentage of hazardous substances regulated by the RTK program are considered Extremely Hazardous Substances (EHS) and are used mostly in the telecommunications industry (e.g., large quantities of sulfuric acid in batteries used for back-up power systems) and automotive repair, automotive body, paint, and maintenance industries. Facilities that use EHS are required to submit a Risk Management Plan (RMP) to DEP to minimize the risk of exposure as established by Local Law 92 of 1993.

AREAS AT RISK: FIXED SITES AND TRANSPORTATION MODES

HAZMAT incidents can either occur on fixed sites or in transit. Fixed sites include industrial facilities, open industrial areas, construction sites, commercial businesses, and even residential buildings that have materials such as heating oil (see figure 2).

Industrial Facilities

Historically, many industrial facilities were strategically located on the waterfront to facilitate operations. From Hunts Point in the Bronx; Newtown Creek in Queens and Brooklyn; the Brooklyn Navy Yard, Gowanus Canal, and Sunset Park in Brooklyn; to the Kill Van Kull in Staten Island, industrial and commercial businesses still continue to operate on the waterfront to this day. Flooding or coastal storm events can significantly contribute to the risk of a HAZMAT release at these sites.

Flood risk is defined by different models including the National Oceanic and Atmospheric Administration's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) used to calculate hurricane storm surge for life safety planning and the FEMA Flood Insurance Rate Maps (FIRMs) as part of the National Flood Insurance Program (NFIP) to demonstrate flood risk for regulatory insurance requirements. Research by the New York City Environmental Justice Alliance (NYC-EJA) has found that a significant portion of New York City's industrial businesses are located within the storm surge zones based on the SLOSH model released by NYS Division of Homeland Security and Emergency Services (DHSES).

Until recently, FEMA's maps had not been updated since 1983. A new study was conducted by FEMA in 2009, and the new Preliminary Flood Insurance Rate Maps (PFIRMs) were released in December 2013. The PFIRMs show that 14,500 businesses are located in the high risk 1 % annual chance (100-year) floodplain. Of these businesses, 1,700 industrial businesses include transportation and warehousing, wholesale trade, construction, manufacturing, telecommunications, waste manage-

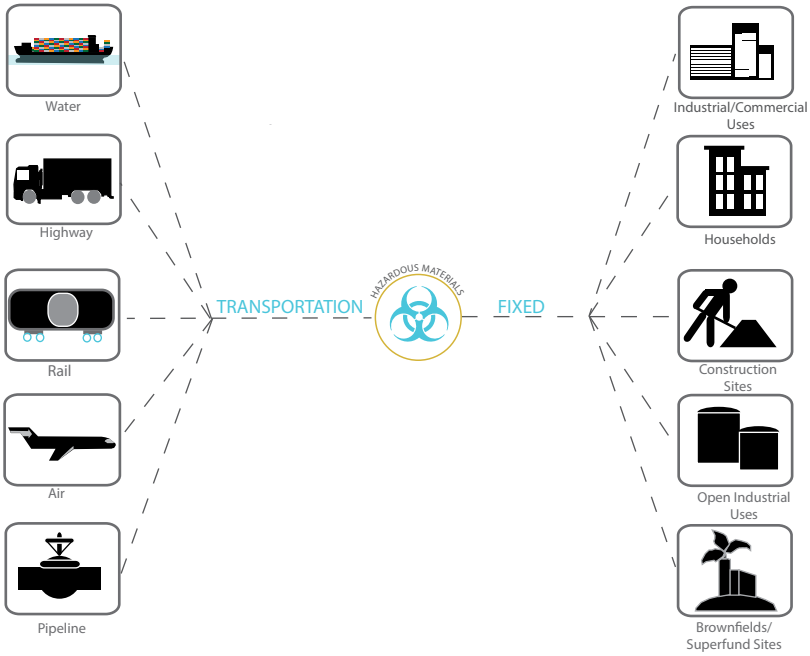


Figure 2: Areas at Risk: Fixed Sites and Transportation Modes

ment, auto repair, and gas stations. In addition, approximately 25 bulk petroleum terminals are located in the PFIRMS. According to the Department of City Planning's Resilient Industry Study, businesses located in the 1 % annual chance floodplain tend to use hazardous materials to produce goods and services daily. These businesses include 150 auto repair and maintenance, 33 metal fabrication, 26 printing, 22 waste management and remediation, and 22 telecommunications businesses. In addition to industrial businesses, there are also numerous commercial and retail businesses in the floodplain that use, stock, or store hazardous materials including 35 homecare and hardware stores, 45 laundromats, and 50 gas stations. Flooding also poses a risk to residential sources of HAZMAT such as the potential of overturning of home heating oil tanks in basements affected by the flood.

Flooding will continue to be an issue for these areas in the future. According to the New York City Panel on Climate Change (NPCC), sea levels are projected to rise and expand the future 1% annual chance floodplain to include more industrial businesses and communities. In addition, the NPCC projects that flooding will likely be more frequent for areas already subject to 100-year flood events.

Open Industrial Uses

Sites containing open industrial uses include construction, distribution, and certain waste processing businesses and tend to be located on large uncovered or open-air sites due to the land-intensive nature of the operations. If these businesses do not properly store hazardous materials, they could be locations for HAZMAT spills because materials may come into direct contact with rain and high winds, making them uniquely vulnerable to severe weather, and they are wholly unprotected from flooding. Heavy concentrations of these sites can be found throughout industrial areas in the city including Newtown Creek in Brooklyn/Queens, Jamaica in Queens, East Flatbush and Flatland in Brooklyn, the Staten Island North Shore, and Hunts Point and Eastchester in the Bronx. According to a DCP study in 2011, 600 open industrial uses were surveyed in these clusters covering 418 acres.

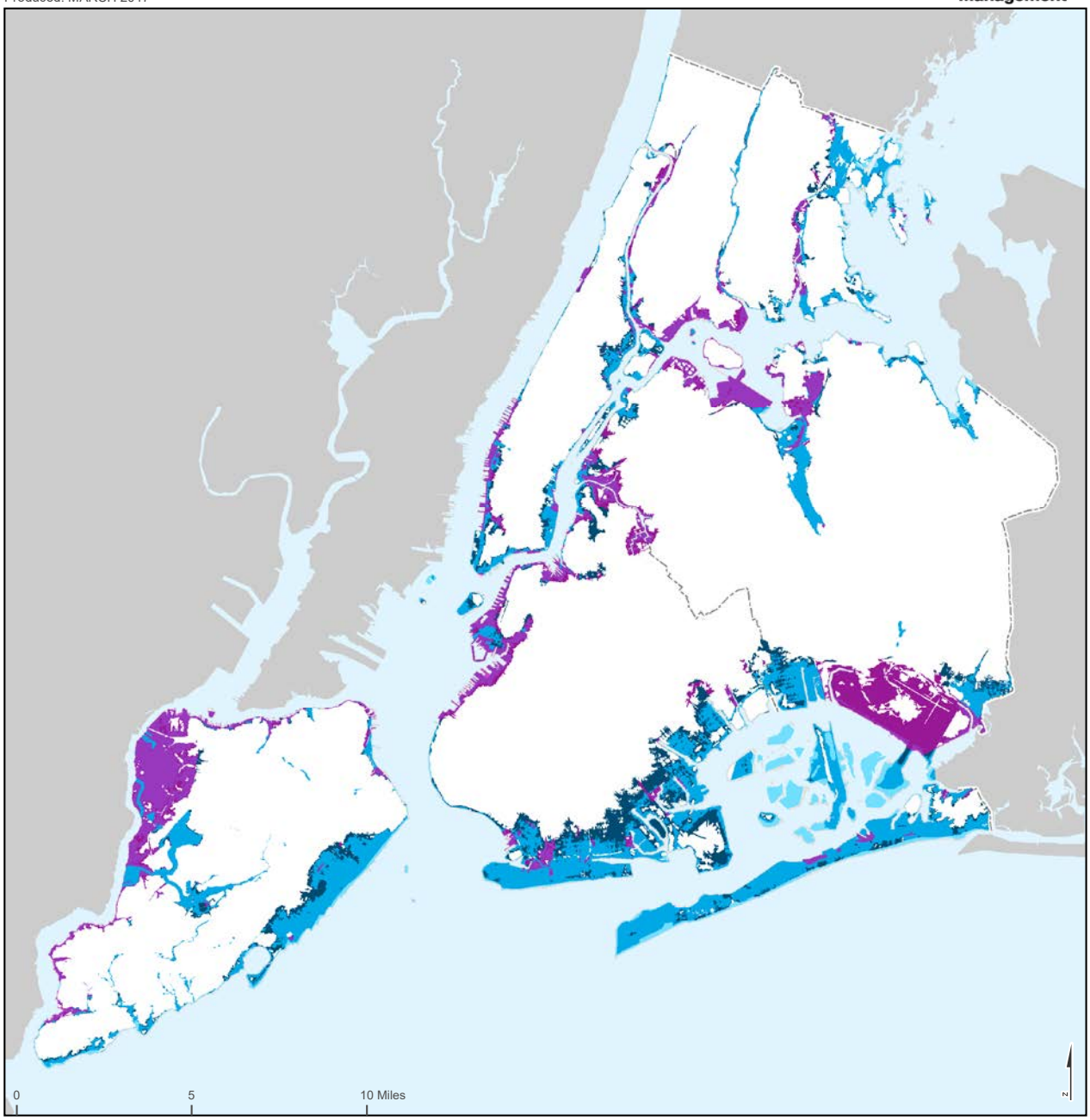
Approximately thirty percent of all Open Industrial Uses are within the 1% annual chance floodplain. Strong winds and flooding have the potential to damage inventory that is not properly elevated, stored in watertight containers, and anchored to secure outdoor storage systems or that is not properly contained or sealed to prevent spilling. Appendix G of the NYC Department of Buildings (DOB) Building Code institutes flood-resistant construction requirements for development located in the 1% annual chance floodplain. Although the building code applies to both buildings and unenclosed uses, the standards for flood resistant design and construction that are referenced within Appendix G address only to newly constructed or substantially improved buildings, structures, or tanks.

Brownfields

The city's industrial past and historic unregulated landfilling activities have left behind contaminated land. Known as brownfields, these properties can contain a variety of heavy metals, organic solvents, and other pollutants because their prior use predates significant environmental regulations. The contamination complicates redevelopment of these sites. If left unremediated,

Industrial zones in FEMA flood zone

Source: FEMA, NYC DCP, NYCEM GIS/ GIS Track-It #5662
Produced: MARCH 2017



Industrial zone in FEMA flood zone

FEMA flood hazard zone (pFIRM - Jan 2015)

100-year with wave action (VE)
100-year (A, AE, AO)
500-year (0.2 probability)

brownfields pose risks to the communities that live in close proximity and are vulnerable to a HAZMAT release during a flooding or a coastal storm event due to abandoned tanks and contaminated soil.

Through land use reviews, the City has designated more than 7,000 properties as subject to mandatory environmental study and management. There are also 3,000 vacant commercial and industrial properties in New York City. Properties often remain vacant because developers may fear the risk of environmental liability and the high cost of environmental remediation. The developers typically look elsewhere for investment opportunities, and communities are thereby deprived of new housing, businesses, jobs, open space, and other benefits of site cleanup and reuse.

The Mayor's Office of Environmental Remediation (OER) reports that brownfield sites are disproportionally found in low-income neighborhoods with over 55% of the properties in the NYC Voluntary Cleanup Program located in historically low and moderate income communities. The average vacancy prior to cleanup and redevelopment is over 12 years.

Furthermore, many brownfield sites are adjacent to Federal Superfund sites that are being remediated by the U.S. Environmental Protection Agency (EPA) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because they pose a risk to the human health and/or the environment or were used for activities that contributed to the contamination within these Superfund sites. The EPA has identified several of these CERCLA sites and related brownfields as candidates for cleanup because they pose as risk to human health and/or the environment. Two of the three Superfund sites in New York City are at risk to severe weather and flooding impacts: Newtown Creek and the Gowanus Canal.

Since the late 1800s, the Gowanus Canal was the home to many heavy industrial uses including coal gasification plants and energy generating facilities. The canal was contaminated from many years of industrial discharges, spills, and stormwater runoff. The canal also receives Combined Sewer Overflow discharges (CSOs), which occur when heavy rain events swell the volume of stormwater and wastewater to exceed a wastewater treatment plant's capacity, and result in the discharge of raw sewage into local waterways. CSOs pose a potential hazard to human health and the environment. The Canal was declared a Superfund site in 2009 and the EPA is now responsible for addressing liability, compensation and cleanup issues, and emergency response for hazardous substances released into the environment.

Newtown Creek, which borders Brooklyn and Queens, has also experienced 150 years of industrial activity from the refineries, petrochemical plants, fertilizer and glue factories, sawmills and lumber and coal yards that have lined its banks. Of particular impact, in 1978 the U.S. Coast Guard first noticed signs of an oil spill entering Newtown Creek. Approximately 17 to 30 million gallons of petroleum seeped into the ground of the Greenpoint area over several decades from Standard Oil refineries on its banks, covering an area of more than 50 acres. This is, to date, the largest oil spill in New York City's history and the largest in the United States. Newtown Creek was listed as a Superfund site in 2010.

TRANSPORTATION OF HAZARDOUS MATERIALS

A significant number of spills and leaks result from accidents that occur during the transportation of hazardous materials to and from storage facilities or manufacturing plants. Transport occurs via highway, rail, air, maritime routes, and natural gas pipelines.

Commercial-vehicle transport

Many types of hazardous materials are transported by commercial vehicles nationwide and throughout New York City's roadways. The U.S. Department of Transportation (USDOT) classifies them as follows:

Explosives

Gases

Flammable and combustible liquids

Flammable solids, spontaneous combustibles, dangerous when wet

Oxidizers and organic peroxide

Toxic and infectious

Radioactive

Corrosive

Bakken crude oil

Home heating oil

Other dangerous goods

SANDY SPOTLIGHT

During Hurricane Sandy, flood inundation levels reached many areas vulnerable to HAZMAT releases including 20% of the City's fuel distribution facilities and nearly 5,500 industrial buildings. According to A Stronger, More Resilient New York report, DEP reported that 367 firms in the Community Right to Know (RTK) database were located within the area impacted by Sandy; however only 18 of these facilities reported spills during Sandy. Of the 18 reported spills, 11 were cleaned prior to DEP inspections, and seven were washed out from the storm. In total, 11.4% of all facilities in DEP RTK database were affected during Sandy.

The EPA conducted tests at Newtown Creek and the Gowanus Canal after Hurricane Sandy, to assess potential contamination. Samples taken from buildings that had been flooded by Newtown Creek indicated high levels of fecal coliform. Samples taken from the ground floors of two buildings flooded by the Gowanus Canal and samples taken directly from the canal indicated elevated levels of bacteria. In addition, approximately 560 million gallons of untreated sewage mixed with stormwater and seawater were released into local waterways including the Gowanus Canal and Newtown Creek.

Another impact from Hurricane Sandy was widespread oil contamination of residential buildings located in the coastal areas of the city including Coney Island in Brooklyn, Broad Channel and the Rockaways in Queens, and Midland Beach in Staten Island. Many residences located in the floodplain rely on home heating oil that was stored in basements. According to the NYSDEC Spill Database, during Sandy there were 1,620 spills that contained motor fuel and oil tanks for heating supply. Removing spilled oil and oil contaminated water resulting from this condition requires specialized response to properly remediate (see How Do We Manage the Risk).

According to USDOT data from 2005-2009, most HAZMAT incidents are likely to occur either by rail or highway transport, specifically, vehicle rollover and derailment while in transit. When comparing US HAZMAT incidents, hazardous materials transportation accidents on highways have caused nine times as many fatalities as HAZMAT incidents on rail. In New York State, between 1971 and 2013 there were 24 fatalities related to highway incidents involving hazardous materials. USDOT regulates the transport of hazardous materials, which will be discussed further in the HOW DO WE MANAGE THE RISK section.

Rail

Although the majority of our trains carry passengers, there are rail lines responsible for freight. These freight rail lines ship building products, scrap metal, construction and demolition debris, petroleum products, biodiesel fuel, propane, plastics, pesticides, and other hazardous materials.

Rail lines in New Jersey that carry hazardous materials could also pose a risk to areas in New York City. Of particular concern is Bakken crude oil- considered one of the most dangerous products because it is highly volatile and flammable. A portion of the crude oil is transported in proximity to New York City along the west side of the Hudson River to an oil storage facility that is located in New Jersey and is across the Arthur Kill River from Staten Island. This refinery converts Bakken crude oil into gasoline, diesel fuel, jet fuel, and heating oil. A HAZMAT release from this facility has the potential to impact the shores and air of Staten Island.

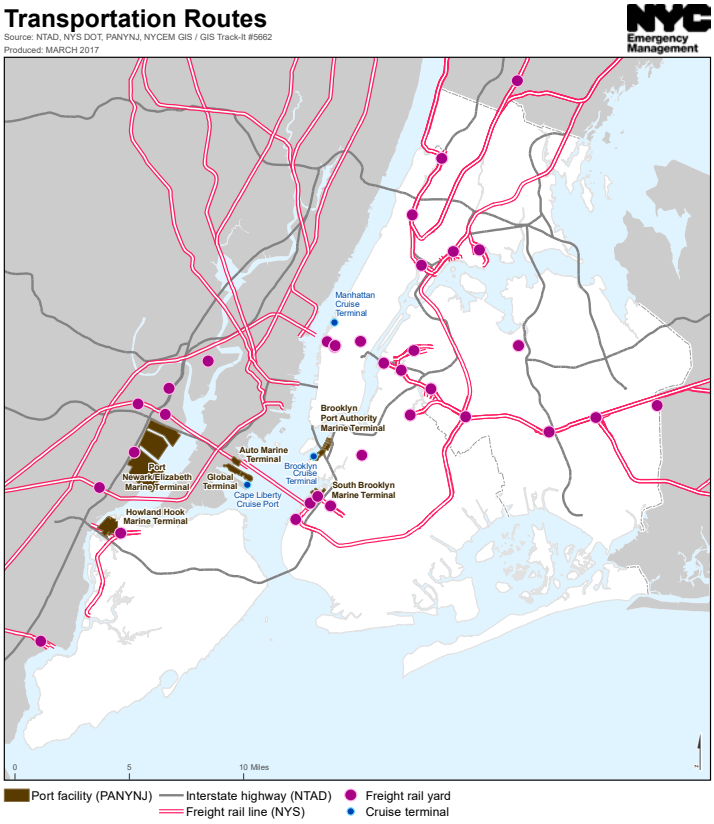
Water

Spills from barges and other vessels into waterways are more likely than onboard spills. Spills at marine terminals are likeliest during transfer operations as barges and ships load and off-load cargo. The Port of New York and New Jersey is the largest port on the East Coast. The majority of ship container facilities are in New Jersey but along waters across New York City, with the exception of the New York Container Terminal in northwestern Staten Island and the Red Hook Container Terminal in Brooklyn. Most materials off-loaded at those facilities are transported directly to New Jersey by water, truck, or rail.

Some of the largest spills in New York City history have been from barges and ships. For example, in 2006, approximately 31,000 gallons of heavy fuel oil spilled from a barge off New York Harbor into the waterway, impacting the shores of Staten Island. The cargo was being transferred from a barge to a Chevron plant. The United States Coast Guard (USCG) and the New York State Department of Environmental Conservation (NYSDEC) responded to the event by setting up protocols to contain the oil as well as oversight of the cleanup operations.

Pipelines

Two of the major pipelines that traverse New York City are the Buckeye Pipeline and the Iroquois Pipeline. The Buckeye Pipeline carries gas, diesel, and jet fuel from



major supply sources up the East Coast to terminals and airports including John F Kennedy (JFK) and LaGuardia (LGA) airports. The pipeline travels from storage tanks located in New Jersey, across Arthur Kill to New York City and Long Island.

The Iroquois Pipeline, carrying natural gas, runs from the Canadian border in New York State across Long Island Sound to Northport, Long Island. The Eastchester Extension of the Iroquois Pipeline runs under the Long Island Sound from Northport, Long Island to Hunts Point in the Bronx. The East River portion of the Pipeline passes under the Whitestone and Throggs Neck bridges and is proximal to LGA.

Pipelines are considered some of the safest modes for transporting hazardous materials. However, the hazards associated with both pipelines could range from a small leak to a full rupture. In the event of a shutdown or a reported pipeline leak for sections located in NYC, pipeline operators will notify response agencies including NYC Emergency Management (NYCEM), the New York City Fire Department (FDNY), and the New York Police Department (NYPD). For pipeline incidences, FDNY will respond to locate and isolate the leak to limit the exposure to the public. For more information on emergency response to HAZMAT incidents see section HOW TO MANAGE THE RISK.

Air

HAZMAT incidents related to aircraft and air cargo are rare, but possible, and could involve virtually any type of hazardous material. More common are spills from airport bulk fuel storage tanks (located above and/or below ground), fuel pipelines, and the tanker trucks that carry gasoline and jet fuels. For spills at JFK and LGA, the USCG's 3rd District has federal jurisdiction because these airports are located in coastal areas. NYSDEC likewise has regulatory jurisdiction.

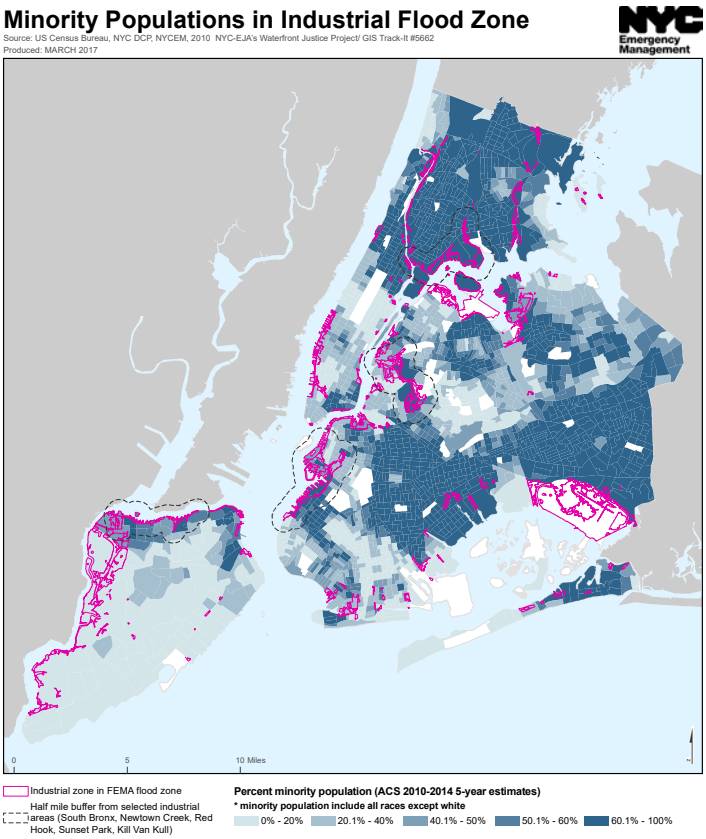
VULNERABILITY

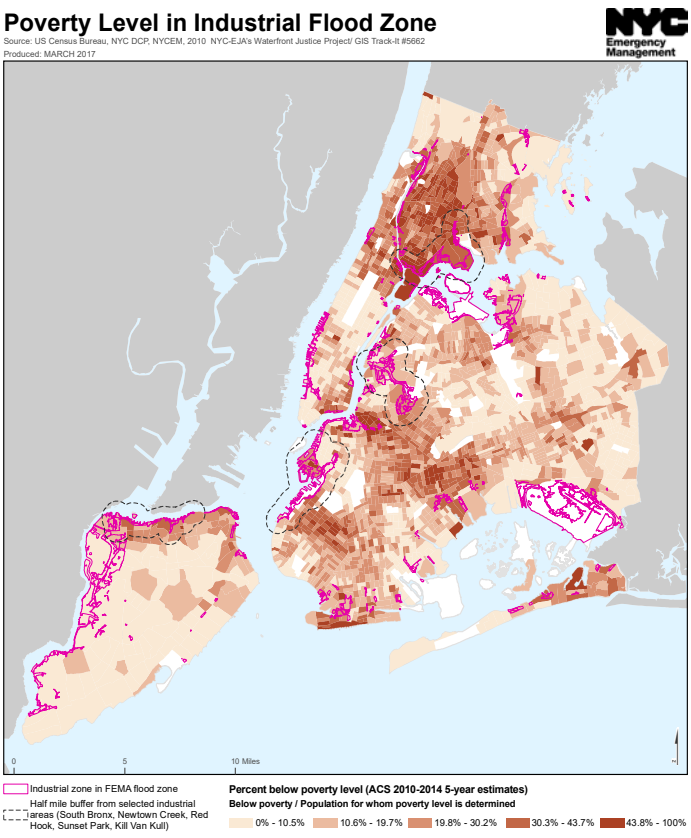
People at risk

HAZMAT releases can compromise the health and safety of any person who resides in, works in, or visits New York City. New York City has a dense population of 8.55 million residents who occupy 305 square miles with a population density varying significantly across the city. Therefore, a HAZMAT release incident could affect many people because of the high population density. People most at risk to these incidences include communities in close proximity to sites that store hazardous materials and emergency responders, who may be exposed in the line of duty.

In addition, a large number of people live near waterfront areas. Residential communities near waterfront industrial areas-- such as the South Bronx, Red Hook, Sunset Park, Newtown Creek, and the North Shore of Staten Island tend-- to be largely comprised of minority populations, as shown on the map on the adjacent page. In addition, some of these areas also consist of lower-income populations, also shown on the map on the adjacent page. As mentioned earlier, brownfield sites also tend to be disproportionately located in low-income areas. For these communities, equity issues are combined with health, environmental, and aesthetic concerns. In the event of a coastal storm, these areas are vulnerable to HAZMAT releases if industries do not properly store or secure these substances pre-event.

Pre-existing health conditions, like asthma, can make some populations more vulnerable to the impacts of a hazardous materials spill. For example, the Bronx has the highest asthma rates in not only the city, but in the entire United States. It is estimated that within some neighborhoods 20% of children have asthma. In





addition, toxic chemicals such as carcinogens, corrosives, or agents may affect the lungs or blood, or pose other physical hazards because they are flammable, combustible, explosive, or reactive. Potential consequences include fatalities, injuries, and other long-term illnesses and health impacts due to water, air, soil, or ground water contamination.

Buildings and infrastructure at risk

HAZMAT releases can also cause property damage and contamination-rendering a site unusable or necessitating a costly clean-up. Corrosive chemicals have the potential to damage building materials and infrastructure. Vapors from spilled materials can collect in houses and businesses, creating health impacts, fire, and explosions.

An incident could shut down or destroy public and private transportation infrastructure causing massive transportation delays and ultimately impacting the supply chain. For example, an explosion occurred in 2016 under Metro-North tracks that was caused by a propane spill at an adjacent property while workers were filling a generator. According to the New York City Fire Department (FDNY), the owners of the business did not have any permits for storing or using fuel or propane. The fire damaged portions of the Metro North Railroad, suspending service and causing massive delays.

Natural environment at risk

HAZMAT releases can contaminate underground water and soil and may discharge into water bodies (including, but not limited to, such important waterbodies as the Hudson River, East River, Long Island Sound, Harlem River, Jamaica Bay, New York Harbor, Gowanus Canal, and Newtown Creek). Certain chemicals may be toxic to many species of plants, animals, and invertebrates. Uncontained spills, especially those that impact surface water, can kill or injure plants, fish, and wildlife and cause damage to their habitat and food sources. The remediation of the natural environment after a release poses unique challenges and is often lengthy and costly.

HOW DO WE MANAGE THE RISK

Strategies for managing risks posed by hazardous materials include extensive regulatory controls, environmental controls, emergency planning, community preparedness, and education efforts that help workers better manage those materials and help communities understand the risks. Many parties, at all levels of government and within the private and nonprofit sectors, contribute to safe management of hazardous materials. What follows is a sampling of their work.

REGULATORY CONTROLS ON FIXED SITES

Since the beginning of the environmental movement in the 1960s, many federal laws were created to effectively regulate the storage and use of hazardous materials. These laws are delegated to state and local governments for effective implementation and enforcement. What follows is a list of regulations from all levels of government.

Federal

- In 1970, Congress passed the Clean Air Act, which is designed to limit air pollution on a national level.
- In 1972, Congress enacted Clean Water Act that established the basic structure for regulating pollutant discharges into the nation's waters.
    - The National Pollutant Discharge Elimination System (NPDES) was created in 1972 by the Clean Water Act, establishing a permit program that is often delegated to state governments (including New York State, implemented by NYSDEC) by EPA, which then perform many permitting, administrative, and enforcement aspects of the program.
- Enacted in 1976, the Resource Conservation and Recovery Act gives the EPA authority to control hazardous waste from beginning to end including generation, transportation, treatment, storage, and disposal, and is incorporated into State regulations and implemented by NYSDEC.
- CERCLA was passed in 1980 and amended in 1986 to actively clean up the most polluted industrial sites around the country by giving the EPA the authority to hold responsible parties accountable for funding the cost of investigation and remediation.
- In 1986 the Congress passed the Emergency Planning and Community Right-to-Know (RTK) act. It requires industries to report on the storage, use and releases of hazardous substances to federal, state, and local governments.
- In 2002, the Small Business Liability Relief and Brownfields Revitalization Act formalized EPA's Brownfields grant program and addressed funding and liability for assessing and cleaning up contaminated properties. It also exempted from Superfund liability contributors of very small amounts of hazardous substances.

State

In 1970, the NYSDEC was created with the responsibility to regulate and enforce the State Environmental Conservation law.

- NYSDEC Toxic Release Inventory: NYSDEC collects Toxic Release Inventory data reported by facilities as required by federal law. The Department requires that environmentally protective design and operational standards be maintained at storage and disposal facilities.
- NYSDEC State Pollutant Discharge Elimination System (SPDES): Designed to eliminate the pollution of New York waters by point sources, implementing NPDES provisions of the federal Clean Water Act, to maintain the highest quality of water possible.
- NYSDEC Petroleum Bulk Storage (PBS) Program: Applies to facilities that store more than 100 gallons of petroleum in underground storage tanks, and to facilities that store more than 1,100 gallons of petroleum in aboveground and underground storage tanks. Facilities must be registered with the state and managed in compliance with applicable regulations for storage and handling of petroleum.
- NYSDEC Chemical Bulk Storage (CBS) Program: Applies to facilities that store a hazardous substance listed in 6 NYCRR Part 597 in an aboveground storage tank larger than 185 gallons, any size underground storage tank, or in a non-stationary tank used to store 1,000 kg or more of a regulated substance for a period of 90 consecutive days or more. These facilities must be registered to store and handle hazardous substances.
- NYSDEC Standards for Management of Used Oil: Establishes management and marketing standards and permitting requirements for used oil generators, transporters, and transfer facilities; processors and re-refiners; and for facilities that burn used oil for energy recovery. Applies to facilities that store a total of 400,000 gallons or more of petroleum in aboveground and underground storage tanks. Facilities must be licensed by DEC and managed in

compliance with applicable regulations for the storage and handling of petroleum. Vessels that transfer petroleum to another vessel while operating in the waters of NYS must also obtain an MOSF license prior to these transfers.

- NYSDEC's Inactive Hazardous Waste Disposal Site (IHWDS) Program, or State Superfund, is the State's program for identifying, investigating and cleaning up sites where consequential amounts of hazardous waste may exist. DEC maintains the "Registry of Inactive Hazardous Waste Disposal Sites" to prioritize site clean-ups, based on the threat a site poses to human health and the environment.

- The 2003 NYS Brownfields Law authorized DEC to operate a cleanup program for sites that were contaminated at lower levels than those on the Inactive Hazardous Waste Site registry and to publish Soil Cleanup Objectives for various site uses.

Local

- Local Law 26 of 1988, the local Emergency Planning Community RTK Law, establishes DEP as the responsible party for regulating the storage, use and handling of hazardous materials above specified thresholds. DEP collects the information that facilities must report and archives it in the Citywide Facility Inventory Database. Facilities where EHS or regulated toxic substances are present at or above federally determined levels must submit a Risk Management Plan to DEP.

- DEP inspects facilities to determine compliance with chemical inventory reporting, storage, and labeling requirements. Facilities not in compliance receive notices of violation and must take corrective action. In 2016, DEP conducted 9,069 facility inspections and issued 555 Notices of Violation to facilities for non-compliance with reporting requirements.

- The New York City Hazardous Substances Emergency Response Law (the "Spill Bill") directs DEP to respond to releases and potential releases of hazardous materials. The City can order responsible parties to remediate hazardous conditions, and it can issue fines and/or hold them financially responsible for response and remediation costs.

- The NYC Brownfields Law authorizes the Mayor's Office of Environmental Remediation to operate a voluntary cleanup program and to oversee clean-ups pursuant to the City's E-Designation program.

- FDNY's Fire Code updated in 2014 establishes fire safety requirements for buildings and businesses in New York City. It regulates the manufacture, storage, handling, use and transportation of hazardous material and combustible materials.

- The Department of Sanitation (DSNY) manages a specialized permitting with site planning review and inspection regime for solid waste transfer station within the city.

- The NYC Building Code requires all new construction and modifications to existing buildings to comply with Appendix G, which includes standards for flood-resistant construction.

REGULATORY CONTROLS ON TRANSPORTATION

Federal law governs shipments by water, highway, rail, air and pipeline and agencies at all levels of government implement and enforce these regulations.

Federal

- U.S. Department of Transportation (USDOT) regulations govern transportation of hazardous materials by highway. Rules require that bills of lading identify materials being shipped, and they specify standards for packaging materials, marking and labeling packages, and placarding vehicles. Under federal rules, each state may designate routes for highway transport of hazardous materials.

  USDOT has proposed new safety rules for rail shipments of crude oil that would require that railroad tank cars have better brakes and thicker steel walls thank typical cars. The rules would also lower speed limits, limit routes through populated areas, and require more testing of the properties of hazardous liquids being transported.

  USDOT Pipeline Hazardous Materials Safety Administration (PHMSA) oversees, regulates, and enforces pipeline safety and spills of natural gas and petroleum products.

- The National Transportation Safety Board Office of Railroad, Pipeline and Hazardous Materials Investigations examines accidents involving transport of hazardous materials by all modes and issues safety recommendations to federal and state regulatory agencies, industry and safety standards organizations, carriers and pipeline operators, equipment and container manufacturers, producers and shippers of hazardous materials, and emergency response organizations.

- The Federal Aviation Administration's (FAA) Office of Hazardous Materials Safety enforces regulations and inspects freight and commercial aircraft. U.S. air carriers cannot carry hazardous materials until they have an FAA-approved hazardous materials training program.

- The USCG Hazardous Materials Division develops and maintains regulations, standards, and industry guidance to promote safety and protection of property and the environment during marine transport of hazardous materials. It provides technical assistance to other USCG units, government agencies, other national governments, industries, and the public.

State

- The New York State Department of Transportation enforces USDOT regulations on roads and highways in New York City. All roadway enforcement agencies have the ability to enforce these regulations, including the New York State Police.

- NYSDEC, through its Hazardous Waste Manifest System, issues waste transportation permits and tracks the movement of hazardous materials destination including generation, transportation, and disposal sites.

- The NYS Navigation Law covers Oil Spill Prevention, Control, and Compensation.

Local

- The Port Authority of New York and New Jersey enforces USDOT regulations on commercial vehicle shipments of hazardous materials via its bridges and tunnels: including the George Washington Bridge, Bayonne Bridge, Goethals Bridge, Outerbridge Crossing, Lincoln Tunnel, and Holland Tunnel. It also inspects cargo at its port facilities and airports.

- NYPD Highway Patrol Motor Carrier Safety Units also has the ability to enforce USDOT regulations on roads and highways.

INITIATIVES AND STUDIES

There are several initiatives and studies taken on by city and state agencies as well as community organizations that aim to make industrial areas and surrounding communities more resilient and provide strategies to protect against a HAZMAT spill. Some offer recommendations to industries and local businesses to better secure hazardous materials, while others offer resources to help revitalize communities that contain vacant brownfield sites.

NYC DCP launched the Resilient Industry initiative to assess vulnerability to flooding in industrial areas of New York City and propose strategies that individual businesses and the City can pursue to make industrial areas and surrounding communities more resilient. The study provides physical, regulatory, and operational strategies to protect businesses and the environment and includes the following flood-specific recommendations:

- For hazardous materials that are stored on unenclosed portions of industrial properties, outdoor shelving should be adequately anchored and incorporate enhanced joinery connections and brace corners. Shelving should include straps and cables to tie down materials.

- To prevent spills and leaks, industrial facilities should include flood-resilient storage of fuel tanks and hazardous materials. Specific strategies include: 1) mounting fuel tanks and other equipment on wheels to move to higher ground prior to a flood event, 2) using containment bunds beneath stationary barrels and tanks with hazardous materials to contain spills and leaks and fastening these bunds to ground to prevent uplift during a flood, 3) storing small amounts of hazardous materials in acid cabinets, and 4) developing and regularly testing facility preparedness plans that include actions to reduce the risk of hazardous materials spills.

- Incorporate within Appendix G of the NYC Building Code specific flood-resilient standards that apply to open storage within Appendix G of the Building Code.

Another initiative by the New York State Department of State (DOS) is the Brownfield Opportunity Areas (BOA) Program that supports planning and limited environmental studies of areas affected by brownfields and economic distress. The program provides resources to communities to establish revitalization strategies that return vacant/dormant parcels into productive, vibrant areas.

The NYC Office of Environmental Remediation (OER) also supports community brownfield planning by local non-profit organizations. It offers matching grants for the BOA program and Place-Based Community Brownfield Planning grants for targeted pre-development projects, such as assistance with design, consensus-building, and legal, financial, or environmental issues.

In addition, the NYSDEC Drum Recovery program focuses on the recovery of abandoned drums that contain non-flammable petroleum products such as waste oil, heating oil, and diesel. The NYSDEC receives reports of these drums from the NYSDEC Spills Hotline. Based on the volume of calls received, the NYSDEC schedules routine "drum runs" where a NYSDEC contractor removes the drums and assures their proper disposal.

At the community level, NYC-EJA's Waterfront Justice Project advocates for increased technical and financial strategies to help businesses comply with environmental regulations, respond to the impacts of climate change, and build more resilient working waterfronts.

The NYC Industrial Waterfront Project collaboration consists of NYSDEC, the New York State Pollution Prevention Institute, and NYC-EJA. They have assessed the vulnerabilities, needs, and capacities of local industrial businesses in the South Bronx Significant Maritime Industrial Area. The project goals are to increase local capacity to implement climate adaptation and pollution prevention strategies, and to identify technical and financial resources that can facilitate implementation.

The Grassroots Research to Action in Sunset Park (GRASP) is a community-research partnership comprised of NYC EJA, UPROSE, The LifeLine Group, and the RAND Corporation. They conduct research to help develop and support community-based actions to address environmental health risks in Sunset Park. GRAP's current initiative is focused on helping small businesses, specifically auto shops, implement chemical security practices to reduce the threat of chemical releases.

The South Bronx Community Resiliency Agenda is an initiative organized by NYC-EJA with THE POINT CDC, which engages local communities in creating a comprehensive climate resiliency agenda that will strengthen both the physical and social resiliency of the South Bronx.

INCENTIVES

Some government initiatives rely on market mechanisms to incentivize industry compliance while others offer grants and technical assistance.

Some local and state initiatives include:

- The New York City Voluntary Cleanup Program (VCP) focuses on cleanup and redevelopment of brownfields in a manner that protects public health and the environment. Property owners enroll in the program voluntarily and bear cleanup costs. Their contractors vent toxic vapors, remediate groundwater, contain spills or releases, and perform other services. Since its inception in 2011, OER is responsible for over 465 projects on over 1,023 tax lots completed or in process. Over 55% of these projects are located in historically disadvantaged neighborhoods.

- The New York City Brownfield Incentive Grant program provides financial assistance to property owners and developers who want to investigate and clean up contaminated properties by offering grants. The grant covers activities throughout the brownfield development process to help facilitate the NYC VCP program.

- NYSDEC Brownfield Cleanup Program (BCP) seeks to encourage private-sector cleanups of brownfields and to promote their redevelopment as a means to revitalize economically blighted communities. It offers tax credits for cleanup costs and, if a site is eligible, development costs.

EMERGENCY RESPONSE ROLES AND PROTOCOLS

In the event of a HAZMAT release, the City has many

plans and protocols for addressing life safety and site cleanup. What follows is a summary of agency roles and protocols for responding to a HAZMAT incident.

FDNY HAZMAT Response: FDNY along with DEP, NYSDEC, and NYPD is responsible for responding to HAZMAT incidents. This includes containing, confining, and capturing as much of the material as necessary and limiting the impact on the public and environment.

DERTA HAZMAT Emergency Response: DEP's HAZMAT Specialists are on call 24/7 to respond to reported incidents and perform chemical analyses at response sites, determine zones of delineation and develop strategies on proper containment, mitigation, disposal, and decontamination procedures.

NYSDEC Spill Response Program: NYSDEC responds to reports of petroleum and other HAZMAT releases and take action based on the type of material spilled, potential environmental damage, and risk to public safety. The public can notify NYSDEC of releases by calling the NYS Spill Hotline a 24-hour, toll free hotline for reporting oil or chemical spills. In addition, NYSDEC administers databases including the Spills database which is a comprehensive listing of approximately 50,000 current and historical spills throughout the NYC area and the Petroleum Bulk Storage Database which has approximately 26,000 listings for Petroleum Bulk Storage locations also throughout the NYC area.

New York City Department of Health and Mental Hygiene (DOHMH): DOHMH's role in a HAZMAT incident includes monitoring the Poison Control Center Hotline, assessing the public health impact or risk, and supporting public messaging with subject matter expertise.

NYC Emergency Management (NYCEM): NYCEM's role for an incident includes overall coordination with city, state, and federal agencies, creating and distributing messaging to the public, coordinating consequence management operations, and identifying/mapping critical facilities, vulnerable populations, and infrastructure on the impacted area. Part of NYCEM's notification system includes collecting critical information and disseminating it to key officials and the public. In addition, NYCEM coordinates the Pump Out Protocol – Residential Oil Contamination (POP-ROC), which supports the flow of information about oil spill conditions to NYSDEC and ensures appropriate resource coordination for oil contaminated dewatering and recovery activities.

OER Site Preparation Planning: Prior to coastal storm events, OER will conduct inspections and secure brownfield cleanup project areas that may be vulnerable to a HAZMAT release. Two days after Hurricane Sandy hit NYC, OER conducted inspections of 80 such sites, and the results indicated that the cleanup methods promoted by OER were effective in preventing pollutant release from the brownfield sites to surrounding communities.

EDUCATION AND AWARENESS

Long-term strategies range from helping affected businesses learn about regulations and facilitating compliance with permitting requirements, to educating the general public about health and occupational hazards associated with hazardous materials, to improving community access to information about brownfields and contaminated sites.

One of many examples is the annual RTK training that employees of City agencies must take. It explains the types of hazardous substances employees could come in contact with and their legal rights if they are exposed to a release.

After Hurricane Sandy, DEP created a brochure for industrial properties in the floodplain that includes recommendations for storing hazardous materials and spill prevention strategies during a flood event. In addition, during inspections of such facilities, DEP will recommend best practices for reducing the risk of a chemical spill. These include elevating chemicals off the ground, storing chemicals in areas less likely to flood, and securing storage cabinets.

As part of the Waterfront Justice Project, NYC-EJA with NYSDEC released the Environmental Best Management Practices for Auto Repair, Auto Body, and Auto Salvage Industries. This comprehensive plan includes strategies for HAZMAT spill prevention, pollution prevention, and hazardous waste management.

In addition, OER offers the following resources:

- The Searchable Property Environmental E-Database (SPEED) portal maps environmental data in New York City from City, State, and Federal sources. The next version of SPEED will be released in winter 2017-2018 to provide additional data and resilience

information, improve functionality, and automate data updates.

- The New York City Brownfield Partnership is a 50-member association of community-based organizations and environmental businesses that runs programs to promote community service and brownfield cleanup. It offers a Pro Bono Expertise Program for Communities that provides initial expert advice at no charge from environmental industry professionals for community members and landowners seeking help with brownfield matters.

- The New York City Brownfield Partnership is a 50-member association of community-based organizations and environmental businesses that runs programs to promote community service and brownfield cleanup.

- BrownfieldWORKS! supports graduates of local environmental training programs by providing mentorship, networking opportunities, and on-the-job training placements.

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NYC Hazard Mitigation

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