



East and South Shores of Staten Island

The massive glacier that covered all of New York City 22,000 years ago left behind certain indelible marks.

As the ice sheet melted, it deposited rocks, gravel, and sand that it had amassed in its journey, forming the varied topography of what is now known as Staten Island. The area that would one day be known as the East Shore became a vast swath of marshes and swamps that sloped roughly from where Hylan Boulevard lies today down to the Atlantic Ocean. The South Shore, farther down the coast and surrounded on three sides by water, contained belts of hillier ground and was separated from the ocean in places by red clay bluffs.

When Staten Island officially became part of New York City in 1898, the low-lying East Shore consisted mostly of small towns and, near the coastline, clusters of seasonal bungalows and beachfront resorts. The South Shore was also lightly populated, with small towns along upland roads and an early railway terminus in the southernmost town of Tottenville. (See map: *The East and South Shores: 1900 vs. 2000*)

By the late 1960s, however, Staten Island's population started to grow rapidly, due largely to the opening of the Verrazano-Narrows Bridge. Residential development began to spread southward through the borough, including on the East and South Shores. On the East Shore, some development occurred on land in close proximity to, and sometimes within, wetland areas. On the South Shore, development also moved closer to the coastline.

Whether they live in the East Shore or South Shore, the residents of these areas, in many ways, live a unique lifestyle. They are part of the

nation's largest city, yet many own detached houses, and, within minutes of returning from work, can stroll along beaches or wooded paths. However, this independence, these homeownership opportunities, and the proximity to nature have always come with some significant downsides.

For example, the East Shore's low-lying topography makes some parts of the area prone to coastal flooding. In addition, a tall, invasive reed called *Phragmites* has flourished in former wetlands. Because its dry stalks are highly flammable, the reed has, from time to time, brought wildfires to the area.

On the South Shore, meanwhile, ocean waves have, over time, eroded the area's bluffs, threatening homes and businesses in some locations. Furthermore, low-lying areas around creeks and tributaries are subject to flooding during storms.

Perhaps of greatest concern, both the East and South Shores occupy a place in New York Harbor that leaves them particularly exposed to storm waves and surge during extreme weather events. This is because the coastlines of Long Island and New Jersey are angled such that, in certain circumstances, they can channel flood waters directly into these areas.

Sadly, many of these vulnerabilities came into play during Sandy. The storm's waves rose up over the East Shore's beaches, battering homes and sweeping some completely off their foundations. Waves also scoured the South Shore's bluffs and smashed ocean-facing houses, in some cases leaving behind only foundations and stairs. In both areas, water muscled its way inland, overwhelming

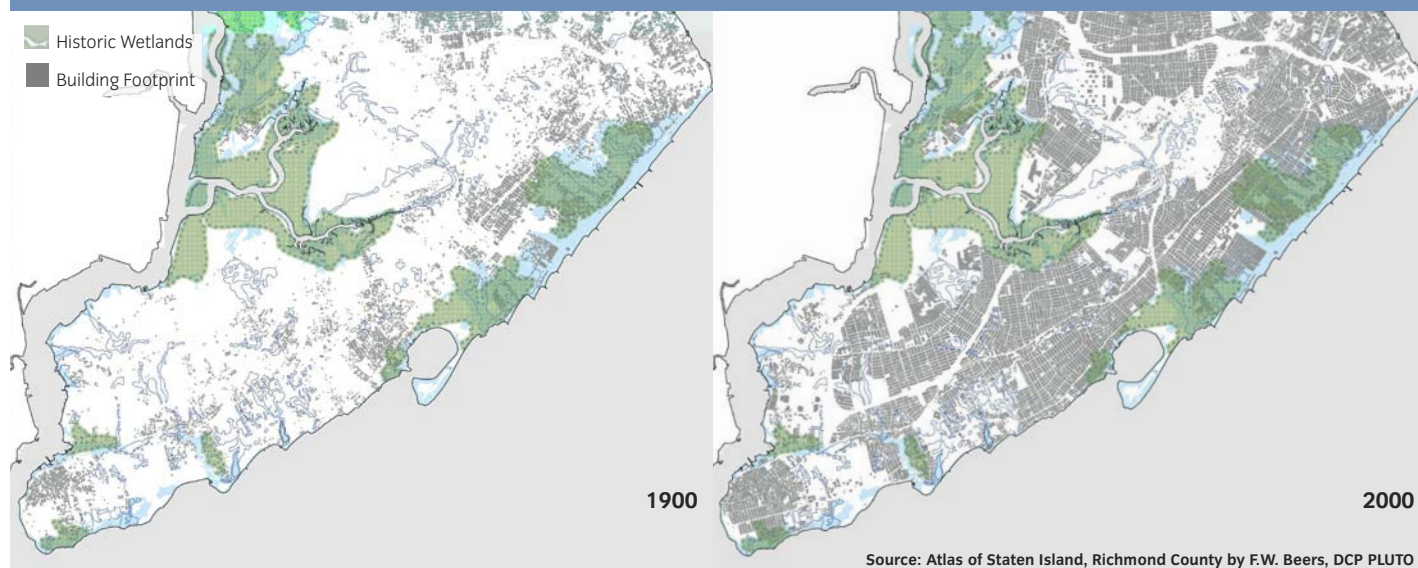
residential communities, business strips, marinas, and roads. Of the 23 storm-related deaths on Staten Island—more than in any other borough—all but one occurred on the East and South Shores.

To help the East and South Shores recover from the tragedy of Sandy and prepare for a future of greater climate risks, the City has developed a plan that reflects the overarching goals of this report: To limit the impacts of climate change while enabling New York and its neighborhoods to bounce back quickly when those impacts cannot be avoided. The plan will address the area's most significant climate risk—its vulnerability to wave action and storm surge, particularly as sea levels rise—by protecting oceanfront and inland exposures, facilitating retrofits and resiliency in new and existing buildings, and safeguarding vital infrastructure. The plan also will address other significant risks—such as more heavy downpours, heat waves, and high winds—by drawing on both citywide and locally tailored initiatives. Finally, the plan will build on the natural assets of the East and South Shores and the powerful attachment residents have to their homes and neighborhoods to make the whole area even more vibrant and economically dynamic than it was before the storm.

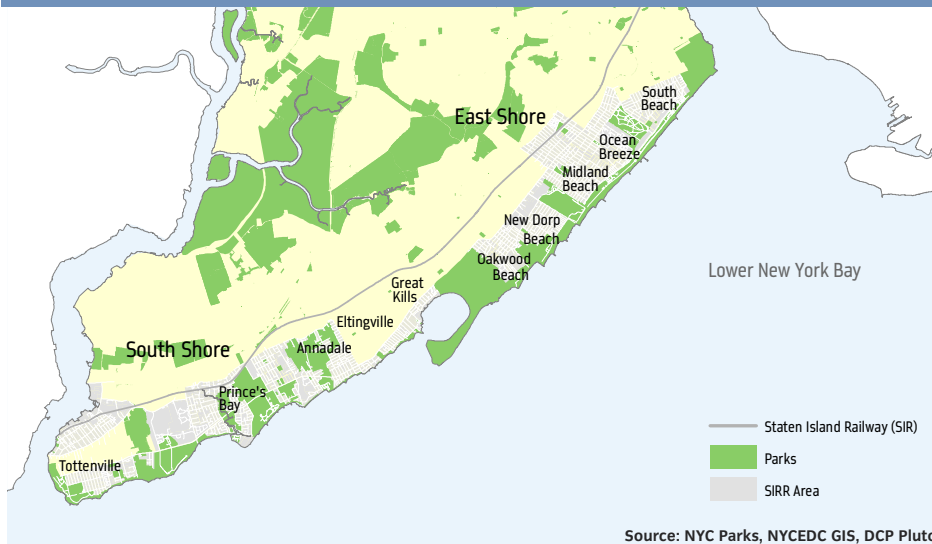
Area Characteristics

The East and South Shores, as defined in the report, are predominantly low-density residential communities, with small business corridors primarily serving local residents. Each community encompasses many smaller neighborhoods. (See map: *Neighborhoods of the East and South Shores*)

The East and South Shores: 1900 vs. 2000



Neighborhoods of the East and South Shores



The East Shore—which stretches approximately three miles, from Fort Wadsworth to Great Kills Park—includes the neighborhoods of South Beach, Midland Beach, New Dorp Beach, and Oakwood Beach. The South Shore extends from Great Kills Park to the southernmost point in New York State and includes neighborhoods such as Great Kills, Eltingville, Annadale, Prince's Bay, and Tottenville. While residents are attached to their individual neighborhoods, they also tend to identify with the broader geographies of the East Shore and South Shore.

Both areas have abundant parkland and open space. The East Shore's 2.5-mile beach, boardwalk and promenade—along South Beach, Midland Beach, and Cedar Grove Beach—are City parks managed by the Department of Parks & Recreation (DPR), as well as important economic drivers for the area. Within the South Shore neighborhood of

Prince's Bay sits Wolfe's Pond Park, one of several major waterfront open spaces that are managed by DPR. Other South Shore waterfront parks include Crescent Beach Park, Lemon Creek Park, and Conference House Park.

Between the East Shore and the South Shore is Great Kills Harbor, surrounded by Great Kills Park, one of three Federal parks (along with Fort Wadsworth and Miller Field) that form the Gateway National Recreation Area. Great Kills Park was built by the City, mostly on fill that dates to the 1930s. It was transferred to the National Parks Service in 1972. Ringed by private and public marinas, Great Kills Harbor is an economic hub and an important recreational amenity for the area.

Beyond the beaches, parks, and marinas—which draw residents from across the borough—the East and South Shores contain

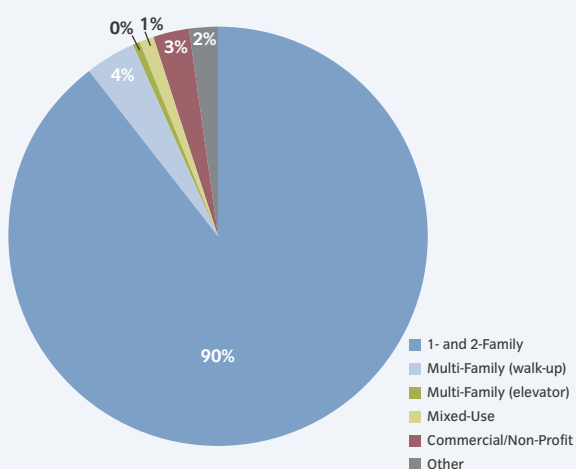
other important Staten Island assets. For example, the historic houses of Conference House Park, in Tottenville, serve as area attractions, while other historic properties, such as the Olmsted-Beil House and Seguire Mansion, have the potential to play a similar role in the future. Critical wastewater treatment and stormwater management infrastructure for the East and South Shores, and transportation assets for the entire borough, can also be found in the area. Finally, important institutions, such as Staten Island University Hospital (SIUH), are both major employers and providers of critical local and borough-wide services.

Residential Development

The population of the East and South Shores today totals approximately 70,000 residents. Between 2000 and 2010, the areas together saw population growth of 11 percent. Families of all incomes have been drawn to the areas by the chance to own homes in what many consider an idyllic setting.

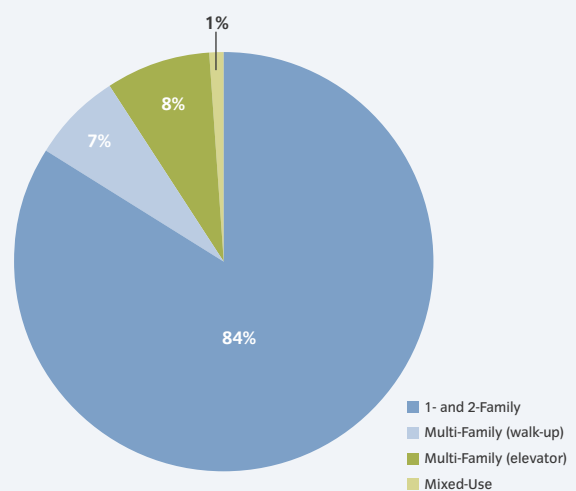
Generally, housing on the East and South Shores is freestanding, or detached, with pockets of semi-attached or attached houses. This stock consists predominantly of 1- and 2-family homes, which account for 90 percent of all area buildings, 93 percent of all residential buildings, and 84 percent of all housing units. Area homes also tend to be of a “combustible” construction type (e.g., wood-frame construction). Over one-half (59 percent) of 1- and 2-family homes were built before 1983, and thus constructed before current flood-protection standards were in place. (See chart: *Area Buildings Characterized by Type*; see chart: *Area Housing Units Characterized by Building Type*)

Area Buildings Characterized by Type



Source: DCP PLUTO

Area Housing Units Characterized by Building Type



Source: DCP PLUTO



Bungalow housing in Midland Beach

Credit: Sunghwan Yoon

Both the East and South Shores have population densities well below the citywide average of 42 people per acre, reflecting the area's single-family-home character as well its ample open space. The East Shore, however, is slightly more densely settled (16 people per acre) than the South Shore (7 people per acre) and Staten Island as a whole (11 people per acre). The East Shore's greater density reflects the fact that many homes in the neighborhoods of Midland Beach, South Beach, and New Dorp Beach are built on small lots and in close proximity to one another. (See chart: *Area Population Density*)

On the East Shore, many of the area's homes were built as seasonal cottages during the beachfront's heyday in the early 20th century, when it was lined with amusements and hotels.

Beginning in the 1950s, though, as those uses and some cottages were cleared by the State for the South Beach Psychiatric Center in Ocean Breeze and by Robert Moses for planned roadways and public beaches, families began turning their cottages into year-round residences, often passing these homes down from generation to generation. However, since the houses were not built to modern standards and many have not been upgraded since they were constructed, they remain vulnerable to extreme weather.

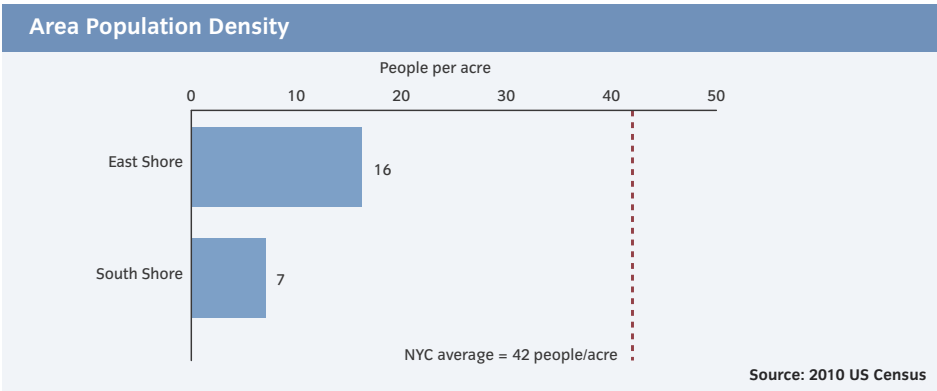
By contrast, in recent years the South Shore has witnessed the construction of more sizable homes on larger lots, with much of the recent building occurring between Hylan Boulevard and the coastline. Some of these residences have been built near the South Shore's

bluffs and beaches. Because of underwater topography, tides, and the natural movement of sediment, ocean waves can hit the South Shore nearly parallel to the coastline, carving away at the bluffs and making homes near the bluffs more vulnerable to flooding. Development also has occurred adjacent to many of the South Shore's creeks and inlets, including Lemon Creek. Though the South Shore community of Tottenville was not reached by the growth in construction after the opening of the Verrazano-Narrows Bridge, since the early 1990s, this area has seen more development, including along the shoreline below Hylan Boulevard, where rows of summer bungalows have been replaced by larger homes.

Socioeconomic Characteristics

Taken together, the East and South Shores are relatively prosperous with a higher combined median household income (\$76,800), higher combined homeownership rate (73 percent) and lower combined poverty rate (7 percent) than city averages. (See table: *Socioeconomic Characteristics*)

However, there are important socioeconomic differences between the East Shore and South Shore. As a whole, the East Shore has a lower median household income (\$68,600) than the South Shore (\$92,800). The median value of a housing unit in the East Shore before



Socioeconomic Characteristics								
Area	Population	Poverty Rate	Median Household Income	Households	Owner-Occupied Housing Units	% Homeowners	% Owner-Occupied Units with Mortgage	Median Owner-Occupied Unit Value
East Shore	45,300	8%	\$68,600	16,150	11,000	68%	72%	\$445,300
South Shore	24,400	4%	\$92,800	8,300	6,900	83%	74%	\$588,100
Total Staten Island SIRR Area	69,700	7%	\$76,800	24,450	17,900	73%	73%	\$500,000
Citywide Total/Average	8,175,000	19%	\$51,300	3,050,000	993,500	33%	64%	\$514,900

Source: 2010 US Census, 2011 American Community Survey, 5-Year estimate

Sandy (\$445,300) was slightly lower than the citywide median average (\$514,900). This was in contrast to the median price of a housing unit in the South Shore, which was higher (\$588,100). The East Shore also has a lower homeownership rate (68 percent) than that of the South Shore (83 percent).

Finally, there are 5,100 households that rent on the East Shore and 47 percent are classified as “cost burdened,” defined by the Federal government as households that pay 30 percent or more of their annual income for housing. In the South Shore, there are only 1,400 households that rent, but the percentage of those that are cost burdened is similar to the East Shore (51 percent).

Business, Nonprofits, and the Local Economy

Before Sandy, there were approximately 2,800 businesses employing over 17,100 people in the East and South Shores. The majority of those businesses (82 percent) were small, employing fewer than five people. However, 40 percent of area employees worked for larger businesses (those with more than 100 employees). (See chart: *Profile of Area Businesses*)

On the East and South Shores, the retail and service sectors are major employers, with the healthcare industry offering the highest wages. In fact, SIUH, an approximately 700-bed teaching hospital, is the largest Staten Island-based employer, with 82 percent of its workforce consisting of Staten Island residents (5,104 residents employed as of 2012). SIUH has two campuses: a North Campus on the East Shore (in Ocean Breeze), that has Staten Island’s only regional trauma and burn center, Staten Island’s largest emergency room, and over one-third of the borough’s inpatient beds; and a South Campus on the South Shore in the Prince’s Bay neighborhood. Adjacent to the SIUH North Campus is a State hospital for the mentally ill, the South Beach Psychiatric Center, which has approximately 200 full- and part-time employees.

The area’s marinas—many with repair facilities and restaurants—are also important to the local economy. Six (five private and one public) are located within Great Kills Harbor, with four more in the South Shore, such as Lemon Creek Marina, located along or in close proximity to inland waterways.

A primary commercial corridor for both the East and South Shores is Hylan Boulevard, a major north-south artery. In addition, the East Shore has small retail and commercial strips that serve local residents and summer visitors

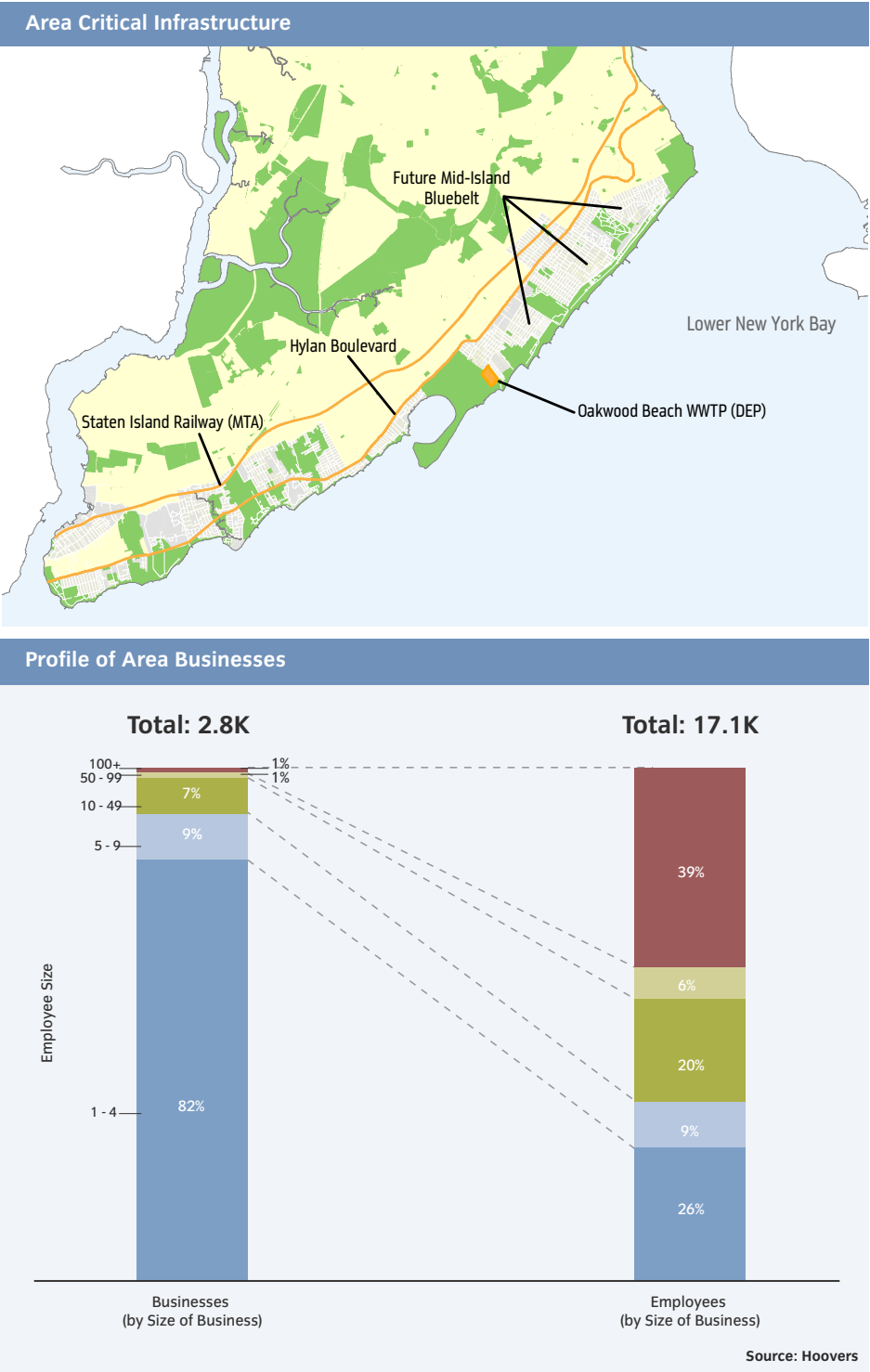
to beach areas. These include Midland Avenue, Sand Lane, Seaview Avenue (where a number of medical offices are clustered), and small strips along Father Capodanno Boulevard, which runs parallel to the beachfront.

In the South Shore, many neighborhoods have historic town centers, such as the commercial stretch of Main Street in Tottenville. Additional commercial thoroughfares include Page Avenue as well as small commercial districts

along Annadale Road in Annadale and around the Staten Island Railway (SIR) stations in Eltingville and Great Kills. The Bricktown Centre and South Shore Commons shopping centers, located in Charleston, just north of Tottenville, house stores that draw customers from other sections of Staten Island and from New Jersey.

Critical Infrastructure

The East and South Shores contain critical wastewater treatment, stormwater



management, and transportation systems. (See map: *Area Critical Infrastructure*)

In the East Shore, the Oakwood Beach Wastewater Treatment Plant has been in operation since 1956 and serves nearly a quarter of a million people (roughly half of the population of Staten Island) in an 11,000-acre drainage area. On an average day, the facility, operated by the New York City Department of Environmental Protection (DEP), treats 30 million gallons of wastewater.

DEP also manages the Staten Island Bluebelt, an innovative system that uses open space to control stormwater while preserving Staten Island's wetlands—the last great stand of freshwater wetlands in New York City. Currently, the Bluebelt system drains 15 watersheds on the

South Shore plus the Richmond Creek watershed, a combined area of approximately 10,000 acres. Property acquisition for the Bluebelt system on the South Shore is complete and DEP is now building out the drainage system for the area. (See sidebar: *What is the Bluebelt?*)

Building on the success of the South Shore system, DEP has proposed a comprehensive Mid-Island Bluebelt, which, would address street and property flooding in East Shore neighborhoods. When fully developed, the Mid-Island Bluebelt will drain a 5,000-acre area encompassing the South Beach, New Creek (Midland Beach), and Oakwood Beach watersheds. A little over half of the area needed for the Mid-Island Bluebelt has been acquired, though completion of the system is not expected until the 2040s.

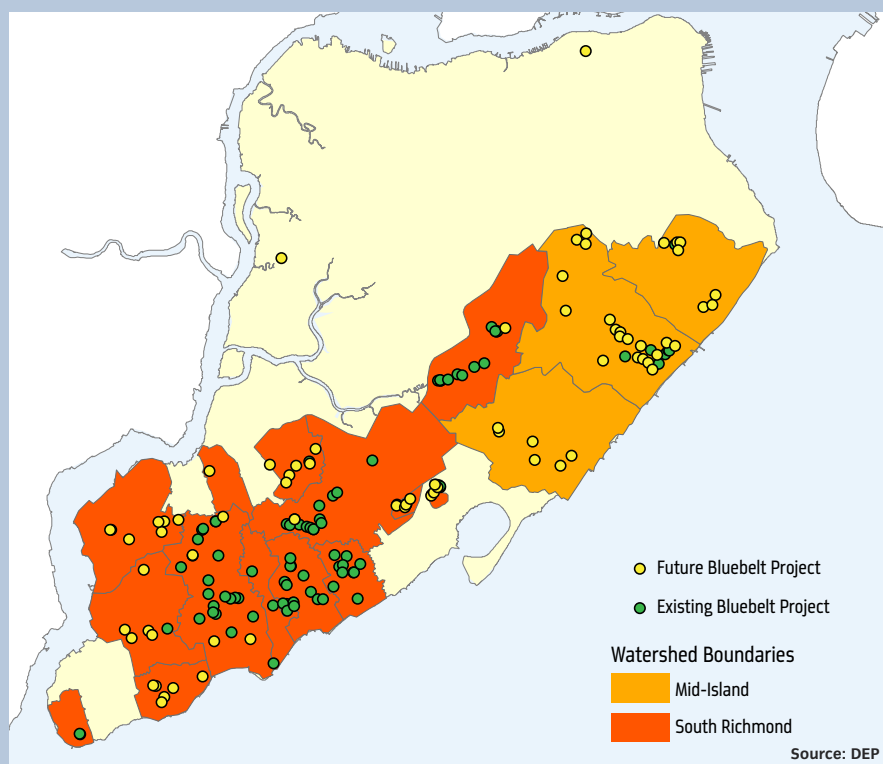
The area's transportation assets include Hylan Boulevard. Running the length of the shoreline—approximately 14 miles, from the North Shore neighborhood of Rosebank to the South Shore neighborhood of Tottenville—the roadway is highly trafficked, with 44,000 vehicles and 32,000 bus riders traveling it on a typical weekday. Select Bus Service (SBS), started in September 2012, connects Hylan Boulevard and Bay Ridge, Brooklyn. Many sections of Hylan Boulevard are low-lying and flood during even normal rainfall.

Another transportation asset on the East and South Shores is the SIR, a 14-mile commuter rail line operated by the Metropolitan Transportation Authority (MTA). The only rapid transit line on Staten Island, the SIR provides service along the east side of the borough between St. George and Tottenville. Many residents from the East and South Shores use the SIR to reach the St. George Ferry Terminal, from which they take the Staten Island Ferry to Manhattan, where more than one-quarter of working Staten Island residents are employed. Several South Shore SIR stations, including the Richmond Valley Station, are in low-lying areas that flood during heavy rains.

Yet another transportation corridor in the area is Father Capodanno Boulevard. The Boulevard, part of a Robert Moses-planned roadway that was never fully realized, was built at a higher elevation than the neighborhoods through which it runs. As a result, during extreme weather events and even smaller storms, the Boulevard has prevented floodwaters in neighborhoods farther inland from draining back into the Harbor.

What is the Bluebelt?

The Staten Island Bluebelt is an award-winning, ecologically sound, and cost-effective stormwater management system, which is also one of the most ambitious stormwater management efforts in the northeastern United States. Initiated in the late 1980s by DEP, the system makes use of natural drainage corridors—including streams, ponds, and other wetland areas—to convey, store, and filter stormwater, thus preserving these natural areas and minimizing the need to construct traditional underground stormwater systems. It works as follows: The Bluebelt natural drainage corridors, acquired by the City, convey stormwater from conventional storm sewers to the Raritan Bay or the Arthur Kill via concrete pipes that are located across beaches or open channels. At each point where storm sewers drain into the Bluebelt, a “best management practice” project, such as a detention basin or pond, is constructed to manage stormwater and enhance water quality. In sum, the Bluebelt program preserves open space, maintains natural floodplains, and provides flexible infrastructure—allowing for an adaptive and sustainable response to climate change.



What Happened During Sandy

Sandy's arrival at high tide on the Atlantic, its massive surge, and its wind-whipped waves all spelled disaster for the East and South Shores. Peak storm tides reached 16 feet—almost five feet higher in Tottenville than at the Battery in Manhattan. Along the Staten Island coastline, monitors indicated storm tide fluctuations of 5 to 6 feet every 30 seconds, as large waves repeatedly slammed into the coast at the height of the storm.

On the East Shore, storm waves came across the beaches and battered homes. The surge was devastating for the neighborhoods of Oakwood Beach, South Beach, Midland Beach, and New Dorp Beach. In Oakwood Beach, for example, the surge swept some homes off of their foundations and deposited them in marshes. It flattened half of the houses on Kissam Avenue, inflicted extensive water



Devastation on Kissam Avenue/Oakwood Beach



Credit: Bill Lyons/Advance

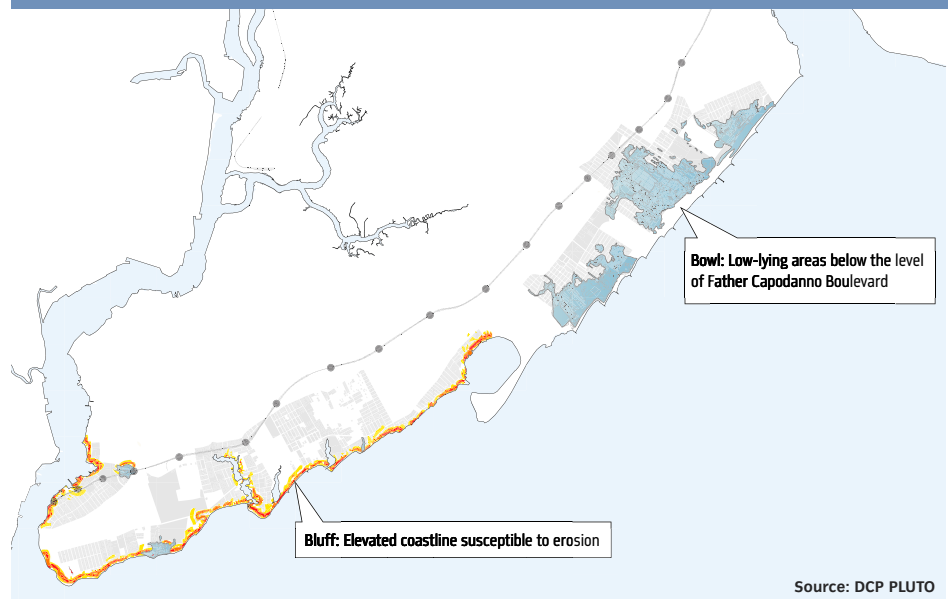
damage on the others, and forced all of the street's residents to seek temporary housing. On the beaches in front of South Beach and New Dorp Beach, much of the sand was washed away. (See photo: *Devastation on Kissam Avenue/Oakwood Beach*)

Many areas on the East Shore flooded due to their low elevation. The “bowl” topography of the East Shore, created by the higher elevation of Father Capodanno Boulevard, exacerbated damage to homes and businesses. When the storm surge topped this elevation, the “bowl” in which the communities inland of the Boulevard are built filled and floodwaters rose rapidly, following the natural contours of the land. With the ground saturated, this low topography trapped water in some neighborhoods at significant depths—in some places for several days. (See map: *Bowls and Bluffs*; see map: *Area Inundation and Surge Height*)

Sandy's surge also overwhelmed the area's drainage infrastructure, which is designed to drain rainwater and not to handle the massive volumes of water associated with a coastal surge. In some cases, floodwaters infiltrated roadway drainage and sewer systems through catch basins, manholes, and storm drains. Additionally, several tide and floodgates, devices that prevent water from flowing backwards through the drainage system—such as at Oakwood Beach—were damaged during the storm.

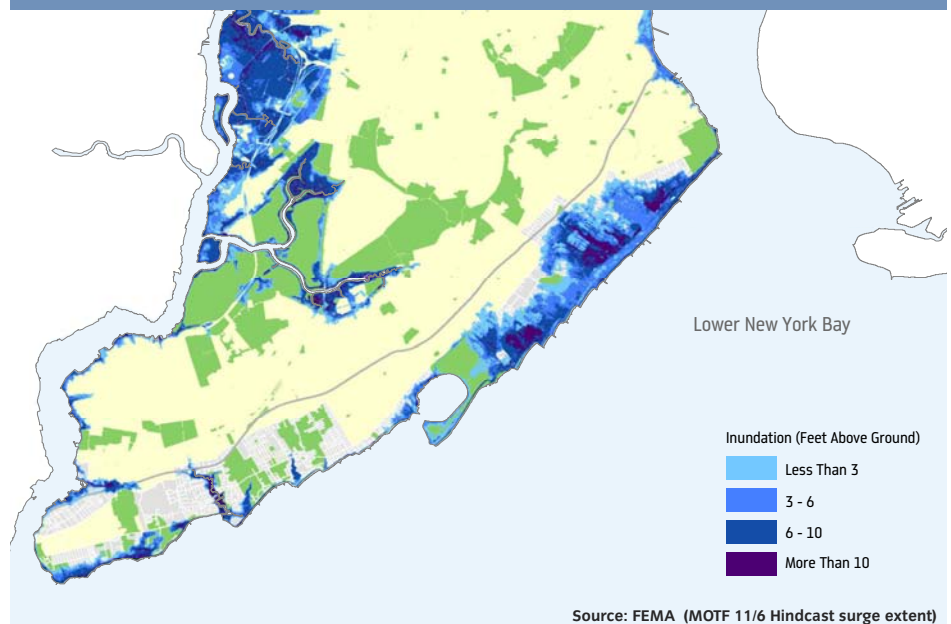
On the South Shore, early winds out of the northeast drove powerful waves almost parallel to the coastline. These waves carved away at the area's protective bluffs, causing significant erosion. Although the direction of the waves and the presence of the bluffs meant that generally only the first few rows of homes in most South Shore communities were exposed to the force of these waves, many homes that were hit, such as those around Tottenville Beach and Yetman Avenue, were smashed.

Bowls and Bluffs



Source: DCP PLUTO

Area Inundation and Surge Height



Source: FEMA (MOTF 11/6 Hindcast surge extent)



New Dorp Beach

Credit: John de Guzman



Erosion of South Shore bluffs

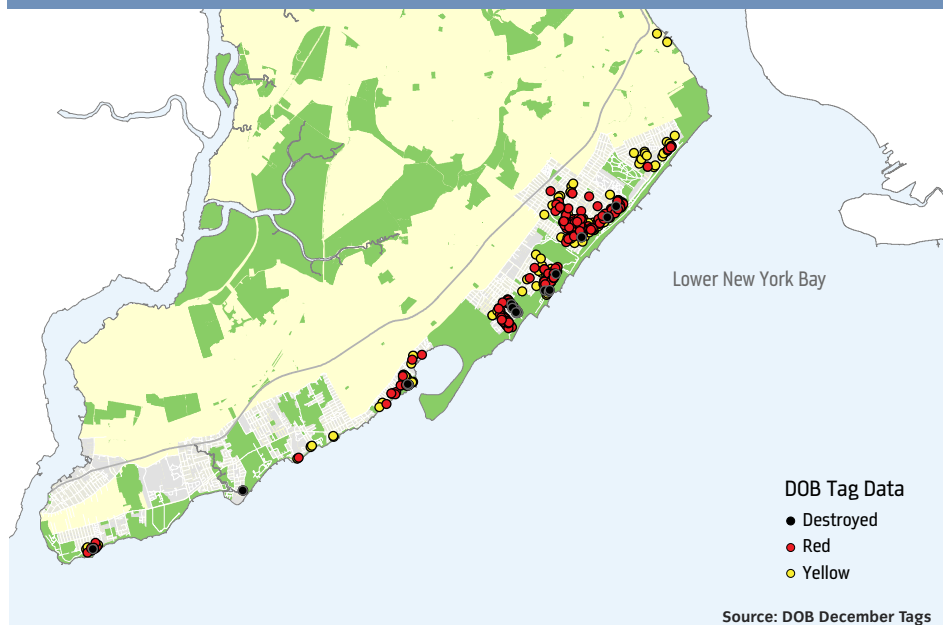
Credit: Bill Lyons/Advance

Meanwhile, in some neighborhoods along the South Shore, waterfront parks such as Wolfe's Pond Park took direct hits from the surge, likely buffering inland areas from further storm damage. However, many of these parks themselves sustained considerable damage that caused them to remain closed for months. Storm surge also traveled far inland on the South Shore into low-lying areas along creeks and tributaries, including Mill and Lemon Creeks. (See photo: *Erosion of South Shore Bluffs*)

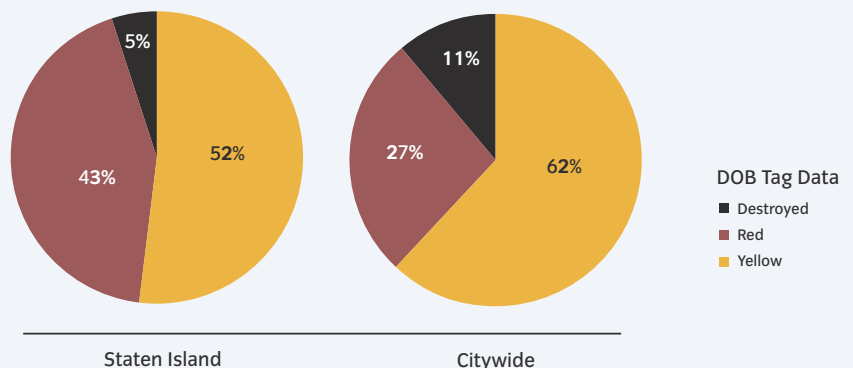
As a result of Sandy, a large number of buildings in the East and South Shores suffered damage. After the storm, the New York City Department of Buildings (DOB) sent out inspectors to assess damages in the East and South Shores and other inundated areas of the City. These inspectors were asked to assign "tags" to buildings based on the observed condition of each structure. "Green" tags indicated less serious damage or no damage. "Yellow" tags indicated that portions of a building might be unsafe or might have significant non-structural damage. "Red" tags indicated structural damage. And a subcategory of "red" tags were further categorized as "destroyed". (See map: *Location and Level of Building Damage*; See chart: *Level of Building Damage*)

The most methodologically rigorous building damage assessment undertaken by DOB was completed in December 2012. According to this assessment, of those buildings citywide that were tagged, either yellow or red (including those further classified as destroyed), 23 percent were located in the East and South Shores. The yellow and red tagged buildings tended to be clustered in the East Shore neighborhoods of South Beach, Midland Beach, New Dorp Beach and Oakwood Beach and the South Shore neighborhoods of Great Kills,

Location and Level of Building Damage



Level of Building Damage



Source: DOB December Tags



Damage to bungalow in New Dorp Beach

Credit: John de Guzman

Annadale and Tottenville. In the East and South Shores, consistent with other ocean-facing areas of the city, the percentage of red and yellow tagged buildings that were tagged red (48 percent) was higher than the percentage citywide (38 percent). This overrepresentation was reflective of the destructive impact that powerful waves coming off of the ocean had on the area's building stock.

The structural characteristics of the area's building stock contributed to the scale of damage and destruction. As described in Chapter 4 (*Buildings*), throughout the city's inundation area, low-rise buildings of combustible construction predating 1983, when the City adopted FEMA's flood maps and incorporated flood-resistant construction standards, proved to be some of the most

vulnerable building types during Sandy. This building type represented over half (61 percent) of the approximately 11,700 buildings in the inundated areas of the East and South Shores.

The damage from destructive waves during Sandy was especially severe for low-rise residential buildings in neighborhoods such as Midland Beach, South Beach, New Dorp Beach, and in East Shore communities along Father Capodanno Boulevard. In particular, a number of winterized bungalows in the area that were not properly anchored were washed off of their foundations during the storm. In these neighborhoods, post-storm demolitions have resulted in "missing tooth" residential blocks, where habitable homes stand next to empty lots previously occupied by neighboring houses.

SIUH also was impacted by the storm. Prior to Sandy's arrival, the hospital transferred especially vulnerable patients, such as those dependent on ventilators, to other facilities. Once Sandy hit, storm surge caused roads leading to the North and South campuses to be flooded, and some of the hospital's administrative and clinical support facilities to sustain damage. During and after the storm, the SIUH heliport was used as a landing site for relief helicopters, while the South campus lost power for days.

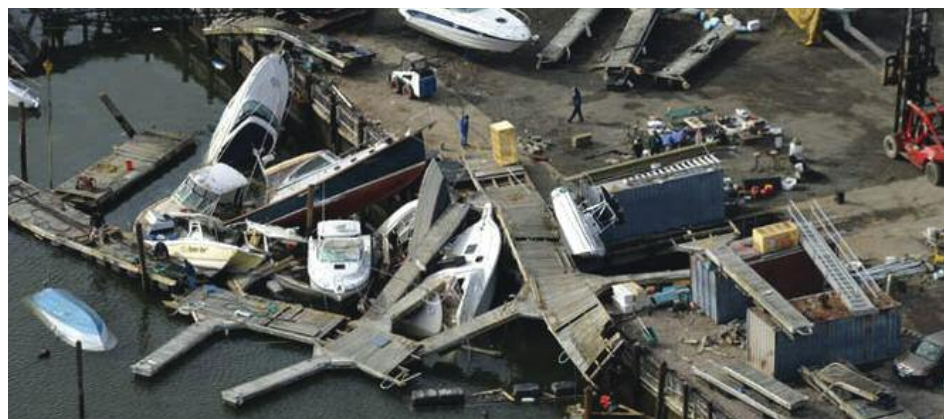
Meanwhile, marinas across the area were damaged severely. As of the writing of this report, all six marinas in Great Kills Harbor are still making repairs and have not reopened. At the publicly owned Nichols Marina in Great Kills Park, 350 floating wooden slips were swept away by Sandy. Repairs coupled with debris removal will effectively take this marina out of commission for the entire 2013 boating season.

A similar tale of damage and destruction played out for retail stores and commercial structures near the area's beaches. Businesses lost equipment, personal property, and building systems. In the East Shore, the small commercial corridor along Midland Avenue was devastated by flooding, winds, and power loss. Nearly four months after the storm, 51 of 72 Midland Avenue retailers remained closed. Businesses in Midland Beach along Father Capodanno Boulevard were similarly affected. In South Beach, professional offices along Seaview Avenue and retailers along Sand Lane suffered extensive damage. The Hylan Boulevard commercial corridor, roughly between Seaver Avenue and New Dorp Lane in the East Shore, was flooded with many businesses, including large-format retailers, forced to close for days. Businesses on and near Main Street in Tottenville sustained structural damage, with first floors often obliterated, leaving only wall studs.



Credit: Bill Lyons/Advance

Beachfront lawn lost on South Shore



Damage at Great Kills Marina

Credit: Bill Lyons/Advance

The storm also damaged critical infrastructure. The Oakwood Beach Wastewater Treatment Plant was completely surrounded by surge waters during Sandy, and the tremendous flow of seawater, sand, and other debris around the plant damaged some of the facility's pumps. DEP employees kept the plant running through the night of the storm, despite the fact that the facility lost some of its electrical power and had to run some functions on generators. Because of these efforts, the plant was able to treat over 80 million gallons of wastewater—more than 2.5 times the amount treated on a normal day—that otherwise would have backed up into homes and businesses.

As for the area's transportation assets, Hylan Boulevard was inundated in many areas during Sandy, causing severe delays in express and local bus service. Major damage also occurred at the SIR's operations and maintenance facilities, limiting service in the days after the storm (ultimately, full service was only restored in mid-December).

The Staten Island Ferry was also knocked out of service for five days after Sandy, mostly due to damage at the Whitehall Ferry Terminal in Lower

Manhattan. This left many residents without transportation options to and from Manhattan, while also affecting those who travel by ferry to Staten Island for work and school. In response, approximately one month after the storm, additional ferry service to Manhattan (to Pier 11, continuing on to Midtown) was launched on a temporary basis from a newly installed, temporary landing in Great Kills Harbor.

Meanwhile, four schools were impacted in the area, with two—I.S. R002 George L Ebert and P.S. 052 John C. Thompson—remaining closed for almost a month following the storm. P.S. 003, The Margaret Gioiosa School, lost power during the storm, and Tottenville High School was closed while operating as a temporary shelter for area residents. During these temporary closures, students at these schools were sent to alternative locations.

Following the storm, many homeowner and civic associations in Midland Beach, Ocean Breeze, New Dorp Beach, and other neighborhoods played an essential role in recovery efforts, even as their own members and leadership dealt with personal challenges and tragedies. Several organizations, including

many faith-based organizations, allowed their buildings to serve as distribution centers and temporary shelters, despite the fact that, in a number of cases, these facilities also suffered damage.

What Could Happen in the Future

Given the area's coastal exposure and low-lying topography, the most significant climate risk to the East and South Shores is the increased frequency of the most intense coastal storms. This risk likely will be exacerbated by sea level rise. (See chart: *Risk Assessment: Impact of Climate Change*)

Major Risks

Preliminary Work Maps (PWMs) were released in June 2013 by the Federal Emergency Management Agency (FEMA). These PWMs will be considered the best available information until FEMA releases Preliminary Flood Insurance Rate Maps (FIRMs), by the end of 2013. The PWMs show increased flood risk throughout the East and South Shores. On Staten Island, the 100-year floodplain, the area that has a 1 percent or greater chance of

Risk Assessment: Impact of Climate Change

■ Major Risk ■ Moderate Risk ■ Minor Risk

Hazard	Scale of Impact			Comments
	Today	2020s	2050s	
Gradual				
Sea level rise	Minor Risk	Moderate Risk	Major Risk	Expected to make low-lying areas more vulnerable to coastal flooding; will also likely cause further erosion of beach and bluffs
Increased precipitation	Minor Risk	Moderate Risk	Moderate Risk	Likely would cause additional flooding of low-lying areas, particularly in areas where the storm sewer system is not fully built out
Higher average temperature	Minor Risk	Minor Risk	Minor Risk	Minimal impact
Extreme Events				
Storm surge	Major Risk	Major Risk	Major Risk	Significant risk of both wave action and coastal flooding, as evidenced by Sandy; risk likely would grow as V Zone and Coastal A Zone expand; increased storm frequency would leave less time to restore coastal protections
Heavy downpour	Moderate Risk	Moderate Risk	Moderate Risk	Will raise likelihood that the capacity of stormwater management systems may be exceeded more frequently, resulting in localized flooding
Heat wave	Minor Risk	Moderate Risk	Moderate Risk	Will place greater strain on the area's power system, increasing the potential for failures
High winds	Moderate Risk	Moderate Risk	Moderate Risk	Would likely affect overhead power lines, the mode of power delivery to the majority of the area

flooding in any given year, has expanded 37 percent in land area since the FEMA flood maps that were in effect during Sandy were released in 1983.

In the East Shore, the floodplain has expanded to encompass most of Midland Beach and extends as much as a mile inland in locations, beyond Hylan Boulevard towards the SIR tracks. In addition, the area surrounding Ocean Breeze Park, and certain residential blocks in New Dorp Beach and Oakwood Beach, have been added to the floodplain. In the South Shore, the new floodplain reaches additional residential blocks along the coastline in Annadale, Prince's Bay, and Tottenville, and extends inland along waterways, such as Mill Creek and Lemon Creek. (See map: *Comparison of 1983 FIRMs and Preliminary Work Maps*)

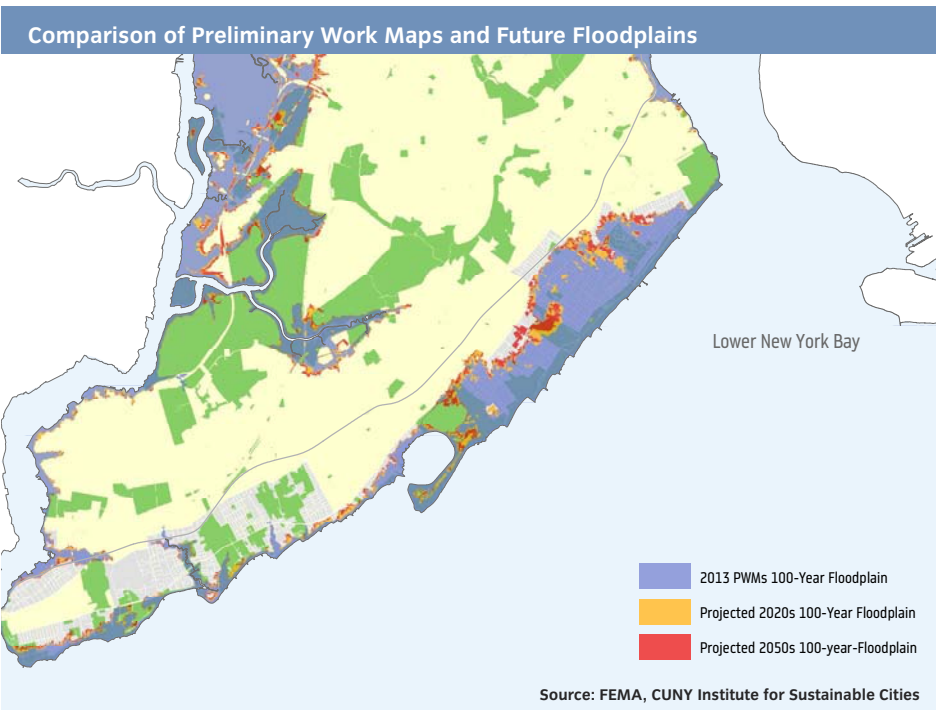
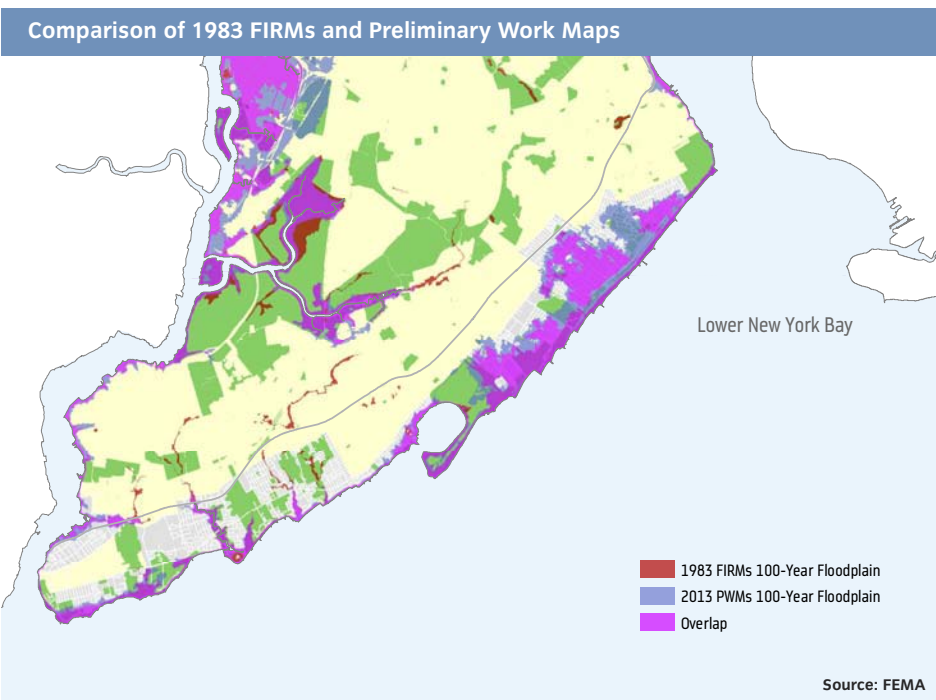
All beaches along the East and South Shore coastlines, and the northern edge of Great Kills Harbor, are now within a V Zone, which is a coastal area at risk of storm waves of three feet or more. In some limited instances, V Zones even encompasses residential properties, including the first inland rows of homes in certain South Shore neighborhoods such as Great Kills, Prince's Bay, and Annadale.

Overall, Base Flood Elevations (BFEs), or the height to which floodwaters could rise during a storm, have increased by two to four feet, in large swaths of the area.

In addition to expanding in area, according to the PWMs, the 100-year floodplain along the East and South Shores also now encompasses significantly more buildings (approximately 9,700 buildings total, a 46 percent increase). This includes an approximate 50 percent increase in residential units in the floodplain, a 32 percent increase in commercial buildings in the floodplain and, perhaps most significantly, a 49 percent increase in the area's 1- and 2-family homes—a housing type that is, as noted earlier, particularly vulnerable to storm surge. (See chart: *Buildings in the Floodplain*)

The PWMs also show critical facilities and infrastructure within the 100-year floodplain. Examples range from stretches of Hylan Boulevard in both the East and South Shores, to the areas surrounding the Oakwood Beach Wastewater Treatment Facility and the North Campus of the Staten Island University Hospital.

Looking forward, according to projections from the New York City Panel on Climate Change (NPCC), sea levels are likely to rise through the 2020s and 2050s (see Chapter 2). As sea levels rise, the floodplain will likely expand,



Buildings in the Floodplain				
	100-Year Floodplain			
	1983 FIRMs	2013 PWMs	Projected 2020s	Projected 2050s
Residential Buildings	6,300	9,240	10,730	12,100
Residential Units	7,000	10,500	12,300	14,700
Commercial and Other Buildings	380	490	550	600

Source: DCP PLUTO, FEMA

Staten Island's Historic North Shore

The neighborhoods on Staten Island's historic North Shore experienced Sandy in some ways that were similar to the neighborhoods on which this report focuses and in some ways that were different. However, each was impacted in ways that continue to affect the residents and businesses of these neighborhoods.

During Sandy, floodwaters reached beyond Bay Street in Clifton, Stapleton, and Tompkinsville, causing property damage and business disruption. The John B. Caddell tanker ran ashore in Stapleton during the storm, closing down Front Street. Piers driven ashore by Sandy blocked the Bay Street Landing in St. George. Along the Kill Van Kull, many docking and landside facilities were damaged. Inundation went beyond Richmond Terrace in parts of West Brighton, Port Richmond, and Mariners Harbor. At the Snug Harbor Cultural Center, volunteers and maintenance workers spent days clearing debris.

Looking to the future, the risks faced by the North Shore from extreme weather events are likely to increase due to climate change. The initiatives described in this report are designed to help address these risks through a range of strategies. Among these are: a program to raise bulkheads and other shoreline structures in low-lying areas most at risk of flooding, including, potentially, areas of the North Shore (see Coastal Protection Initiative 6); investments to harden the St. George Ferry Terminal (see Transportation Initiative 6); loans and grants to help thousands of New Yorkers repair and rebuild housing and reopen businesses (see Buildings Initiatives 2 and Economic Recovery Initiative 1); loans and grants to help thousands of New Yorkers make resiliency investments in their businesses, including a sales tax abatement program for owners of industrial buildings in the 100-year floodplain (see Buildings Initiative 7 and Buildings Initiative 10); and investments to promote community and economic recovery, including planned and on-going investments along the St. George Waterfront and at Stapleton.



Bay Street Landing

Credit: Bill Lyons/Advance

potentially resulting in even higher floodwaters due to storm surge. (See map: *Comparison of Preliminary Work Maps and Future Floodplains*)

Using the high end projections from the NPCC the City projects that the number of buildings in the future floodplain along the East and South Shores could rise to over 11,200 buildings by the 2020s (an approximate 16 percent increase of over what is shown by the PWMs) and to approximately 12,700 buildings by the 2050s (a further 15 percent increase over what is shown in the PWMs). Most of these will be 1- and 2-family homes. During this period, Coastal A Zones—area landward of a V Zone, at risk of storm waves of between 1.5 feet and 3 feet—are also likely to expand westward into East Shore communities and farther inland along the coastline and creeks in the South Shore. It is also possible that sea level rise, even without extreme weather events, could place further strain on low-lying areas and contribute to greater erosion of beaches and bluffs.

Other Risks

Though coastal inundation poses the greatest threat to the neighborhoods along the waterfront, these areas face other climate risks, as well. For example, going forward, increased precipitation and heavy downpours could lead to localized flooding of low-lying areas, particularly areas in the East Shore where the storm sewer system is not fully built out. Heavy downpours may also exceed the capacity of stormwater management systems more frequently, leading to localized street flooding in other low-lying areas of the East and South Shores.

While future projections for changes in wind speeds are not available from the NPCC, a greater frequency of intense coastal storms by the 2050s could present a greater risk of high winds in the New York area, which could result in downed overhead power lines and trees, and potentially damage older buildings not constructed to modern wind standards.

Heat waves may strain electric systems, resulting in power failures that can impact homes and businesses and the functioning of infrastructure. Finally, drought may increase the threat of wildfires in the area, especially in the East Shore, where the pervasiveness of *Phragmites* has resulted in more than 100 serious brush fires in the last 15 years. Many homes in the East Shore are within a designated Wildland-Urban Interface (WUI) zone, which is a zone where homes are built near or among lands prone to wildfire—a rarity in major cities such as New York.

Priorities from Public Engagement in the East and South Shores of Staten Island

Since the Special Initiative for Rebuilding and Resiliency (SIRR) was launched in December 2012, the input of local stakeholders has helped shape an understanding of what happened during Sandy, what risks the East and South Shores face in relation to climate change and what approaches make sense to address these risks.

The East and South Shores are represented by a wide array of elected officials at the Federal, State, and local levels. They also are represented by three Community Boards. The area is served further by a large number of community-based organizations, civic groups, faith-based organizations, and other neighborhood stakeholders. All played an important role in relief and recovery efforts after Sandy. Throughout the process of developing this plan, SIRR staff benefited from numerous working sessions—both formal and informal—with these groups and individuals, including, in the East and South Shores, two task forces that met regularly.

SIRR also held two public workshops in March of 2013 in Staten Island, part of a series of such workshops held citywide in which over 1,000 New Yorkers participated to discuss issues affecting their neighborhoods and communicate their priorities for the future of their homes and communities. On the East and South Shores, attendees expressed concern that programs designed to work in other boroughs of the city may not work in these communities. Generally, the on-the-ground insights provided at these public workshops helped SIRR staff to develop a deeper understanding of the specific priorities of, and challenges facing, the communities of the East and South Shores.



East and South Shores of Staten Island community outreach workshop

Task Force	Briefing Frequency	# of Stakeholders from the East and South Shores
Elected Officials	Monthly	<ul style="list-style-type: none">• ~13 City, State, Federal elected officials
Community-based Organizations	4 - 6 weeks	<ul style="list-style-type: none">• 3 community boards• 20+ faith-based, business, and community organizations

Overall, out of the various task force and other meetings and public workshops attended by SIRR staff since January, several priorities for the East and South Shores and the SIRR effort at large clearly emerged:

- Developing coastal/shoreline protections, while still ensuring public access to the waterfront;
- Protecting low-lying areas, by exploring more effective drainage systems, including the

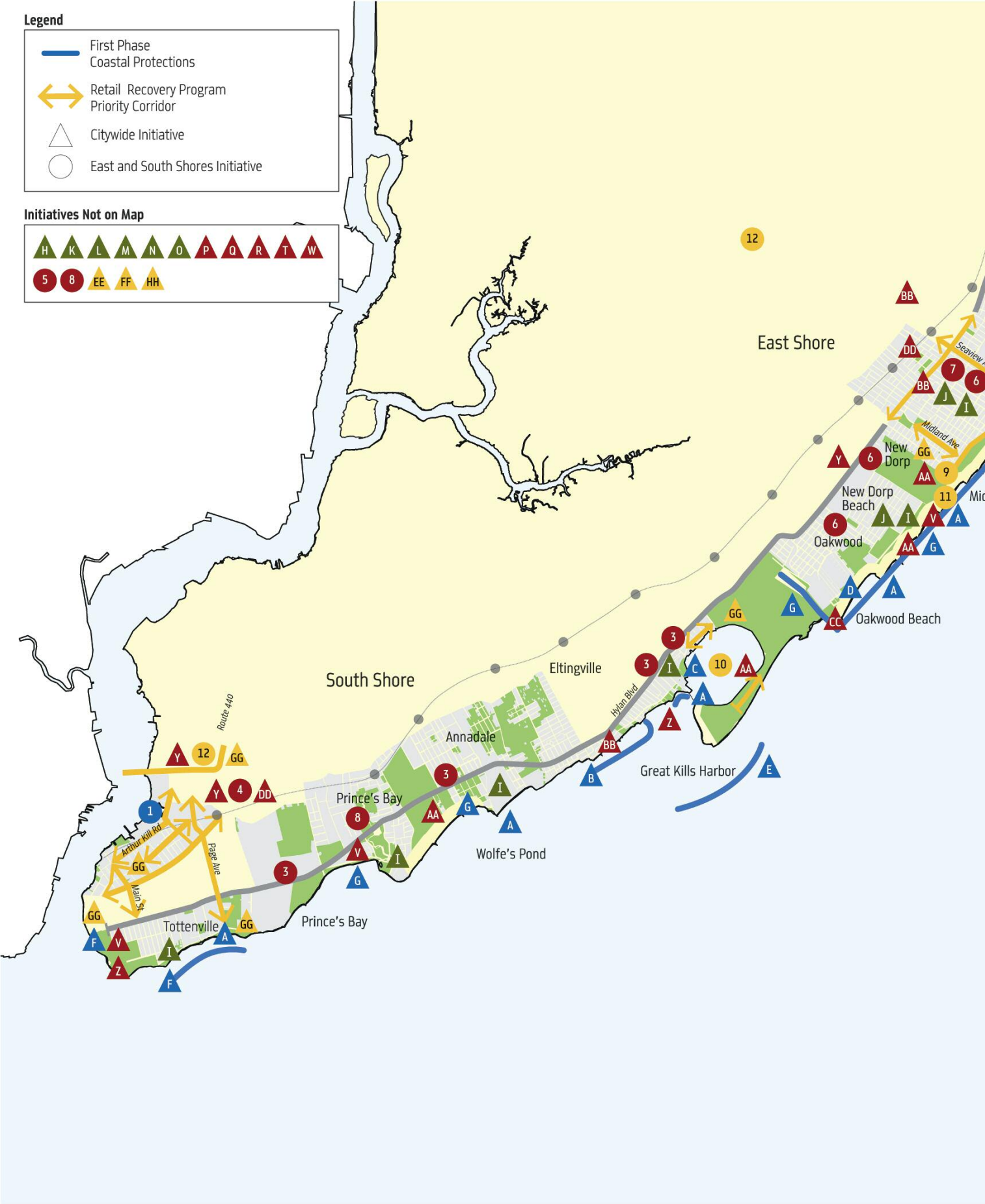
accelerated build-out and ultimate completion of Bluebelts;

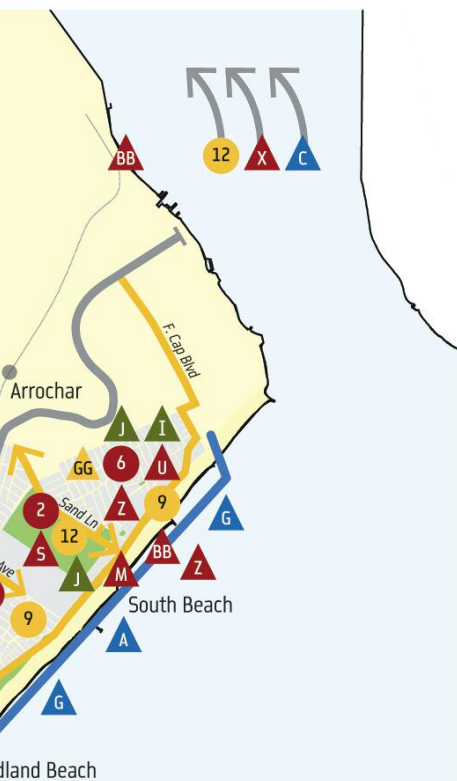
- Developing programs to address the financial and physical challenges of rebuilding homes;
- Revitalizing local business corridors and waterfronts and marinas; and
- Preserving neighborhood character and affordability during neighborhood recovery and rebuilding.



East and South Shores of Staten Island community outreach workshop

EAST AND SOUTH SHORES STATEN ISLAND | Initiative Summary





Coastal Protection

Selected Citywide Measures

- A** Complete short-term beach nourishment, dune construction, and shoreline protection on Staten Island
- B** Install armor stone shoreline protection (revetments) on Staten Island
- C** Raise bulkheads in low-lying neighborhoods to minimize inland tidal flooding
- D** Call on and work with the USACE to complete emergency floodgate repairs at Oakwood Beach
- E** Call on and work with the USACE to develop an implementation plan for the installation of offshore breakwaters adjacent to and south of Great Kills Harbor
- F** Call on and work with the USACE to develop an implementation plan for, and install, living shorelines for wave attenuation in Tottenville.
- G** Call on and work with the USACE to complete existing studies on Staten Island and implement coastal protection projects

* For additional Coastal Protection initiatives, see Coastal Protection section of Community Plan

- 1** Call on and work with the USACE to study the construction of a floodgate at Mill Creek

Buildings

Selected Citywide Measures

- H** Improve regulations for flood resiliency of new and substantially improved buildings in the 100-year floodplain
- I** Rebuild and repair housing units destroyed and substantially damaged by Sandy
- J** Study and implement zoning changes to encourage retrofits of existing buildings and construction of new resilient buildings in the 100-year floodplain
- K** Amend Building Code and complete studies to strengthen wind resiliency for new and substantially improved buildings
- L** Encourage existing buildings in the 100-year floodplain to adopt flood resiliency measures through an incentive program and targeted mandate
- M** Launch a sales tax abatement program for flood resiliency in industrial buildings
- N** Clarify regulations relating to the retrofit of landmarked structures in the 100-year floodplain
- O** Amend the building code to improve wind resiliency for existing buildings and complete studies of potential retrofits

* For additional Buildings initiatives, see Buildings section of Community Plan

Critical Infrastructure

Selected Citywide Measures

- P** Work with utilities and the Public Service Commission (PSC) to harden key electric transmission and distribution infrastructure against flooding
- Q** Work with utilities and the PSC to harden vulnerable overhead lines against winds
- R** Work with utilities, regulators, and gas pipeline operators to harden the natural gas system against flooding
- S** Require the retrofitting of existing hospitals in floodplains
- T** Require retrofitting of nursing homes in floodplains
- U** Require retrofitting of adult care facilities in floodplains
- V** Reconstruct and resurface streets damaged by Sandy
- W** Elevate traffic signals and provide backup electrical power
- X** Protect Staten Island Ferry and private ferry terminals from climate change-related threats
- Y** Call on non-City agencies to implement strategies to address climate change threats
- Z** Restore city beaches
- AA** Harden or otherwise modify shoreline parks to protect adjacent communities
- BB** Harden pumping stations
- CC** Harden wastewater treatment plants
- DD** Continue to implement and accelerate investments in Bluebelts across the city

* For additional Critical Infrastructure initiatives, see Critical Infrastructure sections of Community Plan

- 2** Assist Staten Island University Hospital in applying for hazard mitigation funding
- 3** Implement and expedite roadway and sewer capital projects along Hylan Boulevard, especially in vulnerable South Shore areas
- 4** Call on and work with the MTA to create an implementation plan for the relocation of Richmond Valley SIR station to Page Avenue
- 5** Study potential new ferry routes serving Staten Island and issue Request for Expression of Interest to gauge market interest
- 6** Secure available Federal funding to implement the Community Wildfire Protection Plan for fire-prone areas on the East Shore
- 7** Launch the first capital project for the Mid-Island Bluebelt in Midland Beach
- 8** Explore expansion of the City's mitigation banking pilot as a funding mechanism to facilitate the construction of the Mid-Island and South Shore Bluebelts

Community & Economic Recovery

Selected Citywide Measures

- EE** Launch business recovery and resiliency programs
- FF** Launch the Neighborhood Game-Changer Competition
- Call for Neighborhood Retail Recovery Program**
 - Great Kills Harbor (Full length of Mansion Avenue; portion of Buffalo Street adjoining Nichols Marina)
 - Hylan Boulevard (between Seaver Ave and New Dorp Lane); Main Street Tottenville (between Ellis Street and Amboy Road)
 - Main Street Tottenville (between Ellis Street and Amboy Road)
 - Midland Avenue (between Mason Avenue and Father Capodanno Blvd.)
 - Page Avenue Corridor (all streets between Arthur Kill Road, Nassau Place/Bethel Avenue, Amboy Road, Page Avenue, and Route 440)
 - Sand Lane (Sand Lane, between McClean Avenue and Father Capodanno Blvd., and Robin Road, between Arthur Avenue and Sand Lane)
 - Seaview Avenue (between Hylan Boulevard and Patterson Avenue)
- GG** Support local merchants in improving and promoting local commercial corridors
- HH** Continue to support the FRESH program to increase the number of full-line grocers in underserved neighborhoods

- 9** Issue a Request for Expression of Interest (RFEI) for new concessions and services at City-controlled beaches in the East Shore
- 10** Create a comprehensive revitalization plan for Great Kills Harbor to increase resiliency and to draw additional investment
- 11** Create a strategic plan for public recreational land, including the beachfront recreation areas and open space
- 12** Implement planned and on-going investments by the City and private partners
 - Ocean Breeze Track and Field Athletic Complex
 - Charleston Mixed-Use Development
 - New Stapleton Waterfront (Homeport) Redevelopment
 - St. George Waterfront Redevelopment
 - Former Coast Guard Site Development
 - Brielle Avenue Municipal Site

This chapter contains a series of initiatives that are designed to mitigate the impacts of climate change on the East and South Shores of Staten Island. In many cases, these initiatives are both ready to proceed and have identified funding sources assigned to cover their costs. With respect to these initiatives, the City intends to proceed with them as quickly as practicable, upon the receipt of identified funding.

Meanwhile, in the case of certain other initiatives described in this chapter, though these initiatives may be ready to proceed, they still do not have specific sources of funding assigned to them. In Chapter 19 (*Funding*), the City describes additional funding sources, which, if secured, would be sufficient to fund the full first phase of projects and programs described in this document over a 10-year period. The City will work aggressively on securing this funding and any necessary third-party approvals required in connection therewith (i.e., from the Federal or State governments). However, until such time as these sources are secured, the City will only proceed with those initiatives for which it has adequate funding.

East and South Shores Community Rebuilding and Resiliency Plan

The East and South Shores offer unparalleled access to beautiful beaches, the waterfront, and a network of public parks. Not surprisingly, this area inspires deep feelings of pride, community, and identity among area residents.

The following is a multilayered plan for the East and South Shores that not only applies citywide strategies to the area but also provides strategies designed to address specific local needs and vulnerabilities. In anticipation of future climate change-related risks, this plan proposes ways that East and South Shore neighborhoods can adapt by: Addressing inundation along the entire coastline; providing opportunities to retrofit the area's most vulnerable housing stock; protecting and improving critical infrastructure; and focusing investments in strategic areas, such as the beachfront, to advance a long-term and sustainable recovery.

Coastal Protection

As Sandy illustrated, the greatest extreme weather-related risks faced by New York City is storm surge, the effects of which are likely to increase given current projections of sea level rise. Going forward, it is anticipated that climate change will render coastal regions of the city, including the East and South Shores, even more vulnerable to these risks.

While it is impossible to eliminate the chance of flooding in coastal areas, the City will seek to reduce its frequency and effects—mitigating the impacts of sea level rise, storm waves and erosion, and inundation on the coastline of the city generally and the East and South Shores in particular. Among the strategies that the City will use to achieve these goals will be the following: Increasing coastal edge elevations; minimizing upland wave zones; protecting against storm surge; and improving coastal design and governance. When evaluating coastal protection, other priorities including navigation, ongoing efforts to improve water quality and natural habitats, will also be considered prior to implementation, where appropriate.

The initiatives described below provide important examples of how the City intends to advance its coastal protection agenda citywide. These initiatives will have a significant impact on the residents, businesses, and nonprofits of the East and South Shores. Taken together, when completed, the first seven coastal protection initiatives described below would provide

enhanced protection for over 9,300 buildings representing over 10,000 housing units as well as many businesses and much of the critical infrastructure in the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's comprehensive coastal protection plan, please refer to Chapter 3 (*Coastal Protection*).

Coastal Protection Initiative 3 Complete short-term beach nourishment, dune construction, and shoreline protection on Staten Island

The loss of sand from Staten Island's beaches has left several neighborhoods exposed and vulnerable to future storms. The City, therefore, will complete beach nourishment and short-term dune improvements along these beaches, including a beach nourishment project encompassing South Beach, Crescent Beach, and Tottenville; dune construction from New Dorp Beach to Oakwood Beach; and shoreline stabilization to close the breach at Wolfe's Pond Park. This work will make effective use of existing Federal appropriations and will enhance protection concurrent with the upcoming hurricane season and beyond. DPR will oversee these efforts.

Coastal Protection Initiative 5 Install armor stone shoreline protection (revetments) on Staten Island

As a result of erosion that occurred during Sandy, the South Shore's beaches and bluffs are more exposed to erosion and damage. To address this risk, subject to available funding, the City will install a first phase of revetments (shoreline protection constructed with armor stone) in vulnerable locations along the coastline of neighborhoods such as Annadale, south of Great Kills Harbor. This project will increase the area's resiliency and demonstrate the effectiveness of such shoreline erosion control. The Mayor's Office of Long Term Planning and Sustainability (OLTPS), working with NYCEDC, will design this shoreline protection to mitigate erosion of vulnerable coastal edges and flooding in low-lying areas during lesser storms. The goal is to begin design work in 2013 and complete within three years.

Coastal Protection Initiative 6 Raise bulkheads in low-lying neighborhoods to minimize inland tidal flooding

Bulkheads provide the first line of defense against flooding in many neighborhoods, including Great Kills, and in North Shore neighborhoods such as Stapleton and St. George, but throughout the city many bulkheads are built to

Buried Levee at South Beach



Non-storm conditions



During storm conditions

an elevation that may be insufficient given the latest projections of sea level rise by 2050. Subject to available funding, the City, therefore, will launch a program to raise bulkheads and other shoreline structures across the five boroughs in low-lying areas most at risk of daily or weekly tidal flooding, a phenomenon that could impact approximately 2 miles of the East and South Shores' coastlines by the 2050s. OLTPS will work with NYCEDC to manage this program, to begin implementation in 2013, in conjunction with the new citywide waterfront inspections program described in Chapter 3.

Coastal Protection Initiative 9 **Continue to work with the USACE to complete emergency floodgate repairs at Oakwood Beach**

The failure of a floodgate in Oakwood Beach has left the neighborhood and surrounding areas vulnerable to future storms. The City, therefore, will call upon the US Army Corps of

Engineers (USACE) to complete floodgate repairs at this location. This work will begin in June 2013 and end by December 2013, providing protection during the 2013 hurricane season and beyond.

Coastal Protection Initiative 13 **Call on and work with the USACE to study and install offshore breakwaters adjacent to and south of Great Kills Harbor**

Marinas, businesses, and multiple residential communities adjacent to and south of Great Kills Harbor face an increasing risk of wave action and erosion during extreme weather events that could undermine shoreline bluffs and damage homes. To address this risk, subject to available funding, the City will call on the USACE to develop an implementation plan for off-shore breakwaters that provide cost-effective wave attenuation. This offshore breakwater project will be designed to mitigate waves

before they act upon the shoreline, minimizing their destructive forces in vulnerable neighborhoods. The goal is to complete this project within four years of completing a USACE study.

Coastal Protection Initiative 15 **Call on and work with the USACE to study and install living shorelines for wave attenuation in Tottenville**

Tottenville, the southernmost community in Staten Island, was hard-hit by Sandy's flooding and wave action. To address this community's vulnerability, the City will call on the USACE to develop and implement a living shoreline project to protect the neighborhood and to demonstrate the effectiveness of this approach to wave attenuation on the open Lower Bay. Based on this plan, DPR will design and install this living shoreline project—likely to consist of oyster reef breakwaters, beach nourishment, and maritime forest enhancements—in areas adjacent to Conference House Park in

Tottenville. If this project is demonstrated to be effective, other neighborhoods along the South Shore could be protected by future phases of work. The goal is to complete this project within four years of completing a USACE study.

Coastal Protection Initiative 24 **Continue to work with the USACE to complete existing studies on Staten Island and implement coastal protection projects**

Without additional protection, the East and South Shores remain vulnerable to storm surge and flooding. The City will, therefore, call upon the USACE to complete a longstanding study of flood risk reduction on the East and South Shores on an expedited basis and then to implement the recommended actions, as soon as practicable. This work will make effective use of existing Federal appropriations to advance meaningful flood protection projects. It is expected that the first phase of this study will be completed in 2014, which should lead to the construction of robust protections such as floodwalls and levees in front of the existing boardwalk on the East Shore from Fort Wadsworth to Great Kills. The City will work with the USACE to determine the approach and specific locations for these protections. If a local match for Phase 1 measures is required by the USACE, the City will work to secure the necessary resources. As part of this initiative, the City and the USACE will develop a plan for ongoing beach nourishment to restore sand rapidly after extreme weather events. The second phase of this study is expected to be completed in 2016. This should lead to additional flood protection projects between Great Kills and Tottenville on the South Shore. Two City agencies, DEP and DPR, will oversee these efforts. (See renderings: *Buried Levee at South Beach*)

Beyond the priority coastal protection projects described in Chapter 3, including those summarized briefly above, the City is proposing an additional coastal protection initiative specific to the vulnerabilities of the East and South Shores.

East and South Shore Initiative 1 **Call on and work with the USACE to study the construction of a floodgate at Mill Creek**

The South Shore's creeks and tributaries are vulnerable to inundation and flooding and will become more so in the future. To address this vulnerability, the City will call for the study of a floodgate at the mouth of Mill Creek, an effort that potentially could be incorporated into the

existing USACE study of the South Shore's coastline. Floodgates allow storm water to flow out of waterways while preventing seawater backflow from inundating these waterways in reverse. Such an investment would provide protection against the potential flooding of important assets such as the SIR. It also could serve to demonstrate the viability of a potential mitigation strategy for other vulnerable waterways along the South Shore, including Lemon Creek.

Buildings

The city's buildings give physical form to New York. As Sandy demonstrated, however, the building stock citywide, including in the East and South Shores, is highly vulnerable to extreme weather events—a vulnerability that is expected to increase in the future. While the coastal protection measures outlined above are designed to reduce the effects of sea level rise, storm surge, and wave action on the city and the East and South Shores, these measures will not completely eliminate those risks. They also will take time to design, fund, and build. It is equally important, therefore, to supplement these measures by pursuing resiliency at the building level.

To achieve building-level resiliency, the City will seek to protect structures in the East and South Shores and throughout the five boroughs against a spectrum of climate risks, including not only flooding but also high winds and other extreme events. Among the strategies that the City will use to achieve these goals will be to construct new buildings to the highest resiliency standards and retrofit as many existing buildings as possible so that they will be significantly better prepared to handle the impacts of extreme weather events.

The initiatives described below provide important examples of how the City intends to advance building resiliency citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough building resiliency plan, please refer to Chapter 4 (*Buildings*).

Buildings Initiative 1 **Improve regulations for flood resiliency of new and substantially improved buildings in the 100-year floodplain**

Though buildings constructed to modern Construction Codes generally performed well during Sandy, given the increasing risk of flooding that is likely with climate change, modifications are warranted. The City, therefore, will seek to

amend the Construction Codes and Zoning Resolution to provide for strengthened requirements that will, among other things, improve the design of new buildings through the application of appropriate resiliency measures that are calibrated to the best floodplain data available over time and help ensure that critical building systems are better-protected from flood risks. In 2013, the City, through OLTPS, will seek to implement these code changes and the Department of City Planning (DCP) will continue to take zoning changes through the public review process, with the goal of adoption before the end of the year. If adopted, they will improve resiliency for the significant amount of mixed-use development likely to take place within the 100-year floodplain over time throughout the East and South Shores.

Buildings Initiative 2 **Rebuild and repair housing units destroyed and substantially damaged by Sandy**

Roughly 23,000 private residential buildings encompassing nearly 70,000 housing units were damaged or destroyed during Sandy. Subject to available funding, the City, therefore, through the Mayor's Office of Housing Recovery Operations (HRO), will provide financial and other assistance to owners of residential properties that were destroyed or substantially damaged during Sandy, including to approximately 380 residential buildings encompassing approximately 500 housing units in the East and South Shores. To address the damages sustained and to more effectively prepare these significantly damaged buildings for future storm events, the City either will assist owners or, in limited cases meeting City criteria, will facilitate the acquisition of properties by new owners whom it will assist, in rebuilding and substantially improving these properties based on the best floodplain data available over time. Additionally, the City is seeking to incorporate resiliency measures into approximately 500 to 600 multifamily properties that sustained minor damage including many publicly assisted properties such as those developed pursuant to the Mitchell-Lama program and other affordable housing programs. The City, therefore, will support the retrofit of these publicly-assisted buildings, such as those developed pursuant to Mitchell-Lama and other affordable housing programs.

Buildings Initiative 3 **Study and implement zoning changes to encourage retrofits of existing buildings and construction of new resilient buildings in the 100-year floodplain**

The City, through DCP, will undertake a series of citywide and neighborhood-specific land use

studies to address key planning issues in severely affected and vulnerable communities. As part of these studies, the City will identify ways to facilitate the voluntary construction of new, more resilient building stock, and to encourage voluntary retrofits of existing vulnerable buildings over time. To be undertaken in close consultation with local residents, elected officials, and other community stakeholders, these land use studies will focus on the challenges posed by the combination of flood exposure of the applicable neighborhoods; the vulnerability of the building types that are found in these neighborhoods (e.g., older, 1-story bungalows); and site conditions in these areas (e.g., narrow lots) that can make elevation or retrofit of vulnerable buildings expensive or complicated. These studies will be coordinated with other area studies, including those examining beachfront revitalization, Bluebelt expansion and open space and transportation.

DCP will examine neighborhoods including East Shore communities that were severely damaged during Sandy and previous storms. In neighborhoods like Midland Beach, zoning changes may include mechanisms to accommodate or even encourage retrofits of buildings on existing lots, and the voluntary construction of resilient housing through the combination of smaller lots. Any new development in these neighborhoods would be consistent with the area's low density character and would be required to include resiliency measures. Other communities that may also be studied include South Beach and New Dorp Beach.

Subject to consultation with local elected officials and community members, DCP will also examine the need for resilient housing and measures in the beachfront communities of the East Shore, along Father Capodanno Boulevard. Oceanfront developments that performed well during Sandy and other extreme weather events, such as Arverne By The Sea in the Rockaways, and new coastal designs on Staten Island, such as the proposed Homeport development in Stapleton, would be studied as best practice. All studies will also analyze ways in which retrofits and rebuilding can help to revitalize local commercial corridors and the beachfront as a whole, along the East Shore.

Subject to available funding, the goal is for DCP to commence study in 2013. Thereafter, DCP would move to implement changes, if any, that it deems to be appropriate based on the results.

Buildings Initiative 4 **Launch a competition to encourage development of new, cost-effective housing types to replace vulnerable stock**

Subject to available funding, the City, through the Department of Housing Preservation and Development (HPD), will launch an international competition called the Resilient Housing Design Competition. This competition will offer prizes to private-sector developers who design and develop new, high-quality housing prototypes that offer owners of vulnerable building types (e.g., older, 1-story bungalows) a cost-effective path that is consistent with city building and zoning requirements and meets the highest resiliency standards. In addition to cash prizes, the winners of this competition will be given the opportunity to put these structures into service in connection with a City-sponsored development project. Prototypes will have applicability throughout the five boroughs, including in sections of the East and South Shores, such as Midland Beach and other vulnerable low-density communities. The goal is for HPD to launch this competition in 2013.

Buildings Initiative 5 **Work with New York State to identify eligible communities for the New York Smart Home Buyout Program**

The City will evaluate opportunities for collaboration with the State in connection with its home buyout program, using an objective set of criteria developed by the City, including extreme vulnerability, consensus among a critical mass of contiguous local residents, and other relevant factors. It is anticipated that these criteria will be met in a limited number of areas citywide. As of the writing of this report, the City had expressed support for buyout negotiations under this program that were ongoing between a group of Oakwood Beach homeowners and the staff of New York State Homes and Community Renewal.

Buildings Initiative 6 **Amend the Building Code and complete studies to strengthen wind resiliency for new and substantially improved buildings**

As noted above, buildings constructed to modern Building Code standards generally performed well during Sandy. Sandy, however, brought relatively weak winds, compared to other hurricanes. Given the possibility of more frequent or intense wind events in the future, modifications to the Building Code are warranted. The City, therefore, through OLTPS

will seek to amend the Building Code to provide for strengthened requirements so that new buildings citywide can meet enhanced standards for wind resiliency. The City will further study whether additional wind resiliency standards should be required going forward. The amendments will be submitted to the City Council for adoption, and the study will commence, in 2013.

Buildings Initiative 7 **Encourage existing buildings in the 100-year floodplain to adopt flood resiliency measures through an incentive program and targeted mandate**

Even if every structure destroyed or damaged by Sandy were rebuilt to the highest resiliency standards, this would still leave tens of thousands of existing structures in the 100-year floodplain vulnerable—with more becoming vulnerable as the climate changes. Subject to available funding, the City, therefore, will launch a \$1.2 billion program to provide incentives to owners of existing buildings in the 100-year floodplain to encourage them to make resiliency investments in those buildings. Of the up to \$1.2 billion available through the program, the City will reserve up to \$100 million for 1- to 3-family homes, up to \$500 million for distribution across the five boroughs based on each borough's share of vulnerable buildings citywide, and \$100 million for affordable housing developments.

The City also will mandate that large buildings (those with seven or more stories that are more than 300,000 square feet in size) undertake certain flood resiliency investments by 2030. If the City consistently achieves its stated goal of encouraging significant resiliency retrofit investments for the vast majority of the built floor area in the 100-year floodplain in the five boroughs, nearly 7,500 housing units encompassing approximately 12 million square feet of built space in the East and South Shores would, over time, be made meaningfully less vulnerable. The goal is to launch these programs in 2013.

Buildings Initiative 8 **Establish Community Design Centers to assist property owners in developing design solutions for reconstruction and retrofitting, and connect them to available City programs**

The City, through HRO, will establish Community Design Centers in neighborhoods across the city, potentially including the East and South Shores, to assist property owners in developing design solutions for reconstruction and retrofitting, and connect them to available City

programs. The Centers would be managed by the City—through agencies such as HRO, HPD, DOB, DCP, and NYCEDC—with support from local partners.

Buildings Initiative 10

Launch a sales tax abatement program for flood resiliency in industrial buildings

As Sandy demonstrated, many industrial buildings are vulnerable to extreme weather, with more likely to become vulnerable as the climate changes. However, many industrial buildings operate on thin margins making it challenging to invest in resiliency. The City, through the New York City Industrial Development Agency (NYCIDA), therefore, will launch a \$10 million program to provide incentives to owners of industrial buildings to encourage them to make resiliency investments in those buildings. The program will prioritize 1- to 2-story buildings with more than four feet between their actual ground elevation and the applicable BFE. In the East and South Shores, seven industrial buildings with over 68,000 square feet of floor area will be eligible for this program. This program will be launched in 2013.

Buildings Initiative 11

Launch a competition to increase flood resiliency in building systems

Many existing strategies for improving resiliency in buildings are either imperfect, expensive, or a combination of both. The City, through NYCEDC, therefore, will launch an approximately \$40 million Resiliency Technologies Competition using allocated Community Development Block Grant (CDBG) funding to encourage the development, deployment, and testing of new resiliency technologies for building systems. In the East and South Shores, approximately 9,730 buildings will be eligible to benefit from this competition. The program will be launched in 2013.

Buildings Initiative 12

Clarify regulations relating to the retrofit of landmarked structures in the 100-year floodplain

The City, through the Landmarks Preservation Commission (LPC) will clarify the Commission's regulations to assist owners of landmarked buildings and properties in landmarked districts in the 100-year floodplain who are contemplating retrofit projects. Currently in the East and South Shores, there are a total of seven landmarked buildings, with two in the floodplain shown in FEMA's PWMs. The Commission will issue its clarifying regulations in 2013.

Buildings Initiative 13

Amend the building code to improve wind resiliency for existing buildings and complete studies of potential retrofits

As noted above, given the possibility for more frequent intense wind events in the future, modifications to the Building Code are warranted. The City therefore, through OLTPS, will seek to amend the Building Code and expand the existing DOB Façade Inspection Safety Program for high-rise buildings to include rooftop structures and equipment. The City will further study whether additional wind resiliency standards are required going forward. These amendments will be submitted to the City Council for adoption, and the study will commence, in 2013.

Insurance

Insurance can help provide residents and businesses with financial protection against losses from climate change and other types of risks. Sandy not only highlighted the importance of insurance, it also revealed that many New Yorkers are exposed to flood losses, which are not covered in standard homeowners or small business property insurance policies. Citywide, 95 percent of homeowners carry homeowners insurance, but when Sandy struck less than 50 percent of residential buildings in the effective 100-year floodplain had coverage through the National Flood Insurance Program (NFIP), a federal program administered by FEMA that provides flood insurance to properties in participating communities like New York City. While larger properties, in particular large commercial properties, tend to purchase flood insurance through the private market, NFIP is the primary source of flood insurance for homeowners throughout the country. The City estimates that, in areas of the East and South Shores inundated by Sandy, less than 35 percent of residential properties typically insured under the NFIP, including 1- and 2-family homes, amongst others, actually had policies in force during Sandy. Furthermore, Sandy drew attention to the significant cost increases in flood insurance that many New Yorkers will soon face, resulting from recent reforms to the NFIP as required by the Biggert-Waters Flood Insurance Reform Act.

The City will use several strategies to encourage more New Yorkers to seek coverage and to help ensure the NFIP meets the needs of policyholders citywide. Specifically, the City will work to: Address affordability issues for the most financially vulnerable policyholders; define mitigation measures that are feasible in

an urban environment, such as East and South Shore communities, and create commensurate premium credits to lower the cost of insurance for property owners who invest in these measures; encourage the NFIP to expand pricing options (including options for higher deductibles) to give potential policyholders more flexibility to make choices about coverage; and launch efforts to improve consumer awareness, to help policyholders make informed choices. The initiatives described below are important examples of how the City will advance these strategies. These initiatives will have a major impact on the residents, small businesses and nonprofits in the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough insurance reform plan, please refer to Chapter 5 (*Insurance*).

Insurance Initiative 1

Support Federal efforts to address affordability issues related to reform of the NFIP

The City will call on FEMA to work with the National Academy of Sciences to complete the study of flood insurance affordability, as required under the Biggert-Waters Act. The City will urge its Federal government partners to comply with this provision of the Act and take swift action to enact the recommendations.

Insurance Initiative 4

Call on FEMA to develop mitigation credits for resiliency measures

The NFIP provides few incentives for property owners to protect their buildings from flood damage and reduce their premiums, other than by elevating their buildings—actually lifting structures above flood elevation levels. In an urban environment such as the East and South Shores, for a variety of reasons, elevation can be impractical, undesirable, and/or economically infeasible. Fortunately, other mitigation options are available. The City, therefore, will call upon FEMA to provide appropriate premium credits for mitigation measures other than elevation.

Insurance Initiative 6

Call on FEMA to allow residential policyholders to select higher deductibles

Flexible pricing options can encourage more people, especially those not required to carry insurance, to purchase insurance coverage that suits their needs. A higher-deductible option can substantially reduce premium costs to policyholders while remaining truly risk-based. Currently under the NFIP, deductibles up to \$50,000 are allowed for commercial policies,

but residential policies are limited to a maximum deductible of \$5,000. The City, therefore, will call upon FEMA to allow homeowners that are not required to carry NFIP policies to purchase high-deductible policies, protecting them from catastrophic loss. Initial estimates indicate that doing so could reduce insurance premiums by about half.

Critical Infrastructure

A resilient New York requires protection of its critical services and systems from extreme weather events and the impacts of climate change. This infrastructure includes the city's utilities and liquid fuel system, its hospitals and other healthcare facilities, telecommunications network, transportation system, parks, wastewater treatment and drainage systems, as well as other critical networks—all vital to keeping the city, including the East and South Shores, running.

Utilities

The city's electric, natural gas, and steam systems are essential to everyday life in areas throughout the five boroughs, including the East and South Shores. As Sandy proved, however, these systems are highly vulnerable to extreme weather events, with 800,000 customers losing electricity and 80,000 customers losing natural gas service during Sandy across the city, including approximately 180,000 that lost electricity in the borough of Staten Island. This vulnerability will only grow as the climate changes.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and other parts of the city will be to: Call for risk-based analysis of low-probability but high-impact weather events to be incorporated into utility regulation and investment decision-making; call for capital investments that harden energy infrastructure and make systems more flexible in responding to disruptions and managing demand; and better diversify the city's sources of energy. The initiatives described below provide important examples of how the City intends to advance utilities resiliency citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough utilities resiliency plan, please refer to Chapter 6 (*Utilities*).

Utilities Initiative 5

Work with utilities and the Public Service Commission (PSC) to harden key electric transmission and distribution infrastructure against flooding

Various transmission substations, distribution substations, utility tunnels, and underground equipment in the city are at risk of flooding during extreme weather. For example, 40 percent of transmission substations are in the 100-year floodplain today, and 67 percent are likely to be in the 100-year floodplain by the 2050s. The City, through OLTPS, will work with Con Edison and the Long Island Power Authority (LIPA) to prioritize these assets based on their roles in system reliability and to harden them as appropriate. This effort will begin in 2013.

Utilities Initiative 6

Work with utilities and the PSC to harden vulnerable overhead lines against winds

During extreme weather events, high winds and downed trees threaten overhead electric poles, transformers, and cables. The City, through OLTPS, will work with Con Edison and LIPA to manage the risk of wind and downed-tree damage through tree maintenance, line strengthening, and a line-relocation program. In some limited cases, rerouting lines underground may also be warranted, depending on the outcome of a cost-benefit analysis to be performed in partnership with the utilities. This effort will begin in 2013.

Utilities Initiative 7

Work with utilities, regulators, and gas pipeline operators to harden the natural gas system against flooding

Although the city's high-pressure gas transmission system performed relatively well during Sandy, there were instances where remote operation of parts of the system failed. Additionally, the distribution system had localized outages due to water infiltration. Seeking to limit the compromising effects of future floods on both the system's backbone and the ability of Con Edison and National Grid to control and monitor the system, the City, through OLTPS, will work with the PSC, Con Edison, and National Grid to harden control equipment against flooding. In addition, the City will call upon Con Edison and National Grid to take steps to prevent water from infiltrating its gas pipes. This effort will begin in 2013.

Utilities Initiative 21

Work with public and private partners to scale up distributed generation (DG), including microgrids

The city's DG systems, including microgrids, have the potential for significant expansion—but are constrained by regulations, financing challenges, and lack of information. The City, through OLTPS and the New York City Distributed Generation Collaborative—a stakeholder group convened by the City in 2012—will continue efforts to achieve a PlaNYC goal of installing 800 megawatts of DG citywide by 2030. These efforts will include reform of PSC tariffs and other regulatory changes, expansion of low-cost financing, and provision of technical assistance to property owners and developers. This ongoing effort will continue in 2013.

Liquid Fuels

The liquid fuels supply chain is essential for everyday life throughout the five boroughs, including in the East and South Shores. Sandy demonstrated the vulnerability of this system to extreme weather events. In the aftermath of Sandy, citywide—and particularly in the East and South Shores—there were long lines at gas stations and other challenges for drivers, including emergency responders. The vulnerability of this system will only grow as the climate changes.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and other parts of the city will be to: Develop a strategy for the hardening of liquid fuel infrastructure along the supply chain; increase redundancy and fuel supply flexibility; and increase supply availability for vehicles critical to the city's infrastructure, safety, and recovery from significant weather events. The initiatives described below provide important examples of how the City intends to advance its liquid fuel resiliency agenda citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough liquid fuels resiliency plan, please refer to Chapter 7 (*Liquid Fuels*).

Liquid Fuels Initiative 1

Call on the Federal government to convene a regional working group to develop a fuel infrastructure hardening strategy

The fuel supply shortage after Sandy was caused mainly by damage to infrastructure in New Jersey, where the City and State of New

York have no regulatory or legislative authority or oversight. The City, through OLTPS, will call on the Federal Hurricane Sandy Rebuilding Task Force and the United States Department of Energy to convene regional stakeholders to develop a strategy for hardening key infrastructure against future extreme weather. This effort will be launched in 2013.

Liquid Fuels Initiative 4

Work with New York State to provide incentives for the hardening of gas stations to withstand extreme weather events

New York State's 2013-2014 budget required that certain retail fuel stations invest in equipment that would allow them to connect generators quickly in the event of a power loss, and enter into supply contracts for emergency generators. The City, through OLTPS, will support the State in the design and implementation of this generator program, an effort that will include working with the New York State Energy Research and Development Authority (NY-SERDA) to develop an incentive program to minimize the financial impact of the requirements on the businesses involved. In addition, OLTPS will work with the State to develop incentives to encourage retail fuel stations to implement resiliency measures other than backup power capability. This effort will be launched in 2013.

Liquid Fuels Initiative 5

Enable a subset of gas stations and terminals to have access to backup generators in case of widespread power outages

Gas stations are vulnerable to widespread power outages resulting from extreme weather events, which could prevent them from dispensing fuel. In New York State's 2013-2014 budget, NY-SERDA was directed to develop a generator pool program for gas stations. The City, through its Office of Emergency Management (OEM), will work with NY-SERDA, FEMA, and the USACE in 2013 and beyond to develop such a pool and to create a pre-event positioning plan to enable the ready deployment of generators to impacted areas in the wake of a disaster.

Liquid Fuels Initiative 8

Develop a package of City, State, and Federal regulatory actions to address liquid fuel shortages during emergencies

Various regulations relating to the transportation and consumption of fuels in New York City limit the flexibility of the market to respond to disruptions, including following extreme weather events. The City, through OEM, will

work with the State and Federal governments to prepare an "off-the-shelf" package of regulatory measures for use in the event of a liquid fuels shortage to allow supply-demand imbalances in the fuel supply to be mitigated more quickly. This effort will be launched in 2013.

Liquid Fuels Initiative 9

Harden municipal fueling stations and enhance mobile fueling capability to support both City government and critical fleets

The City must be able to respond quickly to a fuel supply disruption, providing continuous fueling to vehicles that are critical for emergency response, infrastructure rebuilding, and disaster relief. The City, through the Department of Citywide Administrative Services (DCAS), will procure fuel trucks, generators, light towers, forklifts, and water pumps to permit the City to put in place emergency fueling operations immediately following a disruption in the fuel supply chain. DCAS also will issue a Request for Expressions of Interest (RFEI) to potential suppliers of liquid fuels to evaluate options for sourcing such fuel during emergencies. The procurement effort will be launched in 2013, with the RFEI to follow in 2014.

Healthcare

The city's healthcare sector is critical to the well-being of New Yorkers throughout the five boroughs, including in the East and South Shores. It is also a major economic engine for the city as a whole. The East and South Shores feature a network of outpatient and community healthcare providers, thousands of residents employed in the healthcare sector, and SIUH, the largest Staten Island-based employer. Sandy exposed this system's vulnerabilities, which are expected to grow as the climate changes.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and other parts of the city will be to: Build new hospitals, nursing homes, and adult care facilities to higher resiliency standards and harden existing facilities to protect critical systems; seek to keep lines of communication open between patients and providers, even during extreme weather events; and enable community-based providers to reopen quickly after a disaster. The initiatives described below provide important examples of how the City intends to advance its healthcare resiliency agenda citywide. These initiatives will have a positive impact on the residents and healthcare providers of the East and South Shores. For a full explanation of the

following initiatives and a complete description of the City's five-borough healthcare resiliency plan, please refer to Chapter 8 (*Healthcare*).

Healthcare Initiative 2

Require the retrofitting of existing hospitals in floodplains

Many existing hospital buildings in the floodplain remain vulnerable to the impact of storm surge, with more likely to become vulnerable as the climate changes. The City, through OLTPS, therefore, will seek to amend the Construction Code to require existing hospital buildings in the 500-year floodplain—including SIUH—to meet by 2030 a subset of the Construction Code standards for flood-resistant design. To minimize the risk of emergency evacuations and extended closures, these hospitals will be required to protect their electrical equipment, emergency power system, and domestic water pumps to the 500-year flood elevation. These hospitals also will be required to install backup air-conditioning service for inpatient care areas in case of utility outages, pre-connections for temporary boilers and chillers if primary equipment is not elevated, and pre-connections for external generators as a backup power source. SIUH already has begun exploring a number of these and other flood mitigation measures as part of its post-Sandy rebuilding process. OLTPS will propose these requirements to the City Council in 2013.

Healthcare Initiative 4

Improve design and construction of new nursing homes and adult care facilities

New nursing homes and adult care facilities are at risk of power failures due to storm surge, which could result in patient evacuations. The City, through OLTPS, therefore, will seek to amend the Construction Codes to require that new facilities are constructed with additional resiliency measures for their emergency power systems. New nursing homes also will be required to have emergency generators and electrical pre-connections for external stand-by generators. Adult care facilities will be required to install either emergency generators that are adequately protected or pre-connections to external stand-by generators. OLTPS will propose these requirements to the City Council in 2013.

Healthcare Initiative 5

Require retrofitting of nursing homes in floodplains

Many existing nursing home facilities in the five boroughs are vulnerable to storm surge—a vulnerability that will only grow as the climate changes. The City, through OLTPS, therefore, will seek to amend the Construction Codes to

require nursing homes in the 100-year floodplain to meet standards for the protection of electrical equipment, emergency power systems, and domestic water pumps (if applicable) by 2030. These systems will be protected to the 100-year flood elevation, in accordance with specifications already in the Construction Codes, and will help enable patients to shelter in place safely or reoccupy quickly after a storm. OLTPS will propose these requirements to the City Council in 2013.

Healthcare Initiative 6 **Require retrofitting of adult care facilities in floodplains**

Nineteen adult care facilities in the city are vulnerable to storm surge, including one in the East Shore (New Broadview Manor Home for Adults). The City, through OLTPS, will seek to amend the Construction Codes to require existing adult care facilities located in the floodplain to elevate or protect their electrical equipment to the 100-year flood elevation by 2030, in accordance with the specifications in the Construction Codes. In addition, the City will seek to require these providers to have either emergency generators that are adequately protected or electrical pre-connections to external generators. OLTPS will propose these requirements to the City Council in 2013.

Healthcare Initiative 7 **Support nursing homes and adult care facilities with mitigation grants and loans**

The primary challenge for most nursing homes and adult care facilities in implementing mitigation measures is obtaining financing. Subject to available funding, the City, through NYCEDC and the New York City Department of Health and Mental Hygiene (DOHMH), therefore, will administer competitive grants and subsidized loans to assist providers with mandated retrofit projects. The goal is to launch the program when proposed Construction Code amendments applicable to nursing homes and adult care facilities proposed in this report go into effect, likely in 2013.

Healthcare Initiative 8 **Increase the air conditioning capacity of nursing homes and adult care facilities**

Nursing homes and adult care facilities typically do not have enough emergency power capacity to run their air conditioning systems following the loss of power. This could cause some providers to evacuate during power outages that occur during hot summer months. The City will offer sales tax waivers totaling \$3 million citywide to assist eligible nursing homes and

adult care facilities that install emergency power solutions for air conditioning systems.

Healthcare Initiative 9 **Harden primary care and mental health clinics**

In communities such as the East and South Shores that are at risk of extensive flooding during extreme weather events, primary care and mental health services may be compromised for weeks after a disaster due to extended facility closures. Subject to available funding, the City, through DOHMH and a fiscal intermediary, therefore, will administer a competitive financing program to harden large clinics providing primary care and mental health services in the East and South Shores and other high-need communities. The program will include grants and interest-free loans for capital investments that enable faster recovery of services—for example, installation of emergency power systems, protection of other critical building systems, and wet flood-proofing of facilities. The goal would be for this effort to be launched in late 2013 or early 2014.

Healthcare Initiative 10 **Improve pharmacies' power resiliency**

Pharmacies dispense life-saving medicines essential for those with chronic conditions. However, without power, pharmacists cannot access the necessary patient records or insurance information to dispense these medicines. The City, through DOHMH, will work with pharmacies to improve their ability to leverage generators for power resiliency and address their other emergency preparedness needs including the launch of an emergency preparedness website for pharmacies. This effort already has begun and will continue throughout 2013.

Healthcare Initiative 11 **Encourage telecommunications resiliency in the healthcare system**

In the aftermath of a disaster, it is important that New Yorkers be able to speak to their doctors for guidance on needed medical care. The City, through DOHMH, therefore, will develop a best practice guide and outreach plan to help community-based providers understand the importance of telecommunications resiliency. Resiliency solutions could include using backup phone systems (such as a remote answering service that would not be affected by local weather hazards), Voice over Internet Protocol (VoIP) technology that allows office phone lines to be used off-site, and pre-disaster planning to inform patients of available emergency phone numbers. This effort will begin in 2013.

Healthcare Initiative 12 **Encourage electronic health record-keeping**

Doctors rely on patients' medical records to provide and track care, but paper records may be compromised or destroyed due to extreme weather events. The City, through existing DOHMH programs, therefore, will call upon community-based providers located in the 100-year floodplain and other disaster-prone areas to implement electronic health records (EHR) systems for resiliency. DOHMH's Primary Care Information Project will sponsor initiatives to provide primary care and mental health providers citywide with EHR technical assistance. This effort will begin in 2013.

Beyond the priority healthcare resiliency projects described in Chapter 8, including those summarized briefly above, the City is proposing an additional healthcare resiliency initiative that is specific to the vulnerabilities of the East and South Shores. This initiative is described below.

East and South Shore Initiative 2 **Assist Staten Island University Hospital in applying for hazard mitigation funding**

SIUH, which is home to the largest emergency room in Staten Island and accounts for over one-third of the borough's in-patient beds, has two campuses that are located in areas that are vulnerable to flooding. The City will, therefore, provide technical and other support to SIUH as it seeks to secure FEMA Hazard Mitigation Grant Program funding through the State-administered allocation process. This funding would allow SIUH to implement important flood resiliency measures, as described, in-part, in a needs assessment released by the Staten Island Borough President's Office. The City will consider providing similar assistance to other regional hospitals, as well.

Telecommunications

The city's telecommunications system is essential to individuals and businesses throughout the five boroughs, including in the East and South Shores. While this is true at all times, it is especially true during emergencies. As Sandy demonstrated, however, this system is highly vulnerable to extreme weather events—precisely when telecommunications are most needed. Citywide and in the East and South Shores, Sandy resulted in outages to landlines and mobile service, as well as to data service. The vulnerability of this system likely will grow as the climate changes.

Among the strategies that the City will use to address these challenges for residents, businesses and nonprofits of the East and South Shores and other parts of the city will be to: Increase accountability among providers to promote resiliency; use strengthened City regulatory powers and stronger relationships with providers to enable rapid recovery after extreme weather events; encourage hardening of facilities to reduce weather-related impacts; and increase redundancy to reduce the impact of outages. The initiatives described below provide important examples of how the City intends to advance its telecommunications resiliency agenda citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough telecommunications resiliency plan, please refer to Chapter 9 (*Telecommunications*).

Telecommunications Initiative 1 **Establish an office within the** **Department of Information Technology** **and Telecommunications (DoITT) to** **focus on telecommunications regulation** **and resiliency planning**

While the City has regulatory authority over some aspects of telecommunications service, it has no entity focused broadly on ensuring the resiliency of the public communications networks. The City, therefore, will form within DoITT a new Planning and Resiliency Office (PRO) that will have the resources needed to develop, monitor, and enforce resiliency standards, in close cooperation with State and Federal regulators and providers. DoITT will launch the new office in 2013.

Telecommunications Initiative 2 **Establish new resiliency requirements for** **providers using scheduled renewals of** **the City's franchise agreements**

Flooding caused outages during Sandy in facilities that did not follow the Federal Communication Commission's recommended best practices for resiliency, including flood protection measures. The City, through DoITT, therefore, will encourage and enforce resiliency standards for cable TV providers through the franchise renewal process, and explore options to increase conduit infrastructure redundancy and resiliency. The City will also seek to require standardized outage reporting and publishing. DoITT will launch this effort in 2014, in advance of 2020 franchise renewals.

Transportation

Without the city's expansive transportation system, New York would grind to a halt. This was illustrated starkly during Sandy when outages occurred across the system during and immediately following the storm. These outages severely impacted the residents of the East and South Shores, who found themselves isolated by the shutdown of the Staten Island Ferry, other public transit systems and all Staten Island bridges, as well as by flooding on arterial and secondary roads. The vulnerability of this system will only grow as the climate changes.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and other parts of the city will be to: Make the system more flexible and more resilient; protect critical elements of the system from damage; and seek to maintain system operations during extreme weather events; and, following extreme events, to enable quick recovery, while also putting in place plans for backup transportation options until regular service can be restored. The initiatives described below provide important examples of how the City intends to advance its transportation resiliency agenda citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough transportation resiliency plan, please refer to Chapter 10 (*Transportation*).

Transportation Initiative 1 **Reconstruct and resurface key streets** **damaged by Sandy**

Sandy's waves and flooding caused significant damage to area roadways. The City, through NYCDOT will reconstruct 60 lane-miles of streets that were damaged severely, and will repave approximately 500 lane-miles of streets with damaged surfaces. In the East and South Shores, this will include approximately 3 linear-miles of reconstructed streets, including Father Capodanno Boulevard from Sand Lane to Seaview Avenue, and 12 linear-miles resurfaced, including multiple east-west streets in the South Shore, such as Holton and Page Avenues, south of Hylan Boulevard. Wherever feasible, the reconstructed streets also will include resiliency features to prevent future damage. NYCDOT will launch this initiative in 2013 with funding from Federal and City sources.

Transportation Initiative 3 **Elevate traffic signals and provide** **backup electrical power**

New York's traffic signals—and particularly the controllers that operate these signals and communicate with the NYCDOT Traffic Management Center—are vulnerable to damage from flooding, as well as to power loss from various extreme weather events. Accordingly, the City, through NYCDOT, will raise controllers at approximately 500 intersections in flood-vulnerable locations across the city, including in the East and South Shores. In tandem with this effort to place electrical hardware above the 100-year floodplain elevation, NYCDOT also will install power inverters in approximately 500 NYPD vehicles to allow these vehicles to provide backup electrical power to critical traffic signals. This effort will begin in 2013.

Transportation Initiative 6 **Protect Staten Island Ferry and** **private ferry terminals from climate** **change-related threats**

To allow for quicker restoration of service on the Staten Island Ferry, the East River Ferry, and other ferry services, the City will use Federal Transit Administration Emergency Relief funds to construct physical improvements to the floating infrastructure, loading bridges/gangways, pilings, and piers at both the Whitehall and St. George ferry terminals and at additional ferry landings around the city. NYCDOT will launch this investment immediately.

Transportation Initiative 8 **Call on non-City transportation** **agencies to implement strategies to** **address climate change threats**

Many non-City agencies that own and operate critical portions of New York City's transportation system have already announced resiliency and protection initiatives appropriate to their system. Without such action, the critical facilities managed by these agencies will remain vulnerable to damage and disruption from future weather-related events. The City, therefore, will call on these agencies to implement the initiatives they announced and take additional steps to protect their major transportation assets from climate change threats and prepare for quick restoration following an extreme weather event. Assets that may require hardening and/or preparation measures in the East and South Shores include: Maintenance and operations facilities of the SIR, SIR stations in current or potentially future flood zones, park-and-ride facilities, and approaches to Staten Island bridges. The City will work with these agencies to advance these plans in 2013.

Transportation Initiative 9 **Plan for temporary transit services in the event of subway system suspensions**

When major portions of the subway system are out of service, there simply is not sufficient capacity in the rest of the transit network or the roadway system to carry the increased volume of commuters and other travelers. The City, through NYCDOT, therefore, will work with the MTA and other transportation partners to develop and regularly update formal plans to provide temporary transportation services in such an event, including following extreme weather. These services could take the form of temporary point-to-point ferry service, as, for example, the City put in place following Sandy, connecting Great Kills Harbor and Lower Manhattan. This planning effort will begin in 2013.

Transportation Initiative 10 **Identify critical transportation network elements and improve transportation responses to major events through regular resiliency planning exercises**

Many of the facilities critical to the City's ability to respond effectively to a disaster are vulnerable to disruption and damage during extreme weather events, potentially impairing delivery of emergency services and supplies, as well as impairing the restoration of critical non-transportation infrastructure and economic activity. This vulnerability is expected to increase as the climate changes. To respond better to a variety of different possible transportation outage and restoration scenarios, the City, through NYCDOT, will work with transportation agencies around the region to identify the critical elements of the surface transportation network that need to be available quickly following different types of events. The key tool to identify these networks will be an ongoing series of detailed and multi-disciplinary resiliency planning exercises that will allow NYCDOT and its partners to understand where resources need to be focused before, during, and after an event. This effort will begin in 2013.

Beyond the priority transportation resiliency projects described in Chapter 10, including those summarized briefly above, the City is proposing additional transportation resiliency initiatives specific to the vulnerabilities of the East and South Shores. These initiatives are described below.

East and South Shore Initiative 3 **Implement and expedite roadway and sewer capital projects along Hylan Boulevard, especially in vulnerable South Shore areas**

Hylan Boulevard, a critical transit and roadway asset for East and South Shore communities, will remain flood-prone in low-lying areas even after proposed coastal protection measures are put in-place. The City, therefore, will move forward with capital projects to improve stormwater management and traffic-flow along Hylan Boulevard and in close proximity to the corridor. These projects will include: Three roadway projects paired with the installation of sewers and catch basins by DEP (planned from Butler Boulevard to Mount Loretto, from Cornelia Avenue to Poillon Avenue and from Robinson Avenue to Wiman Avenue); intersection improvement projects at Cleveland and Armstrong Avenues that will bring new paving and sewer and bus pad upgrades; and NYCDOT paving projects in the South Shore, encompassing, among other areas, locations around Great Kills Harbor. The three roadway projects are anticipated to begin between November 2014 and January 2016, the Cleveland-Armstrong project is anticipated to be completed by the end of 2013 and the South Shore projects are anticipated to begin in the summer of 2014.

East and South Shore Initiative 4 **Call on and work with the MTA to create an implementation plan for the relocation of Richmond Valley SIR station to Page Avenue**

The Richmond Valley SIR Station already experiences chronic flooding and lacks sufficient commuter parking. Meanwhile, the closing of the Atlantic and Nassau stations in Tottenville left the Page Avenue commercial area without direct SIR service. To aid recovery on the South Shore, subject to available funding, the City will work with the MTA to study the relocation of the Richmond Valley SIR station to Page Avenue to create a rail and bus hub. The study also will assess the feasibility of a park-and-ride facility at the new location. The City, acting through NYCEDC, will work with the MTA to identify funding for the study and, depending on the study's outcome, any proposals resulting therefrom. The goals of the study will be: To create a more resilient SIR station at higher elevation; to support retail recovery along the Page Avenue commercial corridor; to maximize access to public transportation on the South Shore; and to encourage transit ridership more broadly. The study will take approximately six months to complete after funding is secured.

East and South Shore Initiative 5 **Study potential new ferry routes serving Staten Island and issue a Request for Expressions of Interest (RFEI) to gauge market interest**

Many neighborhoods on the East and South Shores lack fast public transit access to Manhattan. In addition, during extreme weather events, the public and other transit options to which these areas do have access is subject to disruption. As part of its update of its Comprehensive Citywide Ferry Study, which is to provide analyses of options for inter-borough commuter and recreational ferry service citywide, the City will assess the feasibility of additional service on Staten Island. The update, which is fully funded, will analyze possible future service corridors, review possible funding sources, and assess issues of governance and oversight. A public outreach process will aid in the determination of which potential Staten Island landing sites to include in the study. NYCEDC will, in partnership with NYCDOT, lead this study, which is expected to take six to nine months to complete.

Parks

During Sandy, it became clear was that, in addition to serving as neighborhood front yards and recreation centers, in many places, including the East and South Shores, the City's parks literally serve as the city's front line of defense when extreme weather events hit, buffering adjacent neighborhoods. As the climate changes, it will be even more critical that the City's parks be able to play all of these roles.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and elsewhere in the city will be to: Strengthen the city's parks so that they are able to survive weather-related events more effectively and can act as stronger buffers for adjacent communities; and pursue technologies and approaches that will enable the City to monitor, analyze, and prepare the parks system for its many roles in an era of increasing change. The initiatives described below provide important examples of how the City intends to advance its parks resiliency agenda citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough parks resiliency plan, please refer to Chapter 11 (*Parks*).

Parks Initiative 1

Restore city beaches

Beaches play an important recreational role in the East and South Shores and also are a vital component of the area's coastal defenses, but they cannot protect adjacent areas without being "renourished" (replenished with new sand to replace that lost to erosion) from time to time. Subject to available funding, the City, through DPR, will collaborate with Federal and State partners—including the USACE—to implement plans quickly to restore sand lost after extreme storm events and to conduct regular nourishment of beaches and regular monitoring to detect the early signs of erosion. This effort will focus on key beaches, including those on the East and South Shores, such as South Beach, Crescent Beach, and in Tottenville. The goal is to begin this effort in 2013.

To restore the beaches following Sandy, the City, in cooperation with many other City, State and Federal partners, conducted an expedited program of projects to provide new and elevated lifeguard stations and public bathrooms and improvements to other beachfront amenities in advance of Memorial Day 2013. This impressive achievement comprised the first phase of restoring the city's beaches. In the coming months and years, DPR will continue its efforts to provide emergency sand nourishment and to expedite planning, evaluation, and design work for long-term plans to restore the beaches, boardwalks, and other beachfront amenities of the East and South Shores.

Parks Initiative 2

Harden or otherwise modify shoreline parks to protect adjacent communities

About 24 percent of DPR properties (by acreage) are today in the city's 100-year floodplain, and that percentage is expected to grow as sea levels rise—including in areas where the city's parks front residential and commercial districts. Subject to available funding, the City, through DPR, therefore, will study cost-effective ways to use its parks system to protect particularly vulnerable adjacent neighborhoods, ideally identifying mitigation strategies that also protect the parks themselves. Immediate target sites in the East and South Shores include the beaches from New Dorp Beach to Oakwood Beach, as well as at Wolfe's Pond Park, as outlined above under Coastal Protections. The goal is to complete this study in 2014.

Parks Initiative 11

Improve the health and resiliency of the city's urban forest

The city's forests and trees provide an array of health and environmental benefits, but are vulnerable to a variety of climate change-related impacts, including storm surge, wind, and even changes in average temperatures. Subject to available funding, the City, through DPR, will undertake a variety of efforts to protect trees—whether located in natural areas and parks, or along streets. This would include adding forest management crews, identifying locations in which to expand tree beds, and modifying regular tree inspection and pruning efforts to prioritize trees in areas vulnerable to extreme weather events. The goal is for DPR to launch this effort in 2013.

Beyond the priority parks resiliency projects described in Chapter 10, including those summarized briefly above, the City is proposing an additional parks resiliency initiative that is specific to the vulnerabilities of the East and South Shores. This initiative is described below.

East and South Shore Initiative 6

Secure available Federal funding to implement the Community Wildfire Protection Plan for fire-prone areas on the East Shore

Homes, essential infrastructure and the area's residents themselves are at substantial risk of catastrophic wildfires within an area of the East Shore that has been designed as a Wildlife Urban Interface Zone by the federal government. This zone covers the majority of the East Shore, including sections of Oakwood Beach, New Dorp Beach, Midland Beach, and South Beach.

To address this risk, the City, through DPR, will pursue funding for priority wildfire management measures within the Community Wildfire Protection Plan that was created and approved by a variety of City agencies, the National Park Service (NPS), and New York State Department of Environmental Conservation (NYSDEC) in 2012. This approval makes the City eligible to receive Federal funding for certain anti-wildfire pilot initiatives associated with the plan. Pilot initiatives will include: A program to control the population of the invasive and flammable reed *Phragmites*; and a program to create or maintain necessary buffer areas between fire hazard areas and existing residential areas. If the pilot initiatives prove successful, these techniques could be deployed throughout high-risk zones in the East Shore, subject to the identification

of additional funding. Implementation of the pilot measures would begin immediately upon the securing of funding.

Water and Wastewater

The city's water and wastewater system is one of the most complex in the world, not only supplying millions of New Yorkers with safe drinking water in all conditions, but also treating wastewater to enable the area's waterways to remain clean, while draining rainwater to minimize flooding. What happened during Sandy demonstrated the system's vulnerability to a whole host of weather-related threats, ranging from surge and sea level rise, to heavy downpours—threats that are expected to worsen as the climate changes.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and other parts of the city will be to: Protect wastewater treatment facilities from storm surge; improve and expand drainage infrastructure; and promote redundancy and flexibility to make available a constant supply of high-quality drinking water. The initiatives described below provide important examples of how the City intends to advance its water and wastewater resiliency agenda city-wide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough water and wastewater resiliency plan, please refer to Chapter 12 (*Water and Wastewater*).

Water and Wastewater Initiative 1

Adopt a wastewater facility design standard for storm surge and sea level rise

Sandy damaged wastewater treatment plants and pumping stations even though the design of City wastewater facilities typically has taken into account the highest historically recorded water height of nearby water bodies or the BFEs identified in FEMA maps. The City, therefore, will adopt an increased level of protection for design and construction of all wastewater facilities based on the latest FEMA maps, modified to reflect sea level rise projections for the 2050s. DEP will adopt the new design guidelines in 2013.

Water and Wastewater Initiative 2

Harden pumping stations

Many of the city's pumping stations are located in low-lying areas and are necessary to convey wastewater and stormwater out of communities; however, their location also increases their

vulnerability to storm surge. Therefore, subject to available funding, the City, through DEP, will retrofit these pumping stations to improve their resiliency. These retrofits will include raising or flood-proofing critical equipment, constructing barriers, and installing backup power supplies. Preliminary estimates indicate that there are currently 58 at-risk pumping stations, of which several are already scheduled for capital improvements. Subject to available funding, DEP will pursue implementation of resiliency projects in conjunction with repairs and planned capital work, and as appropriate based on the level of risk, historical flooding, and potential community impacts, among other criteria. Among the pumping stations to be considered are 3 in the East and South Shores. The goal is to begin implementation in 2014.

Water and Wastewater Initiative 3 **Harden wastewater treatment plants**

All 14 of the City's wastewater treatment facilities are located along the waterfront and are therefore at risk in the event of a coastal storm. Subject to available funding, the City, through DEP, will protect these critical treatment facilities by raising or flood-proofing assets that are critical to the treatment process, constructing barriers, improving waterfront infrastructure, or implementing redundancy measures to avoid failure of these critical treatment systems. DEP will initially target facilities that have been identified as either most at-risk, or most likely to have impact on adjacent communities and waterways, based on the findings of an in-depth study by DEP. These facilities include the Oakwood Beach Wastewater Treatment Plant. The goal is for DEP to begin implementation of adaptation measures for these and other facilities in 2014 as part of repairs and other planned capital projects.

Water and Wastewater Initiative 8 **Reduce combined sewer overflows (CSOs) with Green Infrastructure**

As climate change brings increasing rainfall volume to the New York area, the city may also experience shifts in the frequency and volume of CSOs. The City will continue to implement its Green Infrastructure Plan and CSO Long-Term Control Plans (LTCPs) to reduce such CSOs. For this purpose, DEP, working with DPR and NYCDOT, will continue to pursue its plan to capture the first inch of runoff in 10 percent of impervious surfaces citywide by 2030. At the same time, DEP also will continue to develop LTCPs to evaluate long-term solutions to reduce CSOs and improve water quality in New York City's waterways. DEP will issue an LTCP for Alley Creek in Queens in 2013, with nine additional waterbody-specific LTCPs and one citywide LTCP to follow through 2017.

Water and Wastewater Initiative 10 **Continue to implement and accelerate investments in Bluebelts across the city**

Some areas of the city—including parts of the East and South Shores—lack a fully built-out storm sewer system. Street flooding can occur, therefore, even during minimal rain events in these areas. The City, through DEP, will, therefore, continue to implement and accelerate its innovative Bluebelt drainage program in areas where opportunities exist to preserve and enhance natural areas including streams, ponds, and other wetlands that remove pollutants before stormwater enters waterways. Through the next decade, DEP will substantially complete the South Richmond Bluebelt in Staten Island and begin to construct a new Bluebelt system on the East Shore of Staten Island. Subject to available funding and environmental review, DEP will also accelerate planning of improvements to Last Chance Pond on the East Shore.

Beyond the priority water and wastewater resiliency projects described in Chapter 12, including those summarized briefly above, the City is proposing additional water and wastewater resiliency initiatives that are specific to the vulnerabilities of the East and South Shores. These initiatives are described below.

East and South Shore Initiative 7 **Launch the first capital project for the Mid-Island Bluebelt in Midland Beach**

Low-lying East Shore communities regularly experience flooding of streets and private property, a challenge that likely will become greater with climate change. A drainage system for these areas, which would include a Bluebelt, would help with recovery from extreme weather events, as well as general stormwater management. The City, therefore, will launch the first capital project relating to the creation of a new Mid-Island Bluebelt, which is planned for the New Creek West Branch, located in the Midland Beach neighborhood—a neighborhood that was impacted severely by Sandy and has been impacted previously by other extreme weather events. To allow this project to commence in 2013, the City will work with non-city agencies to finalize the applicable Environmental Impact Statement, obtain all necessary permits, and begin proceedings and explore additional programs to acquire necessary property.

East and South Shore Initiative 8 **Explore expansion of the City's mitigation banking pilot as a funding mechanism to facilitate the construction of the Mid-Island and South Shore Bluebelts**

As described above, Bluebelts have been proven to help mitigate a variety of climate change-related risks. However, their construction is also expensive. To facilitate and accelerate the launch of Bluebelt initiatives citywide, including in the East and South Shores, the City will explore opportunities to develop a freshwater wetland mitigation banking program. Since the early 1990s, more than 900 mitigation banks have been created in 28 states across the country. A mitigation bank in New York could help fund an estimated 50 acres of planned wetland enhancement projects in the Mid-Island Bluebelt and another 11 acres of wetland restoration associated with the South Shore Bluebelt. The development of a pilot mitigation bank will be advanced by NYCEDC in 2014.

Other Critical Networks: **Food Supply**

Though the food supply chain generally emerged intact following Sandy, in certain local areas, residents found themselves without access to basic sustenance after the storm. In addition, had Sandy played out just a little differently, it is possible that significant links in the food supply chain—including the food distribution center in Hunts Point in the Bronx—could have been seriously threatened. As the climate changes, it is likely that risks such as these will grow.

Although initiatives outlined in several other sections above are important contributors to the overall resiliency of the food supply network (including especially those addressing utilities, liquid fuels, and transportation), the City also will pursue food-specific strategies to meet this goal for the benefit of residents of the East and South Shores and other parts of the city. These strategies will involve calling for resiliency investments at the most significant food wholesaling and distribution centers in the city and addressing issues relating to retail access in the event of extreme weather. The initiatives in Chapter 13 describe how the City intends to advance its food supply resiliency agenda citywide. These initiatives will have a positive impact on the residents, businesses, and non-profits of the East and South Shores. For a complete description of the City's five-borough food supply resiliency plan, please refer to Chapter 13 (*Other Critical Networks*).

Other Critical Networks: Solid Waste

On a daily basis, the solid waste collection system in New York disposes of more than 12,000 tons of waste and recycling in a safe and sanitary fashion. Unlike many other critical City systems, during Sandy this one proved remarkably resilient, resuming many of its normal functions almost immediately after the storm. In fact, thanks to the efforts of the City's Department of Sanitation, even as the agency was dealing with its own storm-related challenges, it was able to assist with the recovery of the East and South Shores and the larger city by collecting the debris left by the storm in an organized and efficient manner.

However, the system does face real issues. For example, during Sandy, the city's solid waste disposal system experienced interruptions that interfered with its ability to convey refuse out of the city to its ultimate destination. Additionally, as the climate changes, it is likely that this system will become more vulnerable to extreme weather.

Among the strategies that the City will use to address these challenges for residents of the East and South Shores and other parts of the city will be to: Harden critical City-owned solid waste assets to protect them from extreme weather-related impacts; and seek to improve the resiliency of the broader solid waste network—both City- and third-party-owned—enabling it to resume operation quickly should disruptions occur. The initiatives in Chapter 13 describe how the City intends to advance its solid waste resiliency agenda citywide. These initiatives will have a positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a complete description of the City's five-borough solid waste resiliency plan, please refer to Chapter 13 (*Other Critical Networks*).

Environmental Protection and Remediation

Sandy showed that extreme weather events—which are likely to increase in severity with climate change—not only have the potential to impact the city's people, built environment, and critical systems, they also can have a deleterious impact on the natural environment. To help minimize the impact of future extreme weather on the environment, the City will advance a range of initiatives to protect open and enclosed industrial sites containing hazardous substances in an economically feasible way, and to encourage the cost effective remediation and redevelopment of brownfields in a re-

silient fashion. These initiatives will have a positive impact on the residents, businesses and nonprofits of the East and South Shores, which is home to 674 industrial businesses, and on the city as a whole. For a complete description of the City's five-borough environmental protection and remediation plan, please refer to *Environmental Protection and Remediation*.

Community and Economic Recovery

New York is a city of neighborhoods, and these neighborhoods vary widely in size and nature. Notwithstanding this variety, successful neighborhoods across the city tend to share certain traits. Two of these are: a formal and informal network of community members who help and support one another in good times and bad; and vibrant commercial and nonprofit sectors that employ and provide goods and services to the people of the community.

As Sandy demonstrated, however, both the network of community-based organizations and the commercial and nonprofit sectors in New York's neighborhoods can be sorely tested when extreme weather hits. During these times (when contributions from these networks and sectors are desperately needed) these organizations and businesses themselves are frequently coping with the same set of challenges that the community at large is—a circumstance that can push even the most well-run organization or business to the breaking point. Even with these pressures, during and in the immediate aftermath of Sandy, New York's commercial and nonprofit sectors overcame many of their own difficulties, playing a critical role in the recovery of neighborhoods across the city, including the East and South Shores. However, as the climate changes, difficulties such as these will likely arise more frequently, testing institutions mightily.

Among the strategies that the City will use to achieve the goal of making its neighborhoods and their critical institutions more resilient will be to: Help build grassroots capacity and foster community leadership; help businesses and nonprofits impacted by Sandy to recover; help businesses and nonprofits in vulnerable locations to make resiliency investments that will better prepare them for future extreme weather; and bring new economic activity to neighborhoods recovering from the impacts of Sandy to enable these neighborhoods to come back even stronger than before.

The initiatives described below provide important examples of how the City intends to advance its community and economic recovery agenda citywide. These initiatives will have a

positive impact on the residents, businesses, and nonprofits of the East and South Shores. For a full explanation of the following initiatives and a complete description of the City's five-borough community and economic recovery plan, please refer to *Community and Economic Recovery*.

Community Preparedness Initiative 1 Identify and address gaps in community capacity

The capacity of a community to organize to aid businesses and residents after an extreme weather event or other disaster is a strong predictor of the success of that community's recovery. To improve the capacity of vulnerable communities OEM, working with the NYC Center for Economic Opportunity (CEO), will undertake a pilot assessment of the strengths and weaknesses of a Sandy-impacted community—which could be neighborhoods in the East and South Shores—to inform the creation of a plan to address needs uncovered by the assessment. Subject to available funding, OEM and CEO will choose a pilot community and begin their study in 2013.

Community Preparedness Initiative 2 Continue and expand OEM's Community Emergency Response Teams

OEM currently trains 54 teams of 1,500 volunteers across the city, which staff Community Emergency Response Teams (CERTs). Before, during, and after disasters, including extreme weather events, members of these teams help to organize community disaster preparedness and participate in emergency response and recovery. Going forward, OEM will work with communities to create additional teams, ensuring that these volunteers are as representative as possible of the communities that they serve. OEM, working with CEO, will identify low-income young adults to be trained to lead their communities in disaster preparedness. OEM and CEO will launch this program by 2014.

Economic Recovery Initiative 1 Launch business recovery and resiliency programs

During Sandy, over 27,000 businesses citywide, including approximately 1,300 in the East and South Shores, were inundated by the storm. For many, recovery has been challenging. To assist with this recovery, immediately after the storm, the City launched the series of programs (described in *Community and Economic Recovery*), including a \$25 million loan and grant program and a \$25 million sales tax waiver program de-

signed to help businesses get back on their feet. Building on the momentum of these programs, which have assisted over 2,500 businesses as of the writing of this report, the City, through NYCEDC, will launch the CDBG-funded Business Resiliency Investment Program of up to \$100 million to help vulnerable businesses throughout the city make resiliency investments in their buildings and equipment, and the Business Loan and Grant Program of up to \$80 million will assist businesses with recovery and rebuilding efforts. NYCEDC will launch these programs in 2013.

Economic Recovery Initiative 2 **Launch the Neighborhood Game** **Changer Competition**

The recovery of many of the communities impacted by Sandy, including the East and South Shores, has been hampered by a lack of opportunities for economic advancement and employment among significant populations that were impacted by the storm. In many cases, these challenges existed even before Sandy, but have been exacerbated by the impacts of the storm. To address this, the City, through NYCEDC, will launch the CDBG-funded Neighborhood Game Changer Competition to invest up to \$20 million in public money in each of the five communities on which this report focuses, including the East and South Shores. This funding will be available on a competitive basis to help finance transformational projects. To win the competition, a project will have to spur incremental economic activity, generate new employment opportunities, and match public funding with significant private capital. Projects that would be eligible to be funded in the East and South Shores through this competition could include new attractions bringing new visitors, significant new operations of a major business or nonprofit, the revitalization of important commercial corridors, the expansion of an existing neighborhood institution, or a major new transportation option. NYCEDC will launch this program in 2013.

Economic Recovery Initiative 3 **Launch Neighborhood Retail** **Recovery Program**

At the core of many Sandy-impacted neighborhoods are the local commercial corridors that provide employment opportunities and services to those who live and work around them. They include local retailers, institutions, and service providers—such as food markets, pharmacies, social service organizations, laundromats, and others. In many cases, though, these corridors were devastated by the storm. To address this, the City will call on the PSC and Con Edison to amend the preferential Business Incentive Rate (BIR) program, which offers a dis-

count on Con Edison's electric delivery charges, to allow it to be extended to impacted small businesses in the five communities on which this report focuses, including the East and South Shores. Businesses and nonprofits with 10 or fewer employees that have received support from City-sponsored loan and grant programs will be eligible for the discount for five years up to a maximum discount of \$50,000 per business or nonprofit. The goal is for NYCEDC to launch this effort in 2013. The maximum aggregate benefit available across the East and South Shores will be \$1 million. Among the corridors where the benefit will be available in the East and South Shores include:

- Great Kills Harbor (full length of Mansion Avenue; portion of Buffalo Street, adjoining Nichols Marina);
- Hylan Boulevard (between Seaver Ave and New Dorp Lane);
- Main Street Tottenville (between Ellis Street and Amboy Road);
- Midland Avenue (between Mason Avenue and Father Capodanno Boulevard);
- Page Avenue Corridor (all streets between Arthur Kill Road, Nassau Place/Bethel Avenue, Amboy Road, Page Avenue, and Route 440);
- Sand Lane (between McClean Avenue and Father Capodanno Boulevard) and Robin Road (between Arthur Avenue and Sand Lane); and
- Seaview Avenue (between Hylan Boulevard and Patterson Avenue).

Economic Recovery Initiative 4 **Support local merchants in** **improving and promoting local** **commercial corridors**

As mentioned above, Sandy highlighted the important role played by local commercial corridors in many communities impacted by the storm. The City, through the Department of Small Business Services (SBS), will provide financial and/or technical assistance to area business improvement districts (BIDs), merchant associations, and other groups that work to improve, market, maintain, and otherwise promote primary commercial corridors. Subject to review of applications received, SBS will prioritize Sandy-impacted commercial corridors in allocating its resources, including its CDBG funding. Such funding could be used for a variety of purposes, including capacity building, façade improvement programs, streetscape improvements, and business recruitment and marketing efforts. In the East and South Shores, corridors that could receive this additional assistance include corridors in South Beach, Midland Beach, and Tottenville. SBS will provide this assistance beginning in 2013.

Economic Recovery Initiative 5 **Continue to support the FRESH program** **to increase the number of full-line** **grocers in underserved neighborhoods**

Even before Sandy, the residents of many communities impacted by Sandy, including parts of the East and South Shores, lacked adequate access to fresh fruits, vegetables, and other healthy foods. Noting this challenge, especially in underprivileged areas of the city, in 2009, the City launched the FRESH (Food Retail Expansion to Support Health) program, a series of zoning and financial incentives available to supermarkets to fill this gap in neighborhoods underserved by grocery retail. To promote the recovery of commercial corridors in these areas, the City will continue to support the FRESH program, with a particular focus on Sandy-impacted neighborhoods, including those in the East and South Shores.

Economic Recovery Initiative 6 **Reassess commercial properties citywide** **to reflect post-Sandy market values**

After Sandy, many commercial properties were worth less than before the storm. To reflect this fact and to help with recovery from the storm, the City has reassessed more than 88,000 properties impacted by the storm citywide. Overall, these reassessments have lowered the tax burden on Sandy-impacted properties—including both commercial and residential properties—by over \$90 million, with commercial properties in neighborhoods impacted by Sandy receiving a reduction, on average, of approximately 10 percent off of their pre-storm assessed values.

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In addition to the measures described above, the City will advance the following initiatives to address the community and economic recovery needs of the East and South Shores.

East and South Shore Initiative 9 **Issue a Request for Expressions of** **Interest (RFEI) for new concessions and** **services at City-controlled beaches in** **the East Shore**

Damage inflicted by Sandy was particularly devastating to the East Shore's public beachfront, affecting the economic recovery of nearby commercial corridors and communities. In response, the City will issue an RFEI to help these public areas reemerge as resident and visitor destinations. The RFEI will call for ideas to activate select, strategic locations within publicly-owned lands between the FDR Boardwalk, the promenade, and Father Capodanno Boulevard.

This could include locations across from Ocean Breeze Park, at the Midland Beach Entrance Plaza, on the southern end of Midland Beach, and at New Dorp Beach. An activated beachfront would help to support local retail and business recovery, encourage private investment and development in nearby communities, provide jobs and services for local residents, and support current and planned DPR investments in the beachfront and adjacent areas. A wide range of amenities and services will be considered, including but not limited to: Eating and drinking establishments; concessions; and recreational facilities (such as bicycle rental facilities; kayak rental facilities; beach volleyball facilities; and outdoor fitness facilities). NYCEDC and DPR will issue this RFEI in 2013.

East and South Shore Initiative 10 **Create a comprehensive revitalization plan for Great Kills Harbor to increase resiliency and to draw additional investment**

Most of the six marinas and waterfront restaurants along Great Kills Harbor suffered significant damage from Sandy. Subject to available funding, the City, therefore, will launch a study that will seek to improve both the resiliency of the Harbor and the quality of life for the surrounding community. Even before Sandy, the Harbor held untapped economic and recreational potential. With the help of residents, business owners and other stakeholders, the City, through NYCEDC, will generate strategies to: Help Great Kills Harbor to rebuild; identify design improvements to protect the surrounding residential neighborhoods in future storms; explore partnerships between Federal, City and private recreation organizations; attract new commercial activity; and identify physical, circulation, parking, and design improvements for the area. The strategies developed as part of this plan could also be applicable to other marinas on the South Shore, such as Lemon Creek Marina. The goal is to complete this study within approximately six months after funding is secured.

East and South Shore Initiative 11 **Create a strategic plan for public recreational land, including the beachfront recreation areas and open space**

In many parts of the East and South Shores, there is poor access to and connections between national parkland, City parkland, and the beachfront on the East and South Shores, handicapping the potential of these assets to improve quality of life and contribute to the recovery of local communities. Subject to available funding, the City, through NYCEDC and DPR, therefore, will study the feasibility of ameliorating this situation, through investments that could include: a completed and improved greenway (that may incorporate the Amundsen Trailway) along the beachfront with a link to Great Kills Park; improved coordination between the City and the National Park Service; the creation of view corridors in natural areas; and the creation of public/private partnerships to operate and maintain these connections. The goal would be to complete this effort within approximately six months after funding is secured.

East and South Shore Initiative 12 **Implement planned and ongoing investments by the City and private partners**

Preservation and revitalization of neighborhoods most significantly impacted by Sandy will be hampered if the momentum of planned investments is lost. The City, therefore, will continue to pursue and execute on public and private investments that had been planned prior to Sandy in the East and South Shores and adjacent communities. Such projects include but are not limited to:

Parks and Open Space Projects

- *Ocean Breeze Track and Field Athletic Complex*, a 2,500-seat, state-of-the-art indoor track and field facility, funded with \$72.7 million in City capital.

Community Facility Projects

- *Charleston Mixed-Use Development*, an approximately 60-acre City-owned property that is to be redeveloped into a new park, senior housing, a public school, a public library branch, and new retail space.

Economic Development

- *New Stapleton Waterfront (Homeport) Redevelopment*, a 35-acre decommissioned naval base that is to be transformed into a vibrant waterfront community, the first \$140 million phase of which transformation is expected to break ground in summer 2013 and is to include two new residential buildings with 27,000 square feet of retail space and \$33 million in City-funded infrastructure and open space improvements.
- *St. George Waterfront Redevelopment*, which is to include the world's tallest Observation Wheel and a high-end outlet retail complex and hotel that, together, will attract \$480 million in private investment to St. George.
- *Former Coast Guard Site Development*, a \$250 million development plan for an abandoned Coast Guard site in St. George, with a first phase that is to consist of 53,000 square feet of retail space.
- *Brielle Avenue Municipal Site*, a 46-acre, City-owned site, formerly known as Farm Colony, in connection with which the City is, as of the date of this report, reviewing RFP responses for redevelopment.

