

Resilient Neighborhoods

Harding Park





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Harding Park

THE CITY OF NEW YORK
MAYOR BILL DE BLASIO

DEPARTMENT OF CITY PLANNING
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www.nyc.gov/resilientneighborhoods

FOREWORD

Harding Park is a waterfront community on the shorelines of the Bronx and East Rivers. This waterfront setting is one of the main reasons generations of families choose to live in these neighborhoods, but it is also what makes them vulnerable to flooding, a vulnerability likely to increase in the future.

Hurricane Sandy starkly demonstrated the hazards facing New York City's coastal neighborhoods, like Harding Park. The storm also highlighted these communities' resiliency—their ability to bounce back from the storm and to strengthen themselves for the next one.

Since the storm, the Department of City Planning (DCP) has been working on both the citywide and local level with communities and other agency partners to increase the resiliency of all five boroughs' coastal neighborhoods. Our work includes a citywide flood resiliency zoning text amendment that changes zoning in the floodplain to make it easier and more cost-effective for property owners to retrofit their buildings, and guidelines, such as *Retrofitting Buildings for Flood Risk* and *Urban Waterfront Adaptive Strategies*, that help designers, planners, and residents plan for and adapt to the risks of flooding.

As a complement to these citywide efforts, DCP has been working with various communities in all five boroughs where there was particularly heavy damage from Sandy or substantial flood risks still exist. DCP's Resilient Neighborhoods, an initiative funded by the U.S. Department of Housing and Urban Development, focuses on areas that present specific land use, zoning and resiliency issues that cannot be fully addressed by citywide zoning changes or guidelines.

This report marks the culmination of over two years of research, outreach and hard work by DCP, working closely with the community of Harding Park to reduce immediate flood risks and plan for adaptation over time by encouraging development that is resilient while also respecting each neighborhood's built environment and enhancing its context. Residents will find here recommendations for updating specific zoning and land use regulations, and for investments in coastal infrastructure and other programs.

These recommendations illustrate the importance and effectiveness of strengthening New York City's resiliency through place-based planning, alongside the other city, state, and federal agency projects. This plan is the beginning of a conversation and a commitment to work with Harding Park to ensure their ongoing vibrancy and resiliency.



Carl Weisbrod, Director
Department of City Planning

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EXECUTIVE SUMMARY

Hurricane Sandy's devastating impacts on neighborhoods within New York City served as a vivid reminder of the city's vulnerability to coastal storms and flooding. With climate change, storms like Sandy are expected to increase in frequency and severity in the future, putting New Yorkers living and working near the waterfront at even greater risk. Yet, as Sandy also demonstrated, resilient building design can significantly reduce the damage caused by flooding and enable homes and businesses to be reoccupied sooner. By combining resilient building with thoughtful land use planning and strategic investment in infrastructure, the city can adapt to challenging environmental conditions over time and create neighborhoods that are both vibrant under ordinary conditions and able to withstand and recover quickly from future floods.

Resilient Neighborhoods is a place-based planning initiative, led by the New York City Department of City Planning in collaboration with communities and other agencies, to identify strategies to support the vitality and resiliency of ten neighborhoods in the city's floodplain. This report provides details on retrofitting single-family homes and bungalows for flood risk, as well as recommendations for implementing coastal protection measures and managing stormwater through green infrastructure.

The City's work in the neighborhood of Harding Park has been guided by three primary goals:

Reducing flood risk

Pursue improvements to waterfront open spaces with green infrastructure strategies to prevent erosion and manage stormwater while providing public open space and enhancing connectivity.

Planning for adaptation over time

Enable buildings to be retrofitted or rebuilt to withstand flooding and other hazards while minimizing disruption to residents through removing common zoning barriers citywide.

Creating resilient, vibrant neighborhoods

Support the continuing vitality of Harding Park, considering both short-term and long-term challenges, by working with the homeowner's association to promote an understanding of how current and future flood risk will affect the community and exploring how residents might invest in resiliency measures to protect their property and safety.

In addition, this report provides a detailed description of the outreach, research, and analysis conducted, as well as an overview of the planning framework and regulatory context for these efforts. A glossary of key terms is provided following the conclusion.

The recommendations outlined in this report include specific actions to be undertaken in the short-term, as well as broader strategies that can guide an ongoing response to evolving risks and changing conditions, to promote equity, livability, and safety.

COVERED PORCH / STAIR-TURN
STREETSCAPE MITIGATION
STRATEGIES

SPACE BELOW
HOME IS STORAGE / ACCESS
ONLY

RESILIENT HOMES:
ELEVATED TO REQUIRED
DESIGN FLOOD ELEVATION

MIX OF OPEN SPACE
+ VEGETATED COVERAGE

MIX OF SALTWATER
MARSH PLANT LIFE.

PEDESTRIAN
WALKWAY

PEDESTRIAN
CIRCULATION

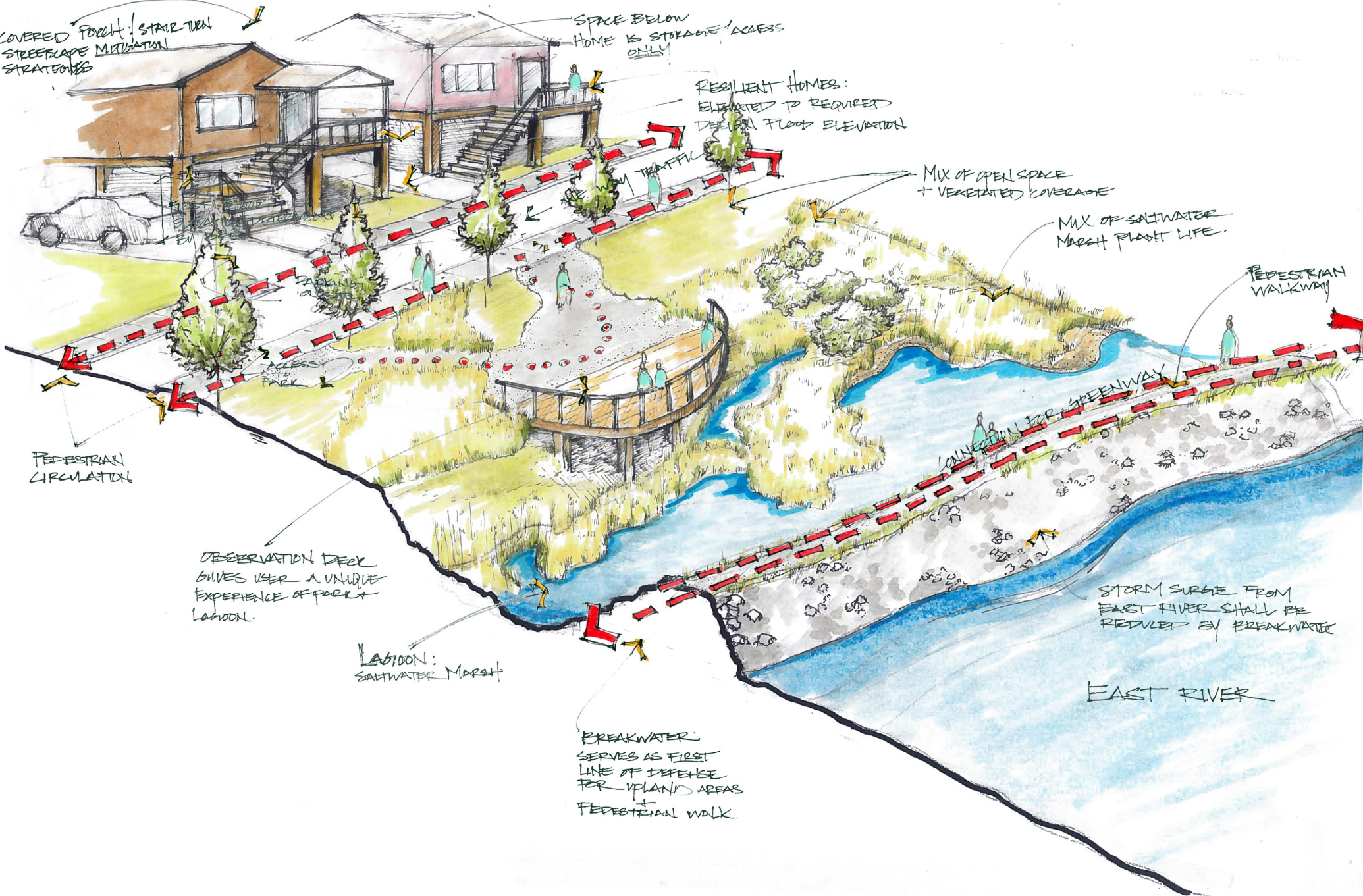
OBSERVATION DECK
GIVES USER A UNIQUE
EXPERIENCE OF PARK
LOOON.

LAGOON:
SALTWATER MARSH

BREAKWATER:
SERVES AS FIRST
LINE OF DEFENSE
FOR VLAND AREAS
+
PEDESTRIAN WALK

STORM SURGE FROM
EAST RIVER SHALL BE
REDUCED BY BREAKWATER

EAST RIVER



INTRODUCTION

Resiliency Planning in New York City

Following Hurricane Sandy in October 2012, the City developed *A Stronger, More Resilient New York*, which laid out a detailed action plan for rebuilding post-Sandy and making the city's coastal communities, buildings, and infrastructure more resilient in the long-term. The City has made significant progress implementing the plan, including funding a \$20 billion climate resiliency program, advancing housing recovery through the Build it Back program, and making long-term resiliency a reality by investing in infrastructure upgrades. Drawing on this work and earlier planning efforts, the City released in Spring 2015 *OneNYC: The Plan for a Strong and Just City*, a long-term strategy to address the city's most pressing challenges, including a rapidly growing population, rising inequality, aging infrastructure, and climate change.

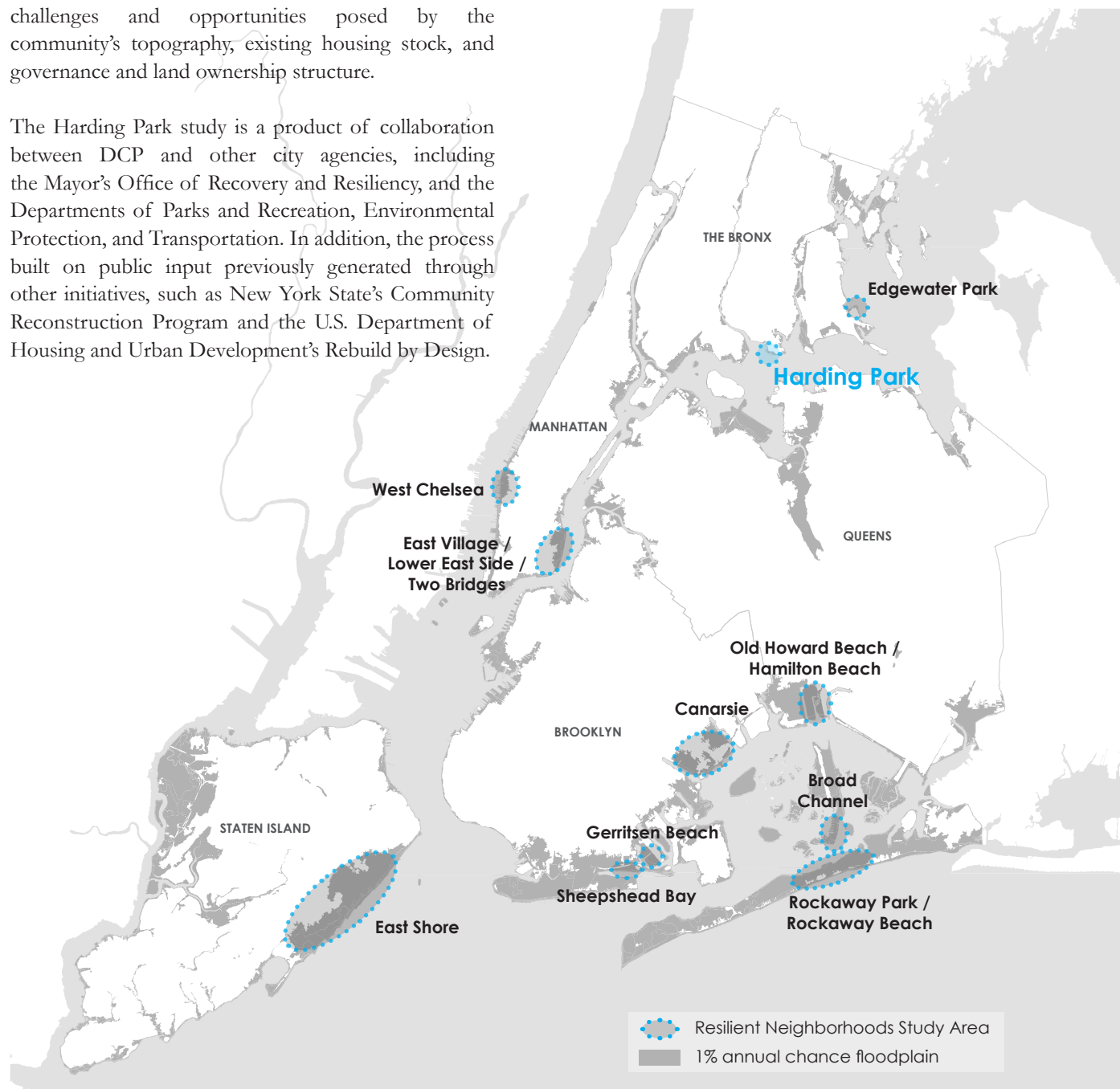
Resilient Neighborhoods

One of the projects described in *OneNYC* is Resilient Neighborhoods, a place-based planning initiative to identify tailored strategies, including zoning and land use changes, to support the vitality and resiliency of communities in New York City's floodplain. Based on collaboration with residents, stakeholders, elected officials, and other City agencies, the initiative focuses on ten study areas located in all five boroughs that represent a variety of demographic and built conditions. The Department of City Planning (DCP) identified these study areas because they present specific land use, zoning, and other resiliency issues that cannot be fully addressed by citywide zoning changes.

While the Bronx fared better during Sandy than other areas of the City, many communities within the borough are at risk from future storms. As a former summer campground on the shores of the Harlem and East Rivers that has retained much of its historic, rustic charm, Harding Park was selected for this initiative due to the unique flood risk management

challenges and opportunities posed by the community's topography, existing housing stock, and governance and land ownership structure.

The Harding Park study is a product of collaboration between DCP and other city agencies, including the Mayor's Office of Recovery and Resiliency, and the Departments of Parks and Recreation, Environmental Protection, and Transportation. In addition, the process built on public input previously generated through other initiatives, such as New York State's Community Reconstruction Program and the U.S. Department of Housing and Urban Development's Rebuild by Design.





INTRODUCTION

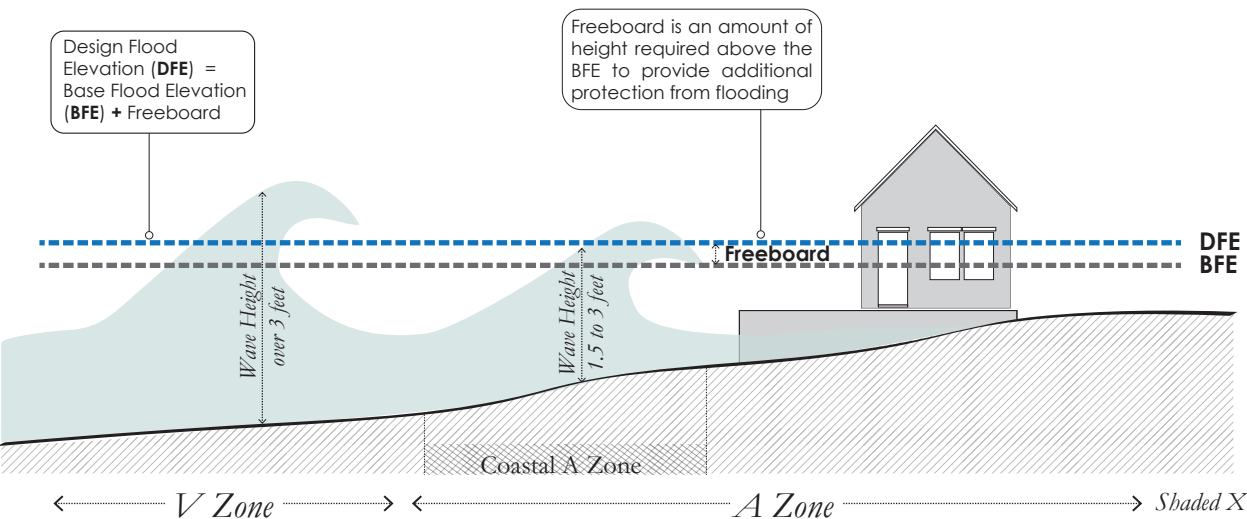
Regulatory Context

A wide array of programs and regulations at various levels of government shape the City’s approach to managing flood risk and promoting resilient development. In the United States, floodplain regulation begins with Flood Insurance Rate Maps (FIRMs), which the Federal Emergency Management Agency (FEMA) creates and maintains. The maps show the extent and elevation to which flood waters are expected to rise during a 100-year flood or a flood that has a 1% chance of occurring in any given year. The elevation of the expected 1% annual chance flood is called the Base Flood Elevation or BFE. FIRMs also show the 500-year or 0.2% annual chance floodplain, which is shown as the Shaded X Zone.

The 1% annual chance floodplain is divided into three areas -- the V Zone, Coastal A Zone, and A Zone -- each associated with a different degree of flood risk. The diagram to the right illustrates these zones and the types of flood risk in each.

The 1% annual chance floodplain is also the area where property owners with federally-regulated or federally-insured mortgages are required to carry flood insurance. For residential structures, flood insurance premiums under FEMA’s National Flood Insurance Program (NFIP) are determined by the relationship between the lowest occupied floor of the structure and the BFE shown on the FIRMs at the structure’s location, as well as other factors. Homes built before the FIRMs were established have historically been offered subsidized insurance rates. However, due to recent federal legislative changes, those subsidized rates are gradually increasing to come in line over time with actuarial rates more closely reflecting the flood risk a home faces.

For the past several years, FEMA has been in the process of updating the FIRMs for New York City, which were implemented in 1983 and most recently updated in 2007. As part of the mapping update, FEMA issued



	ELEVATE	WET FLOODPROOF	DRY FLOODPROOF
	Open structure Eg. Open lattice	Water to run in / run out Eg. Flood vents	Watertight structure Eg. Flood shields
Ground Floor Configuration	<p><i>Bottom of <u>lowest horizontal structural member</u> to be at or above Design Flood Elevation</i></p>	<p><i><u>Lowest occupiable floor</u> to be at or above Design Flood Elevation</i></p>	<p><i><u>Lowest occupiable floor</u> allowed to be excavated below grade. (Not permitted for residential buildings)</i></p>
Permitted Uses (BELOW DFE)	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Parking<input checked="" type="checkbox"/> Access<input checked="" type="checkbox"/> Storage<input checked="" type="checkbox"/> Non-Residential<input checked="" type="checkbox"/> Residential	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Parking<input checked="" type="checkbox"/> Access<input checked="" type="checkbox"/> Storage<input checked="" type="checkbox"/> Non-Residential<input checked="" type="checkbox"/> Residential	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Parking<input checked="" type="checkbox"/> Access<input checked="" type="checkbox"/> Storage<input checked="" type="checkbox"/> Non-Residential<input checked="" type="checkbox"/> Residential

updated Preliminary FIRMs (PFIRMs) in December 2013 with another revision in January 2015. In most places, these PFIRMs show an expanded 1% annual chance floodplain. The maps also heighten Base Flood Elevations for much of the city. The City has filed an appeal of the PFIRMs because they overstate the size of the city's 1% annual chance floodplain due to inaccuracies in FEMA's underlying analysis. The City is committed to resolving the appeal and adopting accurate flood maps as quickly as possible.

Flood Resilient Construction and Building Design

The primary purpose of the FIRMs is to establish parameters for NFIP, based on present-day flood risk. However, the same maps also establish where federal minimum standards for flood resistant construction apply. These standards are enacted through the New York City Building Code's Appendix G on "Flood-Resistant Construction," which as of 2013 applies to the 1% annual chance floodplain shown on FEMA's PFIRMs or the 2007 effective FIRMs, whichever of the two is more restrictive. Appendix G includes different elevation and floodproofing requirements for each flood zone, as well as separate requirements for residential and non-residential structures. Appendix G also includes rules requiring that most residential and commercial developments be floodproofed an additional one or two feet of "freeboard" above the FEMA-designated BFE. The elevation of the BFE plus freeboard is called the Design Flood Elevation (DFE).

To fully comply with Appendix G requirements, residential buildings must elevate all living space to be at or above the DFE, and any enclosed space below the DFE must be wet floodproofed. Non-residential buildings (any building that contains non-accessory non-residential floor area) have the option of elevating and wet floodproofing, or dry floodproofing. Where there is a mix of residential and non-residential uses, dry

floodproofing is allowed, but no dwelling units may be located below the DFE. Full compliance with Appendix G results in lower NFIP premiums.

Buildings that are neither new, "Substantially Damaged," nor "Substantially Improved" (see glossary) are not required to meet Appendix G requirements as long as any changes to the building do not increase the level of noncompliance, but owners may voluntarily choose to implement partial flood mitigation strategies including elevating or floodproofing a building's mechanical systems. These measures may not currently result in lower NFIP premiums, but will reduce a building's overall vulnerability to future floods and enable the building to be reoccupied more quickly in the aftermath of a flood.

Citywide Zoning for Flood Resiliency

The City has instituted a series of zoning changes that remove impediments to retrofitting residential and commercial properties and accommodate many of the aforementioned building regulations. The first of these changes was an emergency Executive Order, issued in January 2013, which suspended height and other restrictions to the extent necessary for property owners to rebuild after Sandy. The City Council adopted many of these changes as the Flood Resilience Zoning Text Amendment in October 2013. This text amendment created allowances for measuring building height from the latest FEMA flood elevations (including freeboard required by building code), providing access from grade to elevated buildings, locating mechanical systems above flood levels, accommodating off-street parking requirements, and allowing reallocation of floor space that is abandoned and wet floodproofed. It also incorporated provisions to mitigate adverse streetscape impacts. The rules, still in effect, apply to all buildings in the PFIRM 1% annual chance floodplain.

Regulatory Context Summary

- The Federal Emergency Management Agency (FEMA) creates Flood Insurance Rate Maps (FIRMs) that show the extent and elevation of the 1% and 0.2% annual chance floodplains.
- FEMA also administers the National Flood Insurance Program (NFIP).
- The New York City Building Code's Appendix G on Flood-Resistant Construction applies within the 1% annual chance floodplain.
- The Department of City Planning works to create zoning, which controls the size and use of buildings, to accommodate flood resilient building regulations and remove impediments to flood resilient construction.

RESILIENCY ASSESSMENT



The resiliency assessment evaluates coastal risks, the capacity of neighborhoods to adapt to these risks, and the potential to align adaptation options with other policy goals or community priorities. The objective is to determine which hazards and vulnerabilities are present within a neighborhood and evaluate the potential for adaptive strategies, such as retrofitting buildings or creating new coastal protection infrastructure, to reduce these vulnerabilities.

Ongoing community outreach

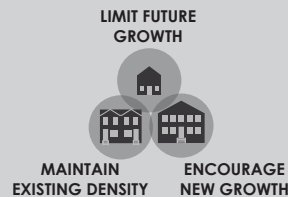
ESTABLISH RESILIENCY FRAMEWORK



The resiliency framework uses the results of the resiliency assessment to envision the range of changes necessary to make the neighborhood more resilient, which might include coastal protection, infrastructure investments, changes to regulations, and community education, among other strategies.

Ongoing community outreach

SELECT LOCAL RESILIENT LAND USE STRATEGIES



Across the city, there is a spectrum of potential land use strategies that can be used as appropriate to achieve the goals envisioned in the resiliency framework. In areas that are at significant risk from future frequent tidal flooding due to sea level rise, as well as more severe flooding from extreme events, it will often make sense to limit growth. In other areas where buildings are at risk of flood damage primarily from extreme events, there may be ways to alter regulations to promote retrofits. Where growth can be supported, increasing densities may promote investment in resilient buildings that will reduce risks of flood damage. More than one type of land use strategy may be appropriate in different parts of a neighborhood, based on flood risk and other planning considerations.

Ongoing community outreach

IMPLEMENT RESILIENCY STRATEGIES



Resiliency strategies can be implemented through a range of tools, including but not limited to zoning changes, changes to other City, State, or Federal regulations, operational measures, education and outreach, financial assistance, construction or upgrades of infrastructure, and emergency preparedness training. A combination of tools enacted at different scales and amongst different stakeholders is likely to be necessary to fully implement a set of resiliency strategies.

DCP anticipates advancing another amendment that will make permanent the basic provisions set forth in the 2013 text, and potentially address resiliency challenges identified since then, to make it easier for property owners to make existing and new buildings resilient to current and future flood risks, while supporting the vibrancy and character of neighborhoods.

Planning Approach for Resiliency

The ten Resilient Neighborhoods study areas each exhibit a variety of physical, environmental, social, and economic conditions, the combination of which creates a distinct set of resiliency challenges, and different potential strategies for addressing them. To account for this diversity of contexts and to ensure that a consistent planning approach underpins the City's resilient land use goals, DCP developed a four-step process for coordinated analysis to guide risk-based decision-making. The diagram shown to the left explains this approach and the latter half of this report details the strategies and recommendations generated for Harding Park using this process.

Outreach Process

The Department of City Planning met with the Harding Park Homeowner's Association and others in late 2013 to launch a neighborhood resiliency study in the community. DCP has maintained an ongoing relationship with stakeholders in Harding Park and developed a collaborative vision of resiliency measures that can be undertaken at both the public (City and State) and private (homeowner's association and homeowner) level. These include site-specific strategies that protect buildings and mitigate stormwater and flooding on individual properties, as well as more comprehensive strategies such as reducing impervious surfaces and installing green infrastructure within the community. Continued outreach with the Homeowner's Association and other City agencies will be necessary to advance these concepts.



Site tour of Harding Park.

COMMUNITY RISK PROFILE

Community Character and History

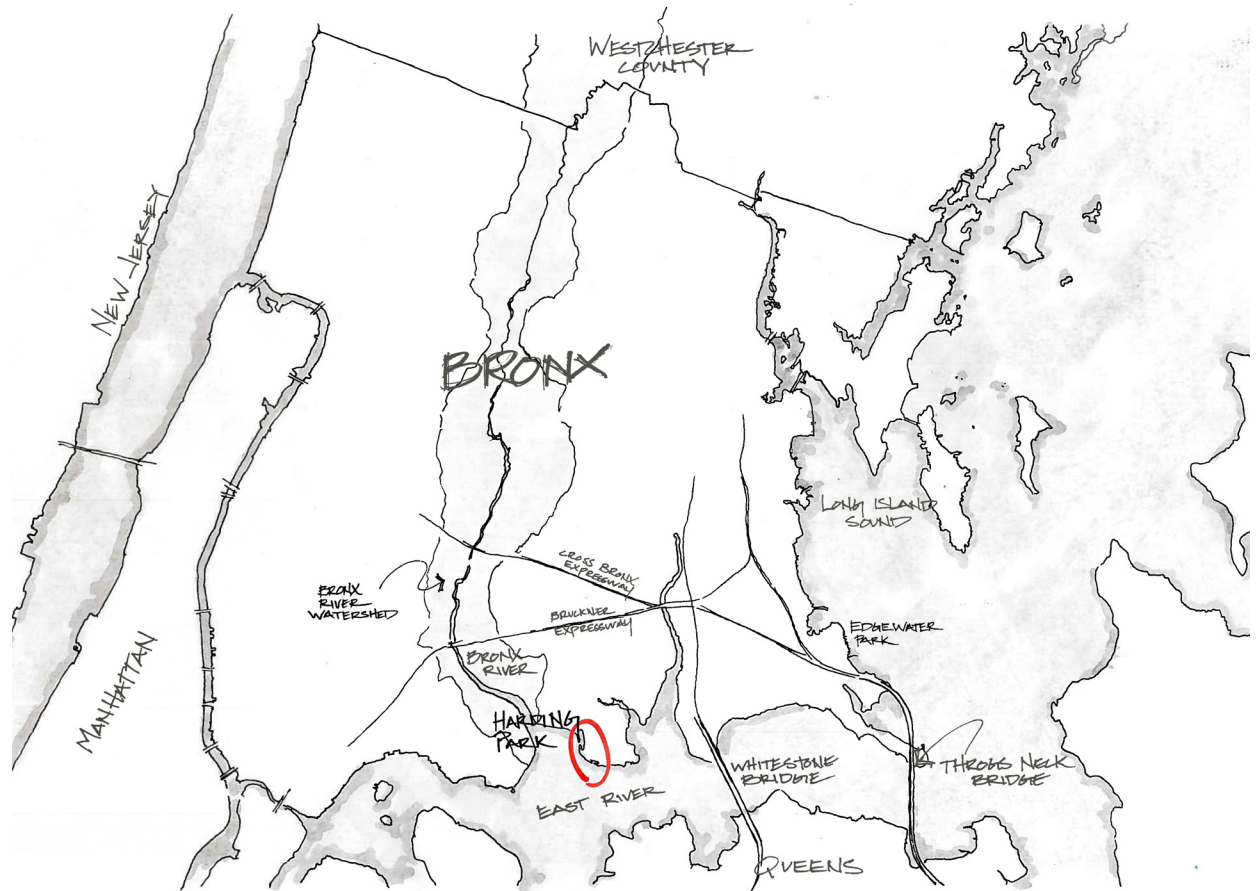
Harding Park is a small, private waterfront community located on the southwestern tip of the Clason Point peninsula. Bounded by the Bronx River to the west and the East River to the south, the neighborhood includes over 12,000 square feet of City-owned parkland and open space along the waterfront. The community reaches Soundview Park to the north and as far as White Plains Road to the east.

Named for President Warren G. Harding, Harding Park was originally established as a beachfront summer campground and cottage colony in the late 19th century. Bungalows were gradually winterized and expanded to become permanent homes as the area's prominence as a summer resort and recreation destination waned during the Great Depression, and a largely immigrant community consisting of Irish, German, Scandinavian and Italian residents settled in the area.

These converted homes typify the neighborhood today, fronting narrow, paved lanes without sidewalks. Such features contribute to the nostalgic waterfront landscape of the community.

In 1957, residents won a decisive battle against then Parks Commissioner Robert Moses, who had planned to raze the neighborhood. The three saltwater lagoons within the study area were built from the construction debris generated by Moses's capital projects as an initial step towards filling the shoreline.

Several years later, the residents fought steep rent increases and eviction notices, and successfully lobbied the state legislature for rent control protections. The City took control of Harding Park in 1978 when the last private owners of the property, Federated Homes, defaulted on their taxes. After years of negotiations, residents secured \$2.5 million of public investment to rebuild the private sewer system and resurface private



ways within the community, and reacquired the land from the City for \$700,000. In 1981, Harding Park became the first cooperatively owned low- and moderate-income community in New York.

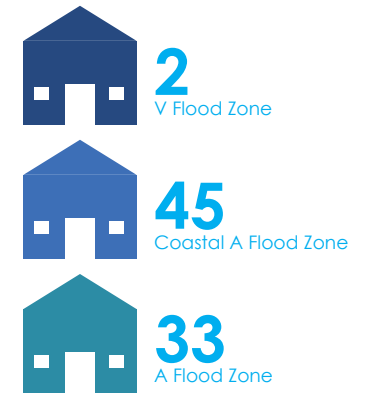
Today, approximately 400 residents live in 226 single-family homes in this tight-knit, residential neighborhood. The Harding Park Homeowner's Association administers the community and manages the privately-owned properties and roads. The community has retained its immigrant character, with current residents hailing from

all over the world. The population is largely Hispanic, with many residents from Puerto Rico. Two local bus routes, the BX-27 and BX-39, serve the area, which sits south of the Bruckner Expressway in between Soundview and Pugsley Creek Parks. A ferry service routed along the east side of Manhattan and terminating at Wall Street is planned for Soundview Park beginning in 2016.

2015 Preliminary FIRMs



Number of Homes in 1% annual chance floodplain



Basemap Features

- Bus Stops
- NYC Park's Property
- Building Footprint
- Study Area Boundary

PFIRM Flood Zones

- V Zone
- Coastal A Zone
- A Zone
- Shaded X Zone
- Subject to Wave Risk (LiMWA)

FEMA & NYC Department of City Planning

Flood Risk Vulnerabilities

While Sandy arrived in the New York harbor at high tide, causing unprecedented damage to neighborhoods concentrated in the southern coastal areas of the city, the storm reached the Long Island Sound at low tide, minimizing the destructive impact to waterfront communities in the Bronx, northern Queens and upper Manhattan. According to modeling by the storm surge research team at the Stevens Institute of Technology and depicted in the map on the following page, if Sandy had arrived nine hours earlier, the extent and severity of flooding in these areas would have been significantly greater.

Harding Park is vulnerable to a variety of flood hazards, including significant inundation and wave action from coastal storm surge, and ponding in streets and yards from rainfall events due to insufficient drainage infrastructure. With projections for more frequent and severe storms as well as sea level rise from climate change, these hazards are expected to worsen over time.

As shown on the previous page, approximately one third of homes in Harding Park are located within the 1% annual chance floodplain. Of these 80 buildings, **the majority are located in the Coastal A or V Zone** and are thus at risk from severe storm surge, substantial flood water depths, and high to moderate wave action. These homes are primarily located in the southern portion of the study area, below Harding Park/South Street.

The Preliminary Flood Insurance Rate Maps indicate that the Base Flood Elevations (BFEs) – the height to which water is expected to rise during a 1% annual chance flood event – range between one and ten feet above grade in Harding Park. **Nearly half of homes within the floodplain have BFEs over three feet, while a quarter have BFEs over five feet. The properties**

with the highest BFEs are in the southern portion of the community.

Further, the **projected flood extents for the year 2050** as modeled by the New York City Panel on Climate Change, a group of scientists and private sector experts that provide local climate change projections for the City of New York, **shows a significantly increased floodplain, nearly doubling the number of homes and residential units within the 1% annual chance floodplain.**

Flood risk in Harding Park is further exacerbated by the **limited stormwater infrastructure within the community.** The six City-owned streets that intersect the study area are part of the City's combined sewer system, which discharges to a Combined Sewer Overflow (CSO) outfall in the East River. However, the HOA-owned land that comprises much of the area is unsewered except for a private sanitary network that services the community. In these areas with no drainage system, stormwater is unmitigated and runoff flows directly over the ground until it is either absorbed or eventually channeled into waterways. **These conditions cause regular inundation of streets, yards, and homes within the community during rainstorms.**

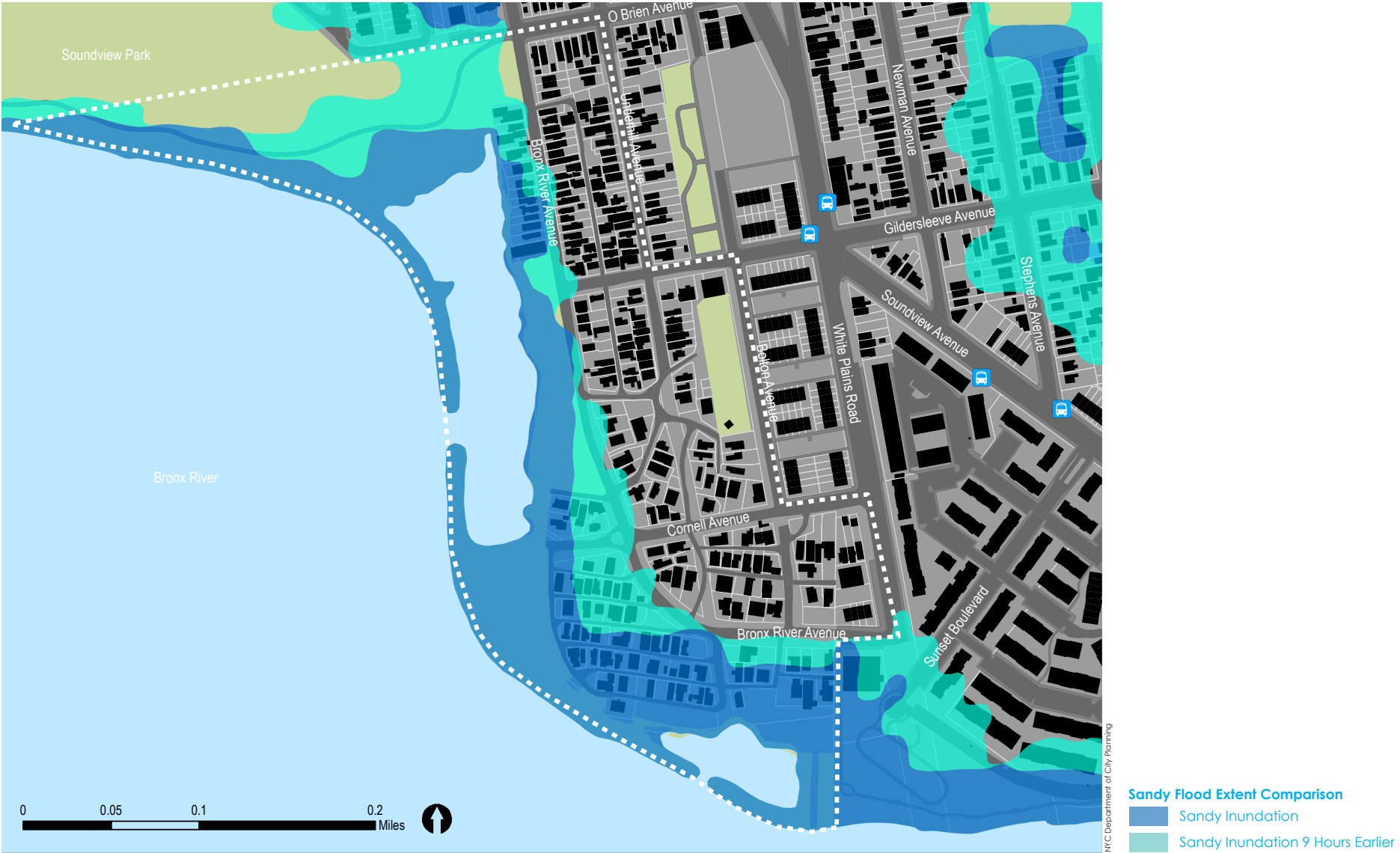
Homes with mortgages from federally-regulated or -insured lenders within the 1% annual chance floodplain are required to carry flood insurance. As of February 2013, **only one quarter of homes located in these vulnerable areas within Harding Park were reported to have active policies,** meaning that a significant number of homeowners living in high-risk, flood prone areas likely have little to no mechanism to protect their assets from the financial losses sustained in a storm event.

On an individual level, this can lead to severe hardship in recovering from and rebuilding after an acute storm event. Property owners may not be able to afford to repair the damages sustained to homes, and may be forced to sell their houses and relocate. On the neighborhood scale, this can lead to disinvestment and vacancy.

During Sandy, several homes were significantly impacted by flood waters. According to data from FEMA, **residents of Harding Park reported almost \$300,000 worth of damage to buildings alone, with average damages claimed at \$45,000.**

The current average flood insurance premium paid annually by those within the community carrying flood insurance is \$2,000 per year, though there is a wide range currently paid by Harding Park residents (between \$600 and \$4,700). Premiums vary based on how much coverage is purchased and how homes are financed. Because the vast majority of homes in Harding Park were constructed prior to the City's adoption of the federal FIRMs in 1983 and are not currently elevated to the DFE, the **premiums paid by many policyholders will likely rise significantly as the new flood insurance regulations take effect if homeowners do not invest in flood resilient retrofits to their structures.**

Sandy Compared To If Sandy Made Landfall 9 Hours Earlier



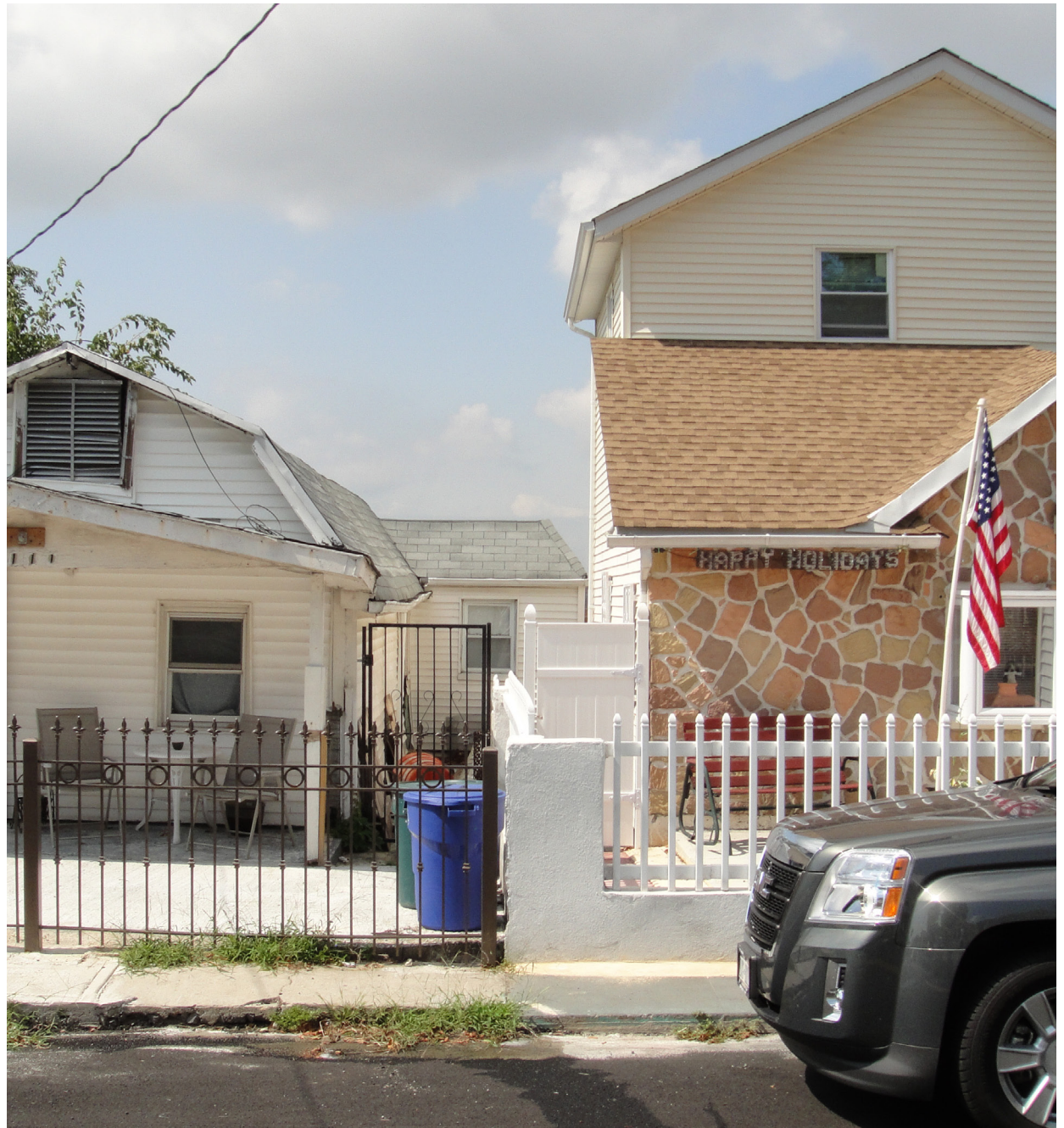
Building and Lot Typology Profile

Harding Park is characterized by a unique variety of lot sizes and construction types. The majority of the 226 single family homes are one- to two-story bungalow structures originally constructed when the community was first established during the early 20th century before the mapping of flood zones. The old, light-frame, and combustible building stock within Harding Park is highly susceptible to structural damage from various kinds of climate-based hazards. Weathering has already caused considerable damage to properties throughout the community.

Over the years, homeowners and renters have made ad hoc improvements to existing homes, expanding the footprints of their buildings, adding second stories and erecting accessory structures. This piecemeal construction has led to the dynamic and varied architectural character within the community. However, due to the structural integrity of some of these homes, rebuilding them may be more feasible than elevating them to be flood resilient.

Lots in the northern section of the study area above Gildersleeve Avenue are uniformly narrow, fronting narrow mapped streets and even narrower private lanes. Here, homes have limited to nonexistent front, side, and rear yards and are located extremely close to one another.

Lot dimensions below Gildersleeve Avenue in the southern section of the study area are generally wider and vary drastically in size. Most of the streets in the southern portion of the study area are privately owned, with widths ranging between nine and thirteen feet. Coupled with structural and access issues, the density of the built environment in much of the community poses challenges to resilient retrofitting and investment.



Homes in Harding Park are located in close proximity to one another.



Homes are built to the lot line and have small side yards in Harding Park.

Zoning Analysis

Like many of the city's older neighborhoods, Harding Park is zoned R3A, which is a contextual district that features modest single- and two-family detached residences on lots as narrow as twenty-five feet in width.

Many homes within the community are non-compliant with the bulk regulations of the district, as the built form in Harding Park predates the 1961 Zoning Resolution. Lot coverage is overbuilt throughout the community due to horizontal expansions and additions as well as lack of yard space, and approximately half of the homes within the flood zone exceed the maximum Floor Area Ratio allowance of the R3A district. The existing non-compliant homes are “grandfathered” regardless of their degree of non-compliance because they were built before the enactment of the Zoning Resolution. Such homes, however, cannot be altered in any way that increases the degree of their non-compliance, except in accordance with the provisions of the Citywide Flood Resilience Text Amendment.

The underlying R3A district mapped as part of the Harding Park Clason Point rezoning in 2007 best fits the character of the community, as it permits an appropriate density and preserves the built form of the neighborhood. In R3A districts, newly constructed detached homes like those in Harding Park must have two side yards totaling at least eight feet, but there is no minimum width requirement for each yard. Homes may be built at the lot line as long as a side yard of eight feet is provided on one side. Front yards must be ten feet deep and, to promote a unified streetscape, the yard must be as deep as an adjacent front yard but not exceed a depth of twenty feet. The R3A district requires a minimum lot size of 2,375 square feet. The maximum FAR of 0.5 may be increased up to twenty percent by an attic allowance for the inclusion of space beneath a pitched roof. The perimeter wall may rise to twenty-one feet before sloping or being set back to a maximum

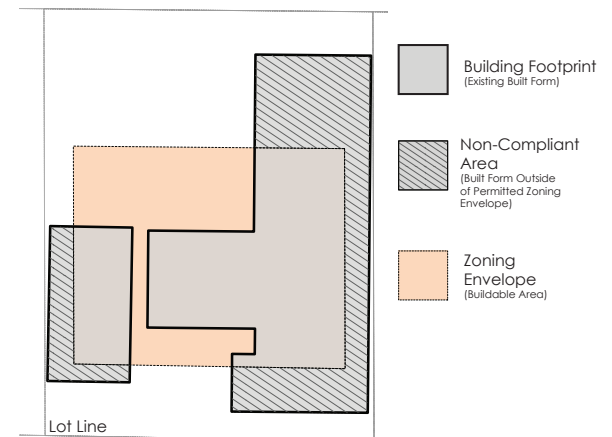


Two residential structures on a single lot are prohibited in an R3A District.

building height of thirty-five feet. Parking is in the side or rear yard, but an in-house garage is allowed if the lot is thirty-five feet or wider, provided the driveway is at least eighteen feet deep. One off-street parking space is required for each dwelling unit.

With the adoption of the Flood Resilience Text Amendment, the current zoning in Harding Park does not present a barrier to redevelopment or investment in building-scale resiliency measures. The amended building envelope and yard requirements permit space for the elevation of homes as well as streetscape mitigation strategies.

Example of a non-complying home in Harding Park



Summary of Resiliency Challenges

1 Harding Park is vulnerable to coastal storm surge and wave action.

Mitigating these risks through building scale retrofits is financially and physically difficult and, on the neighborhood scale, has the potential to alter community character

2 Existing building conditions further impede building scale retrofits.

The existing degree of noncompliance in the community as well as the structural integrity of homes further exacerbates the difficulties in retrofitting buildings for flood risk.

3 Due to limited stormwater infrastructure, the neighborhood also faces flooding from regular or severe rain events.

The private streets in Harding Park are unsewered and impervious, contributing to water ponding and flooding from regular rain and storms.

RESILIENCY FRAMEWORK

A coastal neighborhood at the confluence of the Bronx and East rivers, Harding Park is vulnerable to multiple flood-related hazards. The aging and often ad hoc construction that typifies the former campground community is subject to wave action and high flood elevations. Additionally, the risk of flooding is exacerbated by the limited drainage infrastructure within the area, which contributes to the regular ponding on private streets owned by the Homeowners Association (HOA).

The map on the following page depicts the extent of the study area and floodplain within Harding Park, and highlights the three geographies and scales at which the City has developed strategies as part of its resiliency framework: individual homes and buildings, private HOA-owned property such as streets, surface parking areas and vacant spaces, and City-owned waterfront areas including parks, lagoons and breakwaters.

Building Scale Strategies

Flood resilient improvements to buildings in Harding Park are enabled by the Flood Resilience Zoning Text Amendment, which removes regulatory barriers to retrofitting and rebuilding homes in compliance with Appendix G of New York City Building Code and FEMA standards by allowing building height to be measured from the Design Flood Elevation. This study provides illustrative examples of retrofitting and rebuilding strategies for homes within the community, including those that are fully compliant with applicable regulations, as well as those that are only allowed for non-substantially damaged or improved buildings.

The historic character of the community, with its overbuilt lots, piece-meal additions, aging construction and obstructions to access, make elevating and floodproofing existing structures complicated and expensive. In many cases, such retrofitting would

likely exceed the market value of a home, and some structures may not be able to withstand elevating and meeting other FEMA standards needed in order to qualify for reduced insurance rates. Taking measures to retrofit to partial FEMA compliance such as elevating mechanicals, reinforcing foundations or even retrofitting ground floor space with flood resistant materials can reduce damage to property and increase life safety, even though such measures will not necessarily result in lower annual insurance premiums. Over the long term, rebuilding may be a simpler, more cost-effective option for flood resilient investment in Harding Park, allowing residents to qualify for a full reduction in flood insurance premiums in addition to improving access and providing more open space within the community.

Private Land and City-Owned Waterfront Area Strategies

Flooding from coastal storms, wave action and inundation from rain events could be partially mitigated through a combination of green infrastructure interventions within the neighborhood and surrounding parkland. Through a preliminary analysis of drainage in the study area performed using data from local 311 sewer complaints, site observations, and mapping simulations, DCP has identified several strategic sites within the community that experience regular and/or severe runoff and ponding in both privately-owned and publicly-owned areas.

Working in conjunction with the Departments of Parks and Recreation, Environmental Protection and Transportation as well as the Mayor's Office of Recovery and Resilience, DCP has identified opportunities to utilize the City-owned parkland and open space in and around Harding Park as a multipurpose community amenity that mitigates coastal flood risk, promotes stormwater management, and improves ecological resources on top of improving overall quality of life. These strategies

require further technical study, stakeholder coordination, and are contingent on additional funding. The HOA and tenants are encouraged to pursue similar strategies on the private streets, surface parking areas and vacant land within the community. Any strategy should also be complemented with education and will require ongoing maintenance.



Framework Map

Building Scale Strategies

Homes in Harding Park that are located in the 1% Annual Chance Floodplain

Private Land Strategies

Homeowner's Association-owned streets, surface parking lots and vacant land.

City-Owned Waterfront Area Strategies

Open spaces, breakwaters and lagoons under the jurisdiction of New York City Department of Parks and Recreation.

1% Annual Chance Floodplain

The upland limit of the area that has a 1% chance of flooding in any given year

Study Area Boundary

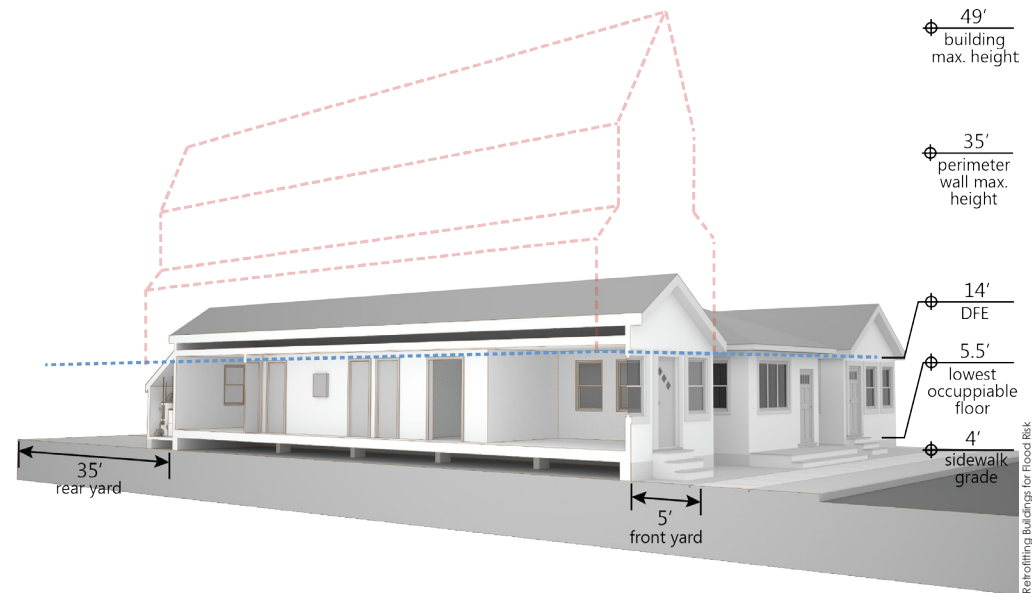
The study area encompasses the entire Harding Park Homeowner's Association and adjacent parkland.

Building Scale Strategies

The following case studies illustrate how homes in Harding Park can be retrofitted to be more resilient.

Existing Conditions

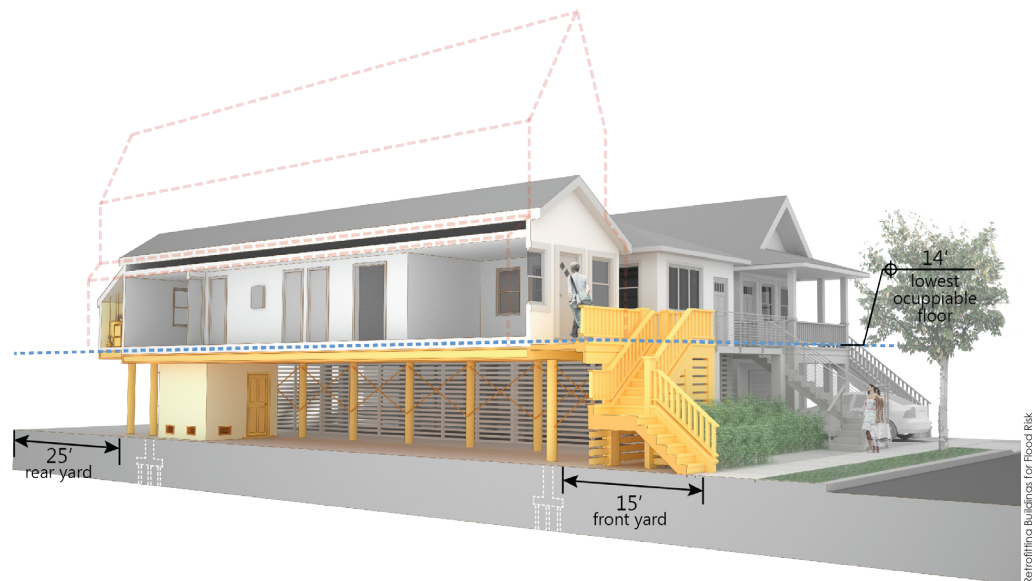
The image to the right depicts a single-story wood frame combustible construction type home on shallow unreinforced masonry foundation. The wood structure is not sufficiently tied to the foundation. The existing building has non-compliant front and side yards, and does not provide required parking. These non-compliances must be considered when retrofitting. Building access is provided at the front and rear entrances approximately one foot above grade. All systems are located in a rear enclosure below the DFE. The allowable building height is measured from the DFE, as shown to the right.



Existing Conditions

Full Compliance Retrofit Strategy

Elevate the existing structure on a new foundation system to bring the lowest occupiable floor above the DFE. To accommodate access to the elevated structure, shift the existing building footprint back from the front property line into the rear yard. Elevate critical systems above the DFE.



Elevation Strategy

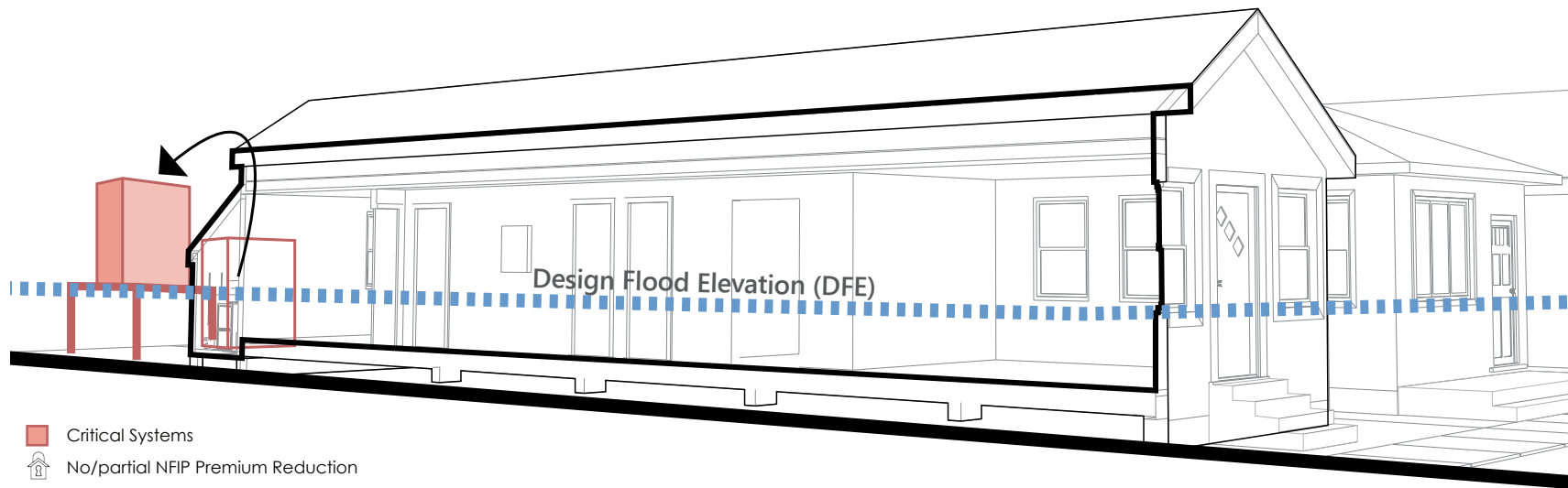
Alternative Building Scale Strategy: Elevate Systems

Non-substantially damaged and non-substantially improved buildings within the floodplain have more flexibility in complying with Appendix G of the New York City Building Code. The alternative illustrated below lowers the risk for buildings, however these measures may not lower insurance premiums. If the DFE is within a few feet of the base of the lowest occupiable floor, consider keeping the structure in place and using flood damage-resistant materials below

the DFE. Residential use and lowest occupiable floor remain located below the DFE. Elevate the critical systems above the DFE. Create a continuous load path by connection of the frame to the roof and foundation. If the lowest occupiable floor is left below the DFE, life safety must be considered. Residents should always follow evacuation procedures.



No or partial reduction in NFIP premiums. Residential use and lowest occupiable floor remain located below the DFE.



Private Land Strategies

Streets

The private streets in Harding Park are owned and maintained by the Harding Park Homeowner's Association. Paved with tar and located throughout the community, they have limited stormwater infrastructure, and potholes collect and hold stormwater runoff.

Strategies:

- Create full or partial permeable surfaces that transport and absorb stormwater runoff.
- Install bioswales or planted strips to collect stormwater runoff.
- Install underground drains that collect and transport runoff to tanks that can hold water for extended periods of time.



Stormwater ponding on private streets in Harding Park.



Key Map:
Location
of streets



Stormwater sheet flow and ponding on surface parking areas in Harding Park.

Private Land Strategies

Surface Parking

There are two primary private surface parking areas in Harding Park located in strategic areas where considerable runoff flows during average storm events.

Strategies:

- Install underground drains that collect and transport runoff to tanks that can hold water for extended periods of time.
- Repave surface with permeable pavement.
- Increase green coverage on site by way of tree pits, planting strips and open space.



Key Map:
Location
of surface
parking

Private Land Strategies

Vacant Land

There are a number of vacant open spaces throughout Harding Park that are critical points for stormwater retention.

Strategies:

- Remove invasive plants and introduce native species. Native plant species must provide habitat value and be adapted to disturbance prone environments.
- Install rain gardens, bioswales, or even retention ponds where stormwater runoff is most significant.
- Incorporate neighborhood amenities such as benches, pergolas, or other site furnishings that allow for passive recreation.



Vacant land in Harding Park.



Key Map:
Location of
underutilized
space



Waterfront open space in Harding Park.

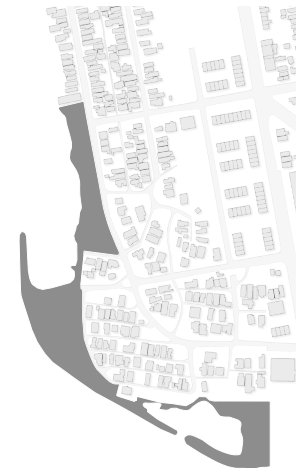
City-Owned Waterfront Area Strategies

Open Spaces

Much of the coastline within Harding Park is City-owned land that has a history of illegal dumping of garbage. The following interventions will enhance the ecological value of the publicly-owned waterfront areas in addition to mitigating stormwater and recharging the groundwater table.

Strategies:

- Remove invasive plants and introduce native species. Native plant species must provide habitat value and be adapted to disturbance prone environments.
- Install green infrastructure such as rain gardens, bioswales or underground collection tanks that can hold runoff for extended periods of time.
- Install neighborhood amenities such as benches, pergolas, or other site furnishings that allow for passive recreation.



Key Map:
Location
of open
spaces

City-Owned Waterfront Areas

Breakwaters

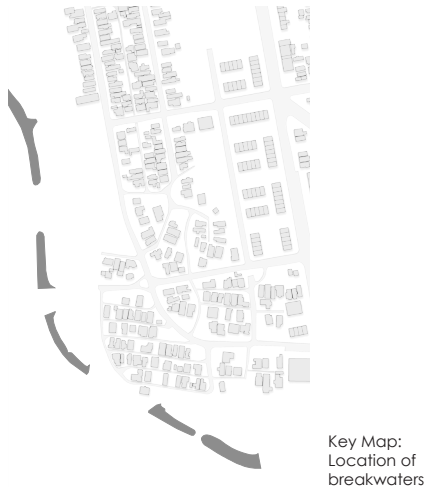
The breakwaters that surround the lagoons range from two to six feet above sea level. These stone barriers protect the community and existing aquatic life within the marsh area from wakes and storm waves. Enhancements to these breakwaters must also consider impacts on adjacent wetlands.

Strategies:

- Increase the height of breakwaters to reduce wave impact.
- Add soils that can sustain plants with deep-rooting systems in order to mitigate wave energy and provide aesthetic value.
- Widen breakwaters to accommodate pedestrian circulation. This must be done with care to preserve existing wetlands.
- Provide oyster friendly surfaces.



Breakwaters in Harding Park.



Key Map:
Location of
breakwaters



Lagoons in Harding Park.

City-Owned Waterfront Areas

Lagoons

The three saltwater marsh lagoons serve as a buffer between Harding Park and the Bronx River, and provide important ecological services to the community.

Strategies:

- Remove debris and import clean sand where needed.
- Remove invasive plants and introduce native species. Native plant species must provide habitat value, be salt tolerant, and be adapted to disturbance-prone environments.
- Capture stormwater runoff through green infrastructure systems on public property before it enters saltwater lagoons.
- Eliminate encroachment and dumping in and around the lagoons.



Key Map:
Location
of
Lagoons

CONCLUSION

Due to factors including the timing, path and size of the storm, the Bronx was spared the brunt of Hurricane Sandy's impact. With almost 100 miles of shoreline, the borough nevertheless faces serious flood risk that is only projected to increase in the coming years with sea level rise, expanded floodplains, and more frequent and severe storms. Through its Resilient Neighborhood place-based planning initiative, the Department of City Planning aims to empower stakeholders at all levels to identify and pursue neighborhood-specific strategies to support the ongoing vitality and resiliency of coastal communities such as Harding Park. Here, three implementation strategies aimed at different scales of intervention were identified to address the vulnerabilities of the community:

Raise awareness of and mitigate flood risks

Engage with the Homeowner's Association and build community capacity to prepare for and respond to future flooding.

Facilitate resilient retrofits

Remove barriers to residential retrofitting and rebuilding in Harding Park through the adoption of the 2013 Flood Resilience Zoning Text Amendment and work towards making these provisions permanent.

Promote resiliency through green infrastructure investment

Mitigate stormwater runoff and coastal wave risk by pursuing funding to study the feasibility of green infrastructure strategies.

The Resilient Neighborhoods study of Harding Park was a participatory process that ultimately empowered the community to understand, proactively prepare for, and mitigate flood risk and future damage within their neighborhood. As an outcome of this process, the City was able to successfully address regulatory barriers that inhibited resilient retrofits and the construction of new, fully compliant homes within the neighborhood, as well as identify strategies for the use of open space that will mitigate both current and future flood risk within the community.



GLOSSARY OF KEY TERMS

Base Flood Elevation (BFE)

The computed elevation in feet to which floodwater is anticipated to rise during the 1% annual chance storm shown on the Flood Insurance Rate Maps (FIRMs) issued by the Federal Emergency Management Agency (FEMA). A building's flood insurance premium is determined by the relationship between the BFE and the level of the lowest floor of a structure.

1% Annual Chance Floodplain (100 Year Floodplain)

The area that has a 1% chance of flooding in any given year. It is indicated on FEMA's Flood Insurance Rate Maps (FIRMs). See "Special Flood Hazard Areas," below.

Design Flood Elevation (DFE)

As defined by the New York City Building Code, the Design Flood Elevation (DFE) is the minimum elevation to which a structure must be elevated or floodproofed. It is the sum of the BFE and a specified amount of freeboard (see definition below) based on the building's structural category.

Flood Insurance Rate Maps (FIRMs)

The official flood map, on which FEMA has delineated the Special Flood Hazard Area (SFHA), 0.2% annual floodplain (Shaded X Zone), Base Flood Elevations (BFEs), and floodways.

Preliminary Flood Insurance Rate Maps (PFIRMs)*

The PFIRMs are the best available flood hazard data. FEMA is in the process of updating the Flood Insurance Rate Maps (FIRMs) for New York City and issued PFIRMs in December 2013 and again in 2015 as part of this process. The New York City Building Code requires new and substantially improved buildings to use the PFIRMs (unless the effective FIRMs are more restrictive) until the maps become effective. The PFIRMs, however, are not used to guide the requirements of the National Flood Insurance Program.

Floodproofing, Dry

For non-residential buildings, a flood mitigation technique that results in the building resisting penetration of flood water up to the DFE, with walls substantially impermeable to the passage of water and structural components having the capacity to resist specified loads.

Floodproofing, Wet

A flood mitigation technique designed to permit parts of the structure below the DFE to intentionally flood, by equalizing hydrostatic pressures and by relying on the use of flood damage-resistant materials. With this technique, parts of the building below the DFE are only to be used for parking, storage, building access, or crawl space.

Freeboard

An additional amount of height above the BFE to provide a factor of safety to address the modeling and mapping uncertainties associated with FIRMs, as well as a degree of anticipated future sea level rise. It is a risk reduction requirement found in Appendix G of the Building Code and recognized by NFIP as an insurance premium reduction factor. In New York City, one foot of freeboard is required for commercial and multi-family buildings, and two feet for single- and two-family buildings.

* In summer 2015, the City submitted a formal appeal to FEMA, citing internal technical analysis that showed a smaller 1% annual chance floodplain across much of the city. As part of the public review of the PFIRMs, FEMA will review the appeal and determine if a re-mapping of the floodplain is necessary.

National Flood Insurance Program (NFIP)

Federal program that makes flood insurance available to municipalities that enact and enforce floodplain management regulations that meet or exceed the criteria established by FEMA. Under this program, properties within the SFHA with a federally-backed or -regulated mortgage are required to buy flood insurance. Communities participating in the NFIP must incorporate flood-resistant construction standards into building codes.

Special Flood Hazard Areas (SFHA)

Area of the floodplain that has a 1% chance, or greater, of flooding in any given year. Also referred to as the 100-year floodplain or the 1% annual chance floodplain. The SFHA is separated into zones depending on the level of hazard:

V Zone

The area of the SFHA subject to high-velocity wave action that can exceed three feet in height.

Coastal A Zone

A sub-area of the A Zone that is subject to moderate wave action between one-and-a-half and three feet in height.

A Zone

The area of the SFHA that is subject to still-water inundation by the base flood.

Substantial Damage

Damage sustained by a building whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed fifty percent of the market value before the damage occurred. When a building is substantially damaged or substantially improved (see below), it is required to comply with Appendix G of the Building Code as if it was a post-FIRM structure.

Substantial Improvement

Any repair, reconstruction, rehabilitation, addition or improvement of a building with cost equaling or exceeding fifty-percent of the current market value of the building. When a building is substantially improved, it is required to comply with the flood-resistant construction requirements of Appendix G of the Building Code.

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Data Sources

Federal Emergency Management Agency
NYC Panel on Climate Change
U. S. Department of Housing and Urban Development

Community Advisory Group

Harding Park Homeowner's Association

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RESOURCES

TECHNICAL GUIDANCE

New York City Department of City Planning

Retrofitting Buildings for Flood Risk

nyc.gov/retrofittingforfloordrisk

Designing for Flood Risk

nyc.gov/designingforfloordrisk

Urban Waterfront Adaptive Strategies

nyc.gov/uwas

Flood Resilience Zoning Text Amendment

nyc.gov/assets/planning/download/pdf/plans/flood-resiliency/flood-resiliency.pdf

Special Regulations for Neighborhood Recovery

nyc.gov/site/planning/plans/special-regulations-neighborhood/special-regulations-neighborhood.page

New York City Department of Buildings

Building Code Appendix G Flood-Resistant Construction

nyc.gov/site/buildings/codes/2014-construction-codes.page

Federal Emergency Management Agency

Flood Insurance Rate Maps

region2coastal.com

National Flood Insurance Program

floodsmart.gov

INFORMATIONAL RESOURCES

OneNYC

nyc.gov/onenyc

Mayor's Office of Recovery and Resiliency

www.nyc.gov/html/planyc/html/resiliency/resiliency.shtml

New York City Panel on Climate Change

onlinelibrary.wiley.com/doi/10.1111/nyas.2015.1336.issue-1/issuetoc

