BROOKLYN, NEW YORK

Resilience in NYCHA's Marlboro Houses

A ULI Virtual Technical Assistance Panel Report

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Urban Land Institute

About the Urban Land Institute

THE URBAN LAND INSTITUTE is a global, member-driven organization comprising more than 45,000 real estate and urban development professionals dedicated to advancing the Institute's mission of shaping the future of the built environment for transformative impact in communities worldwide.

ULI's interdisciplinary membership represents all aspects of the industry, including developers, property owners, investors, architects, urban planners, public officials, real estate brokers, appraisers, attorneys, engineers, financiers, and academics. Established in 1936, the Institute has a presence in the Americas, Europe, and the Asia Pacific region, with members in 80 countries.

More information is available at uli.org. Follow ULI on Twitter, Facebook, LinkedIn, and Instagram.

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ULI's Urban Resilience program is focused on how buildings, cities, and communities can be more resilient to the impacts of climate change and other environmental vulnerabilities. The program works with ULI members to provide technical assistance, advance knowledge through research, and catalyze the adoption of transformative practices for real estate and land use policy.

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ULI New York is a District Council of ULI. District Councils carry out the ULI mission locally by sharing best practices, building consensus, and advancing solutions through educational programs and community outreach initiatives. The objective of ULI New York's Technical Assistance Panels (TAPs) program is to provide expert, multidisciplinary, and objective advice on land use and real estate issues facing local governments, public agencies, and nonprofit organizations throughout its local geographies. Drawing from its extensive membership base, ULI New York conducts one- and two-day panels offering unbiased, pragmatic solutions, best practice advice, and market-based strategies to local decision-makers on a wide variety of complex land use challenges, ranging from site-specific projects to public policy questions. The TAPs program is intentionally flexible to provide a customized approach to specific land use and real estate issues. Learn more at newyork.uli.org.

About the Resilient Land Use Cohort

This virtual Technical Assistance Panel is part of a larger series of resilience technical assistance and learning opportunities called the Resilient Land Use Cohort (RLUC). The RLUC is a network of ULI district councils, member experts, and community partners in eight cities working together to identify strategies to be more resilient in the face of climate change and other vulnerabilities, including floods, extreme storms, drought, wildfire, and extreme heat, as well as the related social, environmental, and economic impacts. RLUC provides on-the-ground technical assistance through ULI's flagship technical assistance models – Advisory Services Panels and Technical Assistance panels. These panels leverage ULI member expertise to advise on complex real estate and land use challenges related to climate resilience, addressing planning, zoning, land use, development strategy, housing, and infrastructure. ULI's Urban Resilience program convenes the cohort regularly to learn from national best practices and discuss peer cities' next steps advancing resilience through land use policies and development strategies. Funding for this engagement and the cohort is provided by the ULI Foundation with support from JPMorgan Chase.

COVER PHOTO: Marlboro Houses, courtesy of NYCHA

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Executive Summary

After Hurricane Sandy caused heavy damage across its portfolio in 2012, the New York City Housing Authority (NYCHA or the agency) has steadily implemented $3 billion in post-disaster federal funding to adapt its developments for climate risks, flooding in particular. As one of the largest landlords in the country, with a portfolio of over 326 developments that house 400,000 residents and an additional 235,000 other New Yorkers served by Section 8 rental assistance, the agency has utilized the federal post-disaster funding to address a wide array of adaptation needs. There are, however, remaining vulnerabilities to storm surge at NYCHA developments. Some developments or buildings were not directly impacted by Hurricane Sandy but could be affected by a storm with a slightly different trajectory; others were ineligible for disaster recovery funding.

Marlboro Houses is in the unique position of having been affected by Hurricane Sandy but having been ineligible for federal disaster recovery funding due to a mixed public-private funding model. Marlboro, the focus of this Technical Assistance Panel (TAP), is a NYCHA campus in Gravesend, Brooklyn, that is home to over 4,000 New Yorkers in 28 buildings. Marlboro was damaged during Hurricane Sandy, experiencing basement flooding, heat and power outages in some buildings, and damage to electrical, mechanical, and stormwater infrastructure at the site. Given the neighborhood's coastal location, despite being slightly inland, Marlboro faces continuing vulnerabilities to future storm surges, as well as immediate risks and challenges from extreme heat and rain.

The agency asked this Technical Assistance Panel to look closely at how Marlboro Houses could be made more resilient to climate-induced hazards, considering its landscape, buildings, operations, and financing.

After in-depth briefings and interviews with NYCHA staff and local stakeholders and deliberations among panelists regarding Marlboro's strengths and needs, the panel's guiding themes underpinning recommendations for Marlboro Houses were:

- Consider near-term health implications for NYCHA residents in planning and design for mitigation and adaptation. Key issues include: cooling options indoors and nearby due to extreme heat exposures presently occurring; stable and resilient energy supplies given the heat and health risks during power outages; air quality monitoring and improvement; and building social cohesion and community engagement.
- Address residents' short-term needs for housing quality, and make quick, tangible interventions in

landscapes and buildings in the near term in order to build trust and inspire confidence among residents for NYCHA's upcoming organizational and capital program improvements. These efforts should be part of the transformational path leading to mid-term and long-term changes.

- Consider how resilience work at Marlboro Houses can inform NYCHA's ongoing climate adaptation work. While the individual site characteristics drive implementation at Marlboro, the recommended tactics may be useful to consider at other sites. These tactics include a combination of social, economic, and environmental solutions intended to address near-, mid-, and long-term needs. In this effort to establish a model for resilience at this specific development, process is as important as product, and a socially relevant process will address resident health and overall wellbeing, trust among stakeholders, and resident awareness and coping strategies for climate risk that undergird physical adaptations.

From these themes, the panel made recommendations for Marlboro's landscapes, buildings, and operations and financing, phased into near-term (next 1-2 years), mid-term (3-5 years), and long-term (5+ years) actions. These recommendations are summarized as follows:

Landscape Strategies: Enhancing Local and Regional Green Infrastructure

- **Inventory** on-site and neighborhood landscape assets and their environmental value. For example, quantify and protect existing tree canopy and increase canopy coverage where feasible to support stormwater uptake and urban heat island reduction.
- **Prioritize** near-, mid- and long-term actions:
  - » Near-term: Develop performance criteria and measurements for green infrastructure improvements on campus; achieve early wins with 'low-hanging fruit' green infrastructure projects; and explore funding and financing alternatives.
  - » Mid-term: Complete integrated green infrastructure initial/phase I efforts.
  - » Long-term: Optimize green infrastructure and performance and consider regional interventions for coastal storm surge and sea level rise.
- **Highlighted** actions:
  - » Implement pilot green infrastructure projects to demonstrate resilience gains for flooding and extreme heat.
  - » Explore the use of existing nearby waterfront parks as starting points for protecting Marlboro and the neighborhood from storm surge and sea level rise.
  - » Describe a holistic return on investment (ROI) that includes a full array of ecological, health, and social benefits.

Buildings Strategies: Net Zero/Passive House and Floodproofing Retrofits

- **Inventory** and spatialize the physical needs assessment as compared to areas of chronic flooding and extreme heat microclimates to better understand where planned investments might provide multiple benefits.
- **Prioritize** near-, mid- and long-term actions:
  - » Near-term: conduct study of building conditions for climate mitigation/adaptation solutions; address immediate maintenance issues ("first tasks"); pursue pre-development activities.
  - » Mid-term: Deliver completed phase I of building upgrades; investigate new building locations.
  - » Long-term: Complete additional renovations and consider new construction opportunities.
- **Highlighted** actions:
  - » Pursue a comprehensive, phased Passive House/net zero retrofit process for Marlboro's buildings to decrease resident exposure to extreme heat and poor air quality while reducing CO2 emissions, energy use, and operating costs.
  - » Implement wet/dry floodproofing for first floors and repurpose their use from residential to alternative uses gradually as units turn over.
  - » Consider resilient, high-performance, mixed-use new construction to offer a more vibrant campus with income-generating opportunities for residents and NYCHA, as well as to prevent any loss in housing units from ground floor repurposing.

Operations & Finance Strategies: Enhanced Neighborhood Management and Resilience Planning

- **Inventory** and create property-level financials and a digital property atlas/database of property information, including resilience/sustainability elements to guide investment and management decisions. Evaluate comparative costs such as the cost of maintaining green infrastructure by comparison to lawn mowing and pavement maintenance.
- **Prioritize** near-, mid- and long-term actions:
  - » Near-term: Use analytics to determine priorities and create processes for transparency and accountability; create long-term resilience plan.
  - » Mid-term: Develop a foundation for operational consistency and excellence; deliver NYCHA's proposed Public Housing Preservation Trust Transaction.
  - » Long-term: Pursue long-term adaptation strategies and financial stability.
- **Highlighted** actions:
  - » Within a long-term resilience plan, include resident risk awareness campaigns, shelter in place strategies, and an all-hazards campus-specific vulnerability assessment to guide investments over the next several decades.
  - » Link risk reduction with ongoing capital improvements program requirements, building in greater sustainability and resilience with each investment, building by building and site by site, including performance measures for each targeted investment.
  - » Increase accountability/transparency using existing work order communication systems and NYCHA's newly reconfigured property management approach.
  - » Conduct operations and maintenance training for residents and staff of new buildings and landscape infrastructure.

The panel's deliberations highlighted the significant potential impact for NYCHA while implementing these solutions – not only potentially for other developments within NYCHA's portfolio but for other similar affordable housing portfolios in the U.S. The panel recommends these steps be considered as one cohesive planning initiative, as they should work synergistically to achieve maximum benefits in creating resilient, sustainable, and healthy places to live.

TAP PANEL

Panel Assignment

NYCHA requested that a ULI Technical Assistance Panel develop strategies for enhancing the resilience of Marlboro Houses, a New York City Housing Authority development in Gravesend, Brooklyn, that is vulnerable to coastal flooding.

Marlboro Houses is home to 4,053 people in 1,765 apartments, across 28 residential buildings. Nine buildings are within the current 100-year floodplain and 18 will be within the 100-year floodplain by 2050 according to projections by the New York City Panel on Climate Change, and more are within the 500-year floodplain, which will certainly increase as storm severity and sea level rise worsen. The development experienced 15-40 inches of coastal flooding and sewer backups during Hurricane Sandy, with some buildings losing power and elevator service for up to a week as a result – an especially problematic situation, as Sandy was followed by freezing temperatures.

In 2015, NYCHA received approximately $3 billion in disaster relief funds to repair housing developments that suffered impacts from Hurricane Sandy and make the properties more resilient to future storms. Although it saw much less damage than many other affected developments, Marlboro Houses was among the developments originally slated to receive upgrades via this funding, but because of its status as a mixed-finance development ineligible for federal funding, NYCHA was unable to spend any of its Recovery and Resilience funds at the site. As a result, Marlboro has addressed repairs to Sandy damage but has not received the flood protection upgrades that the 35 other Sandy-affected developments are receiving. Marlboro Houses' mixed-finance funding model presents NYCHA with specific financing

challenges and resilience must be built into planned capital work and/or financed in creative ways.

This TAP was held at an influential point in NYCHA's climate planning, helping to demonstrate the potential for increasing resilience as the agency undertakes capital projects. As NYCHA makes investments in its properties at a scale previously impossible due to funding shortages, the agency is considering how these investments could position NYCHA properties to be more resilient in the future. The strategies developed for Marlboro will complement future plans for NYCHA investments in and maintenance of properties throughout its portfolio with an eye toward comprehensive resilience.

As NYCHA Chair Greg Russ described to the panel in opening remarks, the agency now has the chance to "create a generational impact if we seize this moment to strengthen what public housing is, in terms of the property itself" by developing a model for turning older buildings into structures prepared to meet current needs and future climate conditions.

Questions for the Panel

The panel was asked to address the following questions:

1. What **landscape features** might be most effectively modified to provide increased resilience to coastal flooding at Marlboro Houses?
2. What **modifications to buildings** should be incorporated into future capital work at Marlboro Houses to increase climate resilience?
3. What **operational changes** might be necessary to support increased climate resilience at Marlboro Houses?
4. What **funding strategies** should NYCHA consider in order to implement needed resilience work at Marlboro Houses?

Panelist Response

During their deliberations, the panelists expanded the TAP scope beyond the initial focus on coastal flooding. Although coastal storms will surely present ongoing hazards, extreme heat and precipitation are pressing issues that threaten the health and wellbeing of residents today, therefore panelists also included these latter hazards in their considerations for making Marlboro more resilient to climate change.

The panel also evaluated mitigation solutions within their deliberations, envisioning how the campus can reduce its carbon emissions to align with larger NYCHA sustainability initiatives such as the Climate Mitigation Roadmap, the agency's plan to meet New York City Local Law 97, which limits greenhouse gas emissions for certain buildings over 25,000 square feet beginning in 2024.

Additionally, the panel broadened the framing of resilience to include consistently meeting residents' basic needs for high-quality shelter, bringing housing up to standards of good repair, and helping the Marlboro community develop emergency/risk preparedness and coping mechanisms, as these factors underpin resilience efforts in the built environment.

Finally, the panel noted the importance of recognizing the economic challenges facing many Marlboro residents. With a median household income of roughly $19,600, well below the citywide median of $64,000 (according to the 2015-2019 American Community Survey), Marlboro's social and economic resilience would benefit significantly from workforce development opportunities. The panel strived to highlight these opportunities within recommendations wherever possible.

Resilience at Marlboro Houses

The panel's analysis and recommendations focused on the areas defined in the assignment:

Landscape strategies focus on protecting and enhancing Marlboro's green infrastructure to reduce the impacts of flooding (both coastal and precipitation-based) and extreme heat using ecosystem services to improve safety, access, and health/wellness within the campus as flood risk increases over time.

Building strategies prioritize retrofitting Marlboro's buildings to extremely efficient Passive House or net zero standards to protect residents from indoor extreme heat and poor air quality, floodproofing to increase flood resilience, and considering opportunities for resilient, high-performance new construction. These steps also align with NYCHA's sustainability goals and programs for electrification and carbon emissions reduction.

Operations and finance strategies propose increasing use of data and reporting in management, developing property-level financial information to increase accountability, and creating a long-term resilience plan to guide investment, maintenance, and operational strategies over the next several decades.

For each set of strategies, the panel prepared near-, mid-, and long-term recommendations, covering the next 1-2 years, 3-5 years, and 5+ years respectively.

Collectively, the panel recommended embedding the following four principles within resilience-building efforts at Marlboro:

Evaluate the Marlboro Houses resilience strategy within its larger community context.	Include an all-hazards approach in all investments, including day-to-day activities.
Leverage all community assets to draw down risks and improve quality of life.	Build an integrated and iterative budgeting, operating, and reevaluation cycle tied to resilience.

Background

Climate Change Risks in New York City and for NYCHA

Although the extensive flooding caused by Hurricane Sandy in 2012 was a wake-up call for New York City, the city is subject to a variety of climate hazards that will affect NYCHA developments and Marlboro Houses, including extreme heat, sea level rise, coastal storms, and heavy rain. The frequency and severity of each of these hazards is accelerating.

NYCHA understands that additional coastal storms, as well as other climate-induced hazards such as heavy rains and extreme heat, will affect NYCHA residents, campuses, and staff in the future. The agency is working to integrate climate resilience into capital projects so that New York City's public housing can continue to serve residents in the changing climate conditions expected in the coming century.

The 2019 report of the New York City Panel on Climate Change (NPCC), an expert scientific body responsible for creating the local climate change projections and observations that underpin city climate adaptation policy, sheds light on the ways climate hazards will play out differentially across the city, and thus the NYCHA portfolio, in the 2020s and beyond. The NPCC projects that New York's climate hazards include coastal storms, sea level rise,

Helpful Definitions: Hazards, Vulnerability, and Risk

A *climate hazard* is a physical event or trend, or their physical impacts, such as extreme heat or flooding.

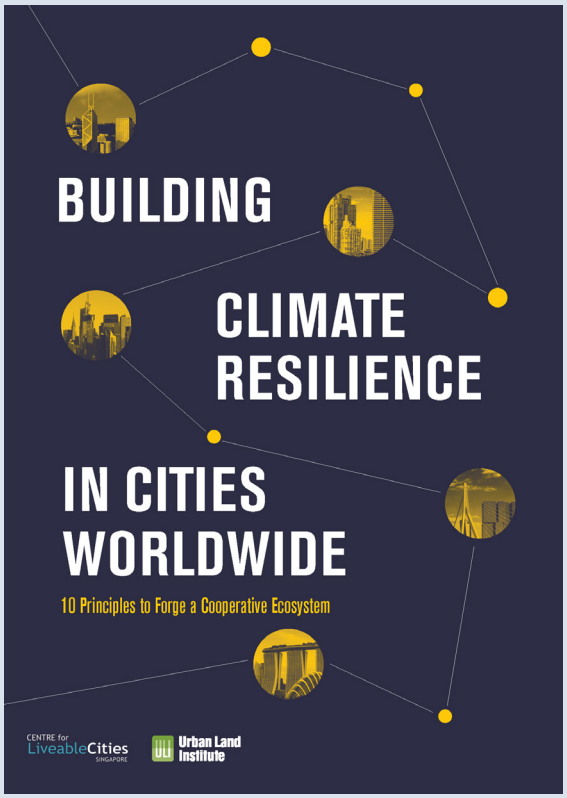
***Vulnerability* is the propensity of being adversely affected by a hazard and includes both the level of sensitivity to hazards and lack of capacity to cope with their impacts. Vulnerability is frequently discussed in the context of socio-economic factors that limit adaptation to hazards, like poverty or racism.**

***Risk* is the interaction of a hazard occurring, the people or places exposed to that hazard, and their relative vulnerability. Risk is frequently used, in this report and more widely, to refer to the overall negative impacts of climate change.**

Source: definitions adapted from the International Panel on Climate Change Fifth Assessment Report.

New York City as a Leader on Climate Adaptation

Since its climate work began in the mid-2000s, New York City has taken a number of innovative steps on building resilience to climate change, including the development of major waterfront infrastructure, flood-sensitive planning, zoning, and design regulation, and climate policy based on local scientific expertise, making it an excellent example of how cities can adapt to changing climate conditions. Building Climate Resilience in Cities Worldwide: 10 Principles to Forge a Cooperative Ecosystem, a book led by the Singapore Centre for Liveable Cities with support from ULI, profiles the work of New York and four other cities – Singapore, Rotterdam, Hong Kong, and Miami – to achieve greater resilience and suggests how the public and private sectors can better collaborate to scale up resilience efforts.



precipitation, and extreme temperatures, which any campus-level vulnerability assessment should use as a basis for understanding current and future climate risks.

Using the NPCC projections, the Mayor's Office of Resiliency (MOR) has released a set of Climate Resiliency Design Guidelines (the Guidelines) for all city capital projects. The Guidelines lay out a process to determine resilience considerations based on the useful life of a project, its exposure to climate hazards over time as determined by a screening and risk assessment, and cost-benefit analysis. New York City Council recently adopted a resolution requiring that all city capital projects meet the Guidelines, starting with a five-year pilot period – this includes NYCHA capital investments of at least $10 million in city funding, though the agency may also develop its own scoring metric for compliance.

In response to climate hazards, two key NYCHA climate plans have been developed, to which any resilience and sustainability-related capital work at Marlboro should align. First, NYCHA's Climate Mitigation Roadmap details the agency's plan to reduce greenhouse gas emissions by 80% from a 2005 baseline through a combination of energy efficiency and electrification of heating and hot water systems, in line with the requirements of New York City's Local Law 97.

Second, NYCHA is currently developing a Climate Adaptation Plan that responds to changing climate conditions by integrating the agency's best understanding of climate-induced hazards into the way it invests in and operates its properties. In 2020, NYCHA conducted a vulnerability assessment to understand how the increases in extreme heat, coastal storms, and heavy downpours projected by the NPCC are likely to affect NYCHA's properties and residents. The Department of Recovery and Resilience is currently working to build awareness of these vulnerabilities into capital planning and design processes and to secure funding to make needed investments to protect NYCHA residents. NYCHA expects to make its findings and work to-date public in a climate adaptation plan in the second half of 2021. As this plan had not been released at the time of this TAP, the panel based its considerations on information on Marlboro's climate provided by NYCHA during and prior to the panel, as well as a briefing provided by the Mayor's Office of Resiliency (see Site and Surrounding Context, page 18).

Current Financing of Marlboro Houses

Challenges of Marlboro's mixed-finance structure

Marlboro is part of a group of 21 developments built using state and city funds instead of funds allocated by the federal government. As such, units at Marlboro were not supported by a federal annual operating subsidy for years, instead relying on state and city budgets. Despite the arrival of HUD operating subsidies after NYCHA closed on a mixed-finance transaction for these developments in 2010, historical state and city budget cuts have led to deep annual deficits in operating and capital expenses. As a result, Marlboro has not had a significant capital project in years, and the level of subsidy and funding at Marlboro remains insufficient to repair and maintain its assets. No private sector partner is involved in the day-to-day operations of these developments, and NYCHA has continued to oversee their repairs, maintenance, and management.

Potential Rehabilitation Solutions: *A Blueprint for Change*

NYCHA continues to face enormous capital needs at its aging developments. NYCHA has, however, developed multiple methods to raise needed funds under A Blueprint for Change, an organizational plan released in late 2020 that identifies strategies to:

- Invest in NYCHA's 110,000 units not covered by previous investment plans, and
- Reorganize NYCHA's model of service delivery.

These tactics include the **Stabilization Strategy** and the **Transformation Plan**.

The **Stabilization Strategy** envisions the creation of a **Public Housing Preservation Trust** (the Trust). Similar to other NYCHA investment strategies, the units covered by the Trust would switch from receiving Section 9 (public housing) subsidies to Section 8 (Tenant Protection Vouchers) subsidies. Section 8 subsidies offer higher per-unit operating funding, and the Trust would be able to issue bonds to pay for capital improvements. The development's ground lease would be held by a **public entity**, not an entity formed by a private developer in partnership with NYCHA.

The creation of the Trust and switch to Section 8 subsidies would provide a significant enough increase in per-unit financing that NYCHA would be able to address the results of decades of federal disinvestment in the condition of its units and could potentially cover the upfront costs of resilience/sustainability upgrades to Marlboro's landscapes and buildings.

The **Transformation Plan** seeks to transform NYCHA as an organization to improve services. One of the first improvements outlined in the Transformation Plan is to break down the existing management structure and create a new neighborhood model designed to improve oversight and provide increased attention to each development via smaller management portfolios.

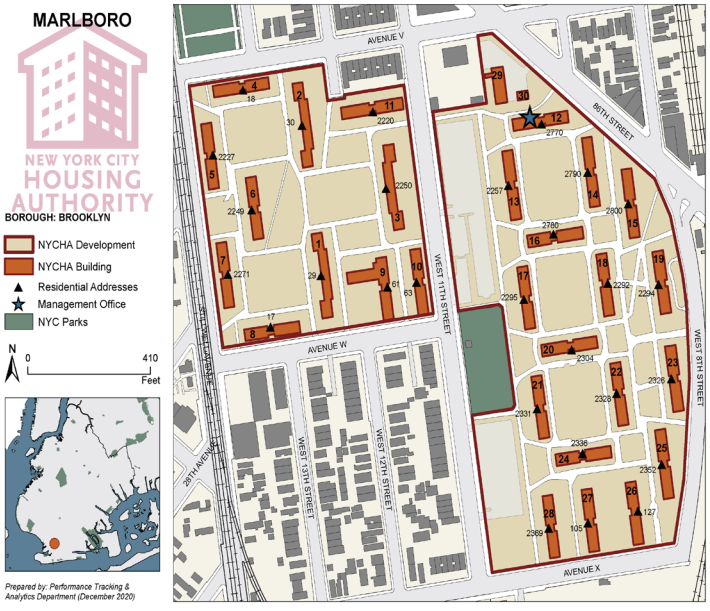
In Marlboro's case, the transformation will be profound: mixed-finance units had been managed by a single regional asset manager responsible for a portfolio of disparate developments spread across New York City, but they will now be managed by a neighborhood administrator as part of clustered local groups. These groups will have a more direct connection to borough-located administration teams with greater capacity and skilled trades staff to respond to issues and concerns. Property managers will report directly to neighborhood administrators.

These operational changes will restructure management at Marlboro and provide a clearer chain of accountability and oversight for residents and staff, streamlining operational efficiency and supporting successful adoption of new resilience strategies and investments.

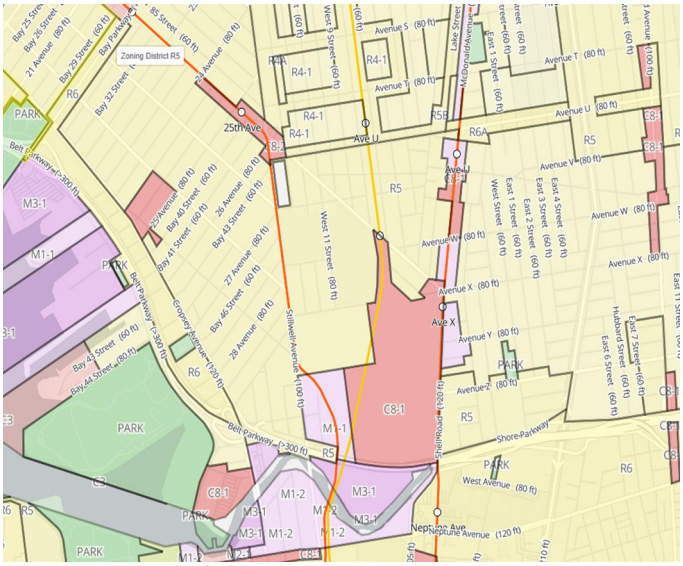
Site and Surrounding Context

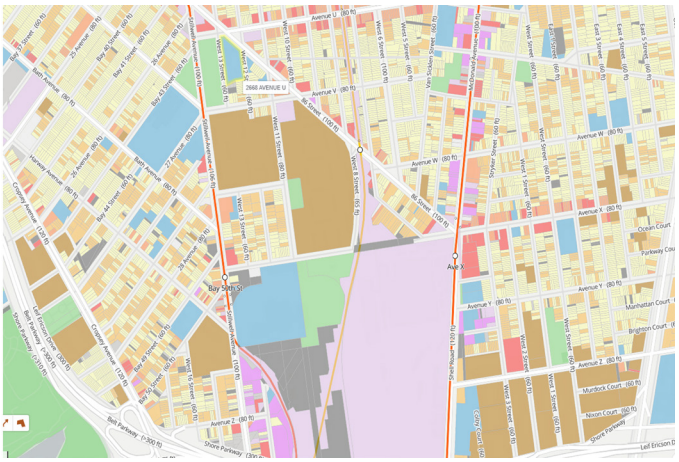
Marlboro Houses is a NYCHA development in Gravesend, Brooklyn, located in the borough's Community Board 13, and is home to over 4,000 New Yorkers in 28 buildings. Marlboro's 28 buildings are 7 and 16-stories tall, with 1,765 apartments housing an estimated 4,053 residents and include a separate boiler building and garage. The 34.86-acre site was completed January 31, 1958, and is bordered by Stillwell Avenue, 86th Street, Avenue X, and Avenue V.

Marlboro was built in the 1950s on land that was acquired through condemnation as part of the city's efforts to replace dilapidated tenements with modern apartment communities, an approach emblematic of the often-inequitable process known as "urban renewal."



Marlboro Houses Site Plan.





Zoning and land use maps for the Marlboro area. Source: Briefing Book.

Most of the development's buildings are 7 stories tall, with the exception of buildings 1, 2, and 3, which are 16 stories tall. The development is surrounded primarily by residential streets featuring smaller, low-rise buildings. It is adjacent to the MTA's Coney Island Subway Yard, a large transportation facility serving four subway lines.

The site is in an R5 residential zoning district, with a dense mix of residential, commercial, and industrial uses and open space nearby. Like many NYCHA developments, however, Marlboro lacks a diversity of on-site uses and its park-like design creates a sudden interruption in the surrounding urban fabric, isolating the campus from its neighborhood.

Among Marlboro's population:

- 60% are female
- 41% are Black, 30% are non-white Hispanic, 21% are Asian, and 8% are white
- 41% of households live on a fixed income (median fixed income: $10,740)
- Many residents have low incomes (median household income: $19,612)
- 22% are over 62 years of age
- 68% have one or more disabilities

Many of these factors increase social vulnerability to climate hazards.

Ecological context

The Gravesend neighborhood is separated from nearby Coney Island by the Coney Island Creek. Gravesend once contained extensive salt marshes and a number of Coney Island Creek tributaries. On the large block containing most of Marlboro's buildings, a pumping station drained what was known as Hubbard's Creek and turned the former marshland and the adjacent Coney Island Yard into dry land.

"Walking" the site

As an in-person tour was not possible due to COVID-19 restrictions, NYCHA provided the panel with a virtual site tour via photos of the campus and building exteriors/interiors.

Aerial view of the Marlboro site and surroundings. Source: Google Maps.

Marlboro (currently located in area marked Gravesend Beach) is built on filled-in marshland. Source: 1891 Map of Jamaica Bay; Joseph Rudolf Bien, David Rumsey Historical Map Collection.

Aerial view of the Gravesend neighborhood and southern Brooklyn. Source: Google Maps.

Site tour images of Marlboro Houses, courtesy of NYCHA.

Resilience Challenges at Marlboro Houses

Marlboro is particularly important to look at within NYCHA's portfolio due to its known storm surge vulnerabilities, as seen in the 2015 Preliminary Flood Insurance Rate Maps (PFIRMS) and the 2050 and 2100 flood projection maps created by the New York City Department of City Planning's Flood Hazard Mapper (flooding frequently occurs outside of these PFIRMS as well). Marlboro is not at risk from tidal flooding, but its vulnerabilities extend beyond storm surge.

To analyze a wider range of hazards, the MOR provided the panel with a risk screening for Marlboro Houses based on the methodology of the Climate Resiliency Design Guidelines. In addition to coastal storm surge, this screening covered precipitation, tidal flooding, and extreme heat. Overall, Marlboro received the following initial screening results:

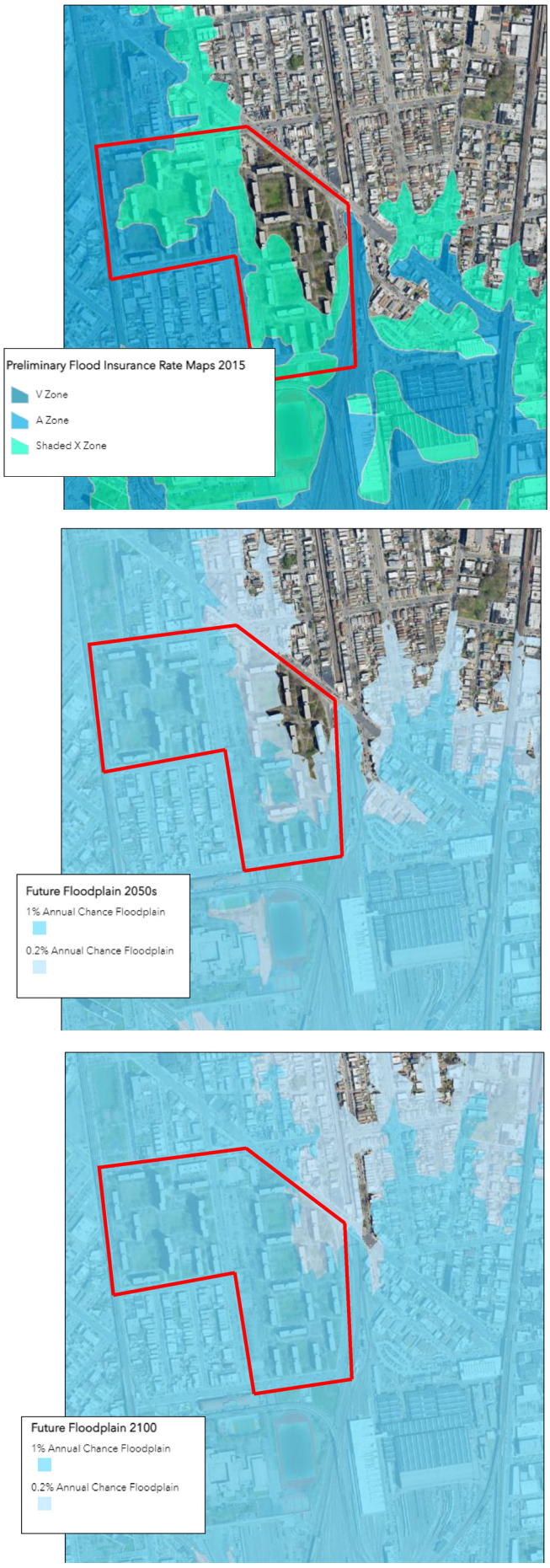
Flooding	Precipitation	Extreme Heat
High exposure	**Medium to high exposure** **(depending on the type of improvements being made)**	**Low to high exposure** **(depending on the type of improvements being made)**

Precipitation

Marlboro is subject to flooding from heavy rainfall. The MOR will soon release inland flood maps relating to precipitation risks, but local knowledge from residents and staff indicates consistent ponding issues, especially in the southern portion of the development. Future projects that significantly improve drainage or decrease impervious surfaces can reduce precipitation-based flood risk.

Extreme Heat

Marlboro is subject to current and future risks to its residents and assets from extreme heat. Extreme heat is the deadliest natural disaster in the United States, killing more people than all other natural disasters, and is thus the most pressing climate hazard at Marlboro. The elderly, the very young, pregnant women, and those with pre-existing medical conditions are more at risk, as are households who cannot afford air conditioning, cannot relocate to cooling centers, or who live in neighborhoods with less green space and more impervious surface (often low-income communities and Black and other communities of color). Marlboro's higher



Flood projection maps for 2013, 2050, and 2100. Source: New York City Department of City Planning's Flood Hazard Mapper.

Extreme heat is the deadliest natural disaster in the United States, killing more people than all other natural disasters, and is the most pressing climate hazard at Marlboro.

proportion of Black and low-income residents elevates its vulnerability to extreme heat, as does its high proportion of elderly residents (22%). Future capital work that uses heat-resistant materials, enhances the landscape's ability to cool, or lowers indoor heat exposure through improved building envelope or HVAC systems, would reduce heat vulnerability.

Other Risks – Groundwater and Air Quality

Though not included in the Guidelines' exposure screening, Marlboro also faces several other risks that interact with precipitation and extreme heat.

- As with many areas developed on former marshland, Marlboro's immediate surroundings are likely gathering points for floodwater and the soils are likely wet and slow to drain, which would exacerbate flooding recovery time by slowing down the pace of water absorption into the ground. Nature-based solutions that allow for safe storage of this water in strategic locations will reduce disruption from slow-draining water.
- Urban air quality is expected to deteriorate further as climate changes and increasing temperatures trap more pollution at ground level. Air pollution in New York City is estimated to cause 3,000 deaths and 8,000 hospital admissions or emergency room visits for lung or heart conditions annually. The presence of the MTA's Coney Island Yard facility and two elevated subway lines (as well as other industrial land uses in the neighborhood) raise concerns related to air quality, although this would need specific measurement at Marlboro for verification.

Air pollution in New York City is estimated to cause 3,000 deaths and 8,000 hospital admissions or emergency room visits for lung or heart conditions annually. The NYC Department of Health monitors air pollution across the city every season.

Ponding at Marlboro frequently occurs during rain events.


COURTESY OF NYCHA

Landscape Strategies: Enhancing Local and Regional Green Infrastructure

Marlboro Houses' open space has catalytic opportunities for the neighborhood (and potentially wider South Brooklyn) as a space for healthy living, recreation, and resilience to flooding and heat. The sections below detail the panel's recommendations for Marlboro's landscapes. These focus on:

- Pursuing a neighborhood approach for resilience to storm surge and sea level rise.
- Developing campus-wide green infrastructure for resilience to flooding, extreme heat, and poor air quality, beginning with a pilot approach and scaling up across campus.

The panel created the following phasing to carry out these recommendations:

- Near-term (next 1-2 years): Develop performance criteria and measurement for green infrastructure improvements on campus; achieve early wins with 'low-hanging fruit' green infrastructure projects; and explore funding and financing alternatives.
- Mid-term (3-5 years): Complete integrated green infrastructure initial/phase I efforts.
- Long-term (5+ years): Optimize green infrastructure performance and consider neighborhood-scale interventions for coastal storm surge and sea level rise.

A comprehensive system of green infrastructure practices that incorporates multiple redundant solutions should be developed to enhance Marlboro's landscapes – especially

passive and fail-safe measures, like bioswales and rain gardens, that can enhance the landscape and do not create high maintenance burdens, as suggested by stakeholders. The system should serve multiple purposes – green infrastructure should help manage multiple climate risks (storm surge, heavy precipitation, and extreme heat), activate public spaces, and engage residents. Implementing these resilience measures can enhance a number of ecosystem services, including:

- Improve and regulate air quality
- Enhance water retention and reduce runoff
- Increase water infiltration
- Improve recreational space for tenants
- Support mental health and wellbeing
- Increase biodiversity
- Reduce heat island effect
- Moderate extreme events

The panel recommends that this system should extend beyond Marlboro's boundaries, as a coordinated neighborhood and site level approach will be most effective. The sections below detail these recommendations further.

Pursue Neighborhood Collaborations on Storm Surge and Green Infrastructure

Most importantly, although coastal flooding from storm surge is a significant risk, the panel determined that **large-scale infrastructural interventions like berms or storm surge barriers would be inappropriate on site**, given that Marlboro is located slightly inland from the waterfront and surrounded by a dense mix of buildings, street networks, and utilities.

Instead, the panel recommends NYCHA consider larger infrastructural solutions with additional stakeholders as part of a **neighborhood adaptation project** that addresses both inland and waterfront areas. Given the extensive green space within and around Marlboro, the panel **encourages NYCHA to explore a neighborhood-scale approach for sea level rise and storm surge in partnership with other city agencies and local organizations, such as the Parks Department**.

As a key part of this strategy, Marlboro can capitalize on its proximity to larger parks such as Calvert Vaux Park, a waterfront green space which is also a high point in elevation that will remain above water as sea levels rise, continuing to provide an asset to the community. Additionally, there are a number of vegetated areas throughout the neighborhood, such as:

- Marlboro Park
- Scarangella Park
- Vacant city-owned lots
- Street trees
- Existing open spaces between buildings

The panel determined that large-scale infrastructural interventions like berms or storm surge barriers would be inappropriate on site, given that Marlboro is located slightly inland from the waterfront and surrounded by a dense mix of buildings, street networks, and utilities. Instead, the panel encourages NYCHA to explore a neighborhood-scale approach for sea level rise and storm surge in partnership with other city agencies and local organizations, such as the Parks Department.

- Neighboring green spaces (e.g., around John Dewey High School)
- Potential new open spaces

This neighborhood-level strategy could thus be anchored by larger-scale infrastructural interventions at nearby parks like Calvert Vaux and complemented by site-scale green infrastructure in and around Marlboro (see Implement Site-Wide Distributed Green Infrastructure, page 24). These larger solutions on the waterfront could include 'grey' or 'hard' infrastructure like seawalls and elevated piers, or nature-based strategies like tidal marshes and living shorelines, or a combination of the two. Examples of successful interventions can be found in nearby coastal locations like Brooklyn Bridge Park and Hunters Point South.

NYCHA would also need to consider Marlboro's increased vulnerabilities caused by existing neighborhood infrastructure. For example, a wall that protects the nearby MTA railyard from flooding channels water flow toward Marlboro, potentially carrying toxic materials with it. This concern should be considered carefully (alongside any potential railyard-related air quality issues previously mentioned), as part of an assessment of the relationship between the railyard site and the health of Marlboro residents. Existing flood maps do not take these infrastructural impacts on flood patterns into account, and they should be incorporated in any resilience assessment (see Operations and Finance Strategies page 42).

In addition to developing storm surge and sea level rise protection, the panel recommends NYCHA work with other city agencies and local stakeholders on assessing opportunities to improve green spaces and infrastructure throughout the neighborhood for inland resilience to flooding and extreme heat.

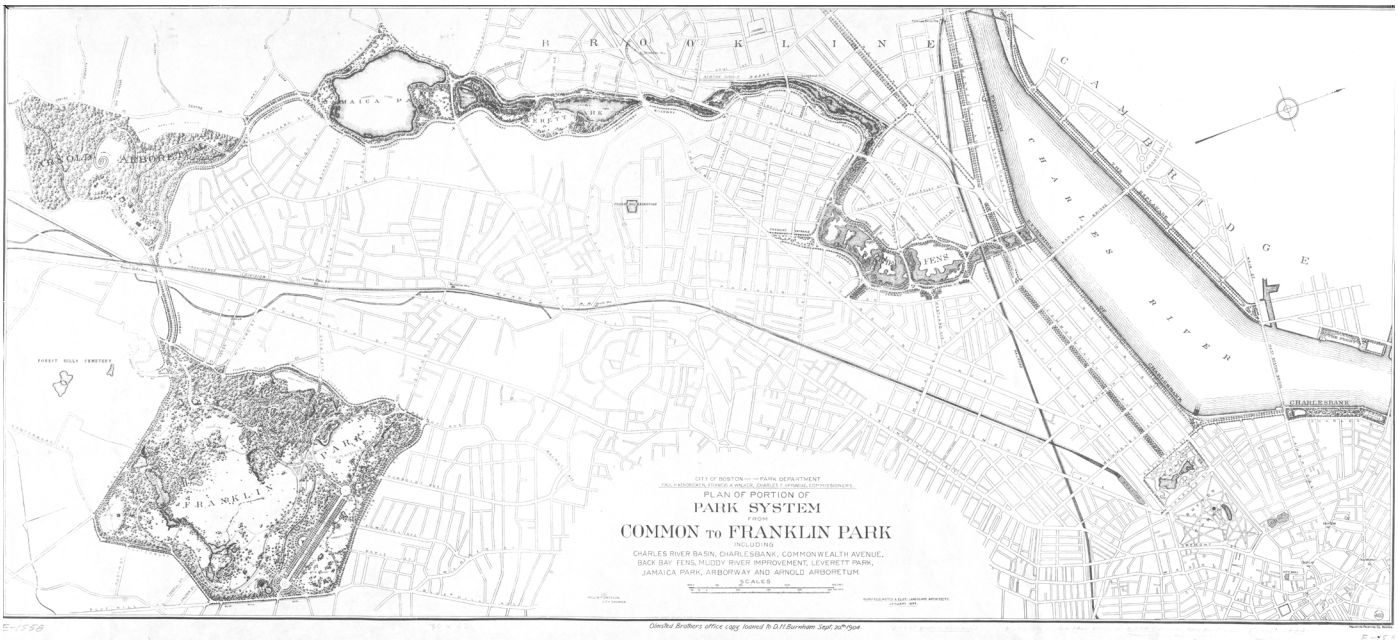
Considering Marlboro as part of the broader community and using green/cool corridors to link neighborhood assets into a network would significantly boost the area's resilience to flooding and heat impacts. These corridors would also boost overall walkability by reducing heat impacts on pedestrians. As Marlboro residents need to be able to successfully navigate the neighborhood beyond campus, it is essential that the surrounding spaces are also made more resilient to climate risks.

Given the amount of open space at Marlboro, the panel encourages NYCHA to think of it as an additional asset rather than simply a setting for buildings. The size of the campus provides a chance to think deeper about the possibilities of a long-term resilience strategy that builds on open space. Marlboro's campus represents a significant value proposition, as it contains roughly as much green space in its 5 northwestern

An aerial view of Marlboro Houses (outlined in yellow) in the upper right corner and the waterfront Calvert Vaux Park in the lower left corner (outlined in green). Though Marlboro may not be itself suited to major infrastructure to protect from storm surge, Calvert Vaux Park is a significant coastal protection opportunity and a recreational asset that can connect residents to green corridors. Source: Google Maps and TAP Panel.

Caption: Marlboro Houses (in yellow) is surrounded by significant green infrastructure (in green) that can create a linked corridor network, providing even greater ecosystem services like cooling and stormwater management. Source: Google Maps and TAP Panel.

acres alone as the beloved Bryant Park in Manhattan, and therefore has the capacity to act as a resilience and recreation attraction for broader South Brooklyn. This could be facilitated if the campus's green space were to be **separated in ownership and transferred, for example, to the Parks Department**. If other city agencies were brought into ownership and management of campus grounds, new sources of funding may open up and the park could conceivably become a marquee resilient open space project for the neighborhood.



Boston's Emerald Necklace (original plan above by Frederick Law Olmsted, 1894) exemplifies how green spaces can be connected for regional ecological and recreational benefit.

Marlboro contains roughly as much green space in its 5 northwestern acres alone as the beloved Bryant Park in Manhattan, and therefore has the capacity to act as a resilience and recreation attraction for broader South Brooklyn. This could be facilitated if the campus's green space were to be separated in ownership and transferred, for example, to the Parks Department.

Lastly, NYCHA has a number of existing initiatives that will affect the landscape at Marlboro and other developments. The Connected Communities initiative provides guidance for using urban design to help reknit NYCHA campuses back into the surrounding urban fabric while enhancing the accessibility, quality, and resilience of their public spaces. According to NYCHA, the design principles contained in the initiative's Connected Communities Guidebook "will serve as the Authority's comprehensive approach to urban design across its portfolio," and "will be an important part of every Request for Proposal (RFP) for new construction" (NYCHA Briefing Book). Additionally, the broader Open Streets program that began during the COVID-19 pandemic may influence the use of streets adjacent to Marlboro by closing them to vehicular traffic, thereby expanding usable public space. These programs should guide NYCHA's work to bridge the neighborhood-scale approach with a site-scale approach, better integrating Marlboro into Gravesend.

Implement Site-Wide Distributed Green Infrastructure

To accompany a neighborhood strategy, the panel encourages NYCHA to create a resilient landscape for Marlboro itself using an **array of nature-based solutions**, providing multiple resilience and ecosystem services for residents and beyond. This site-scale approach would form the core of NYCHA's landscape resilience strategy at Marlboro and help buffer against the impacts of exacerbated flooding and extreme heat, while improving air quality.

The panel recommends implementing the following resilient landscape opportunities:

- Bioswales
- Rain gardens
- Enhanced tree canopy
- Increased landscape diversity
- Regeneration of natural waterways and sinks
- Raised pathways to preserve mobility during flood events

Marlboro's landscape has as much open space in its northwestern portion as Bryant Park in Manhattan, creating a strong value proposition. Source: TAP Panel.

Constructed wetlands - Georgia Tech campus

Constructed wetlands - Sidwell Friends School

Bioretention

Rain garden

Marlboro's landscapes are well suited to an array of green infrastructure solutions to enhance stormwater management, biodiversity, and aesthetics. These solutions could include (reverse clockwise from left side of graphic): wherever possible, restoration of natural wetlands to store water, as in these constructed wetlands at Georgia Tech and Sidwell Friends School, or restoring pre-existing waterways (such as the former Hubbard's Creek on Marlboro's grounds) to move water quickly offsite; bioretention and rain gardens, which can absorb stormwater and reduce flooding; stormwater detention plazas, like Rotterdam's Benthemplein, which serve recreational purposes as sports courts during dry weather and store rainwater during storms; enhanced tree canopy to improve local air quality and mitigate extreme heat; and permeable pavement or strategic de-paving that allows infiltration of rainwater on hard surfaces. If implemented across the campus over time, Marlboro can become more resilient, especially to flooding from precipitation. Graphic created by TAP Panel. Center base map by Google Earth; reverse clockwise from left to right, images courtesy of Biohabitats; Biohabitats; Flickr/Dan Reed; Flickr/Wes Hill; Flickr/Stadtlandschaft; Flickr/Stadtlandschaft; Wikimedia/cathrotterdam; Flickr/Deeproot; Biohabitats.

- Increased connectivity to neighborhood
- Biophilic design connections with indoor space
- Targeted lighting plan to improve safety and reduce impact on wildlife

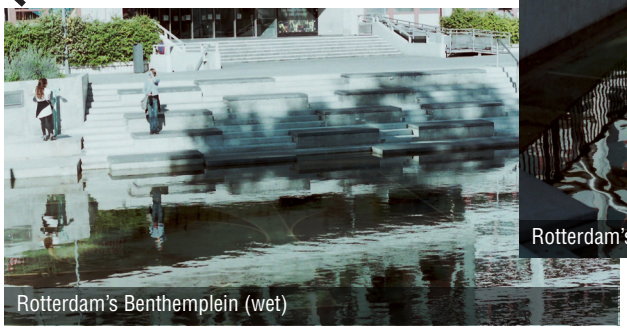
Green infrastructure should be distributed throughout the campus to achieve maximum benefit. Specifically, areas that experience repetitive flooding can be targeted for green infrastructure to move water more efficiently through the landscape. An impervious surface analysis would further calculate Marlboro's contribution to local sheet flow and help identify


Strategic de-paving


Enhanced tree canopy


Rotterdam's Benthemplein (dry)


Rotterdam's Benthemplein (wet)


Rotterdam's Benthemplein (wet)

potential reductions to combined sewer overflow (CSO) events created by green infrastructure improvements or rainwater harvesting. Raised pathways or boardwalks could be installed to help maintain navigability during and after intense rain events.

Additionally, during stakeholder interviews, the landscape team learned how the site's history of marshlands and creek presence still influence its hydrology today as frequent ponding occurs after rains, especially in the southern and northern portions of the development. Therefore, smaller interventions such as bioswales or rain gardens should accompany larger green infrastructure solutions that consider the modern remnants of historic waterways and landforms and seek to restore their original function of absorbing and transporting water while also balancing the needs of current tenants for

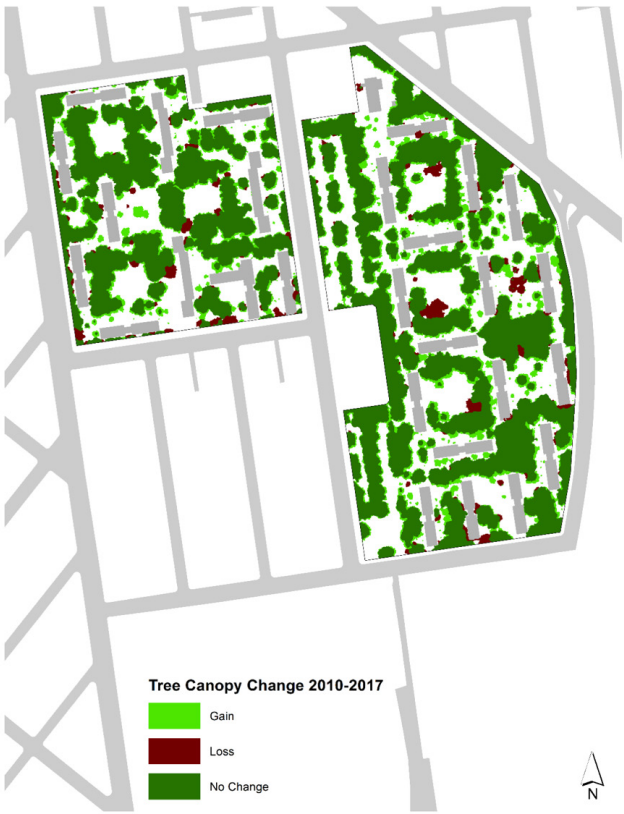
access to dry, usable green space and indoor environments. Hubbard's Creek used to provide the function of draining the area efficiently into Coney Island Creek and from there into the ocean. The panel does not recommend NYCHA try to recreate the original Hubbard's Creek as it was, since buildings are now located on its former footprint, but rather that NYCHA assesses the possibilities of designing a new nature-based system that mimics the Creek's ability to collect and move water offsite after rain or flood events.

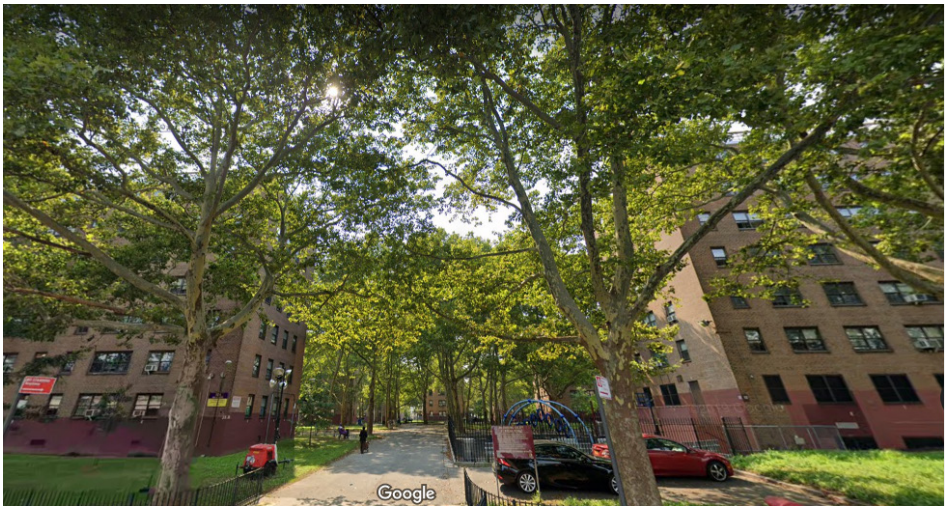
> Green infrastructure solutions should also consider the modern remnants of historic waterways and landforms and seek to restore their original function of absorbing and transporting water while also balancing the needs of current tenants for access to dry, usable green space and indoor environments.

Resilience Benefits

In addition to stormwater and flood management, green infrastructure of multiple types would also reduce the impacts of extreme heat. Cooling can be enhanced through preserving and expanding tree canopy and increasing shading and biodiversity of lawn areas. Mitigating extreme heat is a major priority for the city and NYCHA, as seen in the City's Cool Neighborhoods program and NYCHA's work on Sheltering Seniors from Extreme Heat. Marlboro already benefits from the cooling effect of its extensive, mature tree canopy and permeable surfaces, and NYCHA campuses can be up to two degrees cooler (°F) than their surrounding neighborhoods (NYCHA Briefing Book). This advantage can be improved further, boosting Marlboro's capacity as a local cool island.

Improved green infrastructure would also benefit local air quality. Poor urban air quality impacts human health and compounds underlying respiratory and cardiovascular disease vulnerabilities, such as COVID-19, as well as





Marlboro's tree canopy has thrived and expanded in recent years and is one of the campus's strongest landscape assets. However, with changing climates, trees may experience thermal shocks that may affect their longevity. Understanding the climate projections and related impacts on existing species in this area is key to understanding the likelihood of survivability. Image source: NYCHA Briefing Book and Google Maps.

vulnerability to extreme heat and mold, the latter a secondary risk of flooding and a common issue in NYCHA developments. These spillover effects raise the risk of comorbidity (the presence of two or more diseases/conditions in one patient) and potential mortality from climate hazards, as identified by the NPCC. A screening of local air quality within Marlboro's grounds and any impacts from the nearby MTA railyard would help identify any air quality issues and specific problem areas for prioritization.

Marlboro's green spaces also present prospects for improving social cohesion of residents and the surrounding neighborhood. As an analysis by landscape architecture firm Nancy Owens Studio determined, increasing the variety of active recreation options onsite beyond playgrounds for young children by adding spaces for use by community members of all ages will ensure there are gathering points for everyone. As strong social networks are a defining feature of NYCHA communities, providing these welcoming spaces is key to enriching community resilience.

Marlboro's extensive green space also allows room to support residents' food security, environmental education, and empowerment. Many NYCHA campuses already support urban agriculture, including Marlboro, and the campus's food production capacity will soon expand through the upcoming development of an onsite greenhouse and community educational facility by The Campaign Against Hunger. The greenhouse will address economic distress and disparities for Marlboro residents around issues of food and health equity. The COVID-19 pandemic demonstrated the value of spaces such as these for providing a refuge for safe gathering.

The panel believes that a greenhouse could further maximize benefits for the community if it can be integrated into Marlboro's sustainability operations and provide chances for circular flows that reduce operating costs, waste, and resource intensive inputs. This could include, for example, generating landscaping compost through resident food waste or using space in the greenhouse to grow plants intended for use in Marlboro's grounds.

Training and operations/maintenance considerations

Green infrastructure can provide resilience solutions, but the operations and maintenance of these additions will be important considerations. Stakeholders made frequent mention of the need for guidance and training for grounds staff on how to maintain green infrastructure to preserve functionality.

Additionally, infrastructure designs should address multiple hazards and operational practices – for example, the use of snowplows after heavy winter storms can damage permeable pavement installed to reduce stormwater flooding. Lastly, there is a strong need for education and outreach on green infrastructure maintenance, such as a set of best practices for both grounds staff and residents, which could help prevent unfortunate events such as bioswales being mowed by staff (a common concern mentioned during interviews).

Local community members or existing staff should be responsible and compensated for deploying and maintaining any new infrastructure (whether green or other deployable flood protection infrastructure), which may help generate support for its use and ensure it can be activated in time for storm events. Lastly, when selecting resilience measures, life cycle costs should be considered, as costs of maintenance or deployment of such measures can quickly escalate and affect cost-benefit analyses if not considered early in the planning and design process.

Implementation

As an immediate next step, the panel recommends that NYCHA evaluate all upcoming Marlboro expenditures for opportunities to build resilience. Afterwards, in the near-term, the panel recommends the agency begin with identifying existing assets, creating planning and design criteria as well as metrics for measuring infrastructure performance, and implementing small, 'low-hanging fruit' pilot projects. These can then be scaled up over time to campus-wide implementation as momentum builds within the Marlboro community.

Firstly, an ongoing resource inventory should guide holistic design and monitoring for nature-based solutions and would help NYCHA identify Marlboro's current assets that can be further enhanced. Assets identified by this inventory could include items such as information on the ecosystem benefits provided by existing tree canopy (e.g., U.S. Forest Service i-Tree protocols underway at other NYCHA developments) and green spaces.

NYCHA has engaged Nancy Owens Studio (NOS) to initiate this inventory at Marlboro, analyzing the campus for a recreation master plan initiative that included landscape aesthetics, resilience, and resident health and wellbeing. NOS noted that the campus landscapes are an enormous asset to residents, but they are still vulnerable to climate challenges, and recommended six key strategies/focus areas for enhancing resilience to heat and flooding, including trees, plantings, landforms,

hardscape/paved areas, infiltration, and detention. This inventory can be expanded with new data sources and metrics to create a baseline of performance and evaluate new resilience measures as they are implemented.

When assessing existing assets and mapping current green infrastructure, both on-site and off-site resources should be included and the neighborhood around Marlboro likewise analyzed comprehensively in order to maximize the benefits of resilience work. Additionally, examining an overlay of problem areas and hazards with proposed capital upgrades can highlight potential intersections or gaps for investments and ensure that future risks and chronic issues are adequately addressed. This assessment should support the development of an initial site plan and designs for new green infrastructure solutions.

With this inventory in place, the panel recommends NYCHA develop criteria for success of new green infrastructure (such as the sheet flow reductions mentioned above), as these will be essential for determining and communicating the effectiveness of landscape interventions as implementation rolls out across the mid- and long-term. This should include ROI calculations.

Using a holistic approach to ROI can help with cost-benefit analyses of green infrastructure upgrades and may attract a broader array of potential funders. This approach may include the addition of items such as quantified health benefits from air quality improvements, the value of heat reduction, improved ecological functioning, or other mechanisms. Considering that water rate increase projections extend only a few years, and the cost of water may rise in coming decades, including any metrics that capture the value of onsite water reuse is also recommended to ensure these benefits are recognized. A base ROI, which measures the contributions of green infrastructure currently in place, can be adjusted as future investments are considered to help make a strong business case.

In the mid-term, the information from the near-term green infrastructure planning studies and assessments can inform implementation and facilitate project progress across campus. After vulnerability assessments take place, sea level rise planning for Marlboro should begin and remain a focus throughout this work (see Operations and Finance Strategies page 42). Though high-tide flooding will likely not be an issue at Marlboro, higher sea levels will exacerbate storm surge events. As these storm surges become more frequent, Marlboro will need to consider how to handle repeated saltwater intrusion while sustaining occupancy.

As landscape interventions may not completely keep saltwater out of building ground floors, changes to the use and design of those spaces will likely be necessary (see Buildings Strategies page 31). Additionally, as sea levels rise, Marlboro's location may transition from inland to coastal edge, and the need for larger-scale infrastructure might become more appropriate. Planning for this transition early will help speed implementation of any larger future projects.

In the long-term, the panel recommends finetuning the performance of installed green infrastructure using monitoring and evaluation systems put in place.

Funding mechanisms

Potential funding opportunities may come from a new round of federal Building Resilient Infrastructure and Communities (BRIC) funds under the Biden administration, which Marlboro may become eligible for if it becomes part of the Public Housing Preservation Trust – however, the timeline on this opportunity is uncertain. Similarly, the New York State Restore Mother Nature Bond Act may offer opportunities at Marlboro, particularly if a Marlboro pilot project could contribute lessons learned and greater efficacy to the Act's broader initiatives, although it is important to note that this funding source does not yet exist.

In addition to landscape-related grants, the panel encourages NYCHA to identify grant programs that support water conservation in buildings that may help offset the cost of building water efficiency upgrades. These programs could lower water utility costs and, more importantly, identify and quantify intersection opportunities between building water usage and landscape design. Stakeholders often mentioned **sewer backup as a consistent source of flooding at Marlboro**; therefore, every gallon of water saved or reused within the buildings is a gallon not causing a problem in the landscape. Quantifying building water usage is an important first step toward pursuing water reduction and reuse and can support the creation of the metrics mentioned above.

Every gallon of water saved or reused within the buildings is a gallon not causing a problem in the landscape.

Summary and Data Needs

The following table presents a summary of these recommendations and some of the information NYCHA needs to carry out the recommendations presented here.

Near-Term (1-2 years)	Mid-Term (3-5 years)	Long-Term (5+ years)
Performance Criteria + Measurement › Identify metrics › Assess existing natural resource and open space assets (resource inventory) › Map problem areas, current/future hazards and proposed capital improvements › Create planning design criteria › Develop best practice maintenance guidance for green infrastructure and training of groundskeepers › Complete tree mapping and assign ecosystems values ***Early Wins*** › Identify and complete 'low-hanging fruit' green infrastructure upgrades › Explore / expand greenhouse opportunities within Marlboro's sustainability operations and food systems ***Funding and Financing*** › Explore BRIC and other potential funding incentives › Complete rough ROI for green infrastructure and water capture / re-use infrastructure	› Integrate assets / planning efforts / desired goals › Complete integrated green infrastructure initial/phase I efforts › Introduce community spaces that align with the population demographics, providing assets beyond child-centric playgrounds › Plan for sea level rise adaptation › Evaluate tree canopy composition and likely survivability with climate change	› Optimize performance and function with nature-based solutions and green infrastructure › Consider regional interventions › Begin adaptations for sea level rise

Data	Purpose
Tree Survey	Quantifies ecosystem value and expected lifespan
Community Resource Map	Identifies nearby assets to connect for complete community planning as well as priorities for dry pathways
Microclimate Samples	Identifies surficial, wet-bulb globe temperature, heat vulnerability index metrics in representative outdoor environments
Impervious Surface Assessment	Identifies surface runoff and contribution to CSO
Maintenance Training and Maintenance Budget	Identifies terms and preparation as existing and as related to proposed landscape changes
Existing Conditions Assessment	Identifies areas of current and historic challenges in landscape and civil site infrastructure (e.g. ponding)

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Buildings Strategies: Net Zero/ Passive House and Flood-proofing Retrofits

Defining Passive House and net zero

Passive buildings, according to the Passive House Institute US, are extremely energy efficient buildings designed to stay within comfortable temperature ranges by moderating heat gain or loss to the outdoors, making extreme temperatures much easier to withstand through use of continuous insulation, airtight envelopes, passive solar design, heat recovery ventilation, and minimal space conditioning. These buildings must pass strict energy use intensity measurements to achieve Passive House certification.

Net zero energy buildings produce as much energy as they use by achieving high energy efficiency (for example, by meeting Passive House standards) and using onsite renewable energy sources, like solar panels. If capacity for renewables is limited, buildings can still reach net zero carbon by purchasing entirely renewable energy through the utility grid.

The buildings at Marlboro Houses have enormous potential to offer high-quality healthy, resilient, net zero carbon affordable housing. A thoughtful, comprehensive approach to retrofitting these buildings, which takes advantage of new technologies in building envelopes, HVAC systems, and renewable energy, can transform Marlboro into a high-performance campus that supports NYCHA's goals for sustainability, climate adaptation, and resident quality of life. This section details the panel's recommendations for Marlboro's buildings. These focus on:

- Implementing net zero/Passive House and floodproofing retrofits for all buildings, beginning with a pilot project and scaling up across campus
- Pursuing new resilient and sustainable construction opportunities where feasible

The panel created the following phasing to carry out these recommendations:

- Near-term (next 1-2 years): conduct study of building conditions for climate mitigation/adaptation solutions; address immediate maintenance issues ("first tasks"); pursue pre-development activities.
- Mid-term (3-5 years): Deliver completed initial/phase I of building upgrades; investigate new building locations.
- Long-term (5+ years): Complete additional renovations and consider new construction opportunities.

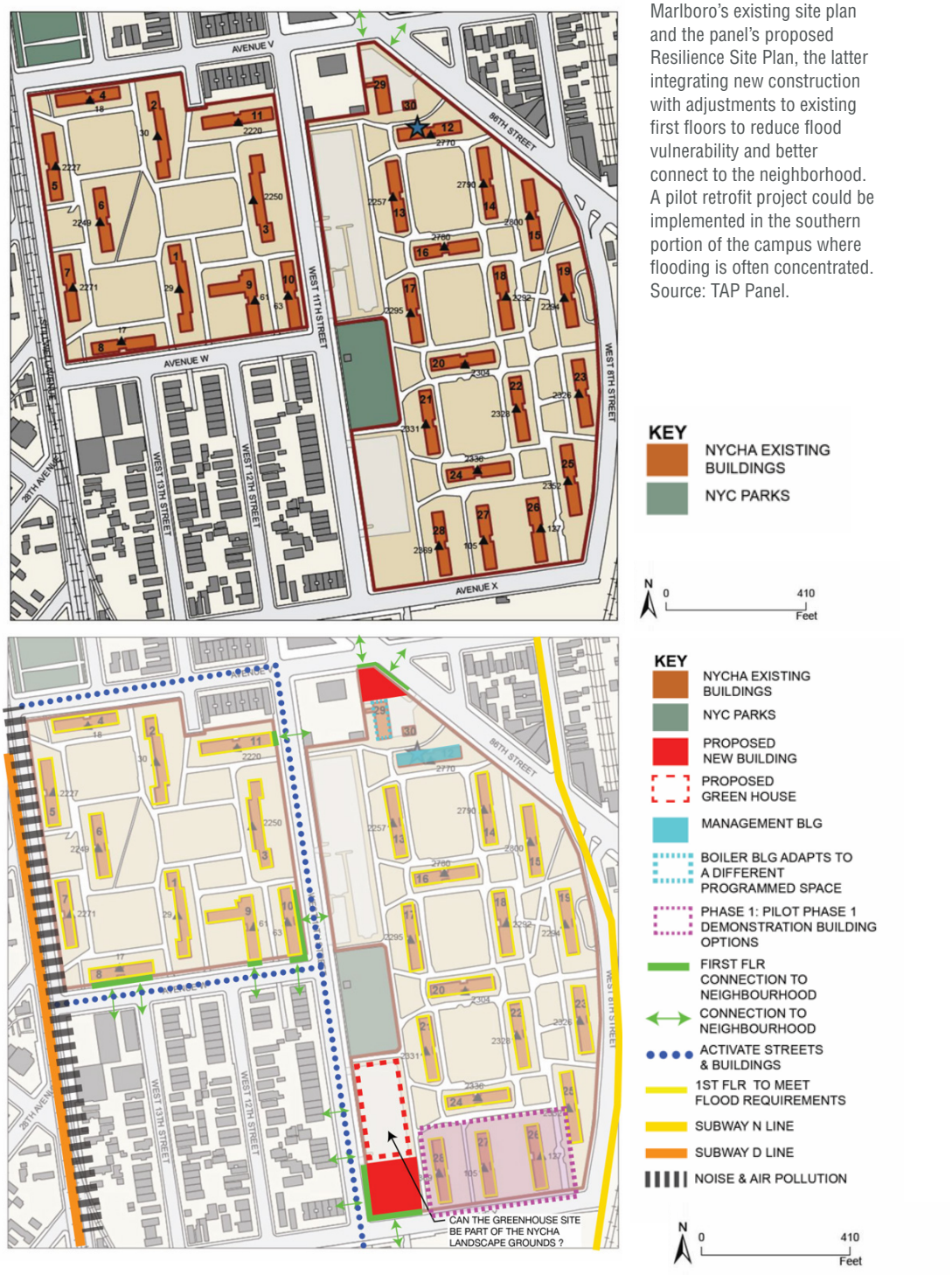
By implementing the panel's two key recommendations for Marlboro's building stock, NYCHA can simultaneously:

- Improve resident risk awareness and coping capacity;
- Boost the development's resilience to flooding and extreme heat;

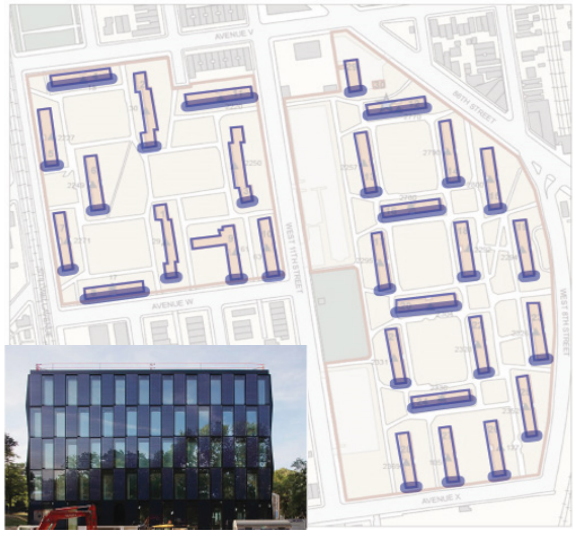
- Improve indoor environmental quality and energy efficiency, reducing NYCHA's operating costs;
- Support income generation for residents and NYCHA; and
- Create a more vibrant, mixed-use campus that engages directly with the surrounding neighborhood.

Based on previous experience with affordable housing retrofits of this scale and NYCHA's input, the panel believes that this approach would be financially feasible given the funding levels needed on a per-unit basis for renovations ($180,000 per unit, as per the 2017 5-year Physical Needs Assessment) and the increases in per-unit HUD subsidies anticipated through a potential conversion to Section 8 and use of Tenant Protection Vouchers (roughly $650 per unit per month).

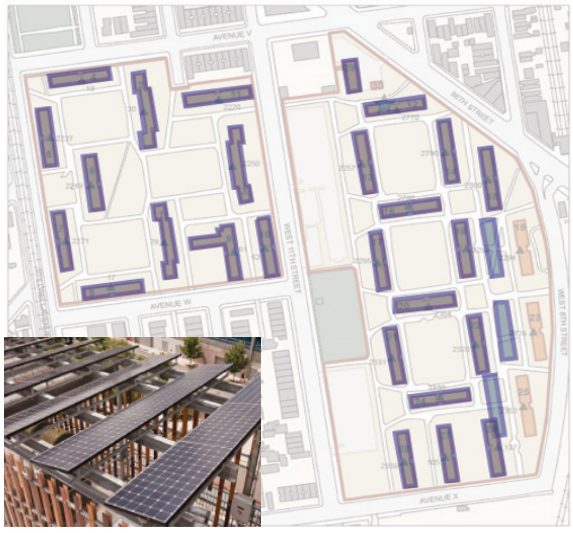
Pursuing retrofits and new construction as one comprehensive program would help NYCHA move beyond what stakeholder interviews indicated was a fragmented, siloed approach to capital planning that has tended to follow specific funding opportunities or emergency needs, rather than a



Marlboro's existing site plan and the panel's proposed Resilience Site Plan, the latter integrating new construction with adjustments to existing first floors to reduce flood vulnerability and better connect to the neighborhood. A pilot retrofit project could be implemented in the southern portion of the campus where flooding is often concentrated. Source: TAP Panel.



SOLAR PHOTOVOLTAIC (PV) INCORPORATED INTO FACADE.



SOLAR PHOTOVOLTAIC (PV) TRELLIS ON EXISTING ROOFS.

SOLAR PHOTOVOLTAIC (PV) TRELLIS INCORPORATED INTO LANDSCAPE & PARKING

Options for integrating solar photovoltaic (PV) arrays into Marlboro's buildings and open space, supporting all-electric operation and potentially generating revenue. Source: TAP Panel.

pre-determined program of repair/replacement, which limits the ability to consider all aspects of a building's performance.

Additional goals for Marlboro's buildings include activating first floor uses with non-residential (potentially commercial/retail) spaces, addressing building design to enhance connection to adjacent streets, and incorporating new construction to provide temporary swing space to relocate residents, if needed, during construction and create new permanent housing units to offset any decreases in ground floor housing units as use of those floors transition.

There are also strong opportunities for commercial and workforce development that support a number of social and economic goals for NYCHA, residents, and the surrounding neighborhood. Not only are the first floors of new buildings usable for commercial or retail (whether shops, restaurants, groceries, or other services), these potential uses also create employment opportunities for local residents. However, any future planning or programming on ground floors should consider building-specific current and future flood risks and include appropriate design interventions.

Similarly, as alluded to by stakeholders during interviews, the retrofit program and other building work should also specify requirements for local workforce training and hiring and strive for a high percentage of MWBE contracts, further increasing economic opportunity for the Marlboro community. Union and local jobs can be added and preserved in areas such as HVAC maintenance, general construction, and future solar installations. Local economies can likewise benefit from the scale of work being carried out if, in addition to any prevailing wage jobs, Marlboro residents are trained and hired. NYCHA management would likely need to be explicit about resident hiring in lease agreements for this to occur.

Conduct Net Zero/Passive House and Floodproofing Retrofits

The panel recommends NYCHA pursue a comprehensive retrofit program consisting of building electrification, recladding, and floodproofing. NYCHA could consider including these steps as requirements within a Request for Proposals for comprehensive modernization program. The main goals of the retrofit program would be to reach net zero and Passive House standards and build resilience by:

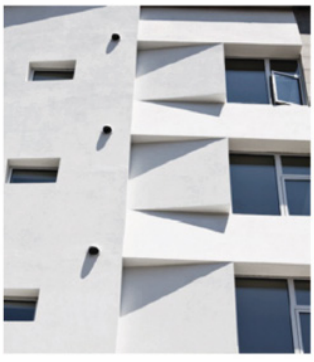
- Combining electrification, facade improvements, and apartment renovations into a complete set of retrofit solutions.
- Planning for future solar development.
- Ensuring first floors and basements meet floodproof requirements (wet or dry, depending on first floor uses and building condition).

The first step of electrification would require transitioning heating systems from steam and central boiler plants to air source heat pumps (as the agency has been testing at other developments like Fort Independence and Lehman Village), and in the long-term, preparing for solar integration on building facades, roofs, and in parking lots. Panelists estimated that the campus could potentially generate at least one megawatt of energy through this combined capacity, which would be enough to power between 150-200 homes, according to the Solar Energy Industries Association (SEIA).

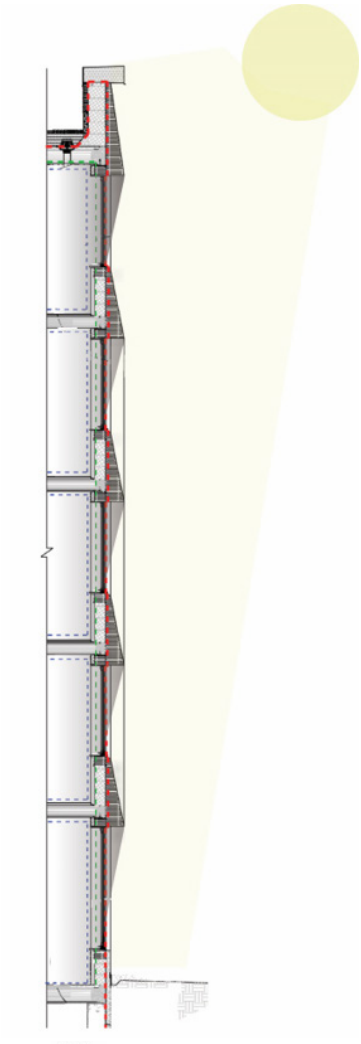
This work would complement interior renovations to apartments planned under NYCHA's Stabilization Strategy

803 Knickerbocker Avenue: Mixed-use house built to the ultra-efficient German Passive Haus standards. the building will feature a senior facility on its ground floor and 31 apartment units as well as a residents' community room and roof garden.

EIFs Insulation wedges with Eco mesh AC units



EIFs Insulation wedges with ERV ducts



* The R-value is continuous and refers to the thermal performance of the entire assembled wall – including windows. In comparison, a standard steel stud brick veneer assembly with R-12 fiberglass batt cavity insulation with double glazed windows yields an overall effective R-value of about 3 to 4.

At Knickerbocker Commons, the EIFS insulation was carved into varying wedge shapes to create a sculptural facade to shade the building, and heating was provided through a unique efficient heating system that is usually used for a smaller, brownstone-size building. A conscious approach to microclimate shading and cooling during the peak summer times is illustrated in the facade with air conditioner units acting as awnings. Eco mesh is used to improve the efficiency of the cooling units.

and Public Housing Preservation Trust, the combination of which will bring units up to quality standards. Though these steps would likely be disruptive for tenants, integrating them into planned upgrades would ensure invasive renovations are performed simultaneously to minimize construction time. Because these upgrades will generate significant waste, NYCHA is encouraged to partner with the Department of Sanitation to identify opportunities for reuse or recycling.

On the exterior of the buildings, surfaces can be reclad using designs and technologies that could help achieve Passive House standards of continuous insulation and envelope airtightness. Prefabricated panels with windows and integrated mechanicals, which panelists estimated are likely to hit the U.S. market within 2-5 years, would be straightforward to install. The simplicity of the current facade design means a recladding could proceed relatively easily, and a single building could be completely reclad in as little as two weeks with minimal disruption to residents.

The prefabricated panels' physical appearance is highly customizable, **creating an opportunity to incorporate significant resident input and community engagement on their aesthetic**. The facade recladding material can even be shaped to create natural shading opportunities that manage solar heat gain, which, alongside enhanced insulation, can lower peak energy loads for cooling and support net zero/Passive House standards. Knickerbocker Commons, a mixed-use affordable housing and daycare project completed in Bushwick for RiseBoro Community Partnership, shaped the exterior insulation finishing system (EIFS) to help lower building energy usage to roughly **10 percent of a comparably sized building** at no extra cost.

As these retrofits would flip the buildings' needs for climate control from staying warm to staying cool, energy recovery ventilators would accompany heat pumps (which can also provide cooling) in shoulder seasons to keep indoor temperatures and humidity consistent and prevent units from overheating.

Retrofit sequence

As NYCHA considers how these retrofits would unfold, a number of steps can be pursued. Marlboro has two main building typologies, including primarily 7-story mid-rise buildings and several 16-story high-rise buildings. Retrofit design would need to approach each building type differently, with the high-rise buildings' facade design presenting greater challenges for energy performance and thermal bridging.

The building retrofitting steps would be as follows:

1. **Comprehensive planning**: including resilient HVAC systems, prefabricated enclosure systems, building energy analysis, and any adjustments to basement level sewer systems that need to be coordinated with landscape strategies.
2. **Facade and HVAC transition**: begin with transitioning HVAC systems externally and pursuing airtightness with air barriers. Heating/cooling lines would be integrated into the exterior facade rather than within unit interiors, and mechanical systems would be incorporated within the panels. (HVAC systems would run vertically up and down the building, reserving all possible roof space for solar PV arrays.)

   Flood elevation and retrofits: This stage of work could also explore elevating the height of the first floor to above base flood elevation if there is adequate floor-to-ceiling height. If this is not feasible, first-floor uses can be converted from residential to alternative (potentially community or commercial) uses and then retrofitted to wet or dry floodproofing requirements. Wet floodproofing, which allows water to enter the building structure in a controlled manner to then be pumped out, is more appropriate for older buildings and all-residential uses. If the buildings can withstand increased hydrostatic pressure, or the first floor is converted to commercial uses, dry floodproofing measures can be used to keep out water entirely.
3. **Thermal enclosure applied**: Thermal enclosures and insulation can then be applied to facades and roofs with the aim of achieving continuous insulation, though the buildings' design and thermal bridging (especially in the high-rise buildings) may make this difficult to achieve. Lastly, the buildings can be clad, either with EIFS or another type of prefabricated cladding system, and prepped for the addition of solar photovoltaic panels at a later date on the facade or roof.

Whatever their final use, these new buildings can be designed for resilience and sustainability by raising first floors above projected base flood elevations and meeting net zero/Passive House standards

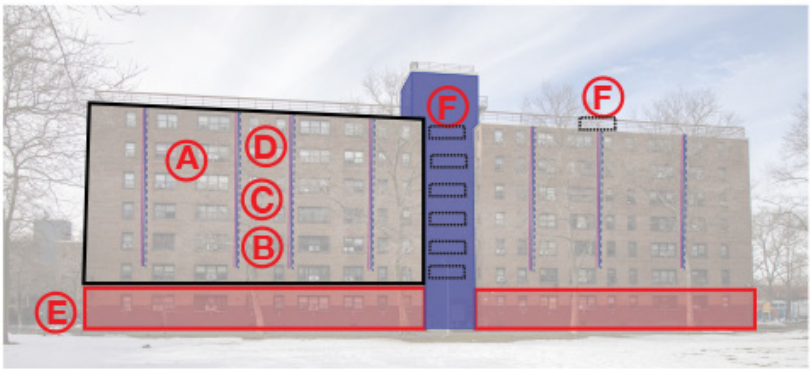
RETROFIT SEQUENCE – TYPE 1 NYCHA EXISTING BUILDING

TYPE 1 NYCHA EXISTING PLAN

- Compact building: ratio of enclosure area to floor area is simple to help peak loads.
- Smaller surface area & volume
- Easter to economically insulate

NYCHA EXISTING TYPE 1 ELEV.

- Smaller surface perimeter.
- Plan work at Basement level for new sewer system coordinated with landscaping.
- Early Resilient design & construction planning: HVAC, Prefab Enclosure & Building Energy analysis.

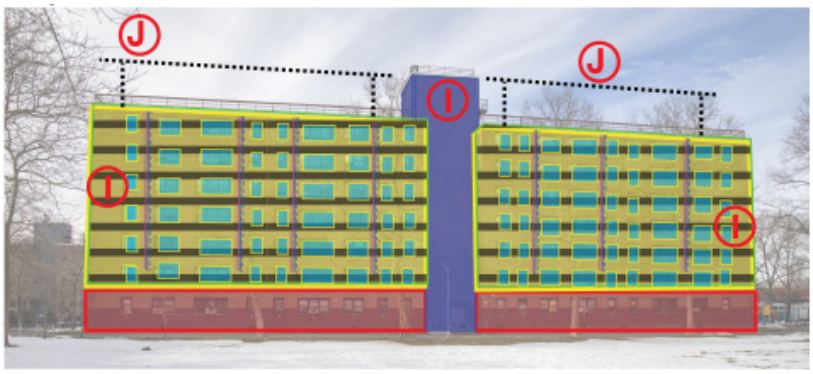


HVAC ON EXTERIOR FACADE & BASE FLOOD ELEVATION

- (A) Airtightness: Air Barrier applied on exterior facade
- (B) Heating & cooling lines on exterior facade
- (C) Coordinate ERV for units
- (D) Mech systems to be unitized
- (E) First floor elevated above Base Flood elevation
- (F) HVAC pods horizontally on roof or vertically off facade

THERMAL ENCLOSURE APPLIED

- (G) Continuous insulation ->Facade & roof
- (H) Thermally broken window



CLADDING & FUTURE ELECTRIFICATION

- (I) Cladding; Site applied or Pre-Fab
- (J) Future Photovoltaic panels

NOTE:

- *Window frame thickness needs to be taken into account for light & air.*
- *1st floor may not be a conditioned space to meet base flood elevation design*

NOTE: ALL IMAGES ARE FOR DIAGRAM PURPOSES BY SATPAL KAUR

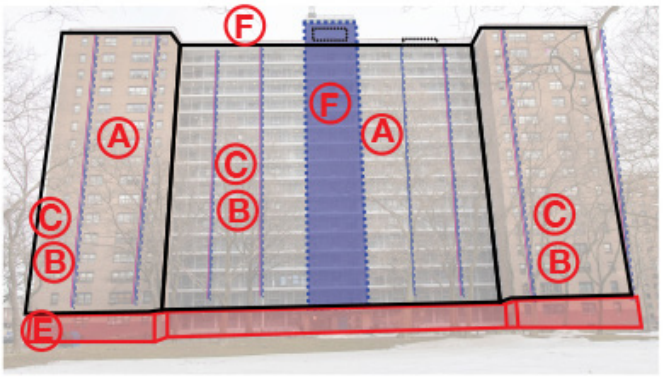
RETROFIT SEQUENCE – TYPE 2 NYCHA EXISTING BUILDING

TYPE 2 NYCHA EXISTING PLAN

- Irregular building shape: ratio of enclosure area to floor area is not simple therefore will have different energy loads.

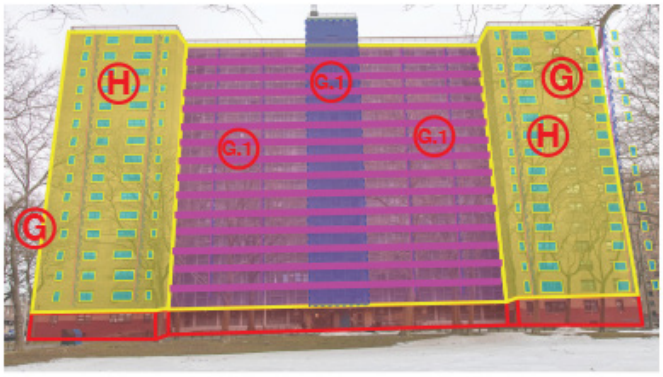
NYCHA EXISTING TYPE 2 ELEV.

- Larger surface area & volume
- Plan work at Basement level for new sewer system coordinated with landscaping.
- Different insulation techniques to be applied to reduce Thermal Bridging.
- Early Resilient design & construction planning:HVAC, Prefab Enclosure & Building Energy analysis.



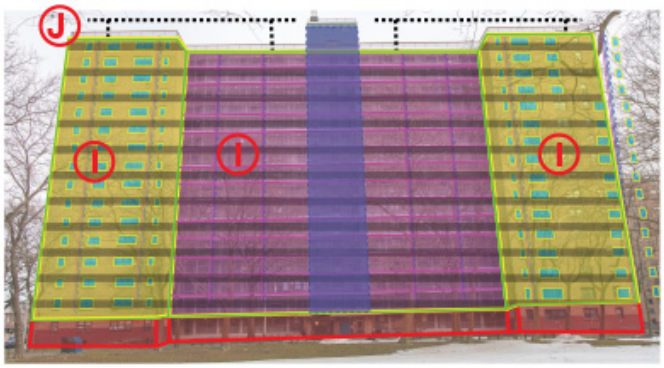
HVAC ON EXTERIOR FACADE & BASE FLOOD ELEVATION

- (A) Airtightness: Air Barrier applied on exterior facade
- (B) Heating & cooling lines on exterior facade
- (C) Coordinate ERV for units
- (D) Mech systems to be unitized
- (E) First floor elevated above Base Flood elevation
- (F) HVAC pods horizontally on roof or vertically off facade



THERMAL ENCLOSURE APPLIED

- (G) Continuous insulation ->Facade & roof
- (G1) Continuous insulation may vary due to Thermal Bridging at balcony extending out. ->Facade & roof
- (H) Thermally broken window



CLADDING & FUTURE ELECTRIFICATION

- (I) Cladding; Site applied or Pre-Fab
- (J) Future Photovoltaic panels

NOTE:

- *Window frame thickness needs to be taken into account for light & air.*
- *1st floor may not be a conditioned space to meet base flood elevation design*

NOTE: ALL IMAGES ARE FOR DIAGRAM PURPOSES BY SATPAL KAUR

A sequence of steps for retrofitting Marlboro's two building types, beginning with adjusting the first floor elevation above the floodplain or floodproofing, performing HVAC conversions, creating a thermal enclosure, and then recladding and integrating solar PV arrays. Source: TAP Panel.

Pursue Resilient, Sustainable New Construction

The panel recommends NYCHA develop new buildings on Marlboro's grounds, especially in the southwestern corner on Avenue X and in the northwestern corner adjacent to 86th Street (see Resilience Site Plan, page 32). Building 29, the boiler plant building, can also be freed up for another use after a new heating system is in place.

These valuable areas are currently utilized for other purposes – parking, sports courts, or the boiler plant – or have been highlighted as potential locations for the upcoming greenhouse. The panel recommends that other open space on campus be considered for the greenhouse (in line with Nancy Owens Studio's recreation master plan analysis) to make best use of available space, while other parking lots can be redesigned to increase capacity and ensure minimal loss of parking spaces.

New buildings can be mixed-use, provide new housing units (especially for residents moving out of flood-vulnerable first floors), and add first-floor commercial opportunities that could generate rental income for NYCHA or act as swing space for residents during the in-unit phase of retrofits. It is also possible that more units can be integrated into these new buildings as unit square foot requirements have decreased or, at the other end of the spectrum, larger units can be offered to accommodate a broader variety of diverse family structures. Purpose-built buildings, such as senior housing, are also a viable use for these new buildings. Whatever their final use, these new buildings can be designed for resilience and sustainability by raising first floors above projected base flood elevations and meeting net zero/Passive House standards.

These new first floor uses can also follow architectural/urban design principles that connect them to the adjacent street and community in more welcoming ways. Currently, the buildings' facades face inward and do not encourage interaction. Incorporating more inviting uses and designs will help activate and energize access points with the neighborhood and reduce the isolation around Marlboro's campus, aligning with the Connected Communities Initiative.

Resilience Benefits of Retrofits and New Construction

These retrofit and new construction opportunities can lead to strong resilience gains for multiple climate and environmental risks. The floodproofing strategies mentioned previously have

Developing Urban Resilience Case Study: Maceo May

Maceo May Apartments, San Francisco's second all-electric affordable housing project, is an excellent case study for resilient, net zero new construction. Planned as part of the larger redevelopment of Treasure Island in the San Francisco Bay, the building will feature:

- **A high-performance, continuously insulated building envelope that minimizes heating and cooling loads;**
- **Solar PV generation and backup battery storage that can power a resilience hub on the first floor in case of blackout;**
- **Energy recovery ventilators and MERV 13 filters to improve HVAC efficiency and indoor air quality respectively;**
- **Air source heat pumps for domestic hot water;**
- **Passive façade strategies that reduce heat gain on southern and western-facing windows; and**
- **Ceiling fans and operable windows in all residential units to maximize airflow and provide cooling.**

These strategies helped the design achieve an energy use intensity (EUI, a measure of energy used per square foot) of 18.2, about 70 percent lower than an average U.S. multifamily building. Coupled with ecological interventions on Treasure Island to raise the entire island's grade above future sea level rise, integrate parks to manage stormwater, and restore wetlands to buffer against high tides and storm surges, this development demonstrates the possibilities of combined building and landscape strategies to achieve holistic resilience.

clear benefits for gradually moving residents out of harm's way, and extreme temperatures and reduced air quality can also be addressed.

Achieving highly insulated and airtight building envelopes through these retrofit strategies will help protect residents from extreme temperatures, especially when used in conjunction with heat pumps to provide mechanical heating and cooling. Passive House buildings are designed to stay within thermally comfortable temperature ranges by moderating heat gain or loss to the outdoors, making heatwaves and higher temperatures (and even cold snaps) much easier to withstand. **As climate change accelerates the severity and frequency of extreme heat, this potentially life-saving advantage may be one of the most important resilience measures implemented.**

A case study in Toronto, discussed in the Urban Design Forum's Turning the Heat report, demonstrated that the Ken Soble Tower, a 50-year-old affordable high-rise building, could be retrofitted with new cladding to remain cool for up to four days in summer and warm for two days in winter if the power fails, compared to a half day and two hours respectively for a typical building.

The benefits of a highly insulated building apply especially in the event of a power outage. Highly insulated buildings have much greater passive survivability, meaning they remain habitable for longer without a power supply. A case study in Toronto, discussed in the Urban Design Forum's Turning the Heat report, demonstrated that the Ken Soble Tower, a 50-year-old affordable high-rise building, could be retrofitted with new cladding to remain cool for up to four days in summer and warm for two days in winter if the power fails, compared to a half-day and two hours, respectively, for a typical building.

As on-site energy use drops and solar generation is integrated over time, the buildings would also have a grid-independent power supply in case of a grid failure, further boosting energy resilience and making outages less likely, both within Marlboro's buildings and more broadly. Given the buildings' efficiency and use of onsite power, they would reduce neighborhood energy use significantly, helping ensure the grid can continue to supply nearby buildings with energy during peak hours.

Lastly, Passive House buildings have enhanced ventilation and filtration systems to maintain comfortable indoor air flow. These systems can reduce the intrusion of particulate matter and allergens and the growth of mold, all of which would support greater enhanced air quality for Marlboro residents. This advantage is especially important, given the fact that rising temperatures raise ambient concentrations of particulate matter and ozone in urban environments.

Implementation

As NYCHA considers holistic upgrades, project sources/uses will need to be identified, and comprehensive energy studies will be required. These may include:

- An Integrated Physical Needs Assessment (IPNA) assessing potential energy conservation measures if the existing Physical Needs Assessment did not include them or if further investigation is needed.
- An indoor air quality (IAQ) assessment to determine residents' exposure to pollution and poor air, the mitigation of which would be important metrics to include in cost-benefit analyses for capital upgrades.
- A solar study of the entire campus, necessary to begin planning for eventual integration of façade/roof/ground-level photovoltaic arrays. Though solar may not be added for some time, planning should include solar from the start to ensure it can be easily implemented when financial considerations align. This study can include facade shading to support heat-reducing design strategies and should also include assessment of campus battery storage potential to support black-start capability to restart power in the event of a larger outage.
- A study of waste streams generated in the course of the retrofit strategy and any potential savings from finding market opportunities for reuse or recycling of materials and equipment.

Additionally, stakeholder interviews and NYCHA briefings highlighted that Marlboro still faces significant building environmental issues such as mold, lead, and asbestos. **For example, one stakeholder mentioned their unit flooded eight times in two years due to sewer backups, causing further mold, sanitation, and pest problems.** Treating these conditions as first-task priorities and remediating them early in any capital work will benefit residents' health, build support for the renovation process, and ensure that resilience and sustainability work are also inclusive of chronic stresses. Along these lines, addressing elevator repairs and clogged sewer lines will accomplish similar goals, rectifying ongoing quality-of-life issues and reducing complications from pre-existing problems during future flood events. Ensuring this work is completed will be essential to reducing health impacts and stress on Marlboro's community and creating a baseline level of resiliency.

As increasing heat is a pressing issue at Marlboro, immediately establishing a temporary cooling center will be essential to helping residents survive increasingly hotter summers. This center can be phased out in five to six years as electrification and heat pumps are implemented.

Because it would be impractical to retrofit the entire campus at once, the panel recommends a pilot project in the southern portion of the campus (building 26, 27, or 28), where past and projected flooding is concentrated, to demonstrate the potential of this retrofit program. Completing a phase I pilot quickly would illustrate the value of the process to residents and help build community support for the rest of the extensive planned and proposed construction processes detailed in NYCHA's Stabilization Strategy. This pilot can then be scaled up across campus, with any lessons learned during implementation of the pilot used to streamline and improve the program. Decisions made on how to use available land for new construction or swing space opportunities in the mid-term can be implemented in the long-term as the retrofit program rolls out.

As these retrofits and new construction projects are completed, they create financial opportunities based on the connections between healthy and resilient buildings, reduced healthcare costs, and insurance premiums. Metrics that measure the value of air quality improvement or heat exposure reduction from landscape improvements can also apply to building improvements. Additionally, depending on the extent of floodproofing pursued, resilience measures may

Near-Term (1-2 years)	Mid-Term (3-5 years)	Long-Term (5+ years)
Consulting/Studies › **Pursue IPNA if needed, or other energy studies** › **Study indoor air quality (IAQ)** › **Study campus-wide solar, including facade shading, storage, and black-start capabilities** › **Study waste stream impacts or potential savings** › **Source pre-development capital** ***Coping/First Tasks*** › **Address environmental issues (mold, asbestos, lead remediation)** › **Repair elevators** › **Clean sewer lines** › **Provide community center cooling strategy (weave into NYCHA electrification)** ***Pre-development*** › **Develop overall project sources/use**	› **Investigate new building locations at Ave X and 11th corner and near current boiler plant location** › **Integrate panelized facades with deployment of electrification work; prepare for integrating solar panels when market is ready** › **Include ventilation upgrades to facade heating/hot water work** › **Deliver a completed initial/phase I to motivate and build the confidence of tenants and stakeholders**	› **Consider new construction opportunities (swing capacity or new development)** › **Complete additional renovations and modify based on phase I learning** › **Meet workforce, MWBE, local hiring, and innovation goals** › **Develop financial links between housing, healthcare, and insurance** › **Consider ground floor repurposing**

help the development qualify for reduced flood insurance premiums. All of these would improve Marlboro's financial performance when considered holistically and can help broaden the scope of NYCHA's ROI.

Summary and Data Needs

The following tables presents a summary of these recommendations and some of the information NYCHA needs to carry out the recommendations presented here.

Data	Purpose
Basement and First Floor Occupancies	**Determines assets at risk for storm surge and cloudburst events**
Marlboro Resident AC Program from Summer 2020	**Offers guidance on units still exposed to extreme heat**
Air Quality	**Identifies impact factors on chronic health issues**
Crosswalk LL97 Prescriptive Measures and Marlboro PNA	**Illustrates the extent to which proposed investments draw down LL97 exposures**
Repetitive Loss Claims	**Identifies areas of chronic flooding on campus**
Health Metrics	**Identifies anonymized chronic diseases exacerbated by climate change and other exposures**
Retrofit Assumptions within $180K	**Identifies parameters of deep retrofit work within available capital budget per unit**


COURTESY OF NYCHA

Operations & Finance Strategies: Enhanced Neighborhood Management and Resilience Planning

Executing the strategies described for buildings and landscapes requires careful, long-term financing and a proactive approach to operations that ensures tenant needs are met. Pursuing greater excellence in management and securing funding through the Public Housing Preservation Trust will help support Marlboro's wellbeing over the long-term and provide the administrative foundation needed to develop a risk-responsive long-term resilience strategy. This section details the panel's recommendations for Marlboro's operations and finance. These focus on:

- Creating a long-term resilience plan.
- Improving neighborhood and site operations and finance using systems such as work order management, property-level financials, and a property atlas.
- Utilizing the operational and finance approaches, such as the Public Housing Preservation Trust, from NYCHA's Blueprint for Change to achieve resilience goals.

The panel created the following phasing to carry out these recommendations:

- Near-term (next 1-2 years): Use analytics to determine priorities and create processes for transparency and accountability; create long-term resilience plan.
- Mid-term (3-5 years): Develop a foundation for operational consistency and excellence; deliver the Public Housing Preservation Trust Transaction.
- Long-term (5+ years): Pursue long-term adaptation strategies and financial stability.

Broadly, the panel recommends a multi-dimensional systems approach:

- Operation managers must take a system view to buildings and campus to define long-range solutions and clear phased implementation.

- Resilience must be fully defined (i.e., thinking beyond storm surge to include chronic precipitation flooding and heat) and a campus-specific plan developed to respond to all hazards.
- All capital investments must integrate resilience and energy efficiency into their scopes and define goals for the life span of the investment to ensure that all dollars spent on Marlboro increase its resilience.

Create a Long-term Resilience Plan

The panel strongly encourages NYCHA to prioritize the creation of a resilience plan for Marlboro that starts immediately and covers the next 50-80 years. Stakeholders highlighted the reality that climate change impacts Marlboro residents today: residents currently face chronic flooding problems and frequent extreme heat, so developing greater resilience at Marlboro requires adapting the campus for future climate projections and addressing today's pressing issues. Additionally, chronic issues that affect health of residents (heat, flooding, and mold, etc.) should be prioritized within Marlboro's capital pipeline, as is intended under the Stabilization Strategy. Stakeholders also echoed the need for capital investments to tie to specific building or campus priorities, rather than letting financing opportunities drive investments. Creating a proactive plan to support execution of a long-term resilience and sustainability strategy for Marlboro would help reprioritize capital work along resilience lines.

Although funding sources may not be immediately apparent or secured for longer-term strategies, a framework to guide resilience investments will help ensure a clarity of approach and that funding sought matches the campus's priorities and not the other way around. Essentially, all capital spending should be contributing to resilience in some way. The components of this plan include:

- A **shelter-in-place strategy** that determines how residents can safely remain in their home and continue meeting their needs during emergencies, whether during extended pandemics, heatwaves, or storm surges. If that is not possible due to conditions or direction from city emergency management staff, an evacuation plan needs to be ready for residents to relocate to safe community shelters or other resources out of harm's way.
- A **comprehensive vulnerability assessment** of Marlboro's landscapes and buildings to determine exposure and risks from all climate hazards, presently and over time. This assessment would be highly granular, capturing social, environmental, and economic indicators.
    - » Each building should be assessed independently, as each will have a slightly different risk profile. This assessment would be the basis for prioritizing work orders that further resilience goals and improving the return on resilience from operational/capital spending.
    - » A climate and physical site assessment of each building and its surrounding landscapes is particularly important to capture the buildings' relation to street grade, potential flood elevations, height of the ground floor, and uses of the ground floor and basements to determine flood vulnerability and any uses/critical systems at risk.
- An **integrated PNA** that considers the findings of the vulnerability assessment and integrates any prescriptive measures from climate legislation like Local Law 97, ensuring that these needs are being addressed in Marlboro's budgeting and allocation.

New funding opportunities from the Biden-Harris administration may make more of this work feasible, whether through the American Jobs Plan, the American Rescue Plan, or another source, and the panel recommends NYCHA be on the lookout for such prospects.

In terms of operations of resilience investments, stakeholders mentioned that careful product selection up front will pay off, encouraging designs with simpler operations and maintenance needs and, if possible, products that are "plug and play" or easily replicable across campuses. This strategy can significantly reduce the lifetime costs of particular solutions and was identified by panelists and interviewees as a best practice in affordable housing delivery by market actors. Given NYCHA's size and considerable buying power, it should be possible to work with suppliers to design custom-built solutions that meet NYCHA's needs more closely.

Gradual First-Floor Repurposing

As climate change advances into the long-term, Marlboro will be forced to adapt, and this resilience plan should form the guiding framework for that process – especially for the dual solution of repurposing ground floors and pursuing publicly owned, resilient new developments discussed in Buildings Strategies (page 38). Marlboro's location and vulnerability to flooding from coastal storms like Hurricane Sandy suggest that continuing to house residents on the first floor of buildings is not a viable long-term strategy. However, some first-floor residents may not want to move, even though they are at risk. The panel recommends a **gradual strategy of managing vacancies and turnover**

over a 10-15-year horizon, as residents choose to leave ground-floor units, with more frequent and disruptive flood events potentially impacting their decision-making. NYCHA should likely consider avoiding re-leasing these units so first floors eventually become available for repurposing into an alternative use, depending on suitability for commercial/community uses. The vulnerability assessment should help identify the scale of the process and determine how many residents would be affected by this transition.

Coping Strategies - Immediate Operational Solutions to Respond to Marlboro's Current Climate Risks

There are a number of opportunities for immediate operational strategies designed to protect Marlboro residents from the risks they will face in upcoming months, which the panel framed as "coping strategies." Coping strategies intend to provide immediate relief while longer-term activities and projects undergo development. A process for creating these strategies is presented below, with a focus on behavioral approaches residents and managers are using to address current climate risks, separate from NYCHA's resilience capital pipeline. This process can be driven by three guiding questions:

1. What resources are available for preparing residents for climate risks, and how are they being used?
2. What could help backstop exposure to climate risks?
3. How might capacity improve to respond to climate risks?

These strategies would be differentiated by steps for management and staff (i.e., developing approaches to flooding or power outages like sandbagging during flood events) and steps for residents (i.e., developing their resilience readiness, finding a source of backup power for needed home health systems, creating a shelter-in-place strategy, etc.). Resilience begins with the individual and their respective family unit. While these larger NYCHA and city programs take more time, resident readiness for the upcoming heat season via access to cooling or shelter-in-place plans could make a significant difference in outcomes.

Along the way, important data considerations need to be made around evaluating vulnerability. For example, when considering heat vulnerability, although Marlboro's surrounding neighborhood of Gravesend is considered to have medium heat vulnerability according to the Department of Health, it is possible that Marlboro residents have much higher heat vulnerability than the rest of the neighborhood given the relationship in heat vulnerability indices with indicators like race, socio-economic status, and quality of housing. In assessing that vulnerability, existing heat data should be overlaid with information on power outages and rolling brownouts, energy poverty, comorbidities, and local hospitalizations/ER visits/clinic visits due to heat-related illnesses.

The goal of this approach is to transcend one-way communication to create meaningful and sustained engagement with the Marlboro community on adapting to climate impacts. This would encourage a transition for NYCHA from informing residents about resilience matters to collaborating with residents in a deeper way, creating opportunities to partner on the informational, social, and economic opportunities created by a long-term resilience strategy. This could begin with a Resilience Ambassador program (see below for more detail) and grow into a community science program to explore data and solutions on climate, a buddy program for neighbors to check in on each other during extreme events, and the workforce training programs mentioned earlier.

Setting Baselines	Providing Backstops	Growing Capacities
Evaluate existing programs for resident preparedness for extreme events. **Assess/sample actual resident coping strategies and access to resources given specifics of Marlboro House campus vulnerabilities.**	**Prepare basic communications to improve readiness for climate-related events such as storms and heat waves. Reference NYC Emergency Management resources.** **Invest in on-site improvement for temporary respite areas (indoors and outdoors) given projected heat season.**	**Develop habituated programs in concert with other community activities to deepen awareness and capacity through social ties and other resource access.**

Process for creating coping strategies for climate risk. Source: TAP Panel.

From... **Did you know?**

1. **Climate changes expected are/ aren't… or Resilience is/isn't…**
2. **Blueprint for Change or NYCHA 2.0 is/isn't…**
3. **NYC Climate Resilience Guidelines are/aren't…**
4. **Flood and heat risks and resources…**

From Useful to Utilized

To... **Could we collaborate?**

1. **Ground-truth Data**
2. **Resilience Ambassadors**
3. **Community Science**
4. **Buddy Program**
5. **Workforce Growth**

Source: TAP Panel.

Improve Neighborhood and Site Operations and Finance

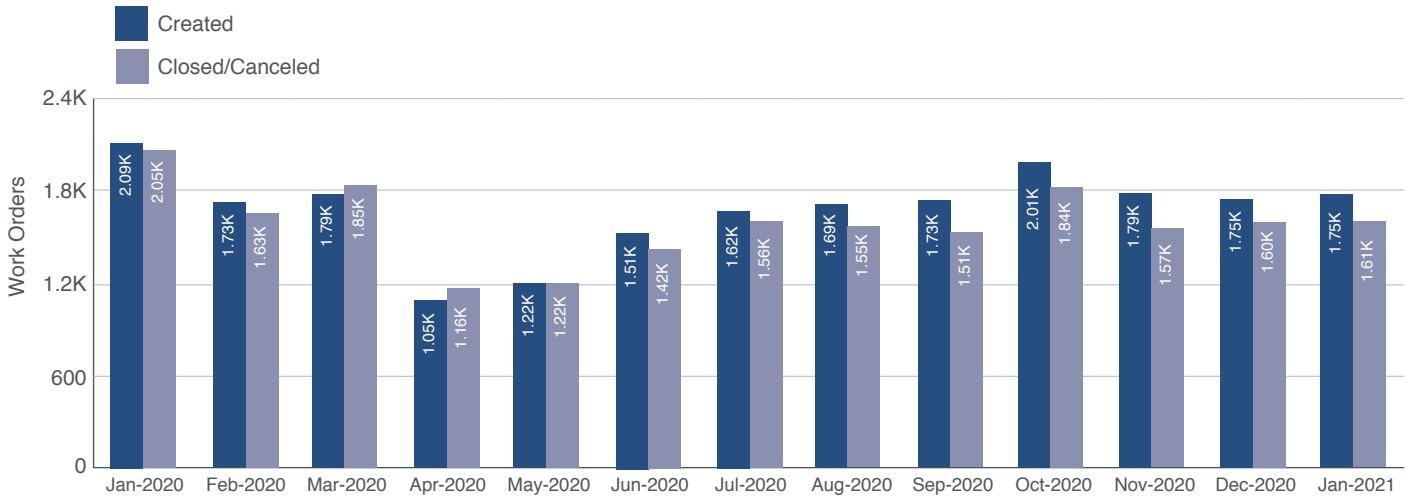
Based on stakeholder input, panelists concluded that clear lines of accountability, protocols, and standardization of management processes will help build greater trust and a sense of excellence in delivery of services. The panel believes that the Blueprint for Change and Transformation Plan are enormous opportunities for improving management efficiency at Marlboro, boosting delivery of both traditional services and resilience benefits to residents. This process should begin with upgrading existing tools into advanced analytics platforms, continue into expanding asset-level databases and information, and building long-term operational and financial stability.

Use MyNYCHA analytics to determine priorities and create processes for transparency and accountability

The operations and finance team heard from stakeholders that a sense of proactive management of the Marlboro campus by NYCHA is sometimes missing, and that between property managers and the NYCHA central office, it is not always clear who is accountable for ensuring management issues are addressed. That sense of confusion, coupled with recurring operational issues and exacerbated by frequent turnover in management staff, leaves residents feeling ignored and unsure of whom to ask for help. This can undermine trust in the development of a long-term, strategic resilience plan.

Several steps can help address decreased accountability and trust. Firstly, the panel recommends NYCHA expand use of existing tools, in particular the MyNYCHA app, to create a system of accountability, transparency and communication

Marlboro Work Order Activity



This chart shows how many new repair requests (work orders) were placed every month at Marlboro for the past year and how many requests were closed or canceled. Source: NYCHA.

for operations and maintenance. By expanding the role of a tool already in use, NYCHA can avoid the time and effort needed to develop and mainstream a new system and leverage the tool to create a larger system of communication. It is important to note that NYCHA is considering significant reorganizations of its work order management system as part of the Blueprint. Therefore, the use of work orders to track resilience needs and improvements proposed here would need to align with those larger changes already underway.

NYCHA already processes a high volume of work orders at Marlboro. As data streams of site-level issues or needed improvements are created by onsite staff through the MyNYCHA app, resident access to this information would also shed light on which resilience-related issues are low-hanging fruit that can be quickly addressed and which are larger, chronic issues (e.g., tracking repetitive flooding) requiring a more systematic solution. Tackling persistent issues like flooding or lack of access to air conditioning positions resilience as an immediate concern, helps assure residents that their everyday lives are taking place within habitable spaces in today's climate conditions, and builds support for a decades-long resilience planning effort.

Creating a systematic schedule of maintenance tasks, inspections, and a method for tracking task completion and campus conditions will also ensure that issues like sewer backups do not become larger, chronic problems impacting quality of life for Marlboro residents. These steps can build a foundation of high-quality operations and greater trust in management.

Secondly, NYCHA's proposed reorganization under the neighborhood model can be put to use serving resilience goals. If property managers and neighborhood administrators are meeting onsite with each other and with residents on a monthly basis, for example at Tenants Association meetings, they can discuss the site's top 10 most pressing issues and how they are being handled, enhancing collaboration. This system could accomplish two goals: clarify the hierarchy and accountability of management, from the property level to neighborhood administration to borough office; and create clear transparency and accountability to the residents, boosting their confidence in management and the associated information flow.

Residents can also be more involved in new operational roles as landscape and buildings modifications roll out. As a long-term resilience plan develops, NYCHA will need to ensure residents are updated on what will be involved and any changes planned for the campus. As use of the MyNYCHA app expands, **a natural opportunity may arise to incorporate resident input** on the plan and related work in a more data-driven management system and simultaneously to show residents the volume of maintenance work NYCHA performs each month through access into monthly work orders and prioritization of projects.

As a long-term resilience plan develops, NYCHA will need to ensure residents are updated on what will be involved and any changes planned for the campus. As use of the MyNYCHA app expands, a natural opportunity may arise to incorporate resident input on the plan and related work in a more data-driven management system.

All of this work would benefit from the creation of a **Resilience Ambassadors** program. The panel noted that immediate maintenance concerns on campus were so pressing that residents and stakeholders were sometimes reluctant to envision climate change impacts years down the road, and yet more in-depth engagement and education on how climate risks will affect the campus would help. Marlboro youth could be provided a stipend to work with

My Green Montgomery Resilience Ambassadors Program

In July 2020, Montgomery County, Maryland hired five youth Resilience Ambassadors to connect with impacted communities on climate risks and emergencies like COVID-19. The program aimed to connect the effects of the pandemic and other structural inequities, such as energy burdens and exposure to pollution or climate hazards, that Black, Indigenous, and other communities of color or low-income communities face at higher rates than whiter, wealthier areas. Ambassadors facilitated community conversations, gathering input from residents and building relationships, and the insights gained will be incorporated into the county's climate and transportation planning initiatives.

residents, telling the story of local climate change impacts and gathering data from tenants about their vulnerabilities and needs to inform a plan for sheltering in place when needed. This program would support household wealth generation and accompany broader efforts to train and hire local residents in the operations and maintenance of resilience solutions at Marlboro.

Develop a foundation for operational consistency and excellence through property-level financials and property atlas

To enhance NYCHA's capacity to manage Marlboro's assets, the panel recommends NYCHA create **property-level financials** with operational and capital expenses for each building, including asset plans that contain complete building inventories and providing complete insight into the needs and funding available for all of Marlboro's buildings. Conducting a review of ongoing spending and financing at the property-level will help create a fuller picture of asset value and available funding and could identify wasteful or redundant spending streams (e.g., energy or water/sewer costs) that do not contribute to resilience – a key item to note as future IPNAs are developed.

Additionally, many of the solutions discussed as landscapes and buildings strategies depend on an ability to focus on specific systems, both within capital and operations, to determine metrics and quantify success. For example, property-level information will allow for expanding the use of existing energy performance contracts to unlock additional capital, as potential operating savings will be identifiable. Having this information on hand will facilitate much more persuasive cost-benefit analyses for Marlboro resilience initiatives.

Within a long-term capital spending strategy, having systems-level information would also assist with making determinations about performance of building systems or whole buildings and deciding when to maintain, retrofit, or replace a system or building accordingly.

Conducting an annual inventory/review of building systems to determine maintenance, retrofit, or replacement actions will also help make sure that the most sustainable and cost-effective option is being implemented.

Building on these plans, a **digital property atlas** should be developed. This tool would combine financial information, findings from the asset inventories, identified current or chronic issues, IPNAs and vulnerability assessments, and implications for each building from the long-term resilience strategy. Having all of this information collected in a compendium and accessible to all levels of management will streamline efficiency and help ensure that operations and capital spending are all working towards the unified purpose of building resilience.

Over the long-term, the panel recommends building operational and financial stability through the systemization of property-level financial tools while also conducting regular budget reforecasting and looking for opportunities to generate income that support NYCHA's continued ownership.

Utilize the Public Housing Preservation Trust for Resilience Goals

The panel supports the ongoing delivery of the Public Housing Preservation Trust transaction to facilitate both access to capital and a clear sense of a long-term plan for improving conditions and management for residents.

Based in part on stakeholder input, the panel concluded that the per-unit funding proposed in NYCHA's Stabilization Strategy and Public Housing Preservation Trust structure **should provide adequate capital** for Marlboro's needed repairs and per-unit retrofit costs, estimated in the 2017 5-year Physical Needs Assessment at $180,000. The Stabilization Strategy assumes use of Tenant Protection Vouchers that provide significant additional funds of nearly $180,000 per unit, though the interest rate and issuance costs for the financing provided by bonding the vouchers would need validation, and the establishment of a sinking fund and meeting debt service coverage ratio (DSCR) requirements may affect available capital as well.

If managed efficiently and employed via the capital strategy mentioned previously, those funds could also cover additional resilience investments. The challenge lies in the creation of an effective process that simplifies control mechanisms

Available Capital for Marlboro from Bonding Tenant Protection Vouchers

Number of units	**1,765**
Tenant Protection Voucher value	**$650/unit/month**
Months of bond	**12**
Interest rate of bond	**1.80%**
Term	**30**
Bond proceeds	**$316,900,000**
Bond proceeds per unit	**$179,547**

and reduces the number of decisionmakers to streamline execution.

In terms of financing resilience capital work at Marlboro, the panel agrees with NYCHA and stakeholder interviewees that the proposed Trust has transformative potential for unlocking access to new sources of capital and expediting procurement options. As an independent new entity, the Trust can be structured similarly to other quasi-public agencies like the NYC Economic Development Corporation. On the capital side, this can allow for additional financing options such as bonding against new revenue streams, impact capital investment, and concessionary debt through such tools as Program Related Investments of Foundations. As the appetite for impact capital placements grows, this new "clean" structure may make it more appealing for environmental, social, and governance (ESG) and similar investments to place capital. On the procurement side, the quasi-public agency structure can allow for contract delivery mechanisms that are more challenging to do within traditional structures.

The Trust will also provide major opportunities for public-public partnerships with other agencies. The panel stressed that this opportunity, in contrast to the negative perceptions and concerns shared by some residents, is not a step towards privatization or loss of tenant protections or rent affordability – the Trust will be a public entity and will contract management back to NYCHA, ensuring continuity of management staff, while also using Tenant Protection Vouchers to ensure maintenance of tenant rights. Getting residents onboard by working to dispel fears around privatization will be essential to ensuring the success of this strategy.

Near-Term (1-2 years)

Use analytics to determine priorities, create processes for transparency and accountability

- Upgrade work order system to generate detailed reporting
- Create property manager "Top 10 list" monthly reporting to community
- Establish Neighborhood Administrator monthly issues tracking with Marlboro residents
- Implement Asset Management Calendar, inspections, variance reporting, and state of good repair

Create long-term resilience plan

- Include shelter-in-place plan
- Add climate and physical site vulnerability assessment
- Integrate PNA
- Identify new funding opportunities with Biden-Harris Administration for innovative resilient landscape and building solutions

Mid-Term (3-5 years)

Develop a foundation for operational consistency and excellence

- Establish property level financials for operating and capital
- Create Asset Plans
- Create Property Atlas in digital form
- Create annual system review: maintain, retrofit, or replace sustainably

Deliver the Public Housing Preservation Trust Transaction

- Finance capital repair at Marlboro
- Address Public Trust structuring: ensure accountability, discipline, and state of good repair
- Position Public Trust to allow for ongoing operating subsidy
- Trust explores operating and funding partnerships with public and non-profits

Long-Term (5+ years)

Long-term adaptation

- Consider ground floor repurposing
- Consider publicly-owned new developments to make up for lost units on ground floor
- Implement best practice adaptation plans with each development

Long-term financial stability

- Conduct regular budget reforecast
- Seek revenue generation opportunities that maintain public ownership

Summary and Data Needs

The following tables presents a summary of these recommendations and some of the information NYCHA needs to carry out the recommendations presented here.

Data	Purpose
Operating Budget	Provides clarity on ongoing expenses as related to PNA, possible cost savings on energy and water
Water/sewer costs	Introduces cash flow improvement opportunity
Training program schedule	Shows where existing and new training require alignment
Vulnerability assessment	Identifies assets vulnerable to climate hazards
Shelter-in-place program	Describes current direction provided to residents
Energy performance contracts	Provides insights to how these relate to LL97 and PNA as well as long view
Power outages reporting	Identifies exposures related to externalities; ConEd peak load shaving programs
Greenhouse and other outside vendors' lease and operating agreements	Identifies financial commitments and operational agreements that impact finances

Cross-Cutting Strategies and Implementation

The Landscape, Buildings, and Operations and Finance strategies outlined by the panel should be considered a single, cohesive plan with multiple components that interact and support each other as they unfold over time.

The "Takeaways" graphic below demonstrates how the main elements of this plan would roll out over the timeline suggested, with initial pilots and foundational elements broadening into a comprehensive, campus-wide approach.

Takeaways

	ASAP	Near-Term (1-2 years)	Mid-Term (2-5 years)	Long-Term (5+years)
Coping	Assess and stabilize coping strategies			
Landscape Buildings Operations Finance	Evaluate planned near-term expenditures for resilience opportunities	Complete baseline assessments Invest in pilot demonstration project Establish campus resilience strategy Develop process to systematically integrate resilience into ongoing spending	Expand resilience projects for landscape and buildings Align Preservation Trust and operating model with property atlas, property-level financials and monitoring approach	Broaden resilience program and integrate complete community planning Strengthen M/WEB and workforce opportunities while furthering buildout Operationalize budget forecasting with resilience spend

To further demonstrate how these strategies work together, the panel developed a matrix to show correlations between each focus area of the plan in the near-term. The same should be developed for mid-term and long-term timeframes. These are not exhaustive lists of actions, but rather an illustrative exercise of how to create synergy.

Matrix of Correlated Resilience & Sustainability Actions for Marlboro				
Near-Term	Landscape	Buildings	Operations	Funding/Financing
Assess existing coping strategies and capacities	Identifies campus resources	Maps building-based behaviors and resources	Identifies priority actions in place and gaps in process	Links city or community resources and programs and resident coping needs
Broaden communications	Sets landscape expectations; provides training on maintenance	Identifies and reflects chronic issues and expected actions	Create "top 10 list"; Improves coping capacity	Don't commit to long-term land or funding strategies
Develop/Refine Shelter-in-Place (SiP) Plan	Maps accessible route/egress pathways	Identifies building resources to support SiP	Provides redundancy programs	Captures costs of relocation or shelter-in-place
Conduct campus-specific vulnerability assessment	Captures tree inventory and canopy risks; captures utility risks	Identifies per building risks	Identifies economic risks; social risks and community resources	Identifies potential losses and leverage points
Crosswalk operating budget, PNA, LL97 requirements, vulnerability assessment and coping assessment	Highlights the degree to which planned investments and ongoing operations costs address key risk areas and resident coping capacities			


COURTESY OF NYCHA

Conclusion

The damage caused by Hurricane Sandy prompted NYCHA to think broadly about the risks faced by its residents, including not only increasingly intense and severe storms, but also other climate hazards such as extreme heat. NYCHA has responded by finding ways to explore, test, and scale up a variety of climate initiatives and funding models that can provide an opportunity to set a national example, given the agency's size and prominence as the country's largest public housing authority.

This panel represents both an opportunity to consider how to better protect the residents of Marlboro Houses from climate-related risks and to pilot a new way of retrofitting high-quality public housing by taking comprehensive action on landscapes, buildings, and the financing, operations, and maintenance of the same. Furthermore, many of the investments which serve to protect residents and facilities can also offer opportunities to enhance public health and quality of life for residents and the surrounding community. In these ways, NYCHA can seize this moment of transformation to deliver the next generation of resilient, sustainable, and affordable housing for Marlboro residents and potentially beyond.

About the Panel

Janice Barnes

Panel Chair

Managing Partner, Climate Adaptation Partners

Janice is the founding partner of Climate Adaptation Partners, a NYC-based woman-owned business focused on planning, advocacy and partnership-building for climate adaptation. As both practitioner and researcher, Janice works with public and private clients to identify their risks and vulnerabilities and to meet their resilience goals. With technical training in architecture and business, and a doctorate linking environment and organizational behavior, her nearly 30 years of experience bridges practical applications with empirical research, to enable organizations to critically evaluate their possible adaptation pathways given current and expected exposures and link these to appropriate design and financing or funding options. Current projects include the New York City Mayor's Office of Resiliency Climate Adaptation Roadmap, the Charleston Medical District Climate Adaptation Roadmap, the National Academies of Science, Engineering and Medicine Resilient America Roundtable, and the American Institute of Architects Resilience Advisory Group National Planning effort. She's recently worked on the City of Hampton Newmarket Creek Resilience Plan which leverages Environmental Impact Bond funding to capitalize resilience projects, 100 Resilient Cities Houston which integrates housing, flooding, transportation, heat and development, Dutch Dialogues Charleston which focuses on adaptation plans for regional typologies, Keep Safe Puerto Rico which is a post-Maria multi-hazard risk awareness and recovery effort for housing across the island, and the Urban Land Institute's Scorched research which highlights strategies to address extreme heat and urban heat island effects on development patterns.

Ryan Cassidy

Director of Sustainability & Construction, RiseBoro Community Partnership

Ryan Cassidy is the Director of Sustainability & Construction for RiseBoro Community Partnership, where he manages the design and construction of a robust affordable housing pipeline. Ryan has developed and monitored the construction of over 100 buildings. His experience ranges from two-family home ownership programs to large multi-family complexes with retail and community facility components. He supervised the construction of the first multi-family affordable Passive Houses in NYC and is currently renovating existing buildings to the Passive House standard. Ryan is a PHIUS Certified Passive House Consultant.

Satpal Kaur

Designer

Designer and building systems thought leader with over a decade of experience implementing cutting edge technologies while designing buildings. Branded as a high-performance building activist because of her passion for data and building science approach in architecture. She was the recipient of the 40 Under 40 Award by Building Design + Construction. A believer of holistically integrating clients to actively become part of the sustainable revolution pursuing comfortable and healthy living environments. Worked with Chris Benedict, RA to design the first Multifamily Passive Houses in NYC recognized by Mayor de Blasio's "One City Built To Last" for its trail blazing approach in reducing New York City's carbon footprint. Her unique skills have delivered a fresh perspective to HELP USA'S Homeless Shelter programming, different envelope typologies ranging from buildings, to landmarked SS US Ship Conservatory and window air conditioning unit prototypes that go beyond the conventional landscape. She is a sought-after public speaker.

Cecilia Kushner

Executive Vice President, Planning Division, NYC Economic Development Corporation

Cecilia Kushner is the Executive Vice President for the Planning Division at NYCEDC where she leads large multidisciplinary teams to deliver on some of the most ambitious and complex urban planning and development projects in New York City. As part of her role, Cecilia oversees $1 billion of active projects geared towards delivering infrastructure and amenities and improving quality of life for New Yorkers across the five Boroughs. With 15 years of experience in urban planning, development and resiliency in New York City, London and Paris, Cecilia has dedicated her career to executing significant initiatives that seek to improve global cities.

Cecilia received her bachelor's degree from La Sorbonne and holds a master's degree in Historic Preservation from The Bartlett School of Planning at University College London, and a master's degree in City Planning from Hunter College, where she has taught Planning as an adjunct.

Matthew Kwatinetz

Managing Partner, QBL Partners

Matthew Kwatinetz is the Managing Partner of QBL Partners, a double bottom line public/private advisory firm. Selected clients included U.S. Department of Energy, Wharton's Geo-Spatial Laboratory, Real Capital Analytics, Denny Hill Capital, Penn Institute for Urban Research, City of Shoreline, Kinzer Real Estate Services, City of Austin, Citiscope/

Ford Foundation. “Professor K” is also a Clinical Assistant Professor of Real Estate at NYU and the Faculty Director of the NYU Urban Lab.

Previously, Kwatinetz was the Executive Vice President of Asset Management for the New York City Economic Development Corporation. In that role he was in charge of managing one of the largest real estate portfolios in the five boroughs at over 65M square feet and encompassing such assets as the 42nd Street Development Project, Hunts Point Food Distribution Center and Brooklyn Army Terminal. For EDC, Kwatinetz also ran PortNYC, the third largest port in the US, and managed the team behind the launch and operations of the NYC Ferry, which is the largest expansion of commuter ferry service in US history. Kwatinetz was the lead on the Mayor’s Affordable Real Estate for Artists (AREA) program, which is the largest affordable artist work-space initiative in the country.

Before NYCEDC, Kwatinetz worked as the VP of Finance and Economics for Kinzer Real Estate Services where he supported real estate investment decision-making and site selection for such clients as the University of Washington, Alaska Airlines, and Starbucks Corporation. For Starbucks, he led a team to negotiate the creation of a $150M manufacturing plant in Augusta, GA. Following that project, he was recruited by the Mayor of Augusta to create Augusta Regional Collaboration Project (ARC), a public development corporation which worked with the City and State to consolidate several higher ed anchors into Georgia’s third research university into the downtown, causing $150M+ of investment in the urban core. With ARC, Kwatinetz also worked with Paine College (an HBCU) and the Housing and Community Development Department to help equitably develop historic Laney-Walker Bethlehem.

He is a former consulting economist for the Penn Institute for Urban Research. In 2018, he published Thriving In Place: Supporting Austin’s Cultural Vitality Through Place-Based Economic Development, sponsored by the NEA, City of Austin and ArtPlace America. He is a co-author of “Introduction to the Big Data Era” with Stephan Kudyba in Kudyba’s Big Data, Mining and Analytics.

While in Seattle, Kwatinetz served as the founding Vice President of the Capitol Hill Chamber of Commerce, co-founded the Seattle Cultural Overlay District Advisory Committee, and sat on King County’s Cultural Real Estate Task Force. Matthew is the Chair of the ULI NY District Technical Assistance Program and serves on the NY District Management Committee. He is the Board Chair for the Augusta Regional Collaboration Corporation. He a Board Member of the Burning Man Project, as well as their interim head of Real Estate. He has been a featured speaker for Wharton, Harvard GSD, NYU, the University of Washington, Columbia, The New School, the International Council of Shopping Centers (ICSC), Americans for the Arts, NAIOP, Net Impact, and the Centre for Policy Studies on Culture and Communities. Matthew received his MBA in Real Estate at The Wharton School, where he was named a Martin Bucksbaum scholar. He is a graduate of Deep Springs College and Harvard University, with honors.

Amy J. Macdonald

Principal & Resilience Practice Leader, Thornton Tomasetti

Amy Macdonald, who oversees Thornton Tomasetti’s Resilience practice, has a broad background in geotechnical engineering, hazard mitigation, disaster response and recovery work. She specializes in providing clients with strategies to offset both physical and financial risk and has consulted on numerous projects ranging from the everyday to the catastrophic. Amy has managed multi-hazard risk assessments, resiliency and mitigation design projects for property owners, insurance companies and public entities. Her experience spans four continents and includes leadership roles in the response, damage assessment and recovery phases of natural disaster events, such as the 2007 Northland floods and landslides, the Gisborne earthquake in 2007 and the 2010-11 Canterbury earthquake sequence, all in New Zealand, as well as Hurricanes Harvey, Irma, Maria and Sandy in the U.S.

Pete Munoz

Senior Engineer and Practice Lead, Biohabitats

Pete is a Practice Lead at Biohabitats. Based out of the Cascadia Bioregion office in Portland, Oregon, Pete works around the globe helping to connect communities with appropriate inspirational living water infrastructure. As a licensed engineer and former wastewater treatment plant operator Pete has been involved in hundreds of infrastructure projects involving wastewater treatment, stormwater management, rain harvesting, environmental remediation, and watershed restoration. Pete has worked with several consulting firms on water infrastructure projects in the United States and abroad. His specialty is keeping a holistic perspective when understanding and tackling water related questions.

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