

# **Bellmore/Merrick** **NY Rising Community** **Reconstruction Plan**



March 2014  
NY Rising Community  
Reconstruction Program



## **NYRCR Bellmore/Merrick Planning Committee**

Joe Baker, Co-Chair

Lawrence Eisenstein, Co-Chair

Joanne Bo, Committee Member

Eileen Casazza, Committee Member

Chris Clement, Committee Member

John Fabian, Committee Member

Allison Frankel, Committee Member

Julie Marchesella, Committee Member

Hugh Mason, Committee Member

Gary Panasuk, Committee Member

Randy Shotland, Committee Member

Paul Waterman, Committee Member

Neil Yeoman, Committee Member

## **Municipal Liaisons**

Representative from Nassau County Department of Public Works

## **Attributions**

This document was developed by the NYRCR Bellmore/Merrick Planning Committee as part of the NY Rising Community Reconstruction (NYRCR) Program within the Governor's Office of Storm Recovery. The NYRCR Program is supported by NYS Homes and Community Renewal, NYS Department of State, and NYS Department of Transportation. The document was prepared by the following consulting firms:

Ove Arup & Partners, P.C.

ASA Analysis & Communications, Inc.

CAS Group LLC

Fine Arts & Sciences, LLC

HealthxDesign LLC

Sasaki Associates, Inc.

Urbanomics Inc.

VJ Associates Inc. of Suffolk

# Foreword

## Introduction

In the span of approximately one year, beginning in August 2011, the State of New York experienced three extreme weather events. Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy wreaked havoc on the lives of New Yorkers and their communities. These tragic disasters signaled that New Yorkers are living in a new reality defined by rising sea levels and extreme weather events that will occur with increased frequency and power. They also signaled that we need to rebuild our communities in a way that will mitigate against future risks and build increased resilience.

To meet these pressing needs, Governor Andrew M. Cuomo led the charge to develop an innovative, community-driven planning program on a scale unprecedented and with resources unparalleled. The NY Rising Community Reconstruction (NYRCR) Program empowers the State's most impacted communities with technical expertise needed to develop through the implementable reconstruction plans to build physically, socially, and economically resilient and sustainable communities.

## Program Overview

The NYRCR Program, announced by Governor Cuomo in April of 2013, is a more than \$650 million planning and implementation process established to provide rebuilding and resiliency assistance to communities severely damaged by Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy. Drawing on lessons learned from past recovery efforts, the NYRCR Program is a unique combination of bottom-up community participation and State-provided technical expertise. This power combination recognizes not only that community members are best positioned to assess the needs and opportunities of the places where they live and work, but also that decisions are best made when they are grounded in rigorous analysis and informed by the latest innovative solutions.

One hundred and two storm-affected localities across the State were originally designated to participate in the NYRCR Program. The State has allocated each locality between \$3 million and \$25 million to implement eligible projects identified in the NYRCR Plan. The funding for these projects is provided through the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) program.<sup>1</sup>

Forty-five NYRCR Communities, each comprising one or more of the 102 localities, were created and led by a NYRCR Planning Committee composed of local residents, business owners, and civic leaders. Members of the Planning Committees were identified in consultation with established local leaders, community organizations, and in some cases municipalities. The NYRCR Program sets a new standard for community participation in recovery and resiliency planning, with community members leading the planning process. Across the State, more than 500 New Yorkers represent their communities by serving on Planning Committees. More than 400 Planning Committee Meetings have been held, during which Planning Committee members worked with the State's NYRCR Program team to develop community reconstruction plans and identify opportunities to make their communities more resilient. All meetings were open to the public. An additional 125-plus Public Engagement Events attracted thousands of community members, who provided feedback on the NYRCR planning process and proposals. The NYRCR Program's outreach has included communities that are traditionally underrepresented, such as immigrant populations and students. All planning materials are posted on the NYRCR Program's website ([www.stormrecovery.ny.gov/nyrcr](http://www.stormrecovery.ny.gov/nyrcr)), providing several ways for community members and the public to submit feedback on materials in progress.

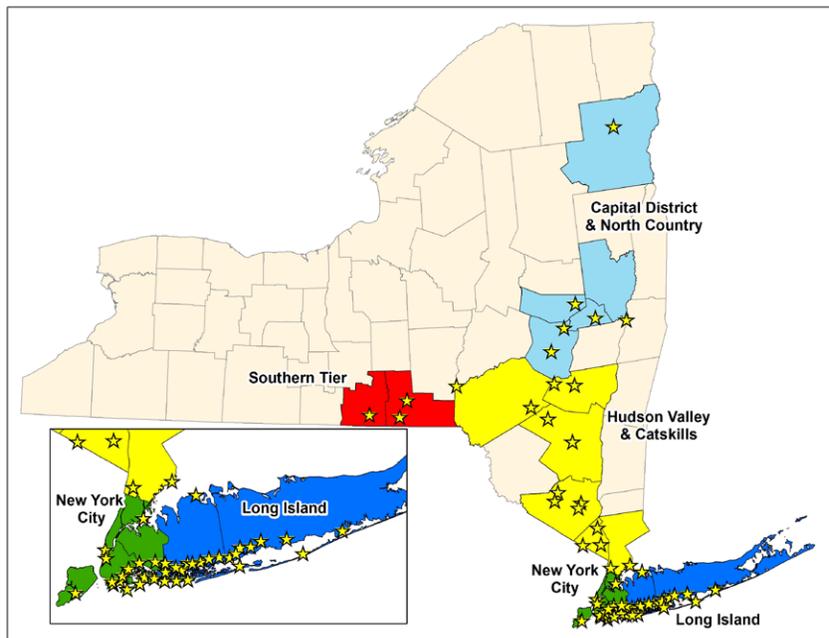
1. Five of the 102 localities in the program – Niagara, Herkimer, Oneida, Madison, and Montgomery Counties – are not funding through the CDBG-DR program.

Throughout the planning process, Planning Committees were supported by staff from the Governor's Office of Storm Recovery (GOSR), planners from New York State (NYS) Department of State (DOS) and NYS Department of Transportation (DOT), and consultants from world-class planning firms that specialize in engineering, flood mitigation solutions, green infrastructure, and more.

With the January 2014 announcement of the NYRCR Program's expansion to include 22 new localities, the program comprises over 2.7 million New Yorkers and covers nearly 6,500 square miles, which is equivalent to 14% of the overall State population and 12% of the State's overall geography.

The NYRCR Program does not end with this NYRCR Plan. Governor Cuomo has allocated over \$650 million of funding to the program for implementing projects identified in the NYRCR Plans. NYRCR Communities are also eligible for additional funds through the program's NY Rising to the Top Competition, which evaluates NYRCR Communities across eight categories, including best use of technology in the planning process, best approach to resilient economic growth, and best use of green infrastructure to bolster resilience. The winning NYRCR Community in each category will be allocated an additional \$3 million of implementation funding. The NYRCR Program is also working with both private and public institutions to identify existing funding sources and create new funding opportunities where none existed before.

The NYRCR Program has successfully coordinated with State and Federal agencies to help guide the development of feasible projects. The program has leveraged the Regional Economic Development Council's State Agency Review Teams (SARTs), comprised of representatives from dozens of State agencies and authorities, for feedback on projects proposed by NYRCR Communities. The SARTs review projects with an eye toward regulatory and permitting needs, policy objectives, and preexisting agency funding sources. The NYRCR Program is continuing to work with the SARTs to streamline the permitting process and ensure shovels are in the ground as quickly as possible.



Communities participating in the NYRCR Program (Note: map includes those NYRCR Communities funded through the CDBG-DR program, including the NYRCR Communities announced in January 2014.)

On the pages that follow, you will see the results of months of thoughtful, diligent work by NYRCR Planning Committees, passionately committed to realizing brighter, more resilient futures for their communities.

## **The NYRCR Plan**

This NYRCR Plan is an important step toward rebuilding a more resilient community. Each NYRCR Planning Committee began the planning process by defining the scope of its planning area, assessing storm damage, and identifying critical issues. Next, the Planning Committee inventoried critical assets in the community and assessed the assets' exposure to risk. On the basis of this work, the Planning Committee described recovery and resiliency needs and identified opportunities. The Planning Committee then developed a series of comprehensive reconstruction and resiliency strategies, and identified projects and implementation actions to help fulfill those strategies.

The projects and actions set forth in this NYRCR Plan are divided into three categories. The order in which the projects and actions are listed in this NYRCR Plan does not necessarily indicate the NYRCR Community's prioritization of these projects and actions. Proposed Projects are projects proposed for funding through a NYRCR Community's allocation of CDBG-DR funding. Featured Projects are projects and actions that the Planning Committee has identified as important resiliency recommendations and has analyzed in depth, but has not proposed for funding through the NYRCR Program. Additional Resiliency Recommendations are projects and actions that the Planning Committee would like to highlight and that are not categorized as Proposed Projects or Featured Projects. The Proposed Projects and Featured Projects found in this NYRCR Plan were voted for inclusion by official voting members of the Planning Committee. Those voting members with conflicts of interest recused themselves from voting on any affected projects, as required by the NYRCR Ethics Handbook and Code of Conduct.

NYRCR Bellmore/Merrick is eligible for up to \$12.1 million in CDBG-DR implementation funds.<sup>2</sup>

While developing projects for inclusion in this NYRCR Plan, Planning Committees took into account cost estimates, cost-benefit analyses, the effectiveness of each project in reducing risk to populations and critical assets, feasibility, and community support. Planning Committees also considered the potential likelihood that a project or action would be eligible for CDBG-DR funding. Projects and actions implemented with this source of Federal funding must fall into a Federally-designated eligible activity category, fulfill a national objective (meeting an urgent need, removing slums and blight, or benefiting low to moderate income individuals), and have a tie to the natural disaster to which the funding is linked. These are among the factors that the Governor's Office of Storm Recovery will consider, in consultation with local municipalities and nonprofit organizations, when determining which projects and actions are best positioned for implementation.

The total cost of Proposed Projects in this NYRCR Plan exceeds the NYRCR Community's CDBG-DR allocation to allow for flexibility if some Proposed Projects cannot be implemented due to environmental review, HUD eligibility, technical feasibility, or other factors. Implementation of the projects and actions found in this NYRCR Plan are subject to applicable Federal, State, and local laws and regulations, including the Americans with Disabilities Act (ADA). Inclusion of a project or action in this NYRCR Plan does not guarantee that a particular project or action will be eligible for CDBG-DR funding or that it will be implemented. The Governor's Office of Storm Recovery will actively seek to match projects with funding sources.

In the months and years to follow, many of the projects and actions outlined in this NYRCR Plan will become a reality helping New York not only to rebuild, but also to build back better.

2. The following localities' allocations comprise the NYRCR Community's total allocation: Bellmore – \$5.7 million; Merrick – \$6.4 million.

# Table of Contents

<b>Executive Summary</b>	<b>1</b>
<b>Section I: Community Overview</b>	<b>11</b>
A. Geographic Scope of NYRCR Plan	13
B. Description of Storm Damage	14
C. Critical Issues	22
D. Community Vision	24
E. Relationship to Regional Plans	25
<b>Section II: Assessment of Risk and Needs</b>	<b>31</b>
A. Description of Community Assets and Assessment of Risk	32
B. Assessment of Needs and Opportunities	49
<b>Section III: Reconstruction and Resiliency Strategies</b>	<b>67</b>
A. Reconstruction and Resiliency Strategies	68
<b>Section IV: Implementation – Project Profiles</b>	<b>77</b>
Proposed: Lifeline Corridor Study and Guidelines	83
Proposed: Downtown and Commercial Corridor Resiliency Plan	86
Proposed: Bellmore/Merrick Stormwater Drainage, Outfall, and Bulkhead Repair	89
Proposed: Southwest Merrick Masterplan and Flood Mitigation Pilot Project	93
Proposed: Meadowbrook Corridor Stormwater System Modeling, Analysis, and Pilot	96
Proposed: Bellmore/Merrick Community Assistance Centers	101
Proposed: Public Communication and Education Gap Analysis	105
Proposed: Business Continuity Program	107
Proposed: Key Intersection Streetlight Retrofit	110
Proposed: South Shore Stormwater System Modeling and Analysis	112
Featured: Resilient Streetscape Implementation	115
Featured: Bellmore road raising: Army Place, Navy Place, Marine Place and Shore Road	117
Featured: Bellmore Road Raising: Koft-Boundary Road Area	119
Featured: Merrick Road Raising: George Court to Leslie Lane	121
Featured: Marina and Dock Resilience Guidelines	123
<b>Section V: Additional Materials</b>	<b>127</b>
A. Additional Resiliency Recommendations	128
B. Master Table of Projects	130
C. Public Engagement Process	136
D. Community Asset Inventory	142
E. End Notes	147
F. Glossary	149



# Executive Summary

## Overview

The hamlets of Bellmore and Merrick—with a combined land area of approximately seven square miles and a population of over 38,000—are desirable “bedroom” communities located along the south shore of Nassau County in Long Island, New York. These unincorporated hamlets within the Town of Hempstead include a mix of upland and waterfront single-family home neighborhoods with a wealth of community amenities, such as waterfront parks, a golf course, easy access to Jones Beach, two Long Island Rail Road (LIRR) stations, and numerous local retail and commercial businesses. Both hamlets lie immediately adjacent to the East Bay, an embayment of the South Shore Estuary, and are composed of peninsulas and canals that allow access for boats and maritime activity.

On October 29, 2012, life changed dramatically for many community residents and business owners. New York and the tri-state region were devastated by Superstorm Sandy, the largest storm of the 2012 Atlantic Ocean hurricane season. The south shore of Long Island, including Bellmore and Merrick, suffered massive storm damage, power outages, and utility and transportation disruption. Superstorm Sandy's destruction came on the heels of Hurricane Irene, which struck the community just a year prior on August 26, 2011, causing significant flooding, wind damage, and power outages. Directly or indirectly, the lives and well-being of virtually everyone in the region were, and continue to be, affected by the aftermath of both storms.

In response, the NY Rising Community Reconstruction (NYRCR) Program was established by the New York State (NYS) to provide rebuilding and revitalization assistance to communities severely damaged by Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee. This program empowers communities to identify resilient and innovative reconstruction projects that consider current damage, future threats, and economic opportunities—all of which are contained in the NYRCR Bellmore/Merrick Plan (NYRCR Plan). For the purposes of this planning effort, Bellmore and Merrick were combined to create the NYRCR Bellmore/Merrick Community (Community).

The geographic scope of the NYRCR Plan includes the entirety of both hamlets, bordered by Meadowbrook State Parkway and the Village of Freeport to the west, Camp and Beltagh Avenues to the north, the hamlet of Wantagh to the east, and the South Shore Estuary to the south. The Community is eligible to receive up to \$12.1 million (\$5.7 million for Bellmore and \$6.4 million for Merrick) of U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) funds for the implementation of projects proposed in its NYRCR Plan.

Residents, business owners, first responders, and local employees from the Community actively participated in the NYRCR Program over a period of seven months beginning in September 2013. These stakeholders considered their goals and aspirations for the future to develop an NYRCR Plan that honors the unique qualities and assets of the Community, that seeks to creatively reduce potential storm- and climate change-related impacts, and that leverages these investments to support other needs and opportunities that can ultimately benefit the Community as a whole. The result of these efforts is this NYRCR Plan, which presents a series of strategies and projects that respond to critical issues, and contribute to building a more resilient, safer, and sustainable future for the NYRCR Bellmore/Merrick Community.

## Storm Impacts

Recent storm events brought significant damage to homes, businesses, infrastructure, and the natural environment. The two most powerful of these storms had different impacts on the Community in terms of both type and magnitude. In August 2011, Hurricane Irene's heavy rain and wind caused flooding and felled trees resulting in impassable roads and power outages. Flooding was concentrated in the residential neighborhoods south of Merrick Road, while heavy winds and power outages affected the entire Community.

In October 2012, Superstorm Sandy caused a storm surge at high tide of over ten feet, which inundated waterfront neighborhoods that generally lie between five and ten feet above sea level. Large swaths of land were flooded and the Community faced severe problems with power outages, heavy debris, and

immobility due to damaged and flooded roads and compromised power lines. More than 3,000 housing units were reported to be damaged, and although the degree of damage varied, many homes were inundated by several feet of water. Major roads and evaluation routes were blocked by felled trees and flooding, preventing access by residents and first responders. Power outages for many residents lasted 16 days and also caused disruption to cellular communications. Some business establishments were directly impacted by flooding and storm damage while others suffered due to power outages and reduced commercial activity as a result of the storm. Gas stations could not pump fuel without backup power. The Town of Hempstead's Norman J. Levy Park and Preserve in Merrick was badly damaged by surge and flood waters washing away paths and dislocating fishing pier pilings. The Town of Hempstead Department of Sanitation facility and nearby Merrick Senior Center suffered over \$3 million in damage from flooding.

### **Critical Issues**

The recent storm events uncovered a variety of critical issues with the natural and built environment in the Community, along the south shore of Long Island, throughout vast utility service areas, and in the broader region. These issues directly and indirectly impact homes; businesses; sanitary sewer, stormwater, and energy infrastructure; public facilities; and natural resources. The following critical issues were identified during the NYRCR planning process, which directly informed the formulation of the strategies and projects of the NYRCR Bellmore/Merrick Plan:

- Flooding and Drainage;
- Energy Infrastructure;
- Housing in High Risk Areas;
- Information, Education, and Communication;
- Regional Connections;
- Resilient Planning, Design, and Construction; and
- Shoreline Protection.

While local issues are paramount, it is important to recognize the Community's relationship to its neighbors and to the region beyond. Communities on

Long Island's south shore have similar patterns of development, interconnected infrastructure systems and road networks, overlapping municipal service provision areas, and a common shoreline. Weaving local and regional efforts together allows for building back in ways that are stronger, better and smarter than before. The plan is tailored to the specific needs of the Community but contains projects of regional interest and also identifies actions or projects that benefit the Community and adjacent neighbors. More information about Storm Impacts and Critical Issues can be found in Section I.

### **Community-Driven Process**

The NYRCR Program provided the Community with a unique opportunity to participate in a community-driven planning effort. The NYRCR Planning Committee (Committee), composed of eleven community representatives, dedicated their time, passion, and expertise to guide the development of the NYRCR Plan. The Committee played an integral role in the planning process by: providing overall direction and guidance; generating material; reviewing, revising, and responding to components of the plan; and deliberating on the initiatives that will bring the greatest recovery and resiliency value to Bellmore and Merrick. The Committee held eight official meetings over the course of seven months, from September 2013 to March 2014. In addition, the Committee participated in two joint Committee meetings with the neighboring NYRCR Communities of Baldwin, Seaford/Wantagh, Massapequas, and Freeport. These joint Committee meetings explored shared issues and opportunities for collaboration and cooperation.

Through a combination of input received from the community during the Public Engagement Events and the work of the Planning Committee, a Vision Statement and list of goals were developed to reflect the Community's aspiration for the future. These statements provide the foundation of the NYRCR Plan, were used to guide the development of strategies and projects, as well as serve as an ongoing reminder of what the Community aims to achieve.

### **NYRCR Bellmore/Merrick Plan Vision Statement**

The NYRCR Bellmore/Merrick Plan proactively implements measures to make our south shore community more resilient, now and in the future. While being mindful of our natural waterways, we will update infrastructure and invest in new projects so that the whole community will benefit, protecting our beloved communities and way of life. The Plan strives to:

- Develop innovative and natural solutions to coastal storm surges and erosion management;
- Ensure public safety during and after major natural events;
- Ensure proper health and social services are accessible to all residents, on a daily basis and in emergency situations;
- Support local business resilience by encouraging business continuity;
- Refurbish fresh water resources and improve stormwater management;
- Enhance and maintain all accessibility and maneuverability in all coastal evacuation routes; and
- Enhance public open space so it serves multiple purposes, such as recreation, resilience, and refuge.

The strategies and projects outlined in the NYRCR Plan will ultimately impact the quality of life for those who live, work, and play in the Community. As such, input from residents, business owners, and community leaders has been an important component of the planning process. Community residents and other stakeholders participated in three Public Engagement Events to review the evolving work of the Committee, and to contribute their ideas, thoughts, and suggestions to the planning process. In addition, a Community website was set up on the NYRCR website (<http://www.stormrecovery.ny.gov>) to post planning materials, including items from Public Engagement Events and online surveys, to give community members an opportunity to provide feedback. A detailed summary of the community-driven process can be found in Section V.

### **Assessment of Risks and Needs**

Hurricane Irene and Superstorm Sandy exposed certain vulnerabilities related to the Community's ability to mitigate and respond to major storm events, climate change, and sea level rise. As part of developing the NYRCR Plan, an inventory of community assets was compiled and evaluated to determine each asset's potential of being damaged or destroyed by a future storm surge or flooding event. By analyzing potential hazards, as well as levels of exposure and vulnerability to possible storm impacts, a measure of risk was calculated for each asset. In addition, the community asset locations were combined with NYS Department of State hazard maps that illustrate a full range of coastal risks, and consider both the frequency and impact of flooding. This quantitative and spatial analysis, in addition to local knowledge from stakeholders gathered throughout the NYRCR process, helped to highlight assets and geographic areas requiring attention, and served as a basis for the generation of project ideas.

In Bellmore and Merrick, several assets in the community are located in high and extreme risk zones, including two fire stations, four schools, three marinas, the Merrick Senior Center, two sanitary sewage pump stations, a Town of Hempstead Department of Sanitation facility, and sections of the Merrick Road and Sunrise Highway commercial corridors, including the section of Merrick Road adjacent to the Meadowbrook State Parkway, which is a key County evacuation route. In addition to these individual assets, over 4,200 residential parcels are located in high and extreme risk areas. Detailed information of these analyses can be found in Section II: Assessment of Risk and Needs.

The risk assessment was paired with an exploration of resiliency-related needs and opportunities, many of which were identified by Committee members and the public at Committee meetings and Public Engagement Events. Risk, needs, and opportunities were organized by six categories that relate to all aspects of life in the Community: community planning and capacity building, economic development, housing, health and social services, infrastructure, and natural and cultural resources. The Community identified the following key opportunities:

- Upgrades to drainage systems to better mitigate flooding from high tides and major storms;
- Increases to energy safety, resilience, sustainability and independence;
- Improvements to communication, education and access to resources in the Community;
- Enhancements to parks, preserves and green spaces that aid or develop storm protection, stormwater management, community building, and recreational opportunities; and
- Expansion of community education and awareness programming around coastal living, climate change, and sea level rise.

### Strategies for Reconstruction and Resilience

Strategies included here are designed to support the two main goals of reconstruction and resiliency. Reconstruction focuses on restoring, repairing, or rebuilding what was damaged or destroyed by Superstorm Sandy. Resiliency is about strengthening the ability of NYRCR Bellmore/Merrick to rebound quickly when confronted with challenges of all kinds in the future. These strategies address and balance regional concerns, an analysis of problem areas, community feedback on local issues, and iterative development by the Committee. Reconstruction and Resiliency Strategies for the Community are listed below and described in detail in Section III of the NYRCR Plan:

- Improve Stormwater Management and Drainage Systems;
- Establish Programs and Policies for Resilient Planning and Design;
- Enhance Communication, Education, and Awareness;
- Improve Transportation Access and Connectivity;
- Invest in Resilience Enhancements for Energy Infrastructure; and
- Plan for Business Continuity and Growth.

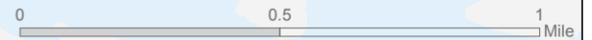
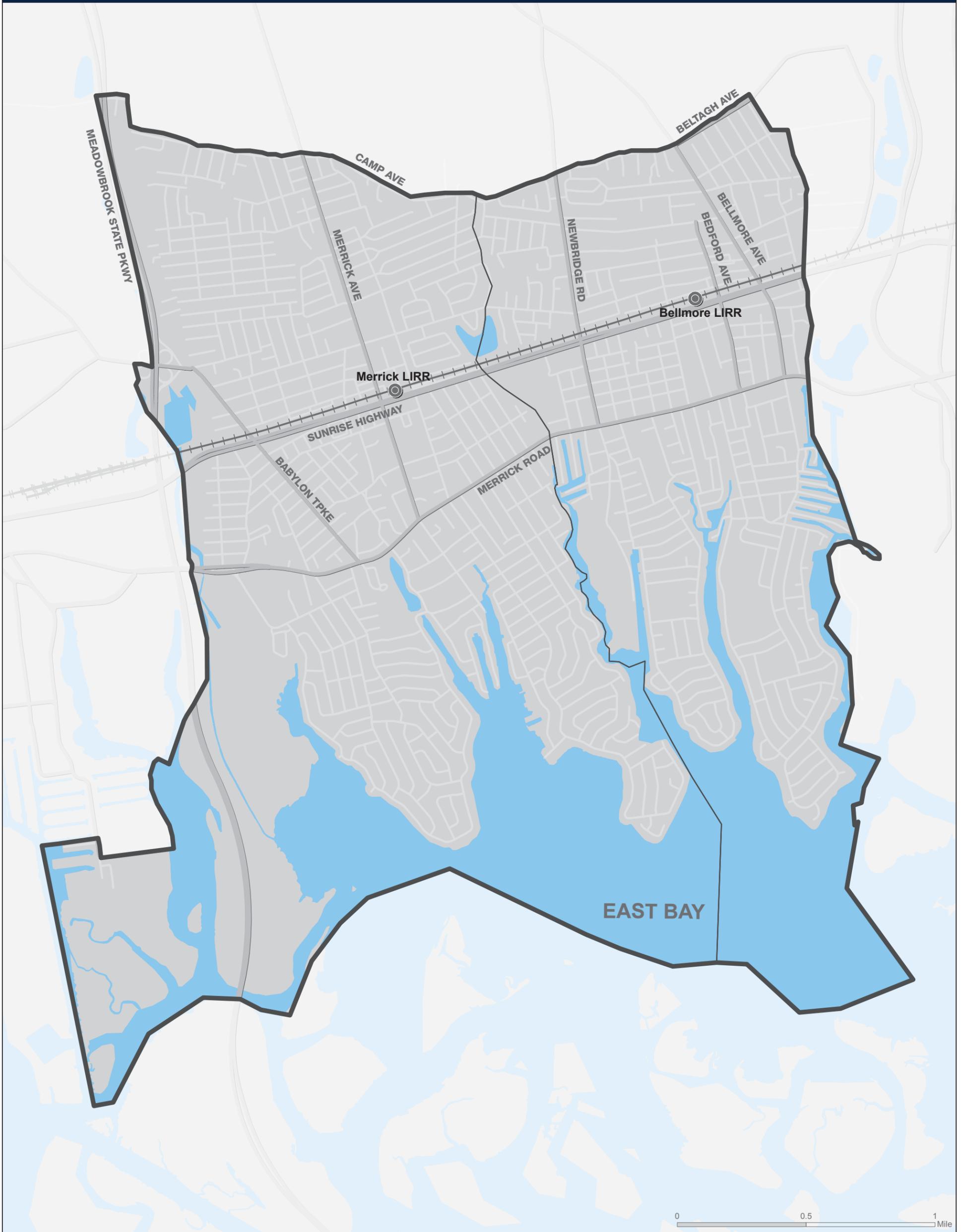
### Proposed and Featured Projects

The projects that resulted from this extensive planning process support the Reconstruction and Resiliency Strategies as well as the vision and goals for the Community. The projects included in the NYRCR Plan are organized into three categories, which are:

- **Proposed Projects** are discrete projects that are affordable within the Community's allocation of Community Development Block Grant Disaster Recovery (CDBG-DR) assistance.
- **Featured Projects** are innovative projects where an initial study or discrete first phase of the project is proposed for CDBG-DR funding or other funding resources. Featured projects also may include regulatory reforms and other programs that do not involve capital expenditure.
- **Additional Resiliency Recommendations** are resiliency projects and actions the Committee would like to highlight and are not categorized as Proposed or Featured Projects.

Table 01 on the following page includes the Proposed and Featured Projects organized by strategy. The projects have not been ranked or prioritized. Detailed descriptions of each project can be found in Section IV of the NYRCR Plan and Additional Resiliency Recommendations can be found in Section V.

# Figure ES-01: Geographic Scope



### Legend

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station
- Water
- Main Roads
- Local Roads

### Data Sources

ESRI, NOAA,  
US Census,  
Nassau County,  
NYS DOS  
Created March 2014



This page intentionally left blank

**Table 01:** Proposed and featured projects

Strategy	Project Name	Short Description	Category	Regional
Improve Stormwater Management and Drainage Systems	Bellmore/Merrick Stormwater Drainage, Outfall, and Bulkhead Repair	Assess the entire Bellmore/Merrick drainage system south of Merrick Road, including the 230 outfalls and related bulkheads. Tidal check valves will be installed on 25 critical and appropriate outfalls.	Proposed	N
Improve Stormwater Management and Drainage Systems; Establish Programs and Policies for Resilient Planning, Design, and Housing	Southwest Merrick Masterplan and Flood Mitigation Pilot Project	Creation of a Masterplan to re-envision the Town of Hempstead parcels. A newly reconfigured site would provide enhanced flood mitigation for the amenities on-site as well as for Merrick Road. Shoreline stabilization or green infrastructure pilot project upon Masterplan completion.	Proposed	N
Improve Stormwater Management and Drainage Systems	Meadowbrook Corridor Improvements Pilot Study	This project would include the reconstruction of five stormwater outfalls currently entering Freeport Creek. And reconnecting the Creek with the natural floodplain. A floating wetland pilot and drainage study would also be conducted for East Meadow Pond to improve water quality and reduce future flooding. A daylighting study for Freeport Creek would examine the potential benefits of uncovering the current underground portion of the Creek.	Proposed	N
Enhance Communication, Education, and Awareness; Improve Transportation Access and Connectivity	Bellmore Merrick Community Assistance Centers	Community Assistance Centers are places for residents to gather information about emergency preparedness under normal conditions. During and after a storm, these centers would become a place to gather, collect and distribute resources, charge cell phones, access the internet/TV, and seek comfort.	Proposed	N
Enhance Communication, Education, and Awareness	Public Communication and Education Gap Analysis	Evaluate existing communication and educational processes and uncover additional needs. Identify public/private partnership opportunities for ongoing communication and education needs.	Proposed	Y

**Table 01 (cont'd):** Proposed and featured projects

Strategy	Project Name	Short Description	Category	Regional
Enhance Communication, Education, and Awareness	Business Continuity Program	Staff person to assist businesses in creating business continuity plans. Education for Chambers of Commerce and other business organization. Identify business assistance funding.	Proposed	Y
Improve Transportation Access and Connectivity	Lifeline Corridor Study and Guidelines	Best practices and guidelines for Resilient Streetscapes, such as green infrastructure, drainage practices, redundant and safe power, resilient street trees and street design.	Proposed	Y
Improve Transportation Access and Connectivity; Invest in Resilience Enhancements for Energy Infrastructure	Key Intersection Street Light Retrofit	Installation of LED/PV streetlights on utility poles along Merrick Road in Merrick and Bellmore	Proposed	N
Establish Programs and Policies for Resilient Planning, Design, and Housing	Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	Proposed	N
Improve Stormwater Management and Drainage Systems	South Shore Stormwater System Modeling and Analysis	Hydrologic and hydraulic (H&H) model to determine the causes of localized flooding issues across the catchment and identify measures to prevent the flooding	Proposed	Y
Improve Transportation Access and Connectivity; Invest in Resilience Enhancements for Energy Infrastructure	Resilient Streetscape Implementation	Underground 19 miles of utility lines, install new PV/LED street lights and new emergency evacuation signage	Featured	N
Improve Stormwater Management and Drainage Systems	Bellmore Road Raising: Army, Navy, Marine and Shore Road	Road raising and associated drainage improvements at Shore Rd, Walters Ct, Horace Ct, Army Pl, Navy Pl, Marine Pl, Surf Dr, Riviera La, Malibu Rd, Driftwood La, Seaview La, and May Ct.	Featured	N

**Table 01 (cont'd):** Proposed and featured projects

Strategy	Project Name	Short Description	Category	Regional
Improve Stormwater Management and Drainage Systems	Bellmore Road Raising: Kopf-Boundary Road Area	Road raising and associated drainage improvements at North Rd, Kopf Rd, Clubhouse Rd, Alder Rd, Beach Ave, Short St, Barbara Rd, and Boundary Rd.	Featured	N
Establish Programs and Policies for Resilient Planning, Design, and Housing	Marina and Dock Resilience Guidelines	Emergency preparedness guidelines, recommendations and education	Featured	N
Improve Stormwater Management and Drainage Systems	Merrick Road Raising: George Court to Leslie Lane	Road raising and associated drainage improvements at George Ct, Helen Ct, Leonard La, Edward La, Leslie La, and Julian La.	Featured	N



## Section I: Community Overview

The hamlets of Bellmore and Merrick are desirable “bedroom” communities where residents value their quality of life, connection to the water, natural amenities, and high-quality schools. Located along the south shore of Nassau County on Long Island, in the Town of Hempstead, they comprise approximately seven square miles, most of which are devoted to a mix of upland and waterfront single-family home neighborhoods. Both hamlets benefit from a wealth of amenities, such as waterfront parks and a golf course, easy access to Jones Beach, Long Island Rail Road (LIRR) stations, and numerous local retail and commercial businesses. About 800 homeowners have direct access to Merrick and East Bays via canals at the rear of their property, where boats are stored for personal use.<sup>3</sup>

Based on the 2010 census, the populations of Bellmore and Merrick were 16,218 and 22,097 respectively, with a combined population of 38,315 residents.<sup>4</sup> The combined area of both hamlets is seven square miles, of which approximately one-fifth is water, including canals and tributaries and parts of Merrick and East Bay. At 5,423 people per square mile, the population density is slightly higher than that of Nassau County as a whole, according to the 2010 U.S. Census.

Both Bellmore and Merrick have an engaged and active citizenry and strong community values. There are two elementary school districts — Merrick Union Free School District and Bellmore School District. They share a school system for middle and high school, known as the Bellmore/Merrick Central High School District. The hamlets are collectively referred to in this document as the NYRCR Bellmore/Merrick Community (Community).

Though it is predominantly residential, the Community has a significant number of commercial and retail establishments clustered around Sunrise Highway, Merrick Road, Bellmore Avenue, and Merrick Avenue. Bellmore has a traditional downtown cluster of retail businesses, known as Bellmore Village. Similarly, Merrick has a traditional downtown area along Merrick Avenue near the Merrick LIRR Station. The Community’s office uses are few and generally scattered throughout the commercial corridors. Industrial uses are also very limited and include some automotive businesses and marinas along the waterfront.

The Meadowbrook State Parkway and Sunrise Highway are two major thoroughfares serving the Community. The Meadowbrook State Parkway traverses the western edge of Merrick to intersect with Sunrise Highway and provides access to the south shore barrier islands, which includes Jones Beach State Park. Merrick Avenue, Bellmore Avenue, and Newbridge Road are also heavily traveled local routes. Bellmore and Merrick each have their own station on the LIRR Babylon Branch, which runs from Penn Station in Manhattan, through the borough of Queens, to the Village of Babylon in Suffolk County. Based on LIRR ridership statistics from 2006, a combined 6,681 passengers traveled west from the Bellmore and Merrick stations as part of their week-day morning commute.<sup>5</sup>

The Community is directly adjacent to Merrick and East Bays, embayments of the South Shore Estuary, which is buffered from the Atlantic Ocean by the barrier islands. The South Shore Estuary stretches from Nassau County's western boundary to Southampton in Suffolk County and is home to extensive coastal habitats and a large number of wildlife. The Community has a direct relationship with the Estuary through peninsulas and inlets that allow access for boats and maritime activity. Besides parkland, the waterfront is almost entirely lined with single-family homes, some of which are located along canals with bulkheads and docks.

The Community has a significant amount of open space and parkland. Parks and preserved areas include Fraser Avenue Park, Meroke Preserve, Norman J. Levy Park and Preserve, Newbridge Road Park, Julian Lane Park, Cammann's Pond Park, Illona Lane Park, John Street Park, Merrick Road Park, Randy Lane Park, and East Bay Park. Cedar Creek, Cow Meadow, and Cammann's Pond are operated by Nassau County; all other parks fall under Town of Hempstead jurisdiction.

With the introduction of the NYRCR Program, the NYRCR Bellmore/Merrick Planning Committee (Committee), comprised of community representatives, came together to identify issues and develop strategies geared at enhancing the long-term resiliency of the Community. More than 120 residents and stakeholders from Bellmore and Merrick participated in Public Engagement Events to address

storm-related impacts that affect their Community as a whole. The result of their efforts is this NYRCR Bellmore/Merrick Plan (NYRCR Plan), which assesses risk, determines needs and opportunities, and presents a series of strategies and projects that, when implemented, will respond to critical issues and community aspirations, and contribute to building a safer, and more resilient and sustainable, future for these two hamlets.

This section of the NYRCR Plan, Community Overview, includes the following sub-sections

- **Geographic Scope** of the NYRCR Plan: Defines the physical boundaries of the NYRCR Plan and includes a description of NYRCR Bellmore/Merrick to provide context for the planning effort.
- **Description of Storm Damage:** Summarizes the impacts of Superstorm Sandy and Hurricane Irene on the lives of residents, their homes, local businesses, community services, and public and government facilities.
- **Critical Issues:** Describes the key concerns facing the community as they relate to major storm events. These issues are further detailed in Section II: Assessment of Risks and Needs.
- **Community Vision:** Includes the Community's aspirations for a more resilient future.
- **Relationship to Regional Plans:** Describes the regional perspectives considered in the preparation of this plan to address shared challenges and issues.

Thirteen Community representatives dedicated their time, passion, and expertise as Committee Co-Chairs and members to guide the development of the NYRCR Plan from its inception. Residents and business owners participated in three Public Engagement Events and shared their opinions and ideas through online platforms, business surveys, and key informant interviews.

## A. Geographic Scope of NYRCR Plan

The geographic scope of NYRCR Bellmore/Merrick includes the unincorporated hamlets of Bellmore and Merrick within the Town of Hempstead, located in Nassau County on Long Island, New York. For the purpose of this planning effort, the hamlets are known as the Community. The scope was chosen by the Committee with input by the public at the first Public Engagement Event.

The NYRCR Plan area, as shown in Figure 01, extends north from Merrick and East Bays to Camp Avenue, which becomes Beltagh Avenue as it moves east across Newbridge Road. The eastern boundary delineates Bellmore from the neighboring hamlet of Wantagh, intersecting Sunrise Highway and the LIRR Babylon Branch as it moves south back to the bays. The area's western edge runs east of the Meadowbrook State Parkway until it intersects with the Parkway near Merrick Golf Course, going north along the Meadowbrook State Parkway and ending at Smith Pond.

Within the greater New York metropolitan area, the Community is approximately 24 miles east of Manhattan, and 10 miles east of the Nassau-Queens Line. The Community is located on the south shore of Long Island between the Village of Freeport to the west and the hamlet of Wantagh to the east, which are also NYRCR Communities. To the north are the hamlets of North Merrick and North Bellmore.

While the Committee discussed limiting the scope of the project to the areas that are most vulnerable to future storms and coastal flooding, it was ultimately decided that the entirety of both hamlets should be included, as both Superstorm Sandy and Hurricane Irene either directly or indirectly affected all neighborhoods and business districts.



A historic home in Bellmore (source: Arup)



Waterfront homes in Merrick (source: Merrick History - [www.merrickhistory.com](http://www.merrickhistory.com))

## B. Description of Storm Damage

Hurricanes, tropical storms, and other weather events can have wide and varying impacts on coastal communities like Bellmore and Merrick. The direct impacts experienced by the Community during Hurricane Irene and Superstorm Sandy included coastal flooding of homes and businesses; wind damage to trees, utility poles, and other support structures; localized flash flooding of streets; boats and debris in homes, along streets, and in parks and open spaces; backups and overflows of sanitary and stormwater drainage systems; and damage to bulkheads, soft shorelines, and coastal wetlands. It is important, however, to acknowledge that these weather systems continue to impact communities long after the storm has passed. These secondary, or indirect, impacts can be equally as damaging as direct storm impacts and can further destabilize recovering communities. Secondary impacts can include:

- Fires from broken gas pipes and exposed electrical wires;
- Contamination of natural environments, homes, businesses and drinking water systems due to fuel and hazardous material spills;
- Corrosion of electrical wires and other utility infrastructure;
- Illnesses related to rotting and molding building components;
- Diminished health from food, water, and power shortages;
- Communication and transportation loss due to extended power outages and fuel shortages; and,
- Job losses due to closed businesses.

This section reviews the direct and indirect damage caused by Hurricane Irene and Superstorm Sandy.

### Hurricane Irene

Although Superstorm Sandy was the most destructive storm to make landfall in the Community in recent history, Hurricane Irene caused significant damage to the Community only 14 months prior. Starting on Friday, August 26, 2011, Nassau County issued an evacuation order for residents living in areas lying 10 feet and less above sea level.<sup>6</sup> On August 28, 2011,

#### What causes coastal flooding?

Coastal flooding, or coastal inundation, is the flooding of normally dry, low-lying coastal land, primarily caused by severe weather events along the coast, estuaries, and adjoining rivers. In coastal communities like Seaford and Wantagh, several factors can contribute to coastal flooding.

**Storm Surge:** Storm surge is an abnormal rise in water level, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure.

**Tidal Flooding:** High tide levels are caused by normal variations in the astronomical tide cycle and occur twice a day in Seaford and Wantagh. Approximately twice a month these daily high tides are at their highest and have been known to cause flooding in low lying areas in Seaford and Wantagh.

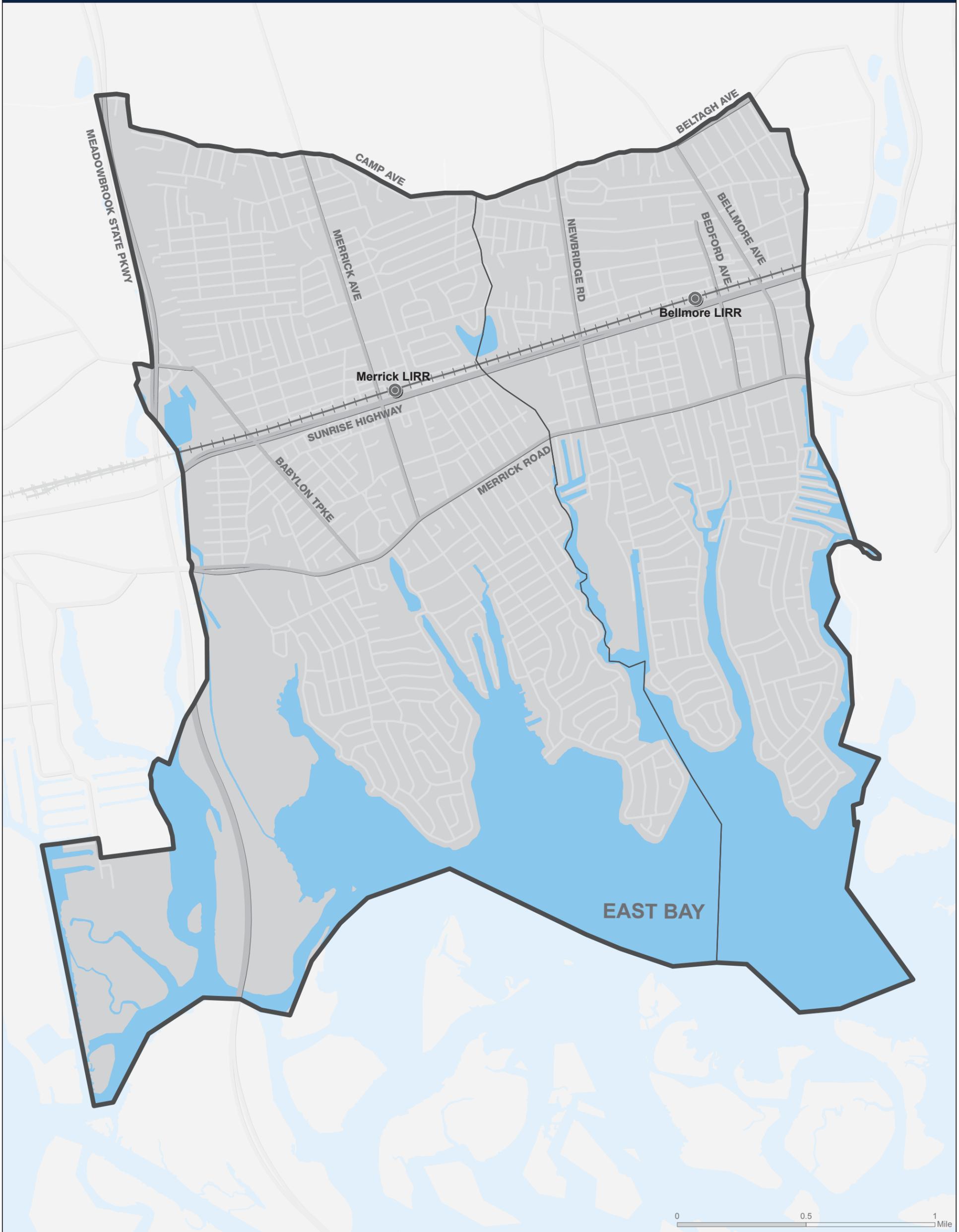
**Inundation Flooding:** Intense periods of rainfall over inland areas may overflow into creeks and combine with storm surge and high tides to increase the flood severity along the coast. Intense periods of rainfall can also cause flooding in inland areas where there is not sufficient capacity for the water to infiltrate into the ground or sufficient capacity for the water to be taken away with drainage infrastructure.

**Sea Level Rise:** Global sea level has been rising since the end of the last ice age. This gradual and permanent change in sea level increases the odds of damaging floods from storm surges.



Downed trees after Hurricane Irene (source: Merrick Patch)

# Figure 01: Geographic Scope



### Legend

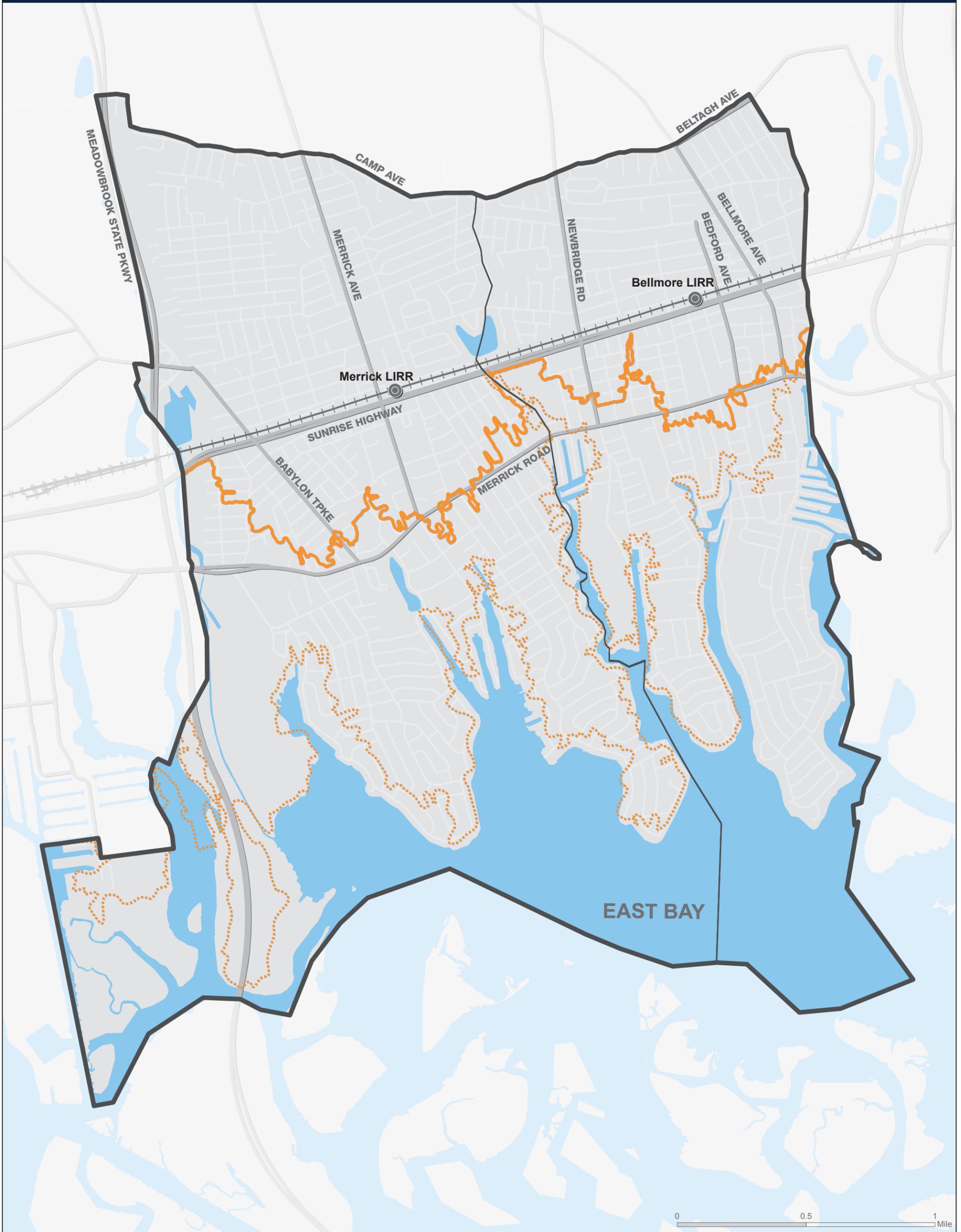
- NYRCR Boundary
- Water
- Long Island Rail Road
- Main Roads
- LIRR Station
- Local Roads

### Data Sources

ESRI, NOAA,  
US Census,  
Nassau County,  
NYS DOS  
Created March 2014



# Figure 02: Extent of Flooding



### Legend

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station
- Water
- Superstorm Sandy extent of storm surge
- Hurricane Irene extent of storm surge

### Data Sources

ESRI, NOAA, US Census, Nassau County, NYS DOS  
Created March 2014



Hurricane Irene made landfall in the Community as a Category 1 hurricane, quickly weakening to a tropical storm. Heavy rain and storm surge caused extensive flooding in Merrick and Bellmore, particularly south of Merrick Road. It is estimated that the surge raised the Atlantic Ocean by eight feet as it swept into Long Island during high tide, sending saltwater spilling into communities south of Merrick Road, which lie, on average, 5 to 10 feet above sea level.<sup>7</sup>

Many local streets were impassable by car. High winds felled trees, compromising power lines and leading to widespread power outages. In Merrick, more than 4,000 homes were without power.<sup>8</sup> The total cost for preparation, clean up, and damage repair in Nassau County was approximately \$12 million.<sup>9</sup>

## **Superstorm Sandy**

On October 29, 2012, New York and the Tri-State region were devastated by Superstorm Sandy, the most destructive storm of the 2012 Atlantic Ocean hurricane season. The Community, along with other communities along the south shore of Long Island, suffered massive storm damage, power outages, and utility and transportation disruption, primarily as the result of wind and storm surge, rather than the heavy rain that was experienced during Hurricane Irene. While initial recovery efforts were well-managed, many residents were unprepared for the extent of the storm's impacts. Directly or indirectly, the lives and well-being of many in the Tri-State region were, and continue to be, affected by the storm's aftermath. Recovery and reconstruction in the Community started immediately after the storm and continue to this day at both the individual and community levels.

### **Emergency Response**

An evacuation order issued by Nassau County went into effect at 2:00 PM on October 28, 2012, a day before Superstorm Sandy was expected to make landfall. The order required the mandatory evacuation of all residents living in a flood or storm surge zone, an area defined as south of Merrick Road from Rockville Centre to the Nassau-Suffolk border.<sup>10</sup> The order instructed residents to utilize coastal evacuation routes, which include Peninsula Boulevard, Long

Beach Road, Meadowbrook State Parkway, and the Seaford-Oyster Bay Expressway. It also instructed those requiring public transportation to evacuate by 7:00 PM, when NICE Bus and the MTA would begin shutting down public transportation. The Long Island Rail Road (LIRR) also began suspending service on October 28, 2012.<sup>11</sup>

According to community participants, the majority of residents who followed the evacuation order chose to stay with friends or family, in line with the Nassau County Family and Friends Sheltering Plan. For those who were not able to find an alternative place to stay, public shelters were opened on October 28, 2012, at 1:00 PM by the American Red Cross, in partnership with Nassau County at Nassau Community College, Levittown Memorial High School, Locust Valley High School, SUNY Old Westbury, and Manhasset High School. At 3:00 PM, a Pet Shelter opened at Nassau County Mitchel Athletic Complex in Uniondale. At 4:00 PM, a Special Needs Shelter opened at Nassau Community College. At 7:00 PM, an Orthodox Shelter opened at West Hempstead High School.

The evacuation order requested residents to evacuate prior to winds reaching 55 mph and reminded all residents throughout Nassau County to tie down and secure all items outside their homes. Some residents chose not to evacuate prior to the storm, which put their lives and those of first responders in danger. Fortunately, no fatalities were reported in the Community.

Superstorm Sandy made landfall at approximately 8:00 PM on October 29, 2012 and continued through most of the following day, weakening as it moved inland to Pennsylvania. Flooding from the storm reached and surpassed the Federal Emergency Management Agency's (FEMA) 100-year flood zones in the Community. The 10-foot storm surge was exceptional both because of the speed and motion of the storm, as well as the storm's arrival at high tide.<sup>12</sup> Large swaths of land were flooded and the Community faced severe problems with power outages, heavy debris, and difficult travel conditions due to damaged and flooded roads and compromised power lines.

Waterfront neighborhoods were most profoundly affected by storm surges and stormwater, particularly those on the bays or near canals. Superstorm Sandy resulted in damage to more than 3,000 housing units in the Community. Although the degree of damage varied, many homes were inundated by several feet of water. Due to the impacts of Superstorm Sandy, over 90% of LIPA's 1.1 million electricity customers lost power, including Community customers. Power was estimated to be restored within ten days, and was ultimately restored within 16 days for all customers (except for those who could not safely accept power).<sup>13</sup>

On October 30, 2012, the day after Superstorm Sandy hit, a number of roads throughout Nassau County were closed due to tidal flooding, debris, and downed power lines, utility poles, and trees. The closure included Merrick Road at Loynes Avenue and Old Mill Road. Local roads were also impacted, and the lack of transportation access made it difficult for emergency response services to effectively identify areas of need and provide aid to community members affected by the storm.

*"The storm ended with 145 calls in the first 48 hours—with not one loss of life in our district and only one firefighter injury...It should be noted that several members of the Bellmore Fire Department experienced severe flooding in their homes, for some, this happened while they were responding to help others. The key factor that allowed them to respond was the early evacuation of their families so they could concentrate on the enormous task that confronted the department." - Volunteer Firefighter<sup>16</sup>*

On November 2, 2012, food and drink distribution centers and showers were opened for residents affected by the storm and these continued to operate through the following weeks.<sup>14</sup> On November 5, 2012, as temperatures dropped in advance of an oncoming nor'easter, warming centers were opened throughout the County.<sup>15</sup> Resident feedback collected at the Public Engagement Events indicated that the Fire Department, Police Department, American Red Cross, FEMA, the Town of Hempstead Department of Public Works, and the Nassau County Office of

Emergency Management best served residents after the Superstorm. This is remarkable considering that two of Bellmore's firehouses were inoperable during the storm, one due to flooding and the other due to lost generator power.

While there has been significant progress after Superstorm Sandy, major gaps still exist in the restoration of many basic care services. Vulnerable groups, including elderly adults, the developmentally disabled population, immigrant families, adolescents, and the homeless population, continue to face challenges accessing health and social services. The Bellmore Jewish Center was closed for six months. The Merrick Senior Center, which provides recreational services to more than 170 seniors, suffered \$500,000 worth of damage. It reopened April 8, 2013, five months after Superstorm Sandy struck the area.

## Homes

As the Community is predominantly residential and many homes are on or near the waterfront, Superstorm Sandy had the most profound impact on housing. The Superstorm Sandy and Hurricane Irene inundation map in Figure 02 clearly illustrates the neighborhoods that were most profoundly affected by storm surges. Homes in southern Bellmore near canals and the bay were inundated by an average of three feet of water. While there were storm-related impacts from strong winds, power outages, and debris, relatively little damage was incurred from flooding in inland areas, outside of the extreme and high risk areas.

Superstorm Sandy resulted in heavy damage to 2,000 housing units in the Community, defined as damage in excess of 50% or more of their value. Another 1,260 units were damaged to between 20% and 50% of their value, and 140 more had damage less than 20% of their value.<sup>17</sup> Damage was caused mostly by flooding, which exceeded four feet in 350 units, ranged between one and four feet in over 1,100 units, and was less than a foot in hundreds of others.<sup>18</sup> In addition, homes and other structures were damaged by drifting vessels that broke free from their docks during the storm.



Some homes in the Community were heavily inundated by the Superstorm Sandy storm surge (source: Hugh Mason)

### Homeowner Assistance

Although damage to privately-owned homes was extensive in some areas of the Community and was a concern raised at NYRCR public engagement events, direct assistance is not part of the NYRCR Bellmore/Merrick Community Plan's strategies and projects. The NYRCR Plan focuses on community-wide resiliency initiatives that seek to mitigate the effects of storm events on residents and neighborhoods. Other Federal and State programs are assisting homeowners with reconstruction directly. For example, the NY Rising Housing Recovery Program, which like the NYRCR Program is a program of the Governor's Office of Storm Recovery, provides housing assistance to help property owners recover, rebuild, or relocate after the devastation of Superstorm Sandy, Hurricane Irene, or Tropical Storm Lee.

From claims registered under FEMA's Individuals and Households Program (IHP) by some 4,200 homeowners as of July 2013, FEMA assessed total damages to owner-occupied housing at \$346.9 million and approved assistance to nearly 2,350 property owners. More than 400 renters filed claims and FEMA assessed an undisclosed amount of rental housing damage, providing assistance to little more than half of those renters registered.<sup>19</sup>

As of July 2013, the total amount of approved funds dispersed by FEMA was \$19.3 million to homeowners and \$1.2 million to renters.<sup>20</sup> An additional \$41.4 million was distributed to homeowners by the Federal Small Business Association (SBA) disaster loan program, as of September 2013.<sup>21</sup> Further funds have been dispersed from the NYS Homeownership Repair and Rebuilding Fund (HRRF), the Empire State Relief Fund, the NY Rising Housing Recovery Program, and the NY Rising Housing Acquisition program to supplement FEMA aid.

In Bellmore, the areas hit hardest by Superstorm Sandy were predominantly residential; homes in Southern Bellmore near canals and the bay were inundated by several feet of water, according to local residents at Public Engagement Events. Community services in Bellmore were also seriously affected by Superstorm Sandy. The Bellmore Jewish Center was closed for 6 months, while the Bellmore Avenue fire station was non-operational for 11 months. Students and teachers had to be temporarily relocated from Shore Road Elementary due to flooding. Businesses, such as the Blue Water Marina, the South Bellmore Veterinary Group, and the CVS Pharmacy on Merrick Road, were also severely damaged by the storm.

### Local Businesses

Many Community businesses were adversely impacted by Superstorm Sandy, either by damage from flooding, disruption or damage from power outages, and, in some cases, decreased business due to the misperception that businesses were closed when they were not. Most of the impacted businesses were located on Merrick Road, as nearby tributaries acted as conduits for inflow of water from East Bay. Damaged businesses on Merrick Road include the South Bellmore Veterinary Group, a CVS Pharmacy, and the Dakota Design Center building.



Local businesses at the Dakota Design Center remain closed due to damage from Superstorm Sandy (source: Randy Shotland)

Additionally, Community marinas were significantly damaged by the storm. Surge waters were strong enough to twist piers and release boats stored on the property into the surrounding residential neighborhoods. Recovery resources were allotted for marina cleanup efforts but many of the facilities have not yet been fully repaired. The inability to fully repair docks and berths has led to further economic losses, as marinas are unable to store vessels to their previous capacities.

According to data from the U.S. Small Business Administration (SBA), 105 Community businesses, representing 314 employees, applied for disaster management assistance after Superstorm Sandy. These applications verified a total of \$7.5 million in real property damage, \$1.2 million of machinery damage, an inventory loss of \$409,722, and a leaseholder improvement loss of \$554,485. Of these applications, only 37 (35.2%) were approved, for an amount totaling just over \$7.1 million, roughly three quarters of the \$9.6 million that was applied for in verified damage assistance.<sup>22</sup>

### **Environmental Damage**

Flooding during Superstorm Sandy caused the release and dispersion of debris, oil, and other toxic substances to various parts of the Community, with the potential to cause health impacts. Superstorm Sandy's storm surge damaged parks and wetlands throughout the south shore, and carried trash and debris into local wetlands and waterways. Saltwater

marshlands off the Community's waterfront remained covered with debris for months after the storm. Household chemicals, fuel from damaged boats, and gas and oil tanks were carried away by flood waters and deposited in wetland areas, coating the water and wildlife in leaked fuel and other contaminants. The Town of Hempstead's Norman J. Levy Park and Preserve was badly damaged by surge and flood waters. Several sections of the park's paths were washed away and pilings at its fishing piers were lifted out of place when the area was inundated. The park remained closed for several months as repairs were made. Newbridge Road Park was also briefly closed as trash and debris were cleared from its ice rink and sports fields. Seawater entered the park's pool and damaged pumps and valves, although repairs were made in time for the 2013 summer season.

### **Infrastructure**

Superstorm Sandy's surge waters travelled as far north as Sunrise Highway and left roadways flooded throughout the southern portion of Community. Areas of low elevation just south of Merrick Road were particularly affected, effectively turning the peninsulas into temporary islands. Streets in low-lying areas were completely inundated and receding floodwaters left roadways littered with heavy debris from damaged buildings, trees, and trash. Heavy winds knocked down trees, traffic signals, and utility lines. While the New York State Police were able to reopen Long Island's major highways north of Merrick Road within the day, several roads to the south needed to be cleared of obstructions before they were opened. Merrick Road, east of the Meadowbrook State Parkway in Merrick, was one of the major roads closed by Nassau County Police after Superstorm Sandy.<sup>23</sup>

The LIRR suspended service the night before Superstorm Sandy was expected to make landfall. Substations feeding the train's third rail had to be powered off after being shut down to avoid damage. Partial service was restored to the Babylon Branch on Friday November 2, 2012, four days after the storm hit. By Monday, November 5, 2012, trains were operating on a modified weekday schedule, and service was nearly restored within the next week.<sup>24</sup>



Barbara Road in Bellmore remained inundated after the Superstorm Sandy storm surge (source: Eileen Casazza)



Fallen trees can knock out power lines and block access for their repair (source: Paul Waterman)

At the peak of Superstorm Sandy's impact, more than 90% of LIPA's 1.1 million electricity customers on Long Island lost power. The utility's transmission and distribution system sustained damage at over 40,000 locations, including 51 substations, 4,400 distribution poles, 2,500 transformers, and 400 miles of power lines. Outages were expected to last no longer than ten days. On November 7, 2012, however, Long Island was hit by a nor'easter and restoration efforts were set back several days. Service was ultimately restored within 16 days for all customers, excluding those in flooded areas who could not safely accept power.<sup>25</sup>

Power outages and storm surge waters affected a number of other critical infrastructure systems. Sewage pump stations that were flooded lost power and failed, causing sewage to back up from the district system into private homes. Storm surge filled the already over-capacity stormwater system, causing localized flooding further inland. Some residents suffered natural gas outages, and damaged equipment and lines created potentially dangerous situations. Seawater entering residential fuel tanks displaced the oil inside, forcing it out and into surrounding yards and homes. Aboveground tanks were ripped off their foundations and carried into nearby properties, and in some areas flooding caused buried fuel tanks to float up out of the ground.<sup>26</sup>

Cellular communication networks were down for days after the storm, as many cellphone towers had insufficient backup power to maintain service. Flooding also affected numerous cell towers and internet switching centers. Facilities that did have reserve power capacity were forced to go offline to prevent damage. Above-ground communication lines on shared utility poles were affected by heavy winds and falling trees, and could only be accessed after initial utility line repairs were made. Emergency notification systems were rendered ineffective for many Community residents because of these outages.

Many gas stations throughout Long Island were left without power for their pumps and the storm prompted the shutdown of two east coast refineries. Although some gas stations did not lose power and remained operational, many wholesale gasoline suppliers did not, and were unable to pump fuel into tanker trucks for distribution. Wholesalers that did have power had difficulty keeping up with demand, as service stations that were open had to be replenished more frequently.

## C. Critical Issues

Recent storm events uncovered critical issues with the Community's natural and built environment. The damages directly and indirectly impacted homes, businesses, sanitary sewer, stormwater and energy infrastructure, public facilities, and natural resources. It is crucial that these issues be addressed in a way that makes the Community more resilient, both on a regular basis and in the wake of potential future disasters. The strategies and projects that are included in Sections II and III of the NYRCR Plan have been designed to address the Community's most critical needs. The following are critical issues facing the Community:

- **Flooding and Drainage:** Flooding and drainage issues caused by storm surges, heavy rainfall, and tidal flooding were the most commonly cited issues raised at the first two Public Engagement Events. Even though Superstorm Sandy's rainfall was only 0.84 inches as measured at Farmingdale, 8 miles northeast of the Community, low elevation in southern parts of the Community make storm surges a particular threat, and can lead to extensive flooding, as was the case during Superstorm Sandy.<sup>27</sup> Hurricane Irene's heavy rainfall, measured as 5.14 inches in Wantagh, inundated the Community's antiquated drainage system and led to widespread flooding south of Merrick Road.<sup>28</sup> Had the winds and surge of Sandy come ashore with the rains of Irene, damage undoubtedly would have been much worse in the Community.
- **Energy Infrastructure:** While flooding caused the most obvious, extensive damage in the Community, loss of power and natural gas was a significant issue for local residents and businesses, and one that threatened life, health, and safety. Much of the electric power loss was due to fallen trees, which affected above-ground power lines. The lack of power to streetlights left residents with dark, flooded roadways.
- **Housing in High Risk Areas:** More than 4,300 homes in the Community are located within flood risk areas, posing a significant risk to life and property. Superstorm Sandy further decreased and destabilized Community home values from damage caused by Hurricane Irene and the real

estate market collapse in 2007, which led to the Great Recession. In the future, the costs of home ownership will continue to increase due to increased repairs and maintenance needs, and higher flood insurance premiums.

- **Information, Education, and Communication:** Many home and business owners were not properly prepared or equipped to handle an event like Superstorm Sandy. Despite educational programs already in place, the Committee commonly cited the need for better information, education, and communication. Communication was greatly hampered by the extended power loss, which made cellular towers inoperable and prevented access to the Internet.



Some Community residents in risk areas have chosen to raise their homes to protect their property from future flood damage (source: Urbanomics)

- **Resilient Planning and Design:** Existing buildings, infrastructure networks, and marinas – many of which were planned, designed, and built more than 50 years ago – are not well suited to deal with changing climate and weather patterns. They also do not reflect current best practice with regards to land use planning, urban design, green building, or sustainable infrastructure. Many support centers designated to provide shelter and assistance to storm victims were ill-equipped, lacking reserve power or other necessary services to support displaced residents.
- **Shoreline Protection:** As with many nearby communities on the south shore, the Community has seen a steady decline in natural wetlands as decades of development have replaced the ecological systems along the Bays. Channeling and bulkhead construction have created a hard shoreline that resists regular tidal movement, but does little to soften the blow of major storms. This hardening has also prevented natural water filtration. Moreover, inconsistent bulkhead height and irregular maintenance have allowed water to seep in at sporadic intervals, which cannot be removed without pumping and other efforts. A softer shoreline would allow for natural protections from storm surge, while consistent bulkhead heights would more effectively protect areas now affected by regular tidal flooding.
- **Shared Regional Issues:** South shore coastal communities on Long Island feel similar impacts during storm events, particularly due to similarities in topography, such as low coastal elevations and the presence of canals and tributaries that serve as pathways for flooding from storm surges. Due to Long Island’s development patterns and government structure, many communities’ infrastructure networks and service districts are closely interconnected and/or overlap. Most communities do not have the autonomy to address local issues and, in many cases, a shared or regional approach could be more effective.

## D. Community Vision

Bellmore and Merrick are quiet, residential communities that value their quality of life, connection to nature, and high-quality schools. These two hamlets have come together during the planning process for the NYRCR Plan to envision a more resilient future, which is captured in the Vision Statement and Goals below. These statements have been used to guide the development of the NYRCR Plan's strategies and projects and should serve as an ongoing reminder of what the community aims to achieve.

### Community Vision

#### Vision for a Resilient Future

The NYRCR Bellmore/Merrick Plan proactively implements measures to make our south shore community more resilient, now and in the future. While being mindful of our natural waterways, we will update infrastructure and invest in new projects so that the whole community will benefit, protecting our beloved communities and way of life. The NYRCR Plan strives to:

- Develop innovative and natural solutions to coastal storm surges and erosion management;
- Ensure proper health and social services are accessible to all residents, on a daily basis and in emergency situations;
- Support local business resilience by encouraging business continuity;
- Refurbish fresh water resources and improve stormwater management;
- Enhance and maintain accessibility and maneuverability in all coastal evacuation routes; and
- Enhance public open space so it serves multiple purposes, such as recreation, resilience, and refuge.

## E. Relationship to Regional Plans

Regional plans and studies previously conducted raise many of the issues and challenges expressed by Committee Members and the public in the Community. The *LI 2035 Visioning Initiative (2009)*<sup>29</sup> discusses the risks faced in coastal areas from hurricanes and major storms, while also documenting infrastructure needs in the Community. The *South Shore Estuary Reserve Comprehensive Management Plan (2001)*<sup>30</sup> deeply examines the needs of wetlands and bay ecosystems. These plans and others formed a foundation of needs and opportunities that were then used to frame strategies, projects, and programs to respond to those needs.

What was learned from reviewing these plans is that the communities along the south shore in proximity to NYRCR Bellmore/Merrick Community share common issues and concerns related to reconstruction, recovery, and resiliency. They inhabit one natural ecosystem along the Great South Bay and also share similar physical attributes. Further, these communities share similar patterns of development, interconnected infrastructure systems, common road networks, overlapping municipal service provision areas, and a common coastline. This dynamic demands a regional perspective on the challenges facing the Community so local solutions take into account and leverage regional considerations, as well as to ground regional strategies in local context.

The NYRCR Plan is therefore informed by numerous existing planning documents and efforts, several of which offer relevant strategies, projects, and actions. A list of the regional and sub-regional plans reviewed can be found in Table 02. Although the geographic scope covered by some of these documents is beyond the boundaries of the Community, many of the strategies identified can be applied at a local level.

In addition to the document review, there were two Joint Committee Meetings held with the neighboring communities of NYRCR Baldwin, NYRCR Seaford/Wantagh, NYRCR Massapequas, and NYRCR Freeport to promote understanding of regional issues and develop shared projects. In March 2014, meetings were also held with Town of Hempstead.

The NYRCR Planning Committee and Consultant Team have identified a set of key themes that outline common issues and opportunities within the region. Some of these issues apply to the Community in the context of this planning effort, while others do not.

- **Infrastructure Investment:** Long Island’s aging infrastructure is struggling to accommodate previous population growth while adapting to the increasing threat of storm events and sea level rise. Roads, bulkheads, and power and gas lines have been particularly affected by flooding and storm damage. For example, the *Places to Grow (2010)*<sup>31</sup> report notes that the transportation network no longer best serves Long Island’s present-day commuting patterns and should be re-evaluated to better accommodate both regional and local mobility. Infrastructure investment has consistently been identified as critical to the region’s growth and economic viability.
- **Water Resources:** Flood management, water conservation, and environmental protection have been recurring themes in many of the documents studied including the *South Shore Estuary Reserve Comprehensive Management Plan (2010)*,<sup>32</sup> the *NYS Coastal Management Plan (2006)*,<sup>33</sup> and the *2010 Draft Nassau County Master Plan (2010)*.<sup>34</sup>
- **Energy Rates:** Electricity rates for Long Island residents are among the highest in the nation and much of its energy supply depends on off-island resources. Many of the documents reviewed, including the *2010 Draft Nassau County Master Plan (2010)*<sup>35</sup> and the *Cleaner Greener Long Island Regional Sustainability Plan (2013)*,<sup>36</sup> favored investment in energy efficiency and conservation, renewable energy sources, and distributed energy generation strategies to increase energy independence and reduce ratepayer costs.
- **Housing:** Nassau County is dominated by single family housing, with a majority of units more than 50 years old. Escalating home prices and property tax levels limit the stock of housing available for the County’s young and aging population, low-income residents, and those displaced by

previous storms. Several plans, including the *2010 Draft Nassau County Master Plan* (2010),<sup>37</sup> the *Nassau County Consolidated Plan* (2010),<sup>38</sup> the *Sustainable Strategies for LI 2035* (2010)<sup>39</sup> the *New Vision for the Long Island Economy* (2011),<sup>40</sup> the *Long Island 2035 Visioning Initiative* (2009)<sup>41</sup>, the *Cleaner Greener Long Island Regional Sustainability Plan* (2013),<sup>42</sup> the *Strong Island* (2013) report,<sup>43</sup> and the *Nassau County Infill Redevelopment Study* (2013),<sup>44</sup> have recommended an increase in smaller, affordable housing and rental developments.

- **Governance:** Long Island's mesh of municipal and administrative jurisdictions can reduce public sector efficiency and limit coordination, while creating an inconsistent regulatory landscape for its residents and businesses. Many of the plans reviewed, including the *2010 Draft Nassau County Master Plan* (2010),<sup>45</sup> incorporate recommendations for consolidating overlapping or duplicated services, streamlining permitting processes, and establishing more comprehensive land use regulations.
- **Emergency Preparedness and Response:** To date, most emergency preparedness programs have been developed and implemented at the regional level, either Town-wide or County-wide. For example, the Nassau County Office of Emergency Management (OEM) is responsible for the *County Multi-Jurisdictional Hazard Mitigation Plan* (2007).<sup>46</sup> The Nassau County OEM has also developed a *Disaster Debris Management Plan* (2009)<sup>47</sup> to facilitate and coordinate the management of debris following an emergency or disaster, specifically a hurricane or nor'easter event, establishing County-wide mitigation goals and providing strategies for implementation of a set of actions selected by each of the participating jurisdictions. The experiences of Community residents during Superstorm Sandy have heightened their desire for greater access to information and resources before, during, and after a similar emergency.

- **Equitable and Supportive Communities:**

Providing equitable social, educational, housing, and workforce opportunities for all of Long Island's residents is essential to the long-term sustainability of the Island. Long Island's population is increasingly diverse: 24% of Long Islanders are Black, Latino, or Asian. At the same time, Long Island remains highly demographically concentrated, with the populations of many communities over 90% White. According to the *LI 2035 Visioning Initiative* (2009), 54% of the population will be non-white by 2035.<sup>48</sup> In addition, the population is also aging. It is therefore important that Long Island welcome newcomers and provide opportunity and a high quality of life to all racial, ethnic and age groups, including meeting the health needs of an aging, diverse population.

**Table 02:** Existing regional plans, local plans, and other reports

Document Name	Date Published	Author
A New Vision for Long Island's Economy – The Strategic Economic Development Plan for Nassau and Suffolk Counties	November 2011	Long Island Regional Economic Development Council
Blue Water Trail Master Plan	October 2013	Nassau County
Cedar Creek WPCP Facilities Masterplan	2009	Nassau County Department of Public Works
Cleaner Greener LI Regional Sustainability Plan	April 2013	Regional Plan Association
Coastal Risk Assessment Areas	2013	New York State Department of State, National Oceanic and Atmospheric Administration Coastal Services Center, Federal Emergency Management Agency
Community Profiles	2012	United States Census Bureau
Draft Nassau County Master Plan	October 2010	Nassau County
LI Comprehensive Economic Development Strategy	August 2012	Long Island Regional Planning Council, Long Island Comprehensive Economic Development Strategy Committee
LI 2035 Visioning Initiative	December 2009	Long Island 2035 Study Team
Nassau County Consolidated Plan	2010	Nassau County
Nassau County Infill Redevelopment Feasibility Report	September 2013	Regional Plan Association
Nassau County Stormwater Management Program Plan	2009	Nassau County Department of Public Works
Nassau County Multi-jurisdictional Hazard Mitigation Plan	February 2007	Nassau County Office of Emergency Management
Nassau County Debris Management Plan	January 2009	Nassau County
North Atlantic Coast Comprehensive Study (NAACS) Draft	Document in Process	United States Army Corps of Engineers
NYS Coastal Management Program	1982	New York State Department of State
Places to Grow – An Analysis of the Potential for Transit-Accessible Housing and Jobs in Long Island's Downtowns and Station Areas	January 2010	Regional Plan Association
Progress and Promise – Building a Foundation for Long Island's Future (Update)	September 2012	Long Island Regional Economic Development Council

**Table 02 (cont'd):** Existing regional plans, local plans, and other reports

Document Name	Date Published	Author
Long Island's Rental Housing Crisis	September 2013	Regional Plan Association
Significant Coastal Fish and Wildlife Habitat Assessments Narrative		New York State Department of State
South Shore Estuary Reserve Comprehensive Management Plan	2001	South Shore Estuary Reserve Council with assistance provided by New York State Department of State
South Shore Estuary Reserve Workplan Implementation- Estuary Public Use and Tourism Study	September 2010	Cashin Associates for Town of Oyster Bay, New York State Department of State
Strong Island – Recovery & Resurgence – Strategic Economic Development Plan for Nassau and Suffolk Counties (Update)	September 2013	Long Island Regional Economic Development Council
Sustainable Strategies for Long Island 2035	December 2010	Long Island Regional Planning Council

This page intentionally left blank



## Section II: Assessment of Risk and Needs

The assessment of risk and needs describes the assets that have been, or could be, affected by hazards associated with coastal flooding. As part of developing the NY Rising Community Reconstruction (NYRCR) Bellmore/Merrick Plan, an asset inventory and risk assessment process evaluated the vulnerability of Community assets to future storm damage, specifically storm surges and flooding, in NYRCR Bellmore/Merrick (Community). The assessment provides a quantitative risk analysis of community assets and systems to supplement the qualitative information collected at Planning Committee Meetings and Public Engagement Events.

An assessment of needs and opportunities provided a basis for the strategies and proposed projects for the Community – this includes lost economic opportunities attributed to damages, opportunities for rebuilding or expanding the local economy, and opportunities for making new and existing assets more resilient.

## A. Description of Community Assets and Assessment of Risk

Community assets are places or resources where economic, environmental, and social functions of communities take place. Assets may be part of the built or the natural environment. Community assets were initially identified through data collected from New York State and Nassau County Geographic Information System (GIS) databases. Using GIS software, County and State data was filtered to include only assets within the geographic scope of the Community. Information contained within different datasets was used to separate individual assets into asset class categories: Economic, Health and Social Services, Housing, Infrastructure Systems, and Natural and Cultural Resources, which could ultimately be distilled into key assets to be included in the asset inventory.

### Asset Class Categories

**Economic:** Assets in this category include office buildings, businesses and industrial parks, manufacturing, warehouses, storage facilities, grocery, restaurants, banks, lodging, storefronts, downtown centers, and seasonal or tourism destinations.

**Health and Social Services:** These assets include schools, health care, day care, elder care, emergency operations, government and administrative services, media and communications, police, and fire and rescue.

**Housing:** Assets include single-family and multi-family dwellings, supportive housing or group homes, senior housing, and affordable housing.

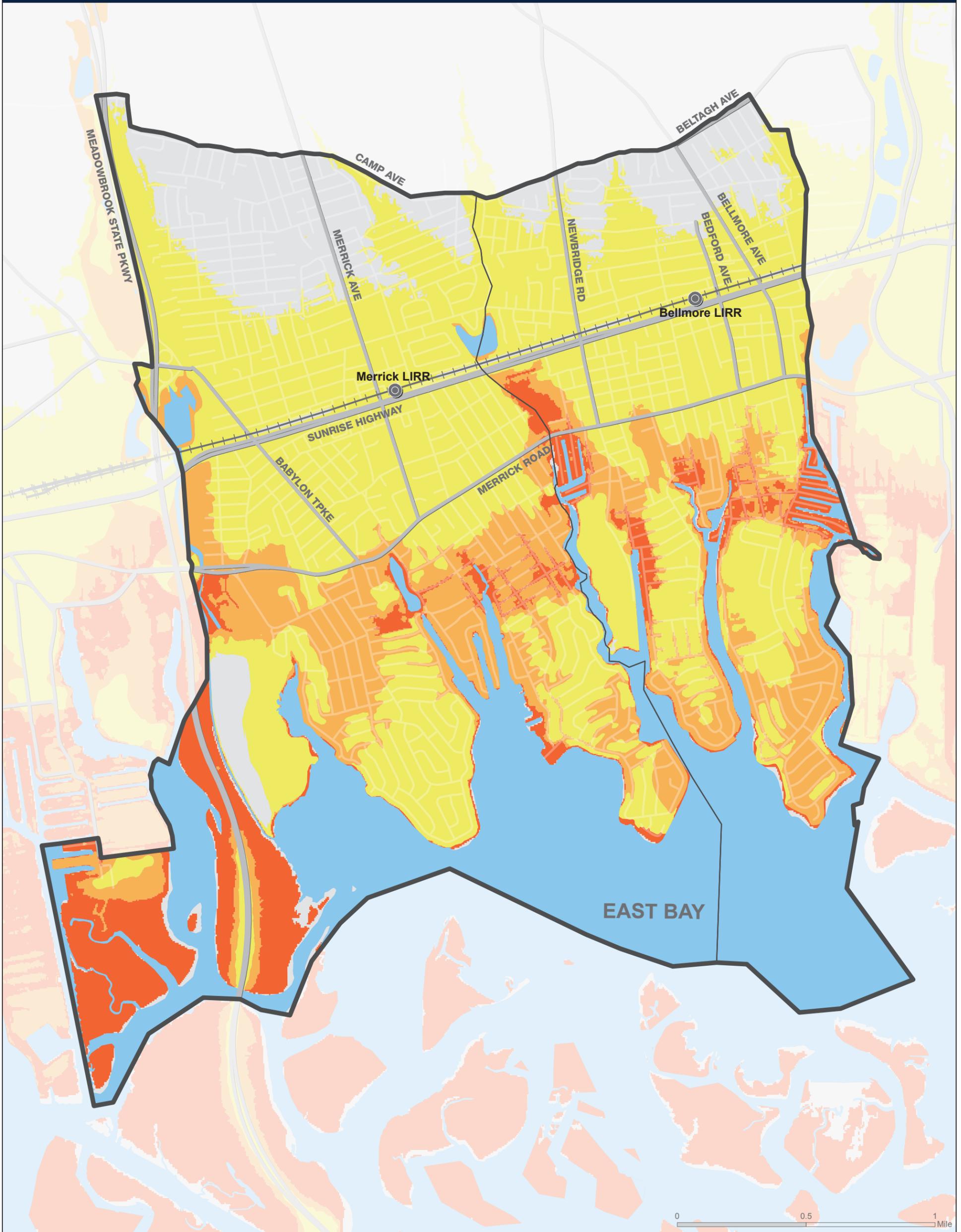
**Infrastructure Systems:** Includes pedestrian, bicycle, and vehicular ways, transit, bridges, airports, rail, ferries, gas stations, water distribution and supply, stormwater and wastewater systems, and solid waste and recycling services.

**Natural and Cultural Resources:** Includes natural habitats, wetlands and marshes, recreation facilities, parks, public open spaces, religious establishments, libraries, museums, historic landmarks, and performing arts venues.

Asset information was combined with New York State Department of State (NYS DOS) hazard maps to identify individual assets in each risk zone. Hazard maps illustrate a full range of coastal risks and consider both the frequency and impact of flooding. These maps, prepared for the NYRCR Program by NYS DOS with assistance from the National Oceanic and Atmospheric Administration Coastal Services Center (NOAA-CSC) and the Federal Emergency Management Agency (FEMA), identify three levels of risk based on aggregated information for multiple hazards. These risk areas are described as subject to extreme, high, and moderate risk from inundation and erosion from future storm events and sea level rise. Risk areas within the Community are identified in Figure 03.

- **Extreme Risk Areas:** Areas currently at risk of frequent inundation, vulnerable to erosion in the next 40 years, or likely to be inundated in the future due to sea level rise. This includes FEMA designated Zone V Coastal High Hazard Areas (CHHA), areas subject to Shallow Coastal Flooding per the National Weather Service's (NWS) advisory threshold, areas prone to erosion or natural features susceptible to erosion, and areas subject to future sea level rise.
- **High Risk Areas:** Areas outside the Extreme Risk Area that are currently at infrequent risk of inundation or at future risk from sea level rise. High Risk areas include geography within FEMA Zone V and Zone A Special Flood Hazard Areas (SFHA), also known as 1% annual risk (100-year) flood zones, and areas subject to future sea level rise.
- **Moderate Risk Areas:** Areas that are outside the Extreme and High Risk Areas but are currently at moderate risk of inundation from infrequent events or at risk in the future from sea level rise. This includes areas within 0.2% annual risk (500-year) flood zones and areas within NOAA's SLOSH (Sea, Lake and Overland Surges from Hurricanes) category 3 hurricane inundation zones.

**Figure 03:** New York Department of State Risk Areas



**Legend**

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station

**New York Department of State Risk Areas**

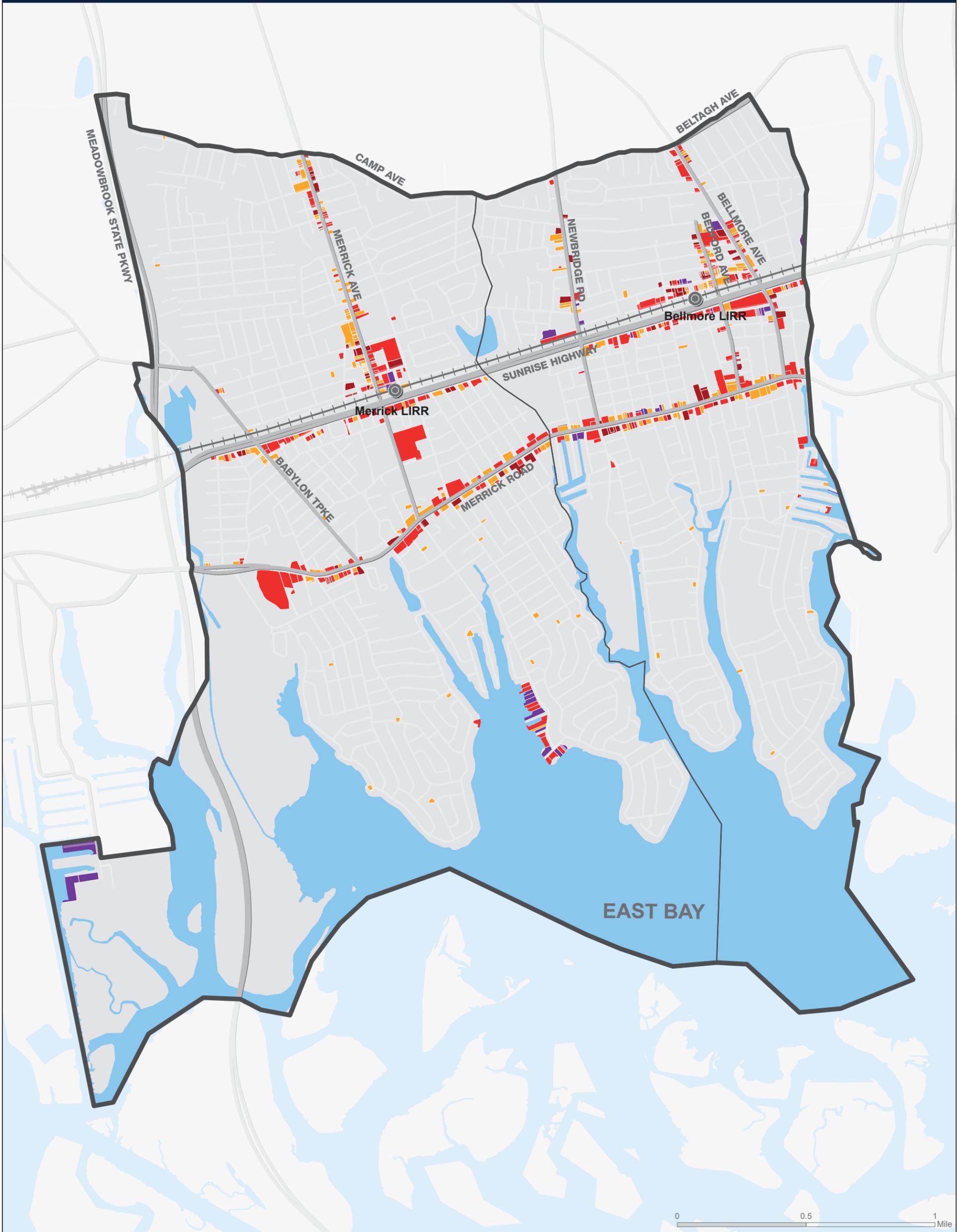
- Extreme
- High
- Moderate

**Data Sources**

ESRI, NOAA,  
US Census,  
Nassau County,  
NYS DOS  
Created March 2014



# Figure 04: Economic Land Uses



### Legend

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station

### Land Uses

- Mixed-use
- Office
- Retail
- Industrial
- Other Land Use

### Data Sources

ESRI, NOAA,  
US Census,  
Nassau County,  
NYS DOS  
Created March 2014



## i. Description of community assets

The following presents a summary of community assets, organized by asset class, that have been affected by previous storms or are at risk from future impacts. Assets were identified through a combination of research and data analysis, meetings with local officials and Community representatives, and Community member feedback, and then tagged according to their classification. Asset information was periodically reviewed at Planning Committee Meetings, and residents were asked to annotate or amend asset maps presented during the first two Public Engagement Events. Table 03 and Table 04 at the end of this section identify the total number of assets located in extreme, high, and moderate risk zones in each asset class.

### Economic

Economic assets include commercial and industrial property, together with office, mixed use and retail. The majority of commercial property value in the Community (77.0%) is located in moderate risk zones, with only 3.7% in extreme risk zones, 12.6% in high risk zones, and 6.8% located outside of hazard areas. Industrial land uses, which are mostly marinas (e.g., Whaleneck Marina Center and Open Bay Marina) are most at risk, constituting 46% of the total assessed property value in extreme (27.3%) and high (18.7%) risk zones. Retail uses are also somewhat vulnerable,



Sandy caused extensive interior damage to this CVS Pharmacy on Merrick Road (source: Neil Yeoman)

with 2.9% in extreme risk zones and 15.1% in high risk zones (e.g., Trader Joe's, Waldbaum's). Less than 20% of property values associated with office and mixed-use properties are within extreme or high risk zones.

As shown in Figure 04, the Community's primary commercial areas include the commercial corridors along Merrick Road and Sunrise Highway and concentrations of commercial uses surrounding the Bellmore and Merrick Long Island Rail Road (LIRR) stations. The Merrick Road business district was largely without power in the aftermath of Superstorm Sandy.

### Health and Social Services

Health and social service assets encompass both emergency and life safety assets, such as police and fire stations, together with administrative assets, such as schools, government facilities, libraries, and community centers.

Two of the Community's fire stations are located in the high and extreme flood risk areas. Together with the Merrick Senior Center, these assets were significantly impaired during Superstorm Sandy, with the Senior Center suffering \$500,000 of damage. The majority of other Health and Social Service assets are located farther north and facilities like the Bellmore and Merrick Libraries have been relied on extensively in emergency events to provide community support.

The Community has a number of schools located south of Merrick Road, which are generally in extreme and high risk zones. These include Norman J. Levy Lakeside School (whose ball field was completely inundated during Superstorm Sandy), Shore Road Elementary, Charles A. Reinhard School, and the John F. Kennedy High School. These, however, are all at slightly higher elevations than the surrounding areas and thus have reduced risk of flooding, although access to these assets is often still restricted by inundation of the surrounding roads.

### Housing

The Community's land use is predominantly residential and consists of 12,955 units.<sup>49</sup> The housing stock is dominated by detached single-family homes, much more so than other communities in Nassau



The Community's housing stock is dominated by detached single-family homes (source: Arup)

County as a whole, with 95% of all housing units being detached and attached single-family homes. Over half of these homes were built between the 1950s and 1960s on land created by infilling the fingers of marshland that reached into the East Bay and creating canals within the residential areas. Due to the infilling of marshland, many of the Community's southern homes have been historically susceptible to storm surge and tidal inundation.

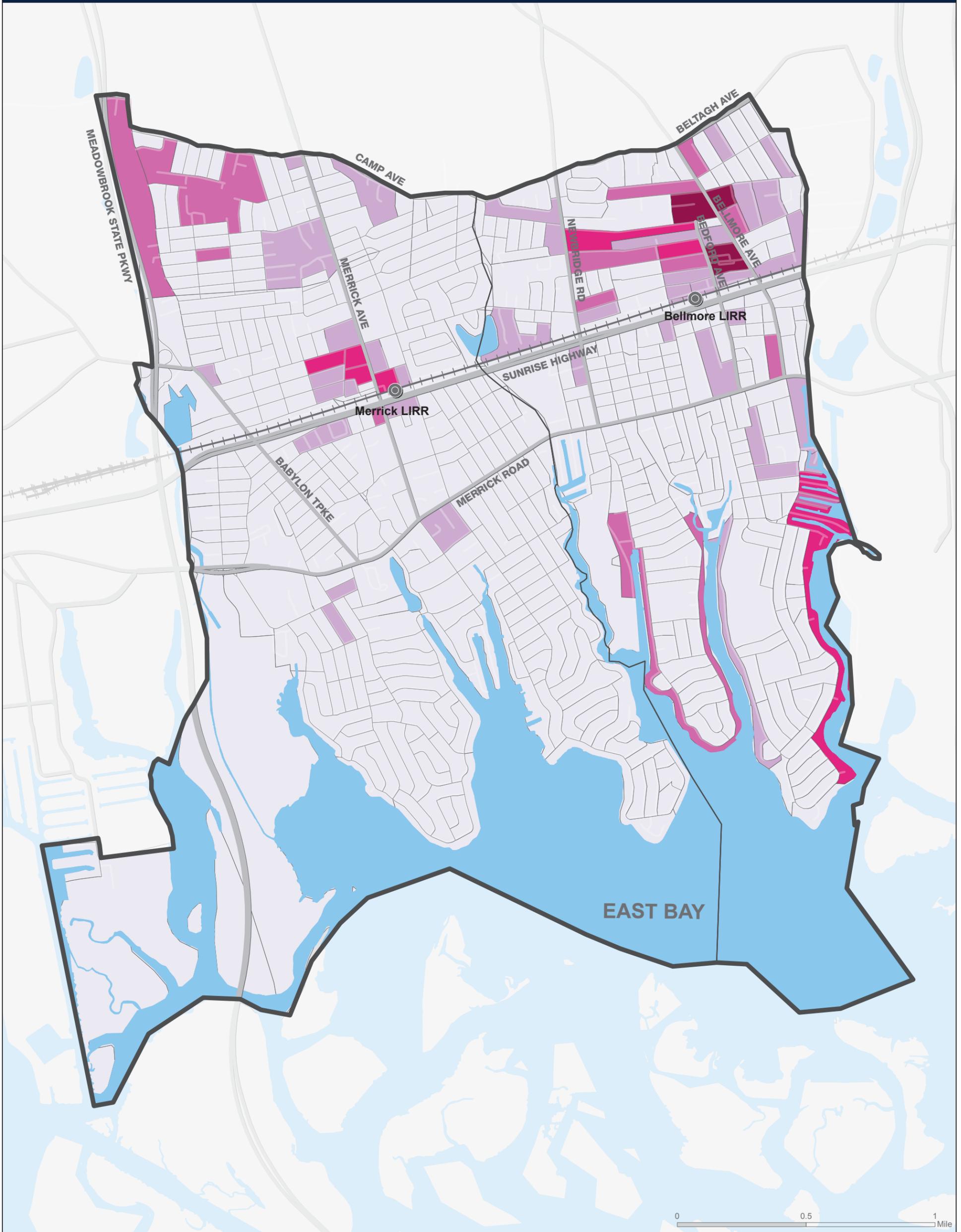
Over the five-year period for which data are available, from 2007 to 2011, only 330 units were vacant in the Community, which is extremely low at 2.5% of total units. The Community has no public housing or shelters, with approximately 8% of all housing stock being available for renters. As shown in Figure 05, renters are concentrated around the Merrick and Bellmore LIRR stations, as well as in parts of Bellmore south of Merrick Road that are at an extreme risk for flooding, such as Bellmore Avenue, Shore Road, Legion Street, and Lee Place.

### **Infrastructure systems**

Almost all of the Community's critical infrastructure assets lie outside of the extreme and high risk flood zones. The only key infrastructure assets which lie within these zones are two sewage pump stations operated by Nassau County, and a Town of Hempstead Department of Sanitation facility, which is designated by the Town as an Emergency Operations Center. The LIRR skirts the northern edge of the moderate risk zone, although it runs through two high risk zones where it intersects Meadowbrook Parkway and north of Nassau County's Meroke Preserve.

The Meadowbrook State Parkway (a County-designated evacuation route) borders the Community and runs through an extreme flood risk corridor. During both Superstorm Sandy and Hurricane Irene the combined effects of coastal flooding and storm-water runoff temporarily obstructed access to the Parkway at the Merrick Road exit ramps. In the same area, the Town of Hempstead sanitation facility was also inundated and consequently unable to function in both Superstorm Sandy and Hurricane Irene.

# Figure 05: Rental Housing



### Legend

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station

### US Census Blocks, 2010

- |                          |                            |
|--------------------------|----------------------------|
| < 6 Renter Housholds     | 50 - 149 Renter Housholds  |
| 6 - 19 Renter Housholds  | 150 - 218 Renter Housholds |
| 20 - 49 Renter Housholds | No Data                    |

### Data Sources

ESRI, NOAA,  
US Census,  
Nassau County,  
NYS DOS  
Created March 2014



This page intentionally left blank

## Natural and Cultural Resources

In addition to providing significant coastal protection and natural ecosystems, which support wildlife habitats and water filtration, NYRCR Bellmore/Merrick's bay and tidal marshlands are important recreational assets. Over the last 80 years, significant areas of coastal wetland have been lost to residential development. This infill of marshland to provide housing for an increasing population has resulted in the degradation and loss of wetland areas and natural habitats. Subsequently, this has reduced the Community's natural protection against storm events, which has been further exacerbated by the dredging of canals for boat access to waterfront homes.

The Community also has a number of parks, several of which are located south of Merrick Road in the extreme and high risk flood zones. Town of Hempstead's East Bay Park is on slightly higher ground, but Cammann's Pond County Park and Newbridge Road Park both abut creeks that render them prone to flooding. The Norman J. Levy Park and Preserve and the adjacent Merrick Road Park (which includes Merrick Golf Club) fronts onto the East Bay, but also runs adjacent to the Meadowbrook Parkway corridor, which is an extreme flood zone. Like Cammann's Pond Park, it experienced severe flooding, in parts, during Superstorm Sandy. Nassau County's Meroke Preserve sits north of Merrick Road, but is at extreme risk of flooding due to the combined effects of coastal inundation and stormwater runoff. The Preserve was flooded in both Hurricane Irene and Superstorm Sandy.

## Asset inventory

With more than six thousand at-risk assets in the Community, the inventory used for risk assessment was refined to consider only key assets, which were identified using the critical asset criteria established by the Federal Emergency Management Agency (FEMA), or were highlighted through NYRCR Planning Committee (Committee) feedback and Public Engagement Events.

Assets identified by the Committee included economic assets, such as marinas, and retailers that provide food and/or medication, like Trader Joe's and CVS, together with the Bellmore and Merrick libraries,



Many homes in the Community abut canals or creeks, such as Simmond Creek in Merrick. (source: Arup)



Waterfront homes in Merrick (source: Charles Brown)

**Table 03:** Community assets located in risk areas

Asset Class	Asset Sub-Class	Moderate	High	Extreme
Health and Social	Assisted Living Facilities	1	0	0
	Community Center	6	0	0
	Day Care Facilities	14	1	0
	Emergency Services	15	2	0
	Government	7	0	2
	Hospital	1	0	0
	Library	3	0	0
	Other Medical	8	0	0
	Pharmacy	5	1	0
	School	25	3	0
	Veterinary	4	2	0
Natural and Cultural	Cultural	3	0	0
	House of Worship	20	5	0
	Parks	3	4	8
	Recreation	13	2	0
	Wetlands (acres)	28	50	20
Infrastructure Systems	Rail Bridges	6	0	0
	Rail Stations	2	0	0
	Roads (miles)	76	29	9
	Road Bridges	2	0	1
	Sewer Pump/Treatment	1	0	1
	Water Treatment Plants	1	0	0
	Water Wells	2	0	0

**Table 03 (cont'd):** Community assets located in risk areas

Asset Class	Asset Sub-Class	Moderate	High	Extreme
Housing	Low Density Residential	6,222	2,643	1,620
	Medium Density Residential	300	75	42
	High Density Residential	30	0	20
	Assisted Living Facilities	1	0	0
Economic	Commercial Parcels	111	8	30
	Industrial Parcels	14	2	3
	Mixed Use Parcels	91	29	6
	Retail Parcels	131	23	1
	Bank/ATM	25	5	0
	Industrial Facility	5	1	1
	Lodging	1	0	0
	Marina/Boat/Pier	1	2	6
	Office	9	0	1
	Post Office	3	0	0
	Restaurant/Food/Caterer	60	12	3
	Retail	101	16	3

**Table 04:** Summary of community assets located in risk areas

Asset Class	Moderate	High	Extreme	Total
Health and Social	89	9	2	100
Natural and Cultural (wetland acres)	39 (28)	11 (50)	8 (20)	58 (98)
Infrastructure (road miles)	14 (76)	0 (29)	2 (9)	16 (114)
Housing	6,553	2,718	1,682	10,953
Economic	552	98	54	704

senior centers, and parklands. Critical assets defined by FEMA guidelines include buildings, infrastructure, and facilities deemed essential to the health and welfare of the community's population (e.g., police and fire stations), the protection of which is important during and following hazardous events.<sup>50</sup> The 41 key asset locations identified through this methodology are shown in Figure 06.

For each key asset, a community value was assigned based on Committee Member input and feedback from Public Engagement Events. A designation of high, medium, or low community value was ascribed to each asset or groups of assets, based on a number of qualitative measures. These could be applied individually or collectively, and it is important to note that similar assets in different communities may vary as a result. Qualitative measures for establishing community value include economic benefits (e.g., a key business or employer), services provided (e.g., a grocery store, medical office, pharmacy, or gas station), or a function provided during emergencies (e.g., a library or parkland used for food distribution). Generally, community value is identified as:

- **High:** Assets that provide multiple important services or functions and which could not be easily and quickly replicated in whole or in part, or assets whose loss would impact both long and short term community function.
- **Medium:** Assets whose function could be duplicated or replaced by similar assets in adjacent areas, or whose loss could be temporarily tolerated.
- **Low:** Assets which play an important role in the community, but whose loss could be tolerated in the short to medium term.

Additionally, each key asset was also screened based on its importance to the Community's socially vulnerable populations.

The complete key asset inventory is located in Section V: Community Asset Inventory.

## ii. Assessment of risk to assets and systems

Risk is the potential for an asset or system to be damaged or destroyed in some future event. The asset inventory provided a baseline to identify the most critical assets in the Community to be advanced through the risk assessment tool for further analysis. The Risk Assessment process utilized a quantitative risk tool provided by the State to assess the risk (primarily flood risk) to each of the key assets identified for the Community.<sup>51</sup> The three factors that contribute to the measure of overall risk for each asset are:

- **Hazards:** Hazard is a measure of the likelihood and magnitude of future storm events. The hazard score is based on a standard storm scenario: the chance that a 1% annual risk storm (100 year flood event) would occur within a 100 year planning horizon.
- **Exposure:** Local topographic and shoreline conditions can increase or decrease the effect of hazards on assets. The exposure score is a combination of the risk area in which the asset is located (from NYRCR risk area maps) and the landscape attributes.
- **Vulnerability:** Vulnerability reflects the level of impairment or consequences that assets may experience during and after a storm event. The vulnerability score is selected from a chart in the NYRCR Program Guidance, based on an estimate of the length of time an asset would be disabled by a flood event.

The Risk Assessment Tool calculates a risk score based on the following formula:

$$\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}$$

The risk score represents the relative risk of community assets to one another. The scores can range from 1.5 to 75. Assets with risk scores greater than 53 are considered at severe risk, assets with scores 24 to 53 are considered at high risk, assets with scores 6 to 23 are considered at moderate risk, and assets with scores lower than 6 are considered to have residual risk.

Asset risk scores and groupings were used to develop projects for the NYRCR Bellmore/Merrick Plan (NYRCR Plan). It should be noted that Risk Scores include some subjective analysis and rely on previous experience to determine future risk. The location of at-risk assets and their respective risk scores can be seen in Figure 07. The scoring of these assets helped to inform, focus, and provide context for the development of needs and opportunities and the types of resiliency strategies and management measures considered by the Committee. Risk scores for each asset are included in Section V: Community Asset Inventory.

## Findings

There is a moderate to extreme risk of flooding throughout almost the entire Community; only the residential neighborhoods on the northern edge of both hamlets, close to Camp and Beltagh Avenues, lie outside of a risk area. There are more than 4,500 assets in the Community's high and extreme risk areas, most of which are parcels with single-family homes, but also include a significant number of commercial parcels, primarily concentrated on Merrick Road.

As shown in Figure 07, extreme and high risk areas are concentrated in an east-west band just south of Merrick Road, roughly representing the former coastline prior to the expansion of the peninsulas with infill during the post-World War II residential housing boom. These low-lying areas, with elevations as low as two feet, are largely residential, but also include publically-owned land devoted to the Town of Hempstead Department of Sanitation facility, Four Towns Fireman's Training Center, Nassau County Traffic Control Division garage, Merrick Road Park, Cammanns Pond County Park, and Fire Department Station #2. Due to their low elevation, these key assets are at risk from both storm surges and heavy rainfall.

When flooded, this band of extreme and high risk areas creates a barrier dividing the southern and northern parts of the Community. Flooding can reach levels rendering many roads impassable, as was the case during and after Superstorm Sandy, but which also happens during more minor storms where

evacuation is not mandated by Nassau County's Office of Emergency Management. The peninsulas to the south of the flooded roads effectively become islands, creating a safety risk for local residents who are unable to access medical services. This "island effect" was an issue often mentioned by local residents at Public Engagement Events. Important access roads to the neighborhoods south of Merrick Road, including Bellmore Avenue, Shore Road, Hewlett Avenue, Frankel Boulevard, Whaleneck Drive, and Lindenmere Drive, all have segments that are at an extreme risk for flooding.

Other areas of extreme and high risk include residential neighborhoods in the southern sections of the peninsulas in eastern Merrick and Bellmore, three marinas along the shoreline in Merrick and Bellmore, the Meadowbrook Corridor adjacent to the Meadowbrook State Parkway in west Merrick, and the Meroke Pond and Preserve, which flank either side of Sunrise Highway along the border of Merrick and Bellmore. All of the Community's areas of extreme and high risk are south of Sunrise Highway, except for Meroke Pond and sections of the Meadowbrook Corridor, a system of retention ponds and tributaries that run north-south along the western border of Merrick.

Of particular concern is the water system that connects Meroke Pond with the East Bay, which is a frequent source of flooding in the Community. The 10-acre Meroke Pond, which is fed by Cedar Swamp Creek, connects with Meroke Preserve through a concrete channel under the LIRR tracks and Sunrise Highway.<sup>52</sup> Water flow continues via Whaleneck Creek to the East Bay. This system, which collects water from the larger Bellmore Creek-East Bay watershed, floods during heavy rains and can also serve as a channel for water from storm surges to travel north into the community. CVS Pharmacy, which is directly adjacent to the Meroke Preserve on Merrick Road, was severely damaged during Superstorm Sandy due to flooding. The Bellmore residential neighborhood directly south of Merrick Road and the Meroke Preserve floods regularly during high tides and is inundated by water during even modest storms.

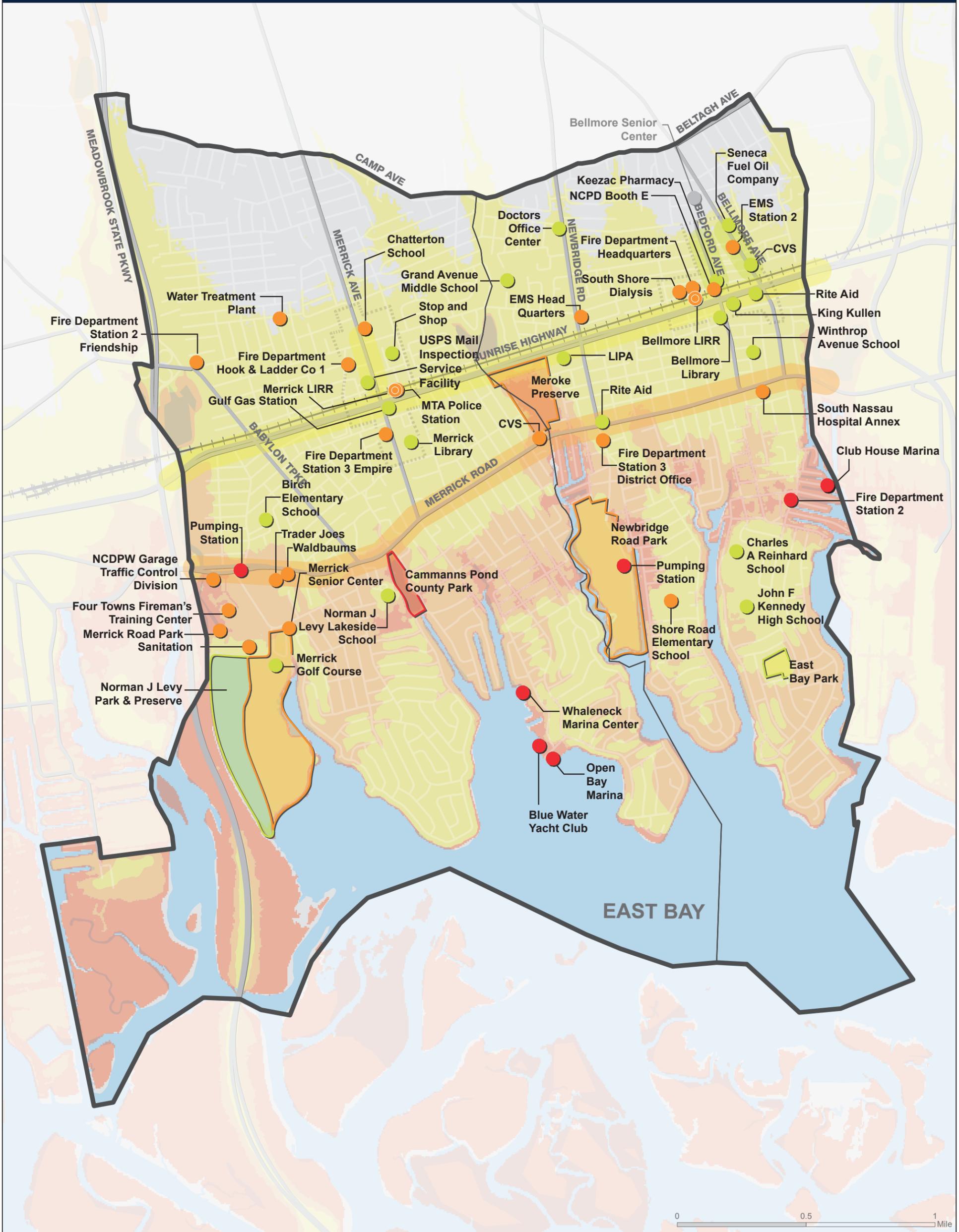
Flooding on the Meadowbrook Corridor is an equally important issue, as the Meadowbrook State Parkway that runs north-south down the middle of the corridor

is an evacuation route. The access ramps to the Parkway at Sunrise Highway are in a high risk area, while the Merrick Road access ramps are within an extreme risk area and flooded heavily during and after Superstorm Sandy. The Meadowbrook Corridor is also adjacent to several key community assets, including the Town of Hempstead Department of Sanitation facility, Four Towns Fireman's Training Center, Nassau County Traffic Control Division garage, Merrick Road Park, Merrick Golf Course, Merrick Senior Center, and Norman J. Levy Park and Preserve, which puts these assets at further risk as water from storm surges can funnel up the Corridor and flood adjacent areas.

The risk assessment identified eight assets with severe risk scores, including Fire Department Station #2, Nassau County DWP pumping station, Cammanns Pond County Park, Newbridge Road Park, three marinas, and a yacht club. Not surprisingly, these assets all incurred damaged from Superstorm Sandy. Assets with high risk scores are more prevalent in the Community —these 18 assets are scattered throughout the two hamlets and include four Fire Department facilities, several food and pharmacy retailers, the South Nassau Hospital Annex, Meroke Preserve, Merrick Road Park, a pumping station, the Town of Hempstead Department of Sanitation facility, and Chatterton School. The remaining 15 key assets were assigned a medium risk score. These assets include several schools, the Merrick and Bellmore libraries, Norman J. Levy Park and Preserve, and East Bay Park.



# Figure 07: Risk Assessment Map



0 0.5 1 Mile

### Legend

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station

### New York Department of State Risk Areas

- Extreme
- High
- Moderate

### Asset Risk Scores

- Severe Risk Score (>53)
- High Risk Score (24-53)
- Medium Risk Score (6-23)
- Residual Risk Score (<6)
- Asset Not Assessed

### Data Sources

ESRI, NOAA, US Census, Nassau County, NYS DOS  
Created March 2014



**Table 05:** Key asset risk assessment

Asset Name	Risk Zone	Asset Class	Critical Facility	Community Value
Bellmore LIRR	Moderate	Infrastructure	Yes	High
Blue Water Yacht Club	Extreme	Economic	No	High
Cammanns Pond County Park	Extreme	Natrual & Cultural	Yes	High
Chatterton School	Moderate	Health & Social	No	High
Club House Marina	Extreme	Economic	No	High
CVS Pharmacy	High	Economic	Yes	Medium
EMS Headquarters	Moderate	Health & Social	Yes	High
EMS Station 2	Moderate	Health & Social	Yes	High
Fire Department Chiefs Office	Moderate	Infrastructure	Yes	High
Fire Department District Office	Moderate	Infrastructure	Yes	High
Fire Department Headquarters	Moderate	Infrastructure	Yes	High
Fire Department Hook & Ladder Co 1	Moderate	Infrastructure	Yes	High
Fire Department Station 2	High	Infrastructure	Yes	High
Fire Department Station 2 Friendship	Moderate	Infrastructure	Yes	High
Fire Department Station 3	Moderate	Infrastructure	Yes	High
Fire Department Station 3 Empire	Moderate	Infrastructure	Yes	High
Fire DepartmentDistrict Office	Moderate	Infrastructure	Yes	High
Fire DepartmentStation 1	Moderate	Infrastructure	Yes	High
Four Towns Fireman's Training Center	High	Infrastructure	Yes	High
Meroke Preserve	Extreme	Natrual & Cultural	No	Medium
Merrick LIRR	Moderate	Infrastructure	Yes	High
Merrick Road Park	Moderate	Natrual & Cultural	No	Medium
MTA Police Station	Moderate	Health & Social	Yes	High
NCDPW Garage - Merrick	Extreme	Infrastructure	Yes	High
NCPD Booth E	Moderate	Health & Social	Yes	High
Newbridge Road Park	Moderate	Natrual & Cultural	No	Medium

**Table 05 (cont'd):** Key asset risk assessment

Asset Name	Risk Zone	Asset Class	Critical Facility	Community Value
Open Bay Marina	Extreme	Economic	Yes	Medium
Pumping Station - Merrick & Clubhouse Rd	High	Infrastructure	Yes	High
Pumping Station - Newbridge Rd	High	Infrastructure	Yes	High
Retail Corridor - Merrick Rd	High	Economic	Yes	Low
Town of Hempstead Department of Sanitation	Moderate	Infrastructure	Yes	High
Shore Road Elementary School	Moderate	Health & Social	Yes	Medium
South Nassau Hospital Annex	Moderate	Health & Social	Yes	High
South Shore Dialysis	Moderate	Health & Social	Yes	High
Town of Hempstead Traffic Control Division	Extreme	Infrastructure	Yes	High
Trader Joes	High	Economic	No	Medium
Waldbaums	High	Economic	No	Medium
Water Treatment Plant - Thelma & Sherman St	Moderate	Infrastructure	Yes	High
Whaleneck Marina Center	Extreme	Economic	No	High

## B. Assessment of Needs and Opportunities

The needs and opportunities identified in this section provide a basis for the strategies and proposed projects for the Community. Needs and opportunities were identified through a combination of research, analysis, NYRCR Planning Committee (Committee) feedback and Community Member feedback from Public Engagement Events. These issues have been organized into FEMA's National Disaster Recovery Framework's Recovery Support Functions (Community Planning and Capacity Building, Economic Development, Health and Social Services Housing, Infrastructure, and Natural and Cultural Resources), which combine traditional repair efforts with long-range planning for recovery and growth.

### Community Planning and Capacity Building

The community planning and capacity building RSF concerns the Community's ability to implement recovery actions while planning for future storm events. They address the need for public education and preparedness, legislative and regulatory reform, and building code and land use regulations that reflect current vulnerabilities and recent storm experience.

#### Community Planning and Capacity Building Needs

Because of the regional nature of planning for a more resilient community, there is a need for more communication amongst the Town of Hempstead, Nassau County, and the State of New York, as well as Federal agencies, such as the United States Army Corps of Engineers. Long-term policy guidance about infrastructure investment, regional approaches to flood mitigation, and the possibility of retreating from the shoreline needs to be coordinated at all levels of government.

Many Community residents and business owners had never experienced storms as severe as Hurricane Irene and Superstorm Sandy. Despite living with frequent flooding from high tides or heavy rainfall, they were unprepared for the risks related to Superstorm Sandy's storm surge, particularly those living in extreme and high risk areas. Home and business owners may still not understand that severe storms are predicted to increase in severity

### Recovery Support Functions

Needs and opportunities were categorized in accordance with the six Recovery Support Functions (RSFs) established by President Barack Obama through the National Disaster Recovery Framework (NDRF). The NDRF focuses on how best to restore, redevelop, and revitalize the health, social, economic, natural and environmental fabric of the community. The six RSFs are:

**Community Planning and Capacity Building:** Addresses the Community's ability to implement recovery actions while planning for future storm events, including public education and preparedness and building code and land use regulations that may influence future rebuilding and recovery.

**Economic Development:** Addresses the needs of local businesses and institutions to recover or relocate following a storm event, and identifies investment opportunities that can provide both economic growth and greater resilience in the community.

**Health and Social Services:** Addresses strategies and management measures needed to ensure that health care facilities and essential social services are accessible to all residents.

**Housing:** Identifies needs and opportunities relative to housing in the Community, prioritizing damaged and at-risk areas.

**Infrastructure:** Addresses the current needs pertaining to the Community's essential systems and services, from energy supply and distribution to transportation routes. Infrastructure opportunities focus on strategies to rebuild in a way that decreases vulnerability to future impacts.

**Natural and Cultural Resources:** Addresses damage to natural and cultural resources, and the actions that should be taken to preserve, rehabilitate or restore these assets or services to their initial state. Natural systems also can provide offer significant environmental and commercial benefits such as stormwater management and recreational opportunities.

## Community Needs

### Community Planning and Capacity Building

- Enhanced communication between different levels of government about planning for resiliency.
- Greater awareness about the threats related to sea level rise and climate change.
- Increase understanding of why evacuation is important to the safety of both residents and first responders.
- More emergency preparedness education for residents and business owners.
- Plans for communicating during power outages.

and frequency.<sup>53</sup> Greater education is needed to help stakeholders understand that storms are a real threat and preparation is crucial.

Despite the efforts of Nassau County's Office of Emergency Management, which mails an emergency preparedness brochure to property owners and occupants once a year, many residents and business owners had not properly prepared for Superstorm Sandy. Nassau County's Evacuation Order was widely heard by the Community, however, many opted not to evacuate, putting first responders at risk. A better understanding of the importance of evacuation is needed.

Home and business owners who chose to obey the Evacuation Order reported that they did not know what to do to secure their properties against damage prior to leaving. Homeowners were unaware of protective measures, such as unplugging electrical devices or turning off energy systems. Boat owners reported following instructions from their insurance companies, which recommended removing their boats from the water; in some cases, however, this resulted in greater damage to their boats because they were knocked over or hit by debris. Similarly, residents were unsure where to move their cars during the storm. Better information about how to secure homes, boats, cars, and other personal property prior to storms is necessary. Nassau County

## Community Opportunities

### Community Planning and Capacity Building

- Better leverage the Internet or other electronic methods to increase awareness about sea level rise, climate change, and emergency preparedness.
- Empower community members and community organizations to educate public about preparing for future storms and better support the Community during and after storm events.
- Better utilize public buildings as gathering places after storms where residents can use the Internet, charge phones, share supplies, and see neighbors
- Create an ongoing governmental task force or other organization that coordinates resiliency efforts across multiple jurisdictions.

OEM and the Town of Hempstead Waterways and Conservation confirmed the need for more education related to the protection of personal property.<sup>54</sup>

Extended power outages inhibited Internet and cell phone usage, making connecting with neighbors, family, and friends difficult. This lack of communication impeded the ability of residents and homeowners to know what to do when returning to their homes and made the distribution of emergency supplies difficult. Committee Members discussed having supplies to share with others, but not knowing who was in need or where to bring the supplies.

### Community Planning and Capacity Building Opportunities

Since Superstorm Sandy, residents have become more interested in protecting themselves and their communities against future storms. A more comprehensive public education program could educate community members about both the risks they face during a storm event and the benefits of mitigation measures. This includes safety measures for property owners during and after major storm events, and the circulation of risk zone maps identifying potential evacuation zones.

Community members are often the best resource for allocating emergency response resources, but are rarely utilized to their greatest effectiveness. A program to facilitate communication amongst local residents could supplement existing outreach and coordination measures and facilitate faster recovery. Neighborhood organizations could assist residents before, during, and after storms and provide a point of contact between communities and government officials.

The Community has a number of community assets, such as libraries and public schools, that could be retrofitted for emergency use. These facilities could also be used as sites for public outreach and education, and central locations for all resiliency-related information services following a disaster, when executive evacuation orders are lifted.

## Economic Development

A disaster can severely disrupt economic and business activities and hinder the development of new economic opportunities. This section reviews the economic damage caused by Superstorm Sandy and the associated needs and opportunities tied to future economic prosperity.

### Economic Development Needs

Despite damage from Superstorm Sandy, very few businesses in the Community permanently closed their doors. However, many small businesses that worked quickly to restore operations and recover revenue flows may not have considered measures for resilience when rebuilding. Rebuilding and redevelopment plans with a focus on mitigation activities are necessary to protect the Community's commercial businesses from future storm damage. Additionally, a number of local business owners have also lost homes to storm damage and are in need of financial assistance to recover from concurrent property losses.

Non-residential parcels in the Community number 813 (5.9%), accounting for 48.9% of the total assessed value in the area. Unfortunately, the largest and most valuable of these properties are either institutional properties or open space use properties, which are exempt from property taxes. Subsequently,

## Community Needs

### Economic Development

- Many local business owners experienced storm damage to both their homes and businesses and may lack sufficient resources to rebuild and repair both properties.
- Local businesses may not have incorporated resilience measures in their rush to rebuild and reopen, leaving them vulnerable to future storms.
- Lack of commercial development and the prevalence of tax exempt properties limit property tax revenue, increasing tax rates for all property owners.
- More options need to be explored for commercial development outside of extreme and high flood risk areas.

over half of the non-residential assessed value does not contribute to municipal tax rolls. Retail, industrial, mixed-use, vacant commercial, and vacant industrial properties constitute 635 of the Community's non-residential parcels. While these properties represent 4.1% of all parcels within the community, they provide 9.8% of assessed land value and 8.3% of total assessed value.<sup>55</sup> Promoting the support and expansion of the Community's existing commercial areas can bring new commercial properties to municipal tax rolls and increase economic resiliency.

Most local residents work outside the Community in high paying service industries, such as finance and insurance. These residents were largely unaffected by the recessions from 2002 to 2005 and again from 2007 to 2008, although the number of working residents dropped during both of those periods. The Community has experienced a long-term decline in the number of working residents overall, losing 227 workers (1.8%) over the period from 2002 to 2011, which may be the result of the Community's aging population.<sup>56</sup> A drop in the number of working residents can have a negative impact on local retailers, although at this point in time the loss in workers is not significant.

## Economic Development Opportunities

In 2012, the Community's businesses reported \$512.3 million in retail sales, around \$116.3 million less than expected given its population and disposable income.<sup>57</sup> This signifies that local residents travelled elsewhere to do their shopping. The Community has an un-met demand for grocery stores, restaurants, health and personal care, sports and apparel, and book and music stores, indicating an opportunity for further commercial development in these categories.<sup>58</sup> This potential demand for more retail uses in the Community can be used to attract new development to the area, which can assist in strengthening the tax base and supporting the economic resiliency of the Community.

Any new commercial development should be located and constructed in a more resilient manner to reduce further risk to Community assets. Development should be focused out of extreme and high risk areas, along commercial corridors such as Sunrise Highway, Newbridge Road, Bellmore Avenue, and Merrick Avenue, and near the Merrick and Bellmore LIRR stations. Both stations are located in close proximity to each hamlet's respective downtown areas and represent an opportunity for redevelopment to include a mix of uses. Compact commercial and mixed-use development around the station areas and commercial corridors could create needed growth and expand the commercial tax base without intruding into existing single-family residential areas. Local demand for restaurants is particularly promising, as full service restaurants located at train stations have been successful in other parts of the region.

Some of the Community's demand for restaurants may be met along its waterfront. Merrick's marinas provide an opportunity for a small water-focused entertainment destination, as the area is well connected and residential properties are located at a sufficient distance to mitigate noise or parking issues. The marinas have hosted a small number of waterfront dining establishments in the past, some of which are still in operation. Any plans for further development along the waterfront would need to include measures for resilient building design.

## Community Opportunities

### Economic Development

- Provide technical and financial assistance for businesses to reopen after storms.
- Redevelop parcels in lower risk areas, such as around the Bellmore and Merrick LIRR stations or along Sunrise Highway, to expand and diversify the commercial tax base.
- Re-design streets on commercial corridors and near stations to improve walkability and attract more customers.
- Create a small waterfront entertainment destination along Merrick's waterfront to meet existing demand for restaurants. Planning must incorporate resilience measures.
- Leverage potential demand for more retail business through commercial redevelopment.

## Health and Social services

The health and social services RSF addresses the strategies and management measures needed to ensure that the Community's healthcare facilities and essential social services can meet the needs of all Community members. This includes the immediate and long-term needs of socially vulnerable populations and individuals affected by previous disasters, as well as opportunities to promote health and well being for all members of the Community.

### Health and Social Service Needs

The damage caused by Superstorm Sandy has increased cases of unsafe living environments for Community residents. Community members living in storm-damaged homes are susceptible to health issues caused by exposure to mold. Construction and maintenance workers are also more susceptible to toxic exposure, in addition to heat and air quality issues. During Public Engagement Events, residents cited the need for more home inspections to identify potential health issues, such as sinkholes or mold.

One in four residents in the Community are seniors, aged 65 and older.<sup>59</sup> Older adults have encountered many challenges accessing health and social services, home care, food, and social support in the

aftermath of Superstorm Sandy. The storm's effects on the informal home care and home service economy have disadvantaged seniors, especially those who are homebound or require minor assistance to perform daily living activities. Prior to Superstorm Sandy, 93% of all Long Island seniors reported their car as a primary mode of transportation. Physical and mental in-home health services are needed for elderly populations who are unable to travel. At the second Public Engagement Event residents cited the Community's seniors as the population in greatest need of assistance. The need to support senior centers as a base for socialization and health programs was discussed during key informant interviews as part of the public outreach process.

The caregiving workforce, both formal and informal, will need support to continue their important role in recovery efforts. The stress and chaos resulting from Superstorm Sandy has put a strain on local families, in particular those with developmentally disabled children. In addition to the financial challenges of rebuilding and repair, these families are faced with the challenge of caring for their loved ones. Direct caregivers are especially challenged to meet the increasing needs of their clients, as the workforce is especially vulnerable to stress-related health risks. Direct support workers make relatively little and many take two jobs to support themselves and their own families. With limited financial resources, and faced with the expense of travel in the region, this population is struggling to move forward.

Better communication is necessary to ensure that the healthcare needs of the Community are met. Many residents are not aware of the resources available to them, despite the efforts of healthcare organizations to ensure effective outreach across all population groups. Sources of accurate information can be difficult to identify, and may not be updated regularly. Although public health information is distributed in multiple languages, the current lack of participation signifies that this information is not reaching its intended audience. Stronger connections with underserved communities, through both formal and informal networks, such as religious institutions and their constituencies, are needed to provide all of Community residents with the right information.

## Community Needs

### Health and Social Services

- Senior community members who are unable to travel lack access to health care and social interaction. Better transportation options are needed for those unable to use a car.
- Caregivers lack resources and are struggling to manage client demands with their own recovery needs.
- Community residents are not aware of available health and social service resources and outreach programs have had difficulty connecting with underserved populations.
- Commercial areas are not pedestrian friendly and residents are dependent on their cars.
- Loss of heat in homes following Superstorm Sandy was a significant issue, especially for socially vulnerable populations.



Replacing a veterans memorial tree at Bellmore Senior Center that fell during Superstorm Sandy (source: Bellmore Patch)

## Community Opportunities

### Health and Social Services

- Provide shuttle services or taxi vouchers to elderly residents to assist those without access to a car.
- Incorporate resilient building techniques and support emergency preparedness programming at Merrick and Bellmore Senior Centers.
- Support energy resiliency measures to prevent power loss at medical facilities and pharmacies.

Extended loss of power in the Community became a safety concern, as temperatures dipped well below 40 degrees in the week after Superstorm Sandy and many homes were still without heat.<sup>60</sup> Nassau County advised people to go to shelters, but for many seniors moving to a shelter is particularly arduous as they struggle with everyday activities, such as packing and travel. The CVS on Merrick Road was closed following the Superstorm due to flood-related damage, making access to prescriptions more difficult for some residents.

### Health and Social Service Opportunities

As the senior population in the Community expands, programs to foster social connection and physical activity become more important. Nutritional and meal-preparation programs will need to be expanded, especially for homebound seniors. In-home services such as shopping, laundry assistance, light house-keeping, and grooming will become more important as the current population ages and family support declines. Social support programs to provide live and/or telephone contacts and safety checks to residents who live alone will be necessary to maintain the emotional and physical well being of older community members.

The Merrick and Bellmore Senior Centers present significant opportunities to expand emergency preparedness education to seniors, as well as become gathering places after major storm events. Reconnecting with other seniors after traumatic

events like Superstorm Sandy can be critical to mental health and the ability of local seniors to rebound from disasters. A program is needed to investigate and address post-storm health issues and provide support for households and community members that are vulnerable to post-storm health impacts.

## Housing

This section considers the impact of recent storm damage to housing stock and the trends or events which may affect housing stock in the upcoming years. The type and location of housing needs considers current and expected demand, as well as the availability of housing units and the range of housing types available to the community relative to demographic factors, such as age and income level. The effects of previous storm events are also significant to the planning and identification of future housing opportunities.

### Housing Needs

Despite the number of Federal and State sources of recovery funding, it is unknown if these programs have provided sufficient aid to meet the needs of recovering property owners in the Community. It is likely that a significant fraction of the costs were borne by homeowners, as many residents are not covered by disaster assistance or private insurance. Furthermore, damage estimates and subsequent payouts may not accurately capture the extent of repair work needed. FEMA provides assistance based upon the estimated costs to make critical repairs, not the cost to fully restore a property to its prior condition. Compared to SBA estimates for real property damage in New York State, FEMA dramatically under-reports the value of damages to homeowners.<sup>61</sup>

As FEMA aid is directed primarily to owner-occupied properties, its estimates under-represent damage to rental housing stock. There are approximately 615 units (4.9%) of rental housing in the Community.<sup>62</sup> Of this population, 58% are low-income occupants.<sup>63</sup> In high and extreme risk zones, where inundation during Superstorm Sandy was highest, rental housing comprises 143 units, or 25% of all housing stock.<sup>64</sup> The rental units that received FEMA aid for



Community homes are still being repaired from Superstorm Sandy damage (source: Urbanomics)

Superstorm Sandy recovery represented 8.6% of the Community's FEMA-assisted housing stock.<sup>65</sup> It is not known how many affected households relocated temporarily to rental stock in the Community, or left the community to stay elsewhere, during reconstruction.

The Governor's Office of Storm Recovery currently operates the NY Rising Housing Recovery Program, which issues housing reconstruction assistance to eligible owners of homes that suffered substantial damage during Hurricane Irene or Superstorm Sandy. Homeowners receive grants to repair or reconstruct homes to minimum standards and receive certain improvements to increase resiliency. This grant also pays for home elevation for properties located within 100-year floodplains. As of March 11, 2014, \$201 million had been distributed to 4,650 Nassau residents.<sup>66</sup> The deadline for all applications was April 11, 2014.

In the 18 months since Superstorm Sandy, the Community housing market has seen a decline in asking prices, a rise in vacancies, an increase in housing foreclosures, and the demolition of innumerable properties.<sup>67</sup> Although some houses in have been raised, others remain damaged and

## Community Needs

### Housing

- Displaced residents didn't have anywhere to stay during Superstorm Sandy or during the many months following.
- Funding from public disaster relief programs and private insurance proceeds may not be adequate to repair and restore damaged properties to pre-storm conditions.
- A significant number of rental units (143) are located in extreme or high risk zones, and a large portion of rental units are occupied by low-income tenants with limited means.
- Several homes in Bellmore/Merrick are now abandoned, as observed by neighbors, but actual data about where vacancies exist is unavailable.
- A weakened housing market has eroded the community's tax base and put financial strain on individual property owners already burdened with repair costs.
- Despite a drop in home prices in many neighborhoods, many young people still can't afford to buy homes in the area.
- Growing demand for owner-occupied housing for a predominantly middle-aged and elderly population will need to be met with options that support community resilience.

uninhabitable. In 2013, the median price of single-family housing in Bellmore was \$63,500 below or nearly 15% less than the asking price in 2008, at the peak of housing sales nationally, while the median price in Merrick was \$98,600 below or nearly 20% less.<sup>68 69</sup> Housing prices fell by roughly \$40,000 in Merrick between 2008 and 2010, likely due to the national recession, but recovered in Bellmore when the asking prices declined again. Now, the median asking price is \$366,000 in Bellmore and \$400,000 in Merrick, according to Newsday's database. The impact of Superstorm Sandy can be approximated as causing a further \$30,000 to \$65,000 decline in single-family housing prices between 2012 and 2013.



A residential street in Bellmore flooded during Superstorm Sandy (source: Bellmore Patch)

After the storm, foreclosures rose to encompass 291 homes, above the prior (financial crisis) peak, with a mortgage value of \$109.9 million.<sup>70</sup>

At Public Engagement Events, many residents were concerned about vacant homes, which pose a risk to the health and safety of residents and can negatively impact neighborhood property values. The Community's tax base has lost value and residents have lost equity in housing assets, which, coupled with repair costs, has severely constrained their budgets. It is clear that with another very severe storm many homeowners would not have the resources to recover again.

The Community is expected to grow modestly over the next five years, increasing in population by 1% to 39,051 residents.<sup>71</sup> An additional 151 households are anticipated, consisting mostly of families, with a decline in the number of children between 5 and 19 years of age and a rise in the number of elderly aged 55 and over. Consequently, the median age of Community residents will rise to 44.4 years. With a growing elderly population, the Community's per capita income is expected to increase from \$50,770 in 2013 to \$59,996 by 2018.<sup>72</sup> Both age and income trends suggest that the demand for new housing may increase or remain at current levels, despite potential damage from future storms. As new housing is built, it is critical that development is guided by strategies for resilience.

## Housing Opportunities

For homeowners with unmet repair or rehabilitation needs, public disaster funding and insurance proceeds may not be sufficient. Need-based local funding could cover the cost of repair for damaged property, including environmental hazard mitigation costs. Prioritizing low-income homeowners in extreme and high risk zones would help residents pay for raising their homes, thus significantly reducing their flood insurance premium costs. Funding could also be made available for homeowners and owners of rental properties to implement green building measures, such as HUD's Green Building Standards, for repairs and retrofits.

For properties damaged beyond repair, an incentivized housing acquisition program could be implemented to return residential land in extreme risk areas to a natural undeveloped state. The existing NY Rising Acquisition Programs could be further promoted and leveraged to acquire houses that are still substantially damaged and are at high risk due to repeated flooding.<sup>73</sup> Currently, Nassau County participates in HUD's HOME Investment Partnerships Program (HOME), which enables municipalities to buy and/or rehabilitate homes to provide decent and affordable housing.<sup>74</sup> However, the program could be amended to offer acquisition of housing at above pre-storm values for demolition of damaged structures and retention of land as a coastal buffer zone. An additional incentive to encourage the acquisition of clusters of contiguous properties could be included. These opportunities are likely to increase the flood resilience of the overall Community while providing recreational and tourism opportunities. In high risk zones, property acquisitions could be offered at pre-storm value for redevelopment as resilient green housing.

Plans for new housing should target land within walking distance, considered to be a quarter-mile, to the Bellmore and Merrick LIRR stations. Potential parcels would need to be rezoned for higher intensity multi-family or mixed-use development and incentives and financing could be offered to attract private investment. Future residents would have the advantage of frequent and relatively fast rail service to Manhattan, as well as access to a variety of local commercial and

## Community Opportunities

### Housing

- Support additional funding for repair and reconstruction costs not covered by public disaster funding or private insurance proceeds.
- Educate homeowners about how to retrofit homes to be more resilient and discourage dangerous situations.
- Incentivize property owners in extreme and high risk zones to rebuild in accordance with green building standards.
- Expand coastal buffer zones by converting residential uses in extreme risk areas to open space and active parkland
- Encourage redevelopment around the Bellmore and Merrick LIRR stations to provide multifamily housing for young people who would like to commute into New York City, seniors, and low- and moderate-income residents.
- Provide continuing care residential development for elderly residents, located outside of risk zones and paired with incentivized buyout and relocation services.

community services. Offered at market competitive rates, these units could attract and retain younger households in the commuter workforce.

Multi-family housing development could be encouraged in upland areas outside of risk zones as opportunities for relocation, especially for the elderly, attracting growth. The Community is forecast to expand by more than 150 households over the next decade, a majority of which will be headed by elderly persons. Younger residents can be attracted, however, especially if growth is linked to transit oriented development in the Community's center and low-income renters may need to be relocated from storm-damaged apartments.

Prior to Superstorm Sandy, almost 600 households in extreme and high risk zones were headed by older community members. The impact of Superstorm Sandy on these areas and the subsequent cost

of recovery and repair not only weakened financial resources, but the physical challenge of remaining and pursuing reconstruction now poses a potential health risk to aging residents. Increasingly, elderly households are moving to "continuing care" environments that combine healthcare-intensive amenities with community facilities in a clustered development. A buyout and relocation program could be coupled with incentives to develop such a facility in an upland low risk area.

### Infrastructure

Infrastructure issues include the rebuilding and recovery of essential infrastructure services, such as water, wastewater, energy, drainage, and transportation, which were damaged or destroyed by Superstorm Sandy. This includes the need to both strengthen and protect critical infrastructure assets in risk areas and meet the Community's current and projected demand in a way that encourages resilience and economic growth.

#### Infrastructure Needs

Flooding in the Community is not limited to major storm events. It is a regular occurrence during heavy rainfall and/or high tide in many areas south of Merrick Road. Regular flooding has been reported around Clements Brook, from Linden Street south to Merrick Road, and along Shore Road. The area surrounding Meroke Pond is also subject to regular flooding and was severely affected during Hurricane Irene. The portions of southern Merrick and Bellmore directly south of Merrick Road are at elevations of two to four feet above sea level. These areas frequently flood and, during extreme events like Hurricane Irene and Superstorm Sandy, the peninsulas to the south become islands.

In these low-lying areas, streets can become impassable at times of flooding, impeding the transportation of people and goods. In major events like Superstorm Sandy, flooded roadways prevent emergency responders from helping residents in need and leave evacuating residents stranded. The Community is predominantly auto-oriented, with residents relying primarily on their cars for transportation. Effective

evacuation routes and safe, adequate parking areas are needed to prevent damage and ensure the safety of community members.

The large area of impervious surfaces in the Community prevents stormwater from infiltrating the ground naturally and creates the need for a substantial storm drainage system to manage flooding. The drainage infrastructure is antiquated and, in many cases, undersized, so the system's ability to convey water efficiently to Merrick and East Bays after storm surges or heavy rainfall is compromised. The limited provision of outflow check valves on storm drain outfalls into the canals and Bays does little to mitigate backflow into the storm sewer system and the devices must be regularly checked to ensure they are properly working. During heavy rainfall events storm sewers are often overwhelmed, causing stormwater to accumulate and ultimately flood the area. These situations can be exacerbated by inadequate maintenance, as trash and debris blocks stormwater from flowing through the system.

Aging and non-functional bulkheads present another source of flooding in the Community. Many bulkheads in the community have exceeded their maximum lifespan, while some older bulkheads are too low, allowing water to pass over them and cause damage to adjacent properties. Many of these older bulkheads have not been raised to current code requirements, causing significant erosion, property damage, and increased flood levels. Height regulations are typically enforced when bulkheads are new or are being replaced, but uniform enforcement is necessary to make bulkhead structures effective at mitigating flooding and erosion.

The Cedar Creek Water Pollution Control Plant (WPCP), located in the neighboring hamlet of Wantagh, receives and treats wastewater from the Community. While the plant remained in operation during the Superstorm Sandy, it is located in a moderate risk zone and is at risk of damage from future storm events. Future upgrades to Cedar Creek WPCP are within Bellmore and Merrick. Unmanaged vegetation around streets and power lines can damage energy and transportation infrastructure during major storms. Wind-damaged and felled power lines result in outages and can create hazardous environments if still energized. Customers in affected areas

## Community Needs

### Infrastructure

- Low-lying streets suffer from routine flooding during high tides and/or heavy rainfall, and can become impassable during major storm events.
- Large areas of paved and impermeable surfaces in the community prevent stormwater from infiltrating the ground naturally and storm sewers do not have the capacity to manage runoff.
- Different roads, as well as surface and subsurface stormwater systems, have different jurisdictions, making implementation of projects and maintenance difficult.
- Aging and non-functional bulkheads exacerbate coastal flooding and erosion issues.
- Most bulkheads in Bellmore/Merrick are privately-owned, making it difficult to implement consistent bulkhead protection.
- Transportation infrastructure is primarily automobile-oriented and lacks alternative options for residents who do not have access to a vehicle.
- Trees damaged power lines during Superstorm Sandy, resulting in loss of power throughout the community.
- Damaged power lines during storms caused significant life safety hazards and jeopardize homes and buildings following Superstorm Sandy.
- Street lights did not function after Superstorm Sandy due to power failure.
- Energy needs cannot be met by local resources. Additional generation capacity combined with energy efficiency measures will be necessary to meet future demand.

must wait for damaged assets to be identified and serviced before their power is restored, a process that typically takes up to several days. Likewise, streets can become blocked and impassable until municipal and/or private repair crews can clear the way. Road and utility rights-of-way in the Community are owned and managed by a number of private and public entities across multiple jurisdictions.

Storm mitigation initiatives have been proposed by LIPA/PSEG to protect assets from future damage. Temporary emergency flood barriers are protecting substations at risk of flooding and mobile generators and switchgear will be used to carry customer load as substations are individually rebuilt and elevated. The utility plans to increase vegetation management efforts, shortening time between trimmings and expanding clearance zones around power lines to prevent damage from surrounding trees. Upgrades to strengthen utility poles and wires are also planned for high risk areas. Enhanced technology will be used to allow rerouting around damaged equipment and to expedite the damage assessment and restoration process by providing outage detection and location capabilities.<sup>75</sup>

Other critical assets and systems require enhanced protection from flooding or power loss. Two of the Community's pumping stations are vulnerable to outages caused by flood-damaged equipment. The Nassau County Department of Public Works Garage in Merrick is located in an extreme risk zone and is likely to become incapacitated in a flood event. Public infrastructure systems, such as street and traffic lights, are also vulnerable and protective measures are needed to ensure their continued function in the face of another disaster.

The Town of Hempstead Sanitation Department operates a Waste Transfer Station at 1600 Merrick Road that was heavily damaged during Superstorm Sandy. Garbage and environmental pollutants were washed into the bay and the office was damaged. Its location in an extreme risk zone makes it vulnerable to future disasters and threatens the health of the wetlands in the adjacent Norman J. Levy Park and Preserve.

Between 2001 and 2013, LIPA/PSEG has contracted for the addition of more than 2,000 MW of supply capability to meet projected electricity demand throughout Long Island, as well as meet the reliability requirements established by the New York State Contract Reporter (NYSCR) and the New York Independent System Operator (NYISO). This includes the addition of 13 new generating stations on Long Island and two submarine transmission cables that connect the local grid to surrounding power markets, through which additional capacity can be purchased. LIPA/PSEG plans to have sufficient capacity to meet demand through 2020, primarily through energy efficiency measures that are currently being implemented.<sup>76</sup>

Without energy efficiency investments, LIPA/PSEG expects peak load to increase an average of 144 MW (2.2%) annually. Energy efficiency and demand response measures would reduce growth to 1.4% on average per year. It is likely, however, that the utility will eventually need to add additional generation resources on the island. The utility has historically relied on short-term purchases from the statewide capacity market to meet demand within the required reserve margin. Given the current surplus of energy and cost-effective capacity on the market, it is likely that LIPA/PSEG will continue to pursue this strategy as necessary.

Much of the electric power loss during Superstorm Sandy was due to fallen trees, which affected above-ground power lines. A lack of switches within the electrical grid meant that more homes and businesses were impacted when other parts of the grid were down. Many critical public and private facilities were not equipped with emergency backup power supplies. The lack of power to streetlights left residents with dark, flooded roadways. Upgrades to the energy infrastructure will be a crucial component of creating a more resilient community. Sanitary sewer/wastewater systems caused extensive damage to residences during Superstorm Sandy and should be upgraded; significant sewage backup in homes.

### **Infrastructure Opportunities**

While upgrades to the existing stormwater system will not prevent flooding from a major storm surge, it can help to address some of the Community's

## Community Opportunities

### Infrastructure

- Upgrade stormwater system, including pipe repair, replacement, or installation of check valves.
- Elevate critical roadways in risk areas to maintain transportation access during flood events.
- Better maintenance of storm drains; installation of netting at openings should be pursued.
- Require more permeable surfaces or other green infrastructure improvements in upland areas.
- Designate emergency parking areas so evacuating residents can safely store their vehicles.
- Implement street improvements in conjunction with repair and recovery work to increase pedestrian access, specifically in downtown commercial areas.
- Focus on improvements that address safety, such as evacuation routes and an efficient transportation network.
- Pursue funding for infrastructure damage restoration and damage mitigation projects.
- Upgrade electric poles and power lines to better withstand storm events and underground lines where feasible.
- Consider natural gas or propane generators for residential use.
- Explore reducing dependence on LIPA/PSEG
- Use solar, or other energy source, for streetlights.
- Coordinate utility-related construction so multiple stormwater and electrical upgrades are done in tandem.
- Pursue any sewer-related upgrades to prevent future backup and support upgrades at Cedar Creek Wastewater Treatment Plant.

routine nuisance flooding issues and expedite drainage following a large storm. Since very few of the outfalls in the Community are equipped with tidal check valves, there are opportunities to explore the effectiveness of this technique to reduce flooding. Given the high amount of impervious surfaces in the Community, there are opportunities to augment the existing stormwater system using “green infrastructure” techniques, discussed in more detail in the following section.

To ensure the Community’s southern neighborhoods are accessible in storm conditions, critical roadways can be elevated to reduce the impact of flooding on mobility. Raised roadways should be coordinated with local evacuation routes and identified for debris removal following emergency weather events; these roadways should also be well publicized to residents. Routes should be clearly marked and provide directions to higher ground, as well as connection to community resources, such as safe parking areas and emergency shelters. Traffic signals along emergency routes should incorporate backup power to maintain function in the event of an outage.

Transportation recovery and reconstruction efforts should be coupled with street improvements to make the Community more accessible to pedestrian activities. Many streets in the community do not have sidewalks and downtown areas, including those around the Bellmore and Merrick LIRR stations, are not well designed for pedestrian use. Increasing sidewalk connections and introducing traffic-calming measures, such as medians and curb extensions, can improve driver and pedestrian safety, making walking more attractive and enjoyable for residents and visitors. Street improvements in downtown commercial areas can help local businesses attract more customers by increasing visibility and access.

### Natural and Cultural Resources

Natural and cultural resources include the impact of Superstorm Sandy on the Community’s natural systems and the services these systems provide. They address the need for the repair and restoration of both natural assets, such as preserves and wetlands, and cultural amenities, such as parkland.

Additionally, these issues present opportunities for the use of natural systems to reduce vulnerability and foster increased resilience.

### Natural and Cultural Resource Needs

Wetlands include swamps, marshes, and bogs, and are often found alongside waterways and in flood plains. They are a critical part of the local ecosystems where they are present, helping to reduce erosion and decrease wave energy created during storm surges. Approximately 284 acres of tidal wetlands have been lost in Nassau County's south shore over the past five decades.<sup>77</sup> Erosion and the growth of phragmites, also known as the common reed, are primarily responsible for today's wetland loss, although the south shore's history of development has also significantly contributed to their disappearance. The popularity of waterfront homes peaked after World War II (1945), when hundreds of acres of marshland were filled and built on, such as the peninsulas in southern Merrick and Bellmore. With the passage of the Water Quality Act of 1965, the Town of Hempstead stopped granting permits for shoreline development, but the shoreline had already been almost entirely hardened, leaving the community without an important natural barrier against coastal flooding. Today, tidal wetlands are limited to Norman J. Levy Park and Preserve and Legion Street; fresh water wetlands are limited to Meroke Preserve and Cammann's Pond.

These development patterns have also resulted in an increase of overland flooding, as the stormwater drainage system is unable to manage the increase in stormwater runoff from parking lots and roadways. Impervious surfaces prevent stormwater from infiltrating the ground naturally, preventing groundwater recharge. As stormwater runs over these surfaces, it collects pollutants, such as gasoline and motor oil, and excess nutrients from fertilizers before being channeled into sewers and eventually the bay.

The wetlands in and adjacent to the Norman J. Levy Park and Preserve in southwest Merrick were damaged during Superstorm Sandy. Other "soft" shorelines in the Community include the Merrick Golf Course and Newbridge Park, which were also damaged. There is a need to restore and stabilize these remaining soft shorelines to reduce damage during

## Community Needs

### Natural and Cultural Resources

- Hardened shorelines in Bellmore/Merrick have resulted in loss of natural protection from storm surges.
- Many storm protection measures conflict with creating healthy ecological systems—a balanced approach is critical.
- Cammann's Pond, Merrick Road Park, and Newbridge Park are located along the shoreline in extreme risk areas, so further resiliency measures are needed.
- Ecological systems are under threat from climate change and further study of the bay's natural systems is needed.
- Community needs better protection and maintenance of green and open space. Parks and recreational spaces are ready for upgrades.

future storm events and explore ways to better mitigate flooding. Committee members and the general public also cited the need for better maintenance of natural open spaces, such as those which line the Meadowbrook State Parkway.

### Natural and Cultural Resource Opportunities

Natural systems can provide a natural solution to storm management and can include restoration and expansion of wetlands and marshlands. It is estimated that an acre of wetland can store approximately 1 million gallons of water, equal to about three-quarters of a football field covered in three feet of water.<sup>78</sup> Trees and other vegetation in wetland areas help to slow the speed of flood water, resulting in lower flood heights and, ultimately, less flood damage. Wetlands in coastal areas are especially important, as the flat coastal terrain leaves land and property exposed to hurricanes and other storms. Coastal wetlands protect these assets from storm surge and provide a sustainable buffer against storm-generated wave action.<sup>79</sup> The U.S. Environmental Protection Agency (EPA) has stated that wetland preservation, along with other natural flood control measures, provides



Levy Park windmill (source: Charles Brown)



Merrick Golf Course (source: Charles Brown)

more effective and less costly flood protection than engineered defenses.<sup>80</sup> Because few wetlands remain in the Community, opportunities for wetland restoration and expansion is limited unless some residential parcels are returned to open space.

Traditionally, bulkheads, rip-rap, or other engineered structures have been used to control coastal erosion and protect property from storm damage. However, these measures can potentially increase erosion in adjacent areas. Wave energy from boat wakes, wind and storm events create scouring in front of these structures, resulting in the loss of vegetated shallow areas to open water. Marshland protection not only provides erosion control, it also improves water quality, creates or restores habitat, and increases the aesthetic value of the property,

typically at reduced cost to the landowner.<sup>81</sup> There are opportunities for marsh nourishment adjacent to Norman J. Levy Park and Preserve.

Restoration and protection measures should be pursued to further preserve and enhance the function of the Community's limited natural shoreline. Natural bank stabilization techniques, such as "Living shorelines" utilize plants, sand, and a limited amount of rocks to provide shoreline protection and maintain habitat. Seagrass restoration entails either the transplant of adult shoots from existing meadows or the seeding of previously damaged seagrass beds. Oyster or mollusk species bed reef restoration may also be considered as a means to protect shoreline areas from erosion, and its potential use is currently under study by the Town of Hempstead Department of Conservation and Waterways.

In addition to these measures, the use of green infrastructure presents an opportunity for the Community to increase resilience while enhancing the community's cultural resources. Green infrastructure approaches use engineered systems that mimic natural processes to infiltrate, evaporate, retain, and reuse stormwater runoff. There are a variety of types of green infrastructure measures, including stormwater ponds and constructed wetlands, which contain and naturally treat runoff on a large scale, as well as localized installations, such as bioswales, which naturally filter sediment and pollutants from stormwater as it enters the ground. Materials such as permeable paving can be used to allow for stormwater penetration into the ground, capture pollutants, and improve runoff quality. These approaches can mitigate flood issues by diverting stormwater from the Community's already overloaded stormwater drainage system. The most effective type of green infrastructure measure for a given area depends on a number of factors, such as topography, land use, the presence of aquifers or wells, soil type, ground water levels, and existing natural resources. Based on a preliminary assessment of these factors, potential locations for the installation of green infrastructure in the Community were identified, as illustrated on the following page.

While Green Infrastructure measures are commonly used on public property, such as parks, medians, and sidewalks, there are opportunities to increase

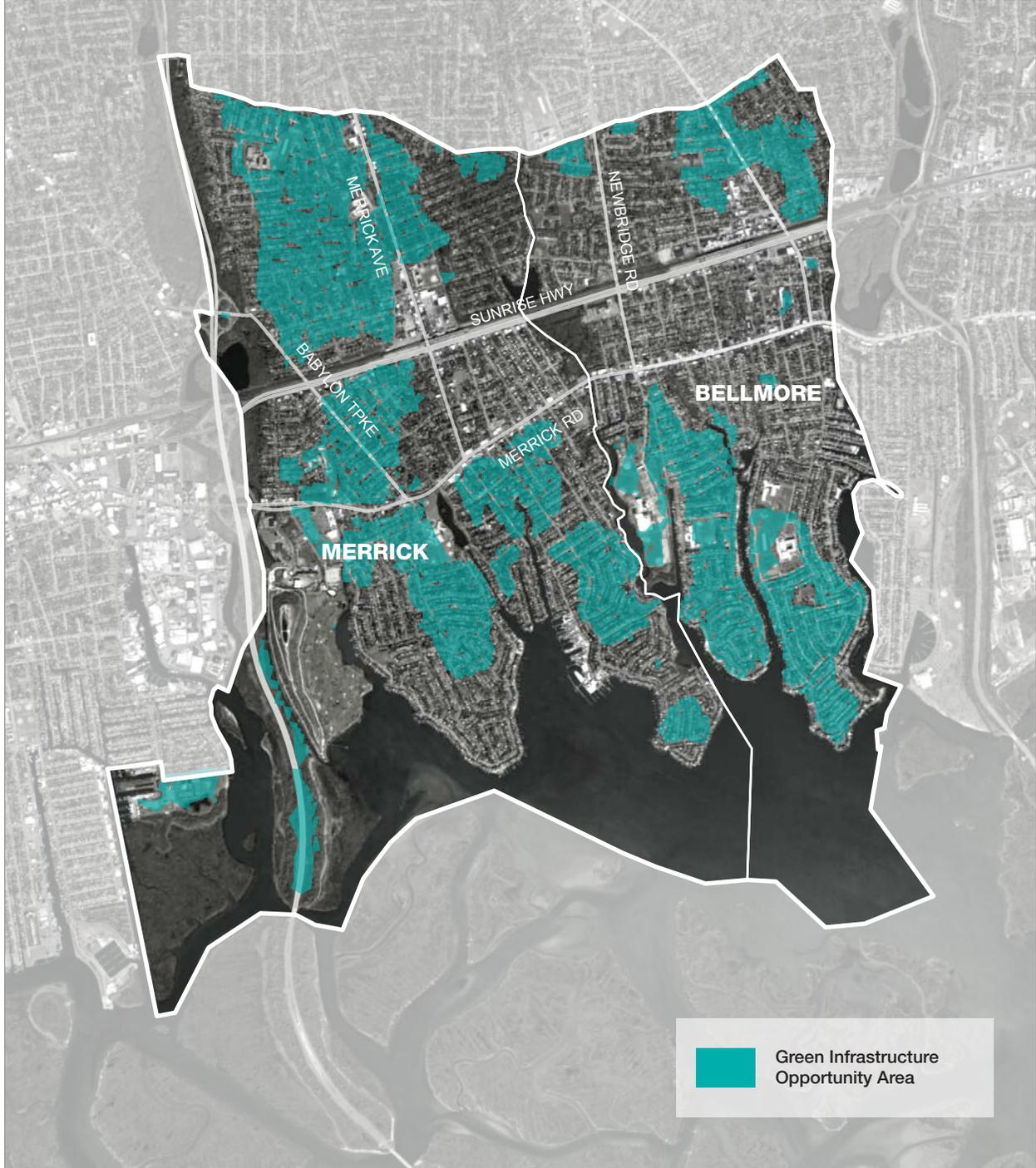
awareness of green infrastructure techniques for residential and commercial property owners as well. Homeowners can install rain barrels to capture rainwater, use permeable pavers for driveways, and generally increase the amount of landscaping on one's property, while commercial businesses can install green roofs and use permeable pavers for parking lots.

The need and opportunities discussed above were the basis for developing recovery and resiliency strategies, which then, in turn, guided the creation of projects that align with the strategies. This alignment ensures that needs are addressed and opportunities are realized through the rebuilding and recovery effort discussed in the sections to follow.

## Community Opportunities

### Natural and Cultural Resources

- Long-term plans to protect Cammann's Pond, Merrick Road Park, and Newbridge Park should be pursued, with an emphasis on natural methods.
- Emphasize storm protection measures that enhance, rather than degrade, the local ecological system.
- Create plans for protected green space to manage stormwater and provide wildlife habitat.
- Develop process for acquisition of severely damaged properties for use as public open space, flood mitigation, stormwater retention, and wildlife habitat.
- Educate public about ecological issues and how resilience can be addressed using natural systems. Raise awareness of the co-benefits of ecological preservation, for example, the role the marshes and barrier beaches play in storm protection and the role inland parks and preserves play in mitigating runoff and pollution.
- Restore and clean wetlands at Norman J. Levy Park and Preserve.
- Create a holistic plan for enhancing resiliency at the Town of Hempstead Department of Sanitation properties at and adjacent to 1600 Merrick Road.
- Restore and clean wetlands at Norman J. Levy Park and Preserve.
- Create a holistic plan for enhancing resiliency at the Town of Hempstead Department of Sanitation properties at and adjacent to 1600 Merrick Road.



Preliminary green infrastructure assessment for the NYRCR Bellmore/Merrick Community (source: Arup)

This page intentionally left blank



## Section III: Reconstruction and Resiliency Strategies

The process of identifying the needs and opportunities of NYRCR Bellmore/Merrick Community (Community) discussed in Section II informed the NYRCR Planning Committee's (Committee) development of the reconstruction and resiliency strategies. The reconstruction and resiliency strategies put forward in this plan address pre-existing needs in the Community, while also responding to the needs and risks revealed during Hurricane Irene and Superstorm Sandy and their aftermath. In considering the long-term recovery of the hamlets, the strategies create opportunities for the Community to conceive and implement projects that facilitate rebuilding in a safer and more resilient, sustainable manner, addressing vulnerability and risk exposure in order to achieve a better future for current and future residents.

As described in Section II, the Community is largely comprised of single-family residential homes with community-oriented retail businesses and limited industrial uses. Over 4,263 residential parcels and 152 commercial and industrial parcels, most of which are concentrated south of Merrick Road, are in extreme and high risk areas. Publically-owned land in extreme and high risk areas includes the Town of Hempstead Department of Sanitation facility, Four Towns Fireman's Training Center, Nassau County Traffic Control Division garage, Merrick Road Park, Cammanns Pond County Park, and Fire Department Station #2.

The risks to these areas come from proximity to water and water features, including shorelines, canals, creeks and watersheds, that rise during major storm events. While proximity to these natural features presents a flood risk, it also offers access to excellent natural resources and to natural and Community assets prized by local residents. The Committee has recognized that keeping the water out is impossible, but that making improvements to both hard infrastructure, like drainage systems, and soft infrastructure, like wetlands, can reduce damage from storm events and allow water to drain more efficiently during and after storms. Energy resiliency was also identified as a primary concern, as power loss after Superstorm Sandy was a significant hardship. Common themes in the analysis of needs and opportunities also included issues related to education, communication, and business continuity.

Facing image: Single-family home in Merrick (Source: Arup)

## A. Reconstruction and Resiliency Strategies

The Reconstruction and Resilience Strategies described below were developed to achieve rebuilding goals, increase resilience, and promote economic stability within the Community. These strategies address regional concerns, problem areas, community feedback on local needs, and iterative development by the Committee and Consultant Team. Each strategy is meant to fulfill one or more of the Recovery Support Functions (RSFs) while addressing risks and needs to resolve critical Community issues. These resiliency strategies are then addressed through the projects identified by the Committee and Community members as important for consideration in the NY Rising process.

The projects represent actions, plans, and projects that offer a higher degree of flood protection, a greater degree of preparation, enabling the area to bounce back quicker after the next event, and stronger physical and natural networks around the Community to allow for a higher level of support before, during, and after a storm event. These same projects improve the day-to-day functioning of the local infrastructure and strengthen and enhance community characteristics, contributing to the quality-of-life identified by local Community members as being vital. The strategies on the pages to follow have been organized into the following areas:

- Improve Stormwater Management and Drainage Systems;
- Establish Programs and Policies for Resilient Planning, Design, and Housing;
- Enhance Communication, Education, and Awareness;
- Improve Transportation Access and Connectivity;
- Invest in Resilience Enhancements for Energy Infrastructure; and
- Plan for Business Continuity and Growth.

A description is provided for each strategy, followed by tables presenting Proposed Projects and Featured Projects (see sidebar for definitions) that would contribute to its implementation. A full description of each project can be found in Section IV: Implementation – Project Profiles. Additional Resiliency Recommendations are included in Section V: Additional Materials.

### Project Types

**Proposed Projects:** Projects proposed for funding through Community Development Block Grant (CDBG-DR) funding.

**Featured Projects:** Innovative projects where an initial study or discrete first phases of the project is proposed for CDBG-DR funding but additional funding is required, an important project where other identified funding opportunities exists, and regulatory reforms and other programs that do not involve capital expenditures.

**Additional Resiliency Recommendations:** Resiliency projects and actions the Committee would like to highlight that are not categorized as Proposed or Featured Projects.

## Improve Stormwater Management and Drainage Systems

Improvements to the Community’s stormwater management and drainage systems are critical to reducing regular flooding caused by tidal and precipitation events. This strategy addresses both the Infrastructure and Natural and Cultural Resources Recovery Support Functions with projects to improve stormwater drainage capacity and enhance natural assets, incorporating green infrastructure initiatives and storm sewer upgrades.

The Bellmore/Merrick Stormwater Drainage, Outfall, and Bulkhead Repair project includes the evaluation of 230 coastal outfalls along the Community’s shoreline. Tidal check valves will be installed at 25 locations where they are deemed to be an effective option for addressing tidal flooding. Three projects, two in south Bellmore and one in south Merrick, address flooding by raising roads and upgrading existing stormwater infrastructure.

Better information about the flow of surface and subsurface water is needed to effectively address flooding issues. The South Shore Stormwater System Modeling and Analysis project uses a hydrologic and hydraulic simulation model to identify the causes of flooding throughout the south shore region. This model allows the Community to be strategic in its use of funds to mitigate flooding by ensuring future projects will be informed by a more accurate understanding of the issues.

The enhancement of wetlands and other natural drainage features can help reduce flooding and improve water quality. Green infrastructure initiatives within the Town of Hempstead (Town) parcels near Merrick Road and Clubhouse Drive will help reduce the risk of flooding to several key assets, such as Merrick Senior Center, the Town’s Department of Sanitation facility, Merrick Golf Course, Merrick Road Park, and the Norman J. Levy Park and Preserve. Addressing flooding on these parcels can also help prevent flooding along the adjacent stretch of Merrick Road, which flooded during Superstorm Sandy, preventing access to the Meadowbrook State Parkway evacuation route. Flooding in this area will also be addressed through green infrastructure pilot projects within the Meadowbrook Corridor.

The Downtown and Commercial Corridor Resiliency Plan project will identify flooding issues along Sunrise Highway, which result from an unused subsurface conduit that obstructs the flow of water from the north of Sunrise Highway to areas to the south of the highway. It will also identify potential for green infrastructure improvements along existing corridors and as part of new development.

**Table 06: Strategy: Improve Stormwater Management and Drainage Systems**

Project Name	Project Description	Cost Estimate	Category	Regional
Bellmore/Merrick Stormwater Drainage and Outfall Repair	Assess the entire Bellmore/Merrick drainage system south of Merrick Road, including the 230 outfalls and related bulkheads. Tidal check valves will be installed on 25 critical and appropriate outfalls. Four publically-owned bulkheads will be replaced.	\$4,150,000	Proposed	N
Southwest Merrick Masterplan and Flood Mitigation Pilot Project	Creation of a Masterplan to re-envision the Town of Hempstead parcels. A newly reconfigured site would provide enhanced flood mitigation for the amenities on-site as well as for Merrick Road. Shoreline stabilization or green infrastructure pilot project upon Masterplan completion.	\$2,400,000	Proposed	N

**Table 06 (cont'd): Strategy: Improve Stormwater Management and Drainage Systems**

Project Name	Project Description	Cost Estimate	Category	Regional
Meadowbrook Corridor Improvements Pilot Study	Hydrologic and hydraulic (H&H) model of Freeport Creek watershed. East Meadow Pond drainage study. Green infrastructure pilot projects, potentially including: creek restoration, regenerative storm conveyance outfall retrofits, and floating wetlands.	\$1,800,000	Proposed	Y
South Shore Stormwater System Modeling and Analysis	Hydrologic and hydraulic (H&H) model to determine the causes of localized flooding issues across the catchment and identify measures to prevent the flooding.	\$725,000	Proposed	Y
Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	\$500,000	Proposed	N
Bellmore Road Raising: Kopf-Boundary Road Area	Road raising and associated drainage improvements for North Rd, Kopf Rd, Clubhouse Rd, Alder Rd, Beach Ave, Short St, Barbara Rd, and Boundary Rd.	\$2,950,000	Featured	N
Bellmore Road Raising: Army, Navy, Marine and Shore Road	Road raising and associated drainage improvements for Shore Rd, Walters Ct, Horace Ct, Army Pl, Navy Pl, Marine Pl, Surf Dr, Riviera La, Malibu Rd, Driftwood La, Seaview La, and May Ct.	\$3,150,000	Featured	N
Merrick Road Raising: George Court to Leslie Lane	Road raising and associated drainage improvements for George Ct, Helen Ct, Leonard La, Edward La, Leslie La, and Julian La.	\$1,250,000	Featured	N

## Establish Programs and Policies for Resilient Planning, Design, and Housing

Resilient planning and design initiatives include programs and policies that support and incentivize resilient building and reconstruction. This strategy addresses the RSFs of Infrastructure, Housing, Natural and Cultural Resources, and Economic Development.

The Southwest Merrick Masterplan and Flood Mitigation Pilot Project will implement resilience strategies across a collection of Town-owned properties near Merrick and Clubhouse Roads. This includes the Town Department of Sanitation Waste Transfer Station and the Norman J. Levy Park and Preserve. The Masterplan will recommend resilient building strategies to upgrade Town-owned facilities, as well as introduce green infrastructure measures to alleviate flooding in and around site areas.

The Downtown and Commercial Corridor Resiliency Plan will explore potential for redevelopment and revitalization opportunities in the Community's commercial areas, with an emphasis on beautification, flood mitigation, and energy resiliency. Marina and Dock Resilience Guidelines, developed in partnership with marina operators, will provide recommendations to assist boat owners in preparing for future storms, as well as recommend dock design and siting and evacuation procedures.

**Table 07: Strategy: Establish Programs and Policies for Resilient Planning, Design, and Housing**

Project Name	Project Description	Cost Estimate	Category	Regional
Southwest Merrick Masterplan and Flood Mitigation Pilot Project	Creation of a Masterplan to re-envision the Town of Hempstead parcels. A newly reconfigured site would provide enhanced flood mitigation for the amenities on-site as well as for Merrick Road. Shoreline stabilization or green infrastructure pilot project upon Masterplan completion.	\$2,400,000	Proposed	N
Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	\$500,000	Proposed	N
Marina and Dock Resilience Guidelines	Emergency preparedness guidelines, recommendations and education.	\$100,000	Featured	N

## Enhance Communication, Education, and Awareness

Improved communication, education, and awareness will assist the Community in better preparing for emergencies, as well as enhancing communication abilities during and after storm events. This strategy addresses the RSFs of Community Planning and Capacity Building and Infrastructure with projects that address emergency communication, preparedness, and awareness.

The Community Assistance Centers (CACs) project proposed in this strategy would establish two public buildings where residents can find emergency preparedness information and education throughout the year, and which will also serve as places to find resources and aid after major storm events. CACs will be equipped with on-site generation capacity to ensure that power is available during outages. Possible locations include the Bellmore and Merrick Libraries.

The Public Education and Communication Gap Analysis will study Nassau County’s existing emergency management efforts to identify opportunities to create a single, user-friendly source for comprehensive emergency assistance information collected from a variety of public agencies. It will identify gaps in the existing communication network and find ways to more effectively link the local government, emergency management agencies, residents, businesses, and faith-based groups, as well as non-profit organizations that direct aid and recovery efforts to the Community’s socially vulnerable populations.

**Table 08: Strategy: Enhance Communication, Education, and Awareness**

Project Name	Project Description	Cost Estimate	Category	Regional
Bellmore Merrick Community Assistance Centers	Community Assistance Centers are places for residents to gather information about emergency preparedness under normal conditions. During and after a storm, these centers would become a place to gather, collect and distribute resources, charge cell phones, access the internet/TV, and seek comfort.	\$1,265,000	Proposed	N
Public Communication and Education Gap Analysis	Evaluate existing communication and educational processes and uncover additional needs. Identify public/private partnership opportunities for ongoing communication and education needs.	\$20,000	Proposed	Y
Business Continuity Program	Staff person to assist businesses in creating business continuity plans. Education for Chambers of Commerce and other business organization. Identify business assistance funding.	\$40,000	Proposed	Y

## Improve Transportation Access and Connectivity

Storm damage during Superstorm Sandy resulted in flooding, loss of power and an impaired transportation system. This strategy addresses the Infrastructure RSF with projects that address transportation infrastructure.

Prolonged power outages after Superstorm Sandy left streetlights and signals inoperable, making it difficult for residents to navigate their way to safety. Flooding during Superstorm Sandy also made key roads impassable. Projects to address the resiliency of the transportation network are included in this strategy.

The Lifeline Corridor Study and Guidelines and Downtown and Commercial Corridor Resiliency Plan projects will identify improvements to drainage, streetscape, streetlights, and traffic flow in order to make the Community’s commercial and local streets more resilient. Infrastructure improvement projects include the installation of solar-powered streetlights with battery backup at key intersections and the implementation of a signage system to guide residents to Community Assistance Centers and other emergency services. Burying, or “undergrounding”, power lines would prevent damage from adjacent vegetation and could be combined with regular road maintenance work or scheduled improvements.

**Table 09: Strategy: Improve Transportation Access and Connectivity**

Project Name	Project Description	Cost Estimate	Category	Regional
Lifeline Corridor Study and Guidelines	Best practices and guidelines for Resilient Streetscapes, such as green infrastructure, drainage practices, redundant and safe power, resilient street trees and street design.	\$120,000	Proposed	Y
Key Intersection Street Light Retrofit	Installation of LED/PV streetlights on utility poles along Merrick Road in Merrick and Bellmore.	\$4,630,000	Proposed	N
Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	\$500,000	Proposed	N
Resilient Streetscape Implementation	Underground seven miles of utility lines. New PV/LED street lights. New emergency evacuation signage.	\$58,000,000	Featured	N

## Invest in Resilience Enhancements for Energy Infrastructure

Investing in energy infrastructure enhancements can help improve the reliability and efficiency of the electrical grid, benefiting Community members and customers throughout the region. This strategy primarily addresses the RSF of Infrastructure by introducing plans to update and expand energy distribution and generation assets. Because a reliable energy grid is critical to sustaining businesses, this strategy also incorporates measures that support the Economic Development RSF by advocating the installation and distribution of generation resources in commercial districts.

The Downtown and Commercial Corridor Resiliency Plan project will evaluate the potential for microgrids in downtown Merrick and Bellmore, potentially connecting to the LIRR power supply or leveraging alternative power generation. The Key Intersection Streetlight Retrofit and Resilient Streetscape Implementation projects include the installation of photovoltaic streetlights equipped with battery backup.

**Table 10: Strategy: Invest in Resilience Enhancements for Energy Infrastructure**

Project Name	Project Description	Cost Estimate	Category	Regional
Key Intersection Street Light Retrofit	Installation of LED/PV streetlights on utility poles along Merrick Road in Merrick and Bellmore.	\$4,630,000	Proposed	N
Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	\$500,000	Proposed	N
Resilient Streetscape Implementation	Underground seven miles of utility lines. New PV/LED street lights. New emergency evacuation signage.	\$58,000,000	Featured	N

## Plan for Business Continuity and Growth

Business continuity and economic resiliency is crucial as the Community continues to face severe weather risks in the future. While most business owners affected by Superstorm Sandy were able to rebuild and resume operations, the loss of revenue and cost of repairs represented a significant financial loss. This strategy addresses the Economic Development RSF through projects that increase the physical and operational resilience of Community businesses.

The Business Continuity Program will provide assistance for businesses to maintain operations under adverse conditions, such as a major storm event. New resilience guidelines for marinas would protect these businesses and neighboring properties from storm damage, unsecured boats, and debris from destroyed waterway structures.

Excess demand for retail in the Community was identified in the housing needs analysis and indicates a potential for business growth. The Downtown and Commercial Corridor Resiliency Plan project will evaluate how new commercial development would be incorporated into downtown Merrick and Bellmore, as well as along the commercial corridors, in a resilient manner.

**Table 11: Strategy: Plan for Business Continuity and Growth**

Project Name	Project Description	Cost Estimate	Category	Regional
Business Continuity Program	Staff person to assist businesses in creating business continuity plans. Education for Chambers of Commerce and other business organization. Identify business assistance funding.	\$40,000	Proposed	Y
Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	\$500,000	Proposed	N
Marina and Dock Resilience Guidelines	Emergency preparedness guidelines, recommendations and education	\$100,000	Featured	N



## Section IV: Implementation – Project Profiles

The New York Rising Community Reconstruction (NYRCR) Program has allocated to the NYRCR Bellmore/Merrick Planning Committee (Committee) up to \$12.1 million (Bellmore: \$5.7 million; Merrick: \$6.4 million). Funding is provided through the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) program. While developing projects and actions for inclusion in the NYRCR Bellmore/Merrick Plan (Plan), Planning Committees took into account cost estimates, cost-benefit analyses, the effectiveness of each project in reducing risk to populations and critical assets, feasibility, and community support. Planning Committees also considered the potential likelihood that a project or action would be eligible for CDBG-DR funding.

The projects and actions set forth in the NYRCR Plan are divided into three categories. The order in which the projects and actions are listed in the NYRCR Plan does not indicate the Community's prioritization of these projects and actions. Proposed Projects are projects proposed for funding through the Community's allocation of CDBG-DR funding. Featured Projects are projects and actions that the Planning Committee has identified as important resiliency recommendations and has analyzed in depth, but has not proposed for funding through the NYRCR Program. Additional Resiliency Recommendations (see Section V) are projects and actions that the Planning Committee would like to highlight, but that are not categorized as Proposed Projects or Featured Projects.

The total cost of Proposed Projects in the NYRCR Plan exceeds NYRCR Bellmore/Merrick Community's (Community) CDBG-DR allocation to allow for flexibility if some Proposed Projects cannot be implemented due to environmental review, HUD eligibility, technical feasibility, or other factors. Implementation of the projects and actions found in the NYRCR Plan are subject to applicable Federal, State, and local laws and regulations, including the Americans with Disabilities Act (ADA). Inclusion of a project or action in the NYRCR Plan does not guarantee that a particular project or action will be eligible for CDBG-DR funding or that it will be implemented.

This section provides a complete project profile for each Proposed or Featured Project identified by the Committee. Project profiles for the following Proposed and Featured Projects include a description and information on two important elements to evaluate the value of each project: a Cost-Benefit Analysis and a Risk Reduction Analysis.

### Cost-Benefit Analysis

A cost-benefit analysis (CBA) is a tool used to calculate and compare the benefits and costs associated with a project. The CBA provides decision-makers with a framework for comparing different projects (i.e., anticipated cost of implementation against total expected benefits) and determining whether the benefits of a particular project outweigh the costs. More specifically, the value of the CBA is two-fold: (1) To inform the Committee as they consider projects for implementation; and (2) to help municipalities prepare grant applications for funding.

Because the NYRCR Program is a community-driven process, the CBA has focused on identifying project costs and benefits that easily relate to the Community. Committee and Community input – informed by a true understanding of local conditions, needs, and community values – plays a crucial role in the selection of projects to be implemented. With this in mind, the CBA has used a mix of both quantitative and qualitative factors in its analysis.

### Project Costs

Project Profiles include a capital cost estimate. The cost-benefit analysis cannot, however, project costs or benefits with complete certainty; rather, it provides the Community with a practical understanding of the potential estimated costs of project implementation and the potential benefits accrued to the Community with the particular project in place.

The cost of implementing a project is just one aspect of the justification for funding these Proposed Projects. Conversely, another important variable is the future costs of not implementing these Proposed Projects, which has the potential to negatively impact the long-term viability of both the Community and its neighboring south shore communities.

While these costs are more difficult to quantify, they are no less important to our analysis, and are therefore addressed qualitatively. These costs include:

- Extensive, repetitive damage to personal property, including vehicles and residences, and public infrastructure resulting from frequent recurring flooding and future storm events;
- Economic loss to residents and to local and regional employers as a result of the inability to work; and
- Hindrance in the provision of life safety and emergency services, resulting in repeated inability to access vast areas of the community.

For five Proposed Projects that are more regional in scale, the Community is partnering with neighboring NYRCR communities to fund these projects. When the estimated project cost is a portion of a shared project, it is noted in the Project Profile.

### Project Benefits

The projects listed offer a number of benefits, which have been grouped into the following categories:

- **Risk Reduction:** The extent to which a project reduces the risk of damage to a Community Asset from a future storm event (discussed below under "Risk Reduction Analysis").

- **Economic Resiliency:** The project’s potential to help minimize economic costs and reduce the time it takes the local economy to rebound from a storm event. Economic data included, where applicable, an estimate of permanent jobs secured/added; relationship to, and/or furtherance of, Regional Economic Development Plan goals; potential for additional economic activity; and the net effect on local municipal expenditures.
- **Health, Social and Public Safety Services:**  
Qualitative information was provided on the overall population benefits of improved access to health and social service facilities and public safety services, type and size of socially vulnerable population secured, and degree to which essential health and social service facilities are able to provide services to a community during a future storm or weather event as a result of the project.
- **Environmental Protection:** Benefits include the protection of crucial environmental assets or high-priority habitat, threatened and endangered species, migration or habitat connectivity; any clean-up resulting from the action; and creation of open space or a new recreational asset.

### Risk Reduction Analysis

A Risk Reduction Analysis estimates the extent to which Proposed and Featured Projects will reduce storm damage (environmental, social, and economic) and flooding risk to specific Community Assets when the project is in place. (The extent to which a project reduced such risk is also considered as a benefit in the Cost Benefit Analysis – see “Project Benefits” above.) Risk “reduction” is different from the risk “assessment” in the previous section in a very important way – risk assessment looks at storm and flood risks to Community Assets before the project is implemented; risk reduction looks at the reduced risk after the project is in place.

The Risk Reduction Analysis uses a tool called “Scenario Planning.” Scenario Planning measures a project’s potential to reduce risk under a variety/ range of potential future environmental conditions or scenarios (e.g., different levels of projected sea

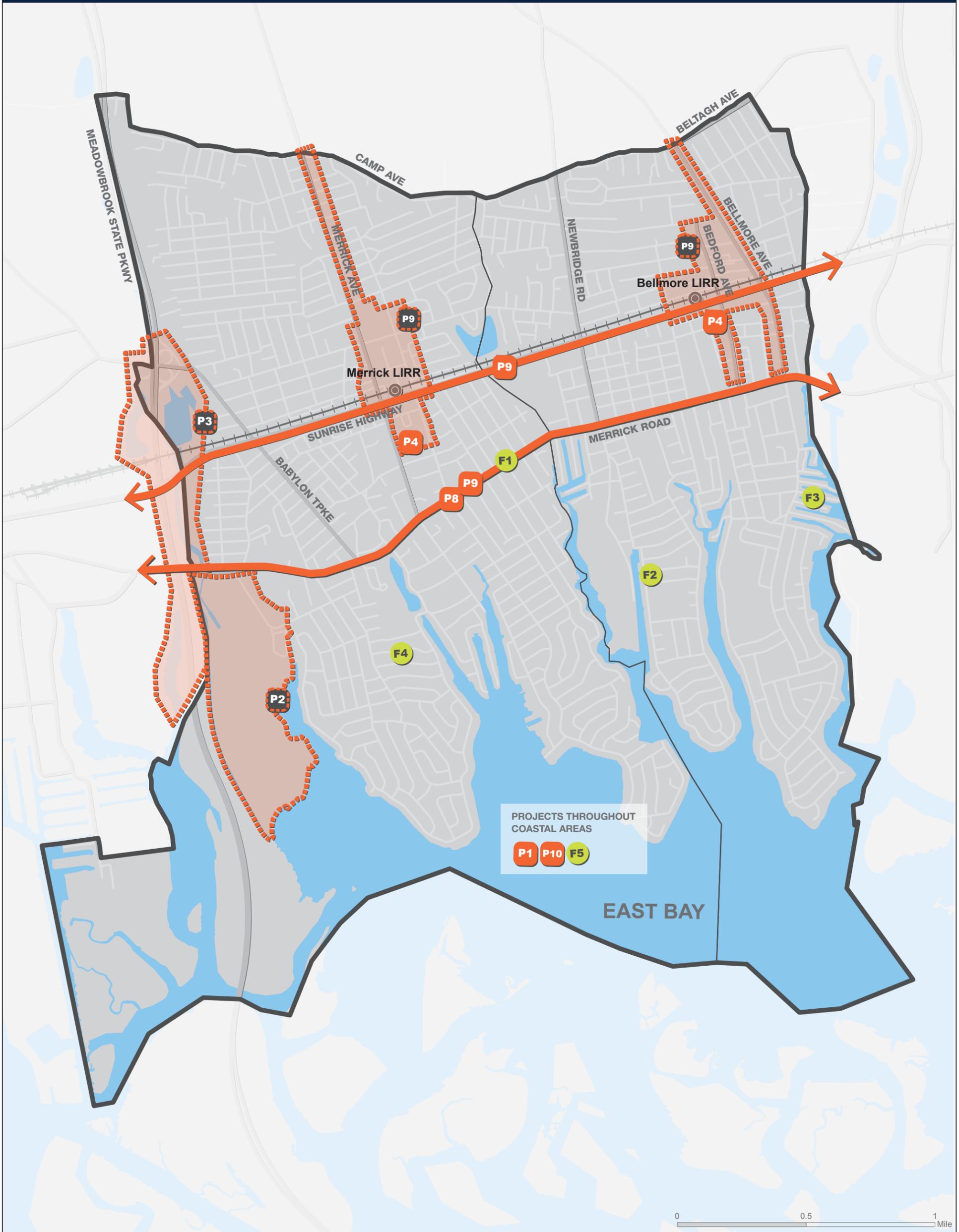
level rise). A risk reduction score is then assigned to each project scenario. This helps communities and decision-makers understand the potential environmental, social, and economic outcomes associated with each scenario.

A full list of Proposed and Featured projects can be seen in Table 12 on the following page. Table 12 includes a “Key” column that references the project map in Figure 08, which provides the geographic location of projects included in the NYRCR Plan (note: project numbering is used for location purposes and does not indicate prioritization). Some projects are not included on the map as they cover a larger geographic area, or require additional analysis and study to determine the appropriate location. When possible, project locations will be specified in the individual project profiles.

**Table 12:** Project list and location key

Key	Category	Project Name	Notes
P1	Proposed	Bellmore/Merrick Stormwater Drainage, Outfall, and Bulkhead Repair	
P2	Proposed	Southwest Merrick Masterplan and Flood Mitigation Pilot Project	
P3	Proposed	Meadowbrook Corridor Stormwater System Modeling, Analysis, and Pilot	
P4	Proposed	Bellmore/Merrick Community Assistance Centers	
P5	Proposed	Public Communication and Education Gap Analysis	Not shown, Community-wide
P6	Proposed	Business Continuity Program	Not shown, Community-wide
P7	Proposed	Lifeline Corridor Study and Guidelines	Not shown, Location TBD
P8	Proposed	Key Intersection Streetlight Retrofit	Not shown, Community-wide
P9	Proposed	Downtown and Commercial Corridor Resiliency Plan	
P10	Proposed	South Shore Stormwater System Modeling and Analysis	
F1	Featured	Resilient Streetscape Implementation	Not shown, Location TBD
F2	Featured	Bellmore road raising: Army Place, Navy Place, Marine Place and Shore Road	
F3	Featured	Bellmore Road Raising: Koft-Boundary Road Area	
F4	Featured	Merrick Road Raising: George Court to Leslie Lane	
F5	Featured	Marina and Dock Resilience Guidelines	

# Figure 08: Proposed and Featured Projects



### Legend

- NYRCR Boundary
- Long Island Rail Road
- LIRR Station
- Proposed Project Area
- Proposed Project
- Featured Project

Refer to Table 12 for Project list and location key

### Data Sources

ESRI, NOAA,  
US Census,  
Nassau County,  
NYS DOS  
Created March 2014



This page intentionally left blank

## Proposed Project: Lifeline Corridor Study and Guidelines



Artist's impression of Merrick Road as a "green street" (source: Arup)

Throughout the NYRCR Communities of Baldwin, Bellmore/Merrick, Freeport, Massapequas, and Seaford/Wantagh, conditions on various roads after Superstorm Sandy compromised life safety and impeded the ability of first responders and residents to access certain destinations. Issues, such as lack of power to traffic lights, lack of street lighting, flooding, downed power lines, damaged trees, and debris all contributed to disruptions to the road network.

By strategically focusing infrastructure investments to key streets within the five areas, a "Lifeline Network" could be developed that would provide maximum accessibility in and out of residential neighborhoods, as well as in and out of the area in general. This network of State, County, and local streets would



Merrick Road in Merrick (source: Arup)

integrate resilient streetscape design, such as redundant power and improved drainage systems, so it will be more resilient to storm events and better able to serve first responders and residents before, during, and after a storm.

The project includes a study to determine the location and specific objectives of the Lifeline Network streets, followed by the creation of guidelines for increasing the resiliency of Merrick Road and Sunrise Highway, which traverse all five NYRCR Communities, and a north-south street in each Community.

This study seeks to accomplish the following:

- Coordinate the needs and efforts of all relevant jurisdictions and agencies;
- Identify a network of “Lifeline Corridors”; and
- Develop guidelines for street improvements to be made to Lifeline Corridors.

The study will identify best practices and develop design guidelines for resilient streetscapes. The guidelines will include opportunities for:

- “Green Street” design (stormwater management and green infrastructure);
- Redundant and safe power distribution (stand-alone lighting and signaling, undergrounding power lines);
- Resilient street trees (trees that are more resilient to wind and saltwater); and
- “Complete Streets” design (flexible lanes, bicycle capacity, sidewalk width, treatment and amenities, and appropriate transit provision).

The guidelines will also include cross-section designs for Merrick Road, Sunrise Highway, and a north-south street in each Community that integrates the resilient streetscape methods listed above.

### **Estimated Project Cost**

This project has also been proposed in the neighboring NYRCR Communities of Baldwin, Freeport, Massapequas, and Seaford/Wantagh. The approximate total project cost is \$600,000, with an estimated contribution of \$120,000 by the NYRCR Bellmore/Merrick Community.

### **Project Benefits**

This project addresses the Infrastructure Recovery Support Function (RSF). Developing streetscape design guidelines that incorporate resiliency features, green infrastructure, and complete streets principles will provide the Communities with the information needed to refit critical roads to function better in case of major storm events.

### **Risk Reduction & Resiliency Benefits**

Green street design will improve stormwater drainage and reduce the amount of standing water on roadways, allowing for safe vehicle operation during all types of inclement weather. Managing/trimming street trees will enhance energy security for NYRCR Communities by removing threats to the electrical distribution system.

### **Economic Benefits**

This project also reduces government expenditures by reducing the cost of power supply to public facilities. Enhancement of roadway corridors in this manner will increase the attractiveness of more areas in the Community. This will provide economic benefit by diversifying the less risk-prone areas to which waterfront landowners could relocate within the community.

### **Health and Social Benefits**

Introducing more tolerant and resistant street trees will reduce the occurrence of downed trees and limbs that may block roadway access.

By maintaining a stable energy supply along key roads, emergency response facilities will have a better chance of remaining operational during storm events, reducing risk to the population through faster emergency response. Buildings and homes throughout the Community, including those housing vulnerable populations, will have a better chance of retaining electricity and remaining habitable, reducing the need for immediate emergency response or shelter.

Solar power and battery backup systems for streetlights will improve public safety at night. Access to critical assets will be secured, including key routes from coastal areas to Community Assistance

Centers. Recovery efforts can be accomplished at night, improving the pace at which access to roadways and properties can be restored, which has multiple benefits including improving access to community facilities, reducing roadway congestion, improving travel time and fuel efficiency, and improving local economic recovery. Complete streets will improve walking, cycling, and transit infrastructure by offering viable alternatives to automobile travel and improving access for vulnerable populations.

### **Environmental Benefits**

The volume of stormwater being released into the South Shore Estuary will be reduced and the water that does reach the estuary will be filtered of toxins. Tree trimming guidelines will enable the Community to maintain the environmental benefits of trees, including surface water retention, decreased soil erosion, shade, and air quality improvements. Complete street guidelines can reduce the use of private automobiles, reducing greenhouse gas emissions in the process.

### **Cost-Benefit Analysis**

The design guidelines represent a small investment with multiple returns by changing how roads and corridors are designed. These guidelines can be integrated into normal maintenance, operations, and capital programming activities. When applied to subsequent projects, the guidelines will transform single-purpose roads into Community Assets serving multiple functions and offering local benefits, as described above. The guidelines can also be used in an efficient manner without disrupting normal operations for the Town. Once developed, they can be applied during standard maintenance cycles and as they become manifest in the built environment, the Communities that sit along them will become more resilient and robust. Once installed, the new street designs will increase the safety and reliability of the roadway system during and after any storm event, as the lighting system will be independent from local power supply, allowing for quick restoration of access after a storm.

Green infrastructure will enhance the attractiveness and livability of the Community, while reducing and filtering stormwater. Enhanced Community attractiveness and livability will help bolster home values

and attract new residents. These functions, in turn, protect public and private assets throughout the Community by reducing flood risks and reserving stormwater capacity to move excess water that cannot be stored or absorbed locally out of the area. The public and private assets span all asset classes throughout the vulnerable areas of the Community and such systems will improve overall population protection.

### **Risk Reduction Analysis**

Developing design guidelines for future roadway improvements will reduce Merrick Road's risk of flooding and debris, which would block transportation access and might interfere with the electrical distribution network. Independent streetlight power sources, proposed for the pilot project, will improve public safety along the road at night, reducing risk to Community residents. Developing mechanisms to improve transportation access and options can reduce the risk of social isolation, which is exacerbated after disasters, for socially vulnerable populations.

### **General Timeframe for Implementation**

The implementation of this project will take approximately 24 months from commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

NYS Department of Transportation, Nassau County, and Town of Hempstead.

## Proposed Project: Downtown and Commercial Corridor Resiliency Plan



An artist's impression of a resilient downtown streetscape (source: Arup)

Downtown Merrick and Bellmore are both home to clusters of businesses, near their respective Long Island Rail Road (LIRR) stations, that provide commercial and entertainment uses to local residents. The economic health of these areas is crucial to the appeal of living in Bellmore and Merrick. Similarly, the key commercial corridors, such as Merrick Road, Newbridge Road, and Sunrise Highway, provide important retail services to the Community. Many of these businesses were negatively impacted by Superstorm Sandy, either by physical damage, loss of revenues, reduced working hours for employees, or, in some cases, they permanently closed for business.

The economic health of local residents has also been negatively impacted by Superstorm Sandy. The cost of raising and maintaining a home in the Community has significantly increased, in an area where existing



The existing condition of Bedford Avenue in downtown Bellmore (Source: Arup)

home prices were already high. Downtown Merrick and Bellmore have been identified as an area where housing opportunities could be created in the future.

This project includes a comprehensive planning and resiliency study to re-envision the downtown and commercial corridors in both Merrick and Bellmore. The planning study will address the following:

- Opportunities for housing and commercial business creation out of high and extreme risk areas, close to LIRR stations, to expand the tax base. New housing will diversify current the housing mix, which is almost exclusively single-family homes, and will assist young people, seniors, and low/moderate-income residents in being able to stay or move to area.
- Assess emergency needs related to Downtown as a hub for major evacuation routes (car, rail, mass transit).
- Evaluate demand for hotel uses that could provide additional shelter during emergencies.
- Identify opportunities for use of existing buildings/facilities for temporary shelters in the downtown area.
- Identify microgrid opportunities with alternative power generation.
- Identify stormwater management, including green infrastructure, which could be incorporated by new developments and existing property owners.
- Recommendations for new zoning, building codes, and/or design regulations to make downtown more resilient.

### **Estimated Project Costs**

The Proposed Project will cost an estimated \$500,000.

### **Project Benefits**

Creating a plan for the downtown area provides an opportunity to create a safer, cleaner, more attractive, and more economically resilient Community. The Downtown and Commercial Corridor Resiliency Plan addresses all of the Recovery Support Functions.

### **Risk Reduction and Resiliency Benefits**

The Proposed Project will create a plan for downtown growth, allowing for the construction of new residences and businesses outside of low-lying and flood-prone areas. As a result, lower-risk options for housing and commercial space will be available for residents and businesses currently located in higher risk areas. It would offer an opportunity to relocate should a resident or business wish to move out of a risk zone, yet still remain in the Community. The regulatory recommendations for resilient buildings will ensure that the risk of flooding to newly constructed buildings is adequately reduced. Lastly, the investigation of microgrid potential in the Community may provide an opportunity for greater energy reliability during future events and reducing the risk of unsafe conditions following future disasters.

### **Economic Benefits**

Implementation of the plan will help the Community develop a more robust economy and potentially increase tax revenues through development, commercial, and retail uses. In developing a microgrid, energy costs can be reduced and capacity can be increased to enable potential economic growth. Greater economic continuity can be achieved if businesses can be located outside of risk areas, protecting a valuable revenue stream for local governments should future storms occur.

### **Health and Social Benefits**

Social benefits of the plan include access to more affordable and diverse housing options. Providing new housing, economic development, and recreation opportunities in the downtown area can improve the public realm and facilitate walkability. These areas will also provide better transit access and improve access to community services for socially vulnerable populations. Developing a central location with a cluster of essential services that can effectively avoid power loss through implementation of a microgrid is highly beneficial to Community members' ability to directly access resources and information following a future disaster. Diverting or delaying stormwater from entering the drainage system through the development of green infrastructure systems can protect Community Assets, homes, and businesses from flooding.

Fostering vibrant, pedestrian-oriented downtowns and commercial corridors encourages walking, which provides health benefits to local residents and employees.

### **Environmental Benefits**

A walkable and attractive downtown area can also reduce road congestion and vehicle emissions by reducing the need for short car trips to the train station or shopping areas. Sustainable mobility options may also reduce the amount of pollution from stormwater runoff from automobiles. The development of a microgrid can also enable the generation of clean energy, improving local air quality and reducing the generation of greenhouse gases in the Community. Green infrastructure can also provide numerous environmental benefits, including groundwater recharging, pollutant reduction in bays and wetlands, aesthetics, air quality improvements, and shade and cooling on hot days.

### **Cost-Benefit Analysis**

Creating a plan for future resiliency and economic development in the Community's Downtown and along commercial corridors would cost approximately \$500,000. In the creation of opportunities for growth, development, and possible relocation to less risky areas, the plan and subsequent development can reduce both the exposure to harm and the potential need to rebuild by creating opportunities to relocate within the Community to areas of greater safety. The development that results from the Downtown plan will generate construction jobs during the building phase and local jobs at retail or commercial establishments after the project(s) are built. Finally, green infrastructure can reduce or eliminate the costs of future stormwater drainage infrastructure by dealing with stormwater on site. The additional tax revenue that can be generated from attractive commercial development and subsequent increase in local spending can also help to justify the project cost.

### **Risk Reduction Analysis**

This Proposed Project will offer suitable areas for relocation of businesses and residents who want to move closer to Downtown and away from the shoreline or other high risk areas. The plan can lead to the development of hundreds of new houses outside of flood risk areas, reducing the risk to the overall housing market in the Community.

### **General Timeframe for Implementation**

This proposed project can be implemented within 24 months of project commencement.

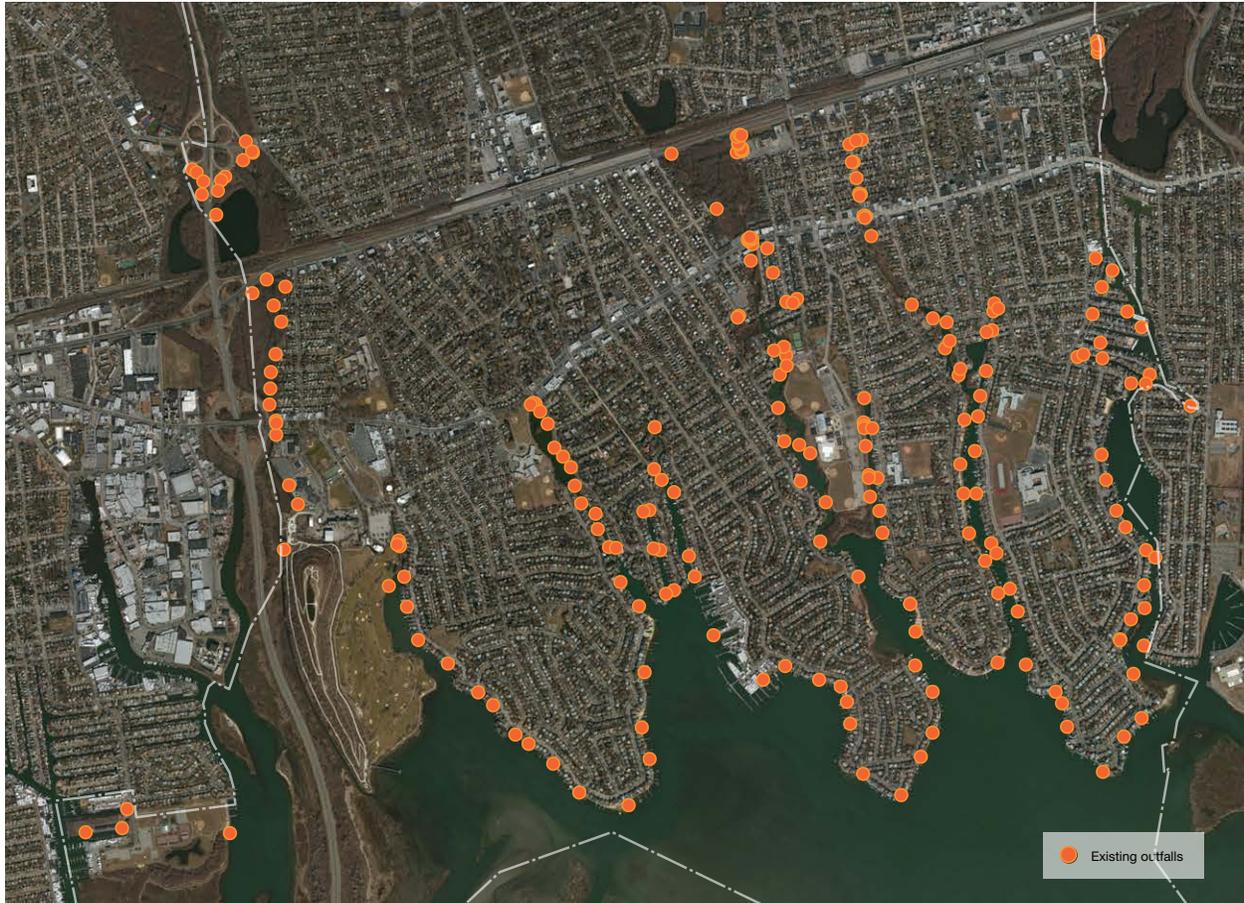
### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

The Town of Hempstead has jurisdiction and permitting approval for property improvement projects in downtown Merrick and Bellmore.

## Proposed Project: Bellmore/Merrick Stormwater Drainage, Outfall, and Bulkhead Repair



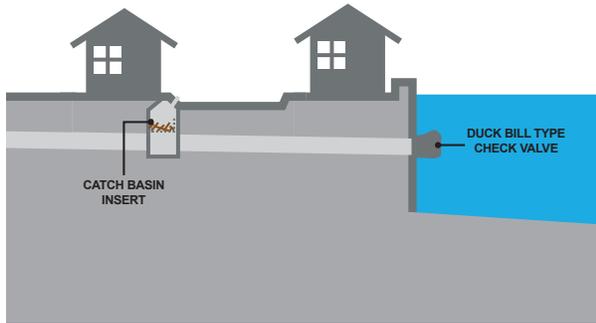
Drainage outfall locations throughout the Community (source: Arup)

South of Merrick Road, the Community is characterized by peninsulas fronting the Merrick and East Bays with several narrow waterways reaching as far north as Merrick Road. The combination of the area's low elevation and high groundwater table has led to a chronic flooding problem. Flooding occurs during rainfall, storm surges, and high tide. During Superstorm Sandy flood waters rose over bulkheads and into neighborhoods, with seawater travelling back up through stormwater drains, bringing with it debris from the bay. During Hurricane Irene flooding due to heavy rainfall overwhelmed the drainage system's capacity.

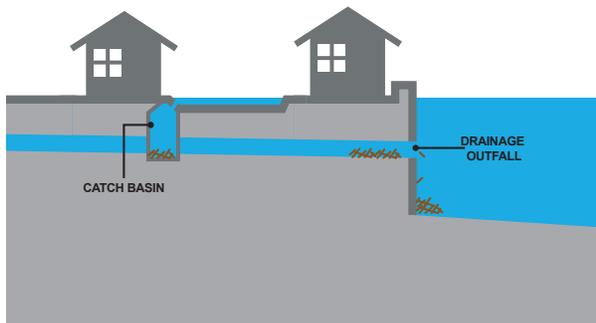
There are approximately 230 drainage outfalls along the coast of the Community that discharge storm water collected upland from impervious surfaces,

such as building roofs and streets, into the bay. Most of these outfalls do not have check valves, therefore creating a direct path for tidal water to inundate the drainage system and cause a reduction in the system's capacity, as well as flood roadways with saltwater upstream of the outfalls.

This project proposes to survey and inspect the location, condition, and elevation of the Community's drainage system south of Merrick Road, including outfalls, related bulkheads, underground pipes, manholes, and catch basins. This information will not only inform the appropriateness of the installation of a check valve, but also help to focus the installation to key locations that will be most effective at mitigating flood risk. Tidal check valves of either the inline pipe type or the slip-on duckbill type will be installed on 25



A check valve at the end of an outfall prevents storm surge of high tides from entering the drainage system. Catchbasin inserts prevent debris accumulation (source: Arup)



Several outfalls do not have check valves, allowing storm surge, high tide, and debris to enter the drainage system (source: Arup)

critical and appropriate outfalls. The chosen outfalls will be the ones deemed most effective for preventing upland flooding.

The project will include four phases, including an area-wide system survey and inspection; an assessment of check valves; check valve installation; and conveyance system cleaning and repair.

- **Phase 1:** Area-wide Survey and Inspection to determine the condition of each outfall along the coastline and any associated bulkheads; a survey and inspection of drainage infrastructure leading upland; and an assessment of the size, type, and location of any check valves that may be present.
- **Phase 2:** Check Valve Assessment will assess and categorize all outfalls in need of improvements.
- **Phase 3:** Check Valve Installation and Conveyance System Cleaning will, based on the Phase Two analysis, install check valves at locations where valves are determined to be an effective method of flood mitigation and where the most critical need exists.
- **Phase 4:** Bulkhead Replacement will replace a limited number of bulkheads owned by the Town of Hempstead (Town) where existing damage would prohibit the upgrade of an outfall and/or installation of check valve.

### Estimated Project Cost

The total estimated cost of this project is \$4,150,000.

### Project Benefits

This area south of Merrick Road is subject to episodic flooding and has a high level of vulnerability during a storm event. The featured project addresses the Infrastructure, Housing, Economic Development, and Natural and Cultural Resources Recovery Support Functions (RSF) and provides risk reduction and resiliency, economic, environmental, and health and social benefits. The Proposed Project will increase the efficiency of the existing drainage system by upgrading stormwater defense in critical areas prone to flooding.



Horace Court in Bellmore, two days after Superstorm Sandy (Source: Larry Eisenstein)

### Risk Reduction and Resiliency Benefits

The addition of tidal check valves and replacement of bulkheads will provide coastal protection during moderate storms, reducing flood risk to assets, including roadways, utilities, and property, as well as residential properties located near outflows. These improvements would offer more reliable performance of infrastructure systems on a day-to-day basis by ensuring adequate drainage of rainfall and preventing the back flow of flood waters during a significant high tide or storm surge. This, in turn, maintains access to the local community, offers greater protection for property in vulnerable areas, and reduces the potential for harm during storm events by reducing the volume and speed of floodwaters should they enter the Community.

### Economic Benefits

By reducing the exposure to flood damage this project will reduce the risk for economic loss associated with rebuilding and repair in future flood events. It also reduces the likelihood that businesses in the area would close by removing the risk for flood damage to both personal and public property and assets. Finally, the project provides an information basis for additional system improvements, better asset management, and reduced future costs associated with deferred maintenance.

### Health and Social Benefits

In addition to reduced flood damages, the benefits include reduced delays in accessing schools, parks, and homes during tidal flooding events or after heavy rainfalls. Local residents, including seniors, will benefit from being able to access critical services on Merrick Road, such as food stores and pharmacies. Health risks related to exposure to contaminated water are reduced.

### Environmental Benefits

Installation of trash/bar screens will have an environmental benefit by reducing the amount of debris reaching bodies of water where it could potentially damage sensitive ecosystems.

### Cost-Benefit Analysis

Stormwater and drainage issues are important to the Committee and Community. There is regular flooding throughout the Community and the current drainage system is directly exposed to both tidal and storm surge inundation events. For a cost of \$4,150,000, this investment will bring the current infrastructure systems into a state of good repair and offer another line of defense against flooding from rainfall, storm surge, or high tide. It also protects Community Assets, both public and private, reducing both the risk of flooding and the potential costs for rebuilding after a major event. The project will reduce flooding to thousands of homes south of Merrick Road in the Community, as well as several parks, schools, marinas, and fire department facilities.

### Risk Reduction Analysis

Because of the low-lying nature of the area and its proximity to water, the risk of flooding is extremely high during regular or extreme weather events, as well as during regular high tides. This project will reduce the risk to thousands of homes south of Merrick Road, as well as the following assets: Nassau County Department of Public Works Garage, Four Towns Fireman's Training Center, Town of Hempstead Department of Sanitation facility, Merrick Road Park, Merrick Golf Course, Merrick Senior Center, Pumping Station (West Merrick), Norman J. Levy Lakeside School, Cammann's Pond County

Park, Whaleneck Marina Center, Blue Water Yacht Club, Open Bay Marina, Club House Marina, CVS, Rite Aid, Trader Joe's, Waldbaum's, Fire Department Station 3 District Office, Newbridge Road Park, and Pumping Station, Shore Road Elementary School, Charles A. Reinhard School, John F. Kennedy High School, East Bay Park, Fire Department Station 2, and South Nassau Hospital Annex. The risk is reduced by repairing bulkheads and closing off outfalls to prevent storm surge or tidal waters from inundating the drainage system and pushing water into Community areas. By reducing or eliminating this possibility, the Community assets in the surrounding area have a higher degree of protection.

### **General Timeframe for Implementation**

This project has the potential for implementation within 24 months of commencement.

### **Regulatory Requirements Related to Project**

This project will require permits and/or coordination with Nassau County, Town of Hempstead, This project may involve coordination and approval from the Town of Hempstead, Nassau County, NYS Department of Environmental Conservation, the U.S. Army Corps of Engineers, and a Coastal Zone Management coastal consistency concurrence from NYS Department of State.

### **Jurisdiction**

The Town of Hempstead Department of Conservation and Waterways, Town of Hempstead Highway Department, and Nassau County Department of Public Works have jurisdiction over this project area. Outfalls are owned by the Town, but many have been built over by private property owners.

## Proposed Project: Southwest Merrick Masterplan and Flood Mitigation Pilot Project

The Town of Hempstead (Town) owns a collection of parcels along the waterfront in Merrick, southwest of Merrick and Clubhouse Roads, totaling approximately 180 acres. These properties are used for a variety of public purposes, and include the Town’s Norman J. Levy Park and Preserve, the Merrick Golf Course, Merrick Senior Center, Merrick Road Park, Four Towns Fireman’s Training Center and its Department of Sanitation. The Department of Sanitation facility is comprised of a waste transfer station, offices, and a vacant structure previously used as an incinerator.

Due to its low elevation and close proximity to the Merrick Bay and Mudd Creek, these sites are subject to regular flooding during storm surges and severe precipitation events. Damage to these sites during Superstorm Sandy was significant. The Town Department of Sanitation Waste Transfer Station was flooded, causing trash to enter the waterways, and the Department’s office, garages, and operations building suffered \$2.8 million in flood damage.

The transfer station, previously deemed an Emergency Operations Center by the Town, was not able to function during Hurricane Irene and Superstorm Sandy. It would have been an effective place to store debris from Superstorm Sandy but flooding from the storm prevented the site from being utilized. Other Town-owned parcels in Southwest Merrick suffered damage during Superstorm Sandy, including \$500,000 of damage to the Senior Center. These Town-owned parcels also suffered heavy flood damage during Hurricane Irene.

The largest single use in this area is the Norman J. Levy Park and Preserve, a nature preserve and recreational area constructed on a former landfill. This landfill is the only area of relatively high elevation, as the remaining parcels are at 4 to 18 feet above sea level. The southern and eastern edges of the site are surrounded by the East Bay, while the western edge adjacent to the preserve is bordered by Mudd Creek, which carries water from the East Meadow Pond to Merrick Bay.

The Norman J. Levy Park and Preserve wetlands provided protection from the Superstorm Sandy storm surge, but were damaged in the process. The shoreline of the Merrick Golf Course was similarly damaged. Merrick Road, an emergency evacuation



The Town of Hempstead owns a collection of parcels along the waterfront in Merrick that are subject to regular flooding from storm surge and precipitation events (source: Arup)

route, was severely flooded, preventing access to the Meadowbrook State Parkway. Additionally, inundation caused petroleum from an adjacent gas station on Merrick Road to spill into the area.

Phase 1 of this project includes the creation of a comprehensive Masterplan to re-envision the functions and use of these Town parcels as a showcase of resilient planning along the waterfront. Key Masterplan concepts include:

- Repositioning buildings and outdoor amenities within the site to increase their resiliency, as well as reduce flood risk to Merrick Road.

- Identifying resilience-related upgrades to recreational facilities, golf courses and Preserves.
- Green infrastructure measures, including enhanced wetlands, marsh nourishment or other natural barriers along the shoreline.
- New open space and recreational opportunities, including expanding the already popular Norman J. Levy Park and Preserve.
- Evaluation and inclusion of future Town and Department of Sanitation needs for the site.

Following the Masterplan development phase, a pilot project which provides flood mitigation to the site and to Merrick Road will be designed and constructed. The pilot project will employ green infrastructure measures, such as wetlands restoration, which was identified by the initial green infrastructure opportunities assessment as a potential feasible location.

### Estimated Project Cost

This Proposed Project will cost an estimated \$2,400,000 to implement. Phase 1 is estimated to cost \$250,000; the green infrastructure pilot project is estimated to cost \$2,150,000.

### Project Benefits

#### Risk Reduction and Resiliency Benefits

With the incorporation of green infrastructure, as well as resilient site planning and building techniques, the vulnerability of the site's many public assets to flooding and contamination is reduced. In addition, these resiliency measures within the site will also reduce the risk of flooding to the adjacent segment of Merrick Road – a key access point to the Meadowbrook Parkway evacuation route.

#### Economic Benefits

By reducing the risk of flooding to these key public assets, the Town will see an economic benefit associated with reduced future expenditures for repairing and replacing these important structures. Redevelopment of this site as a showcase for resilient planning and design, with the implementation of modern, enhanced, open spaces and community



The Town of Hempstead Department of Sanitation facility was badly damaged by Superstorm Sandy, causing service disruptions and environmental damage to the East Bay (source: Merrick Patch)



View of Merrick Golf Course from Norman P. Levy Preserve (Source: Charles Brown)

amenities, has the potential to improve residential and commercial property values, thereby increasing property tax revenues. The Town will also benefit from the ability to keep the Department of Sanitation facility at this site and avoid the difficulties associated with truck traffic and aesthetic concerns which would arise from relocating the facility.

#### Health and Social Benefits

Reduced flood risk will increase the overall attractiveness of the site as both a passive and active recreational asset in the Community. This will encourage more social interaction and Community understanding of the value of parks and open spaces. In

In addition, reduced flooding of nearby roads will enable better disaster management, response, and recovery, improving public health and safety in the process. By reducing the amount of standing water on adjacent roadways, such as Merrick Road, this project will also improve traffic safety and minimize road congestion, which in turn affects travel times and vehicle operating costs. Enhancing the resiliency of the Merrick Senior Center will provide educational, social, and recreational benefit for a vulnerable segment of the population.

Protection of the Town Department of Sanitation facility will allow the facility to operate to its intended purpose as an Emergency Operations Center, which benefits the health of local residents following a disaster.

#### **Environmental Benefits**

Incorporating resiliency measures at the Town Department of Sanitation facility will limit environmental damage caused when trash, debris, and environmental pollutants are washed from the facility into the East Bay. By employing green infrastructure methods for flood prevention, the site's community value will be maintained and enhanced. By diverting or delaying stormwater from entering the drainage system, green infrastructure helps protect Community Assets, homes, and businesses from flooding. It also provides numerous co-benefits, including groundwater recharging, pollutant reduction in bays and wetlands, aesthetics, air quality improvements, and improved comfort in summer months.

#### **Cost-Benefit Analysis**

The proposed Masterplan and green infrastructure improvements at the site would cost approximately \$2,400,000. The investment for this study and capital improvements is low relative to the significant benefits of improved resiliency at this critical site. Protecting important assets like the Town Department of Sanitation facility, which is a designated Emergency Operations Center, is critical to proper functioning of the Town's waste removal system.

#### **Risk Reduction Analysis**

The project site lies entirely within extreme and high risk areas and is therefore highly vulnerable to storm events. This project will help protect Merrick Road, which provides important access to the Meadowbrook Parkway evacuation route, from future flooding. In addition, risk to Community Assets will be reduced, including Merrick Golf Course, Merrick Senior Center, Merrick Road Park, Four Towns Fireman's Training Center, and the Town Department of Sanitation facility, comprised of a waste transfer station, offices, and a vacant structure previously used as an incinerator. It will also reduce environmental risk by enhancing Norman J. Levy Park and Preserve and increasing flood protections for the Town waste transfer station and private Mobil and BP gas stations on Merrick Road.

#### **General Timeframe for Implementation**

This project has the potential for implementation within 36 months of commencement.

#### **Regulatory Requirements Related to Project**

The project will require permits and/or coordination with Nassau County, Town of Hempstead, and New York State Department of Environmental Conservation (NYS DEC). This will also involve the USACE and NYS DOS. Coastal Consistency approval may be required for any activity within the Coastal Zone.

#### **Jurisdiction**

The Town of Hempstead has jurisdiction within the project area. Nassau County has jurisdiction over Merrick Road.

## Proposed Project: Meadowbrook Corridor Stormwater System Modeling, Analysis, and Pilot

The “Meadowbrook Corridor” is a large tributary system running south from Westbury to the Hempstead’s Middle Bay and Merrick Bay. The Corridor tributaries and system of retention ponds were originally part of the Brooklyn Water Works reservoir system, which was a water conveyance system built to provide drinking water to the rapidly growing New York City Borough of Brooklyn. Today, the corridor conveys stormwater from the Freeport Creek watershed out to the South Shore Estuary. The Corridor is divided by the Meadowbrook State Parkway’s elevated roadway, which also serves as the border between the hamlet of Merrick and the Village of Freeport. It is a Nassau County-designated evacuation route serving the Community and the barrier islands. There are more than 200 stormwater outfalls draining into the Meadowbrook Corridor and sensitive tidal wetlands.

Due to its low elevation and connection with the bay, the Corridor is vulnerable to flooding from storm surges. The high number of stormwater outfalls combined with runoff from the Meadowbrook State Parkway leads to severe flooding. During and after Superstorm Sandy, South Freeport, Merrick, and Bellmore residents were restricted from using Merrick Road where it meets the Parkway when Merrick Road received floodwaters from the Corridor. In addition, on the Freeport-side of the Corridor, the storm surge and the stormwater runoff converged between Sunrise Highway and Merrick Road, exacerbating flood damages in the area.

The area is very low lying (2-4 ft.) above the water table, and the soil types are mainly Udipsammments wet substratum, Ipswich mucky peat, Udorthents, refuse substratum at south end and Atsion loamy sand at the north end. Within the Corridor, the East Meadow Brook to the north of Freeport and Merrick is polluted with pathogens from urban and stormwater runoff. The Freeport Reservoir and East Meadow Pond, located in Freeport and Merrick, respectively, are polluted with chlordanes from contaminated sediments, which are currently carried into the Merrick Bay.

Information about the existing stormwater infrastructure within the Freeport Creek Watershed is limited and a better understanding of how surface and subsurface water moves through the area will be used to provide insight into the most effective water



The Meadowbrook Corridor area (source: Arup)

management solutions along the Corridor. This project, therefore, includes both a comprehensive analysis of the existing system, as well as the identification and implementation of five pilot projects using “green infrastructure” methods to help mitigate flood risk and improve water quality.

The project includes the following phases:

**Phase 1:** The location of the Meadowbrook Corridor and Freeport Creek Watershed requires coordination across several jurisdictions and with numerous stakeholders. An initial phase of key stakeholder meetings will be used to collect and collate existing drainage sets from Nassau County, the Village

of Freeport, the Town of Hempstead, and the New York State Department of Transportation (NYS DOT). Other stakeholders may include the New York State Department of Environmental Conservation and Department of State, as well as the Town of North Hempstead.

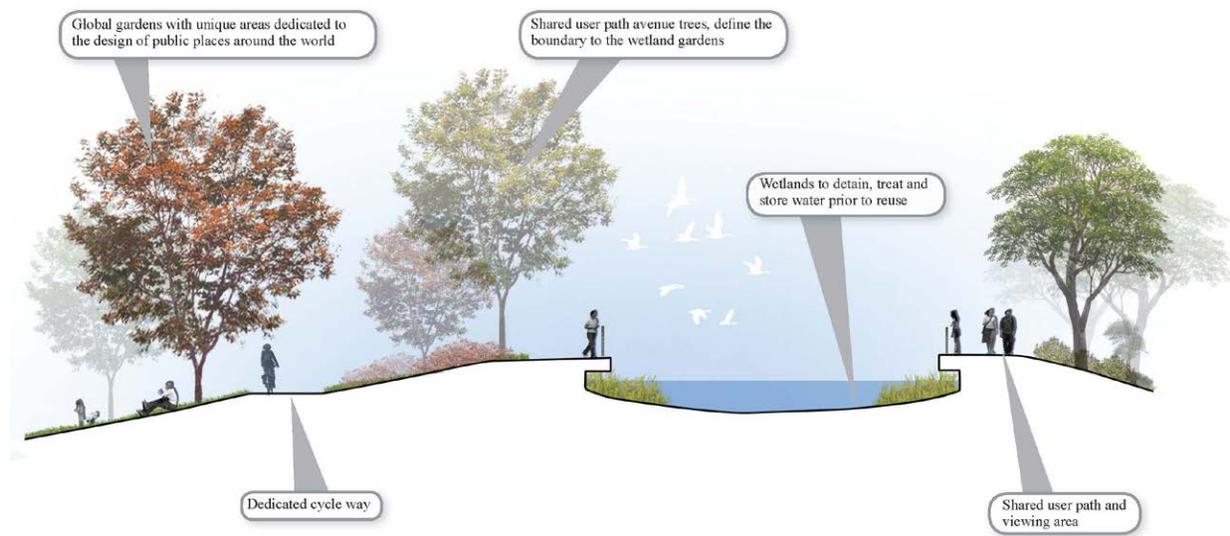
**Phase 2:** This phase includes gathering data on the existing stormwater system within the Freeport Creek Watershed and the development of a hydrologic and hydraulic (“H&H”) model to provide a detailed picture of where runoff is coming from, how much there is, whether the current system has adequate capacity, and what improvements could be made.

A proportion of the drainage will be surveyed to inform the model. The survey will include manhole inspections and connectivity surveys to give level, size, line, and condition of the pipes. The survey assumptions include one manhole every 300 feet, a drainage length of 195,288 feet, and 651 manholes. The build and verification of an integrated catchment model will be undertaken to determine the contributors to flooding as well as the most appropriate solutions

and the outfalls with the greatest discharges into the impaired bodies of water. Using the latest high-resolution LiDAR (Light Detection and Ranging) data of the ground surface available, this stage will involve processing the data, building, and calibrating the model, as well as installing and collecting data from four stream gauges.

This model will be capable of:

- Determining the causes of localized flooding issues across the catchment and identifying measures to prevent the flooding.
- Determining which outfalls are contributing the most urban stormwater runoff to the impaired watercourses, lakes, and estuaries and identifying outfalls for the implementation of green infrastructure to reduce and treat stormwater runoff.
- Locating green infrastructure solutions to provide the most effective investment to reduce surface water flooding.



Example of resilient park design, including green infrastructure for stormwater management (source: Arup)

Following development of the model, it will be used, in combination with a GIS mapping study of the physical ground conditions, to determine the most appropriate location for green infrastructure in order to maximize water retention, infiltration, and additional water quality benefits as well as select the most appropriate green infrastructure solutions for the various sites.

**Phase 3:** Upon completion of the model and corresponding analysis, pilot projects will be conducted to explore various methods of managing and treating stormwater runoff. A few pilot projects have been conceived though an initial assessment of existing conditions and issues and, contingent upon verification of benefits using the H&H model, will involve the following five interventions:

- Regenerative storm conveyance retrofits at five locations within Merrick: This involves moving the storm drainage outfalls further away from the road and constructing a staggered regenerative storm conveyance system that retains and cleans storm water. The following outfall retrofits have been identified:
  - Babylon Turnpike: 180 foot long conveyance system;
  - Webster Avenue: 93 foot long conveyance system;
  - Camp Avenue: 99 foot long conveyance system;
  - Michalicki Place: 171 foot long bioswale along one side of the highway with three crossing points for driveways and a 158 foot conveyance system; and,
  - Reid Avenue: 274 foot long bioswale along one side of the highway with three crossing points for driveways and a 108 foot conveyance system.
- Creek Restoration: This project entails reconnecting the creek with the natural floodplain using a wetland seepage regime to reduce wet-weather velocities, prevent further erosion, and improve flood plain wetland area. The restoration will involve filling the incised channel (5,250 feet long) with sand and gravel



An example of a soft landscape treatment (source: Arup)

to raise the stream bed elevation, as well as constructing a series of shallow pools and riffle grade weir controls to encourage seepage.

- East Meadow Pond Drainage Study: This study will seek to understand the capacity of the two East Meadow ponds and the operation of existing flow controls at the outlets of the ponds. Additionally, it will investigate whether any drain down regimes can be implemented at the ponds to prevent flooding in these areas.
- East Meadow Pond Floating Wetlands Restoration: Restoration of wetland along Meadowbrook Parkway Pilot: This pilot project will demonstrate the ability of a modular floating wetlands system to both remove excess nutrients from the pond, which are deposited by stormwater runoff, and improve the aesthetic quality of the pond.
- Freeport Creek Day-lighting Study: Freeport Creek currently runs through a culvert under industrial and retail properties between East Meadow Pond and Mill Road for a length of one-half mile. This study will assess whether day-lighting the creek is feasible and assess the costs and benefits of this project.

This project will be shared with the NYRCR Freeport Community, which is located to the west of the Meadowbrook Parkway corridor and is within a portion of the Freeport Creek Watershed. It will be funded in partnership with NYRCR Freeport.

## Estimated Project Cost

The total project cost will be approximately \$2.5 million. However, the cost would be shared with neighboring NYRCR Freeport; given the weighting of benefits toward Merrick, will cost the Community an estimated \$1,800,000.

## Project Benefits

### Risk Reduction & Resiliency Benefits

This project will yield several risk reduction benefits for the NYRCR Bellmore/Merrick and Freeport Communities and the natural environment. As noted, the volume of upstream stormwater that drains through the area exacerbates flooding issues. Through the proposed improvements, stormwater runoff will be better managed in the vicinity of the Communities and subsequently reduce the risk of flooding impacts for adjacent property owners. Flooding in these areas also impacted Merrick Road and Sunrise Highway during Hurricane Irene and Superstorm Sandy. Reducing stormwater runoff impacts will also reduce the risk that Merrick Road and Sunrise Highway will become impassable during and after future storms and flooding events. This benefits residents and businesses owners who rely on these roads to access goods and services, primarily through access to the Meadowbrook Parkway, which is a regional gateway for freight deliveries and emergency services.

### Economic Benefits

Owners of businesses adjacent to the corridor will benefit from reduced recovery costs following future flooding events. The model that will be constructed will provide future cost-savings benefits to the Village of Freeport and the Town of Hempstead, as it can guide agencies toward projects that are more cost-effective, resilient, and co-beneficial, such those that increase recreational space and add new green spaces to commercial areas.

### Health and Social Benefits

Through reducing the impacts of stormwater runoff, the Proposed Project will enable emergency and disaster response resources to be allocated to other



An example of a previously industrial landscape, restored to a natural setting (source: Arup)

areas in future storm and flooding events. In addition, the improvements can decrease flood damages and increase the aesthetic value of existing green spaces. The improvements can create an opportunity in the future to develop pedestrian and bicycle paths along the Meadowbrook Corridor, increasing property values for residents and businesses. Flooding impacts can also be reduced at the ball fields owned by Freeport School District. Finally, socially vulnerable populations living at the Moxie Rigby Apartments will also benefit from reduced occurrence and severity of flooding impacts.

### Environmental Benefits

The proposed project will create a system to retain stormwater within the Meadowbrook Corridor so that it can be filtered before it enters the South Shore Estuary. The Estuary will benefit through improved water quality and, subsequently, ecosystem health. The Creek Restoration pilot project will improve the quality of wetlands and restore a portion of the natural systems, which have been heavily damaged. Bird, fish, and other fauna, as well as several floras, will benefit from the restoration. air quality, emission reduction, and air temperature benefits may also be realized by expanding green space and reducing the use of hard infrastructure,. Finally, the proposed model can help demonstrate the value of green infrastructure solutions, furthering the justification for improvements to the natural environment in the future.



Localized flooding at Meadowbrook Parkway in August 14, 2011 (Source: Merrick Patch)

### Cost-Benefit Analysis

Modeling and analysis is necessary to help identify and focus solutions for stormwater management, which include initiatives for capital projects, updated maintenance requirements, regulatory improvements, public awareness programs, and other property owner assistance measures. These initiatives will improve the functionality of the stormwater system and reduce flooding issues in the region, reducing damage to buildings due to flooding and increasing the chance that buildings will remain habitable.

This project will improve access to critical assets and facilities during storms, as well as improving access for fast and safe evacuation. By reducing the amount of standing water on roadways, vehicle operation becomes safer during all types of inclement weather and road congestion will be reduced. During major storms, improved drainage will increase the amount of time that roads are available to emergency services at the storm's outset, as well as help return a flooded road to service more quickly.

Green infrastructure projects will help to clean stormwater before it reaches the estuary, reducing pollution effects on wetlands that, when healthy, provide a natural barrier, helping to filter stormwater and attenuate storm surge. Additional benefits of green infrastructure projects include localized air quality improvements, habitat restoration, aesthetic improvements, and potential savings of capital and maintenance costs in expensive, traditional infrastructure improvements.

### Risk Reduction Analysis

Hurricane Irene and Superstorm Sandy brought the various causes of flooding and flood damage to the attention of the Communities. NYRCR Freeport and NYRCR Bellmore/Merrick now understand that they can improve the way stormwater runoff from upstream areas is managed in order to more effectively protect their Communities from flood risk. These initiatives will increase the capacity of the stormwater system and reduce flooding issues in the region. This reduces risk to population and private and natural assets. The various components of the Proposed Project will help reduce the risks of flooding to homes, businesses, parks and open spaces, civic institutions, and infrastructure systems. The ability to keep roads operating under more severe circumstances in the future will also enable more effective disaster management, response, and recovery, reducing the risks to public health and safety in the Communities.

### General Timeframe for Completion

The implementation of this project will take approximately 24 months from commencement.

### Regulatory Requirements Related to the Project

Coordination on approvals and permits will be required with NYS DOT and Nassau County Department of Public Works. This will also involve the NYS DEC, USACE, and NYS DOS. Coastal Consistency approval may be required for any activity within the Coastal Zone.

### Jurisdiction

The majority of drainage is under the jurisdiction of the Town of Hempstead, NYS DOT, and the Village of Freeport.

## Proposed Project: Bellmore/Merrick Community Assistance Centers



A artist's impression of a library retrofit to function as a Community Assistance Center (charging stations and emergency alert monitors) (source: Arup)

Following Superstorm Sandy, Community residents were without power for extended periods, making it difficult to access the internet, make phone calls, communicate about distributing aid, and gather with their neighbors for support. Many residents cited the need for more access to education information on how to prepare for storm events.

This project proposes to establish two Community Assistance Centers (CACs) as places that can provide residents with assistance before and after storms. Under normal conditions, residents will be able to gather information about emergency preparedness. After a storm, these CACs will become a place to gather, collect, and distribute resources, including emergency supplies (not funded by this project) and access to electricity and the Internet.

This project will include the installation of an emergency backup generator, additional electricity outlets, wireless internet access, and electronic dynamic signage at each location. The electronic dynamic signage will provide status updates in the community and updates for emergency management, as well as listing resources available at the CACs. Finally, this project proposes the employment of a Local Disaster Recovery Manager, working 20 hours per week for the Town of Hempstead or Nassau County. When combined with other Nassau County NYRCR Communities, this could result in one to two full time staff.



Merrick Library (Source: Arup)



The Bellmore Memorial Library (Source: Arup)

Responsibilities of the Local Disaster Recovery Manager (LDRM) are defined as:

- Develop a Resiliency Education Program that provides preparedness training sessions geared towards businesses and Community members.
- Provide yearly workshops to the Community on what types of assistance will and will not be available in pre-disaster and post-disaster phases.
- Ensure all information is accessible and understandable to all residents (including bilingual materials).
- Establish a list of resiliency features to be added to CACs (features not funded by this project, except for natural gas generators).
- Install one natural gas generator at each CAC location. The project cost estimate assumes 100 kW capacities at each location.

The Merrick and Bellmore libraries were chosen as likely locations because they are outside of high or extreme risk areas and are centrally located near the Sunrise Highway and their respective LIRR stations.

### **Estimated Project Cost**

The total estimate project cost is \$1,265,000.

### **Project Benefits**

This proposed project seeks to establish locations within the Community for residents to learn about disaster preparation and response, as well as obtain resources and information after a future disaster. This project addresses the Recovery Support Functions (RSF) of Community Planning and Capacity Building, Health and Social Services, and Infrastructure.

#### **Risk Reduction and Resiliency Benefits**

The installation of natural gas generators with battery backup reduces the risk of power failure, providing resiliency and continuity benefits to the CACs.

#### **Economic Benefits**

The project provides an economic benefit by reducing disaster relief and recovery costs through utilization of Federal- and State-level public grants for preparation costs, as well as creating full-time positions through the creation of the LDRM positions.

#### **Health, Social and Public Safety Services**

Many residents at Public Engagement Events cited the need for improved access to information about happenings in the region as well as improved connectivity to family and friends. The CACs address urgent human needs after a major storm event by providing information and communication support

within local areas. The CACs will provide a year-round educational benefit by increasing the Community's access to, and understanding of, emergency procedures and responsibilities. After an event, each CAC will directly provide basic health and social services, including food, water, electricity, and communication services. Dynamic signage will provide updates and information, keeping the public informed. In turn, people whose basic needs are met will be able to turn their attention to recovery, using information and communication services available at the Centers to minimize time needed to rebound from a storm event. This project will also reduce the risk of power loss by equipping each Center with a backup generator.

Socially vulnerable populations will benefit from the employment of the LDRM, who will ensure that all residents, despite English literacy, reduced mobility, or diminished ability, understand disaster preparation and recovery protocols. In addition, these residents, who may be more likely to have insufficient access to post-disaster comforts and necessities, will have these resources available in the Community.

### **Cost-Benefit Analysis**

The funding for this project provides an opportunity for people who are in the local areas – storm-affected or not – to learn how to be prepared before, and how to respond during and after, an event. Greater awareness of preparedness, as well as a response plan for every home or business in the local area, ensures people are ready to act when a storm is approaching. People are more informed by the community education programs supported by the CAC. This helps build support for following directives from local, State, and Federal officials. It also reduces the possibility that Community members will not know what to do and, therefore, stay behind.

After an event, it provides a one-stop-shop to get information about important matters, such as the suitability of drinking water and the availability of power, fuel, food, and medicines. This helps protect the health and well-being of people in the area after an event occurs. In the case of a significant event, such as Superstorm Sandy, it also offers the opportunity for Community needs to be communicated to support functions outside the area in the event clean

drinking water, medications, food, or other supplies are needed locally. The CACs can tabulate the needs and issue requests for support to the local areas.

This project cultivates preparedness in the local area and allows a more informed population to take appropriate actions before and after events occur. The benefits of a more informed Community and the potential for this information to prevent injury, illness, or loss of life justify the cost of the project.

### **Risk Reduction Analysis**

Lack of information was cited as a major issue in the Community and a problem requiring a response in this NYRCR Plan. The educational programming associated with this project reduces risks by creating a more educated and prepared public. Preparation before a crisis occurs ensures people will be more likely to respond appropriately when a disaster occurs. On a day-to-day level, the CAC can distribute information about preparedness.

If downed communication lines or loss of power restricts access to television, radio, or the Internet during or after a storm event there is currently no method of informing Community members of appropriate actions or activities to undertake. A CAC can be an information clearinghouse, providing information to the local population so they can make informed and safe choices. It also provides an opportunity for local populations to communicate news and needs outward to friends, family, and support organizations. The CACs can offer information about health and safety risks and approved repopulation zones, as well as dispense necessary supplies and provide communication links between local populations and family or friends further away. This reduces the risk that people will enter into hazardous areas or undertake activities, such as drinking unsafe water or entering a home, before knowing whether it is safe to do so.

### **General Timeframe for Implementation**

The implementation of this project will take approximately 24 months from commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory approvals required for this project, however, consent to use the Bellmore and Merrick Libraries as CACs will be required.

### **Jurisdiction**

Coordination with Nassau County OEM will also be required to ensure consistency of information and that post-disaster responsibilities are complementary and not duplicated and to dispatch appropriate agencies to each CAC after a disaster. The Merrick and Bellmore School Districts have jurisdiction of each of their respective libraries, however, each library independently maintains and operates its respective facility.

## Proposed Project: Public Communication and Education Gap Analysis

Currently, Nassau County Office of Emergency Management (OEM) coordinates all Federal, State, and local agencies to create and implement an Emergency Operations Plan. OEM identifies vulnerabilities, mitigates disasters, provides public education, responds to all-hazard emergencies, and protects Nassau County's first responders. Nassau County has identified enhanced communication and education as ongoing needs critical to its ability to respond effectively during a storm event.

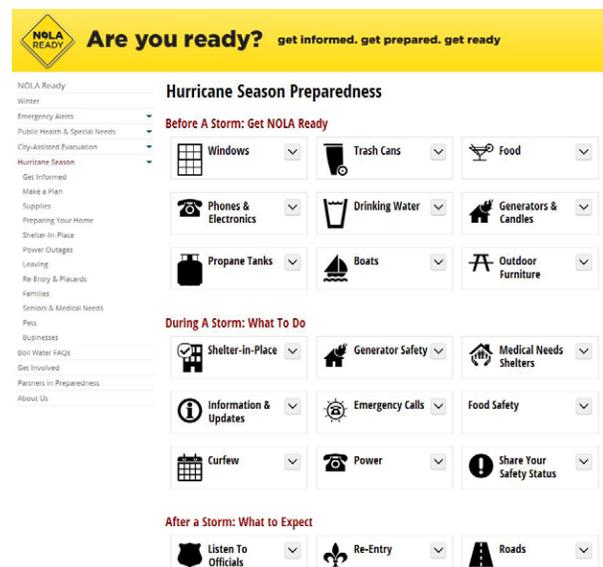
Despite warnings and orders from OEM before Superstorm Sandy, many residents did not understand the severity of the storm and were unable to evacuate after conditions became unsafe. According to members of the Community, this resulted in a number of emergency distress calls to local police and fire departments, putting themselves and emergency responders at risk. Many residents were also unsure how to access emergency information. Following the storm, power outages and lack of cell phone service left residents unable to communicate with friends and family members and without the means to find emergency resource information. Even those with power stated they did know of a central place to go online to share or find out about available emergency supplies in their communities.

This project will study Nassau County's existing emergency management efforts to identify opportunities to create a single, user-friendly source for comprehensive emergency assistance information collected from a variety of public agencies. It will identify gaps in the existing communication network and recommend ways to increase the effectiveness of local government, emergency management agencies, residents, businesses, and faith-based groups, as well as non-profit organizations that direct aid and recovery efforts to the Community's residents, including socially vulnerable populations.

This project will evaluate existing emergency communication systems and determine additional needs, with an emphasis on coordination across multiple jurisdictions, allowing Community members to communicate with each other, as well as providing emergency readiness education. This initial study will provide recommendations for addressing gaps

in communication and education and will identify potential public/private partnerships to implement the study's recommendations.

A next phase of work, not funded by this project, will need to establish a centralized location, such as a website, with consistent "branding" to make disaster information identifiable, as well as regular updates to keep information current. A further phase of work will



The City of New Orleans' "NOLA Ready" hurricane preparedness portal (Source: [www.nola.gov/ready](http://www.nola.gov/ready))



"Prepare SoCal" is a public awareness campaign to prepare Southern California for major earthquakes (Source: [www.preparesocal.org](http://www.preparesocal.org))

need to include the creation of an educational component, using the website to promote educational seminars on disaster planning.

### **Estimated Project Cost**

This project has also been proposed in the neighboring NYRCR Communities of Baldwin, Freeport, Seaford/Wantagh, and Massapequa. The approximate total project cost is \$100,000, with an estimated contribution of \$20,000 by the NYRCR Bellmore/Merrick Community.

### **Project Benefits**

This project, which addresses the Community Planning and Capacity Building Recovery Support Functions (RSFs), will allow emergency response agencies to coordinate efforts before, during, and after storm events, focusing resources to the areas of greatest need. Implementation of the project will improve access to emergency preparedness information for all Community residents and businesses.

### **Risk Reduction & Resiliency Benefits**

The benefits of a well-prepared Community include reduced risk of physical damage from storm events, less social strain on the Community during and following disasters, and reduced risk of injury or death.

### **Economic Benefits**

Post-disaster claims for financial assistance from State and Federal programs may be reduced if homes are retrofitted appropriately and if people are safe from harm because they know when, where, and how to evacuate.

### **Health and Social Benefits**

Knowledge and understanding of emergency procedures, responsibilities, and resources will be increased across the Community. An enhanced website that allows Community members, local organizations, and governmental agencies to communicate with each other will benefit disaster recovery and aid efforts, while enhancing social connections at a time when they are needed the most.

### **Environmental Benefits**

Better awareness and information on how to properly securing personal property, including fuel tanks, household paint, and other toxic chemicals, prior to a storm provides environmental benefits by reducing the volume of harmful toxins entering the water during a flooding event.

### **Cost-Benefit Analysis**

The project identifies and addresses gaps in communication and education needs to better prepare the community for emergencies. It also helps the Community react quickly and appropriately to notices, warnings, and orders, reducing the potential for property damage as well as the potential for injury or death. This project represents a low investment of capital that would benefit the entire Community. Given the high costs associated with damage to homes and property, and medical costs associated with injury or death, better emergency preparedness equates to a savings for community members and municipalities.

### **Risk Reduction**

Risk to populations will be reduced by increasing access to educational materials and improving knowledge of emergency procedures and resources. Risk to vulnerable populations will be reduced, as emergency response agencies will be better able to focus resources to the areas of greatest need. Population health risks will be reduced as public access to up-to-date information on hazardous conditions is improved.

### **General Timeframe for Implementation**

The implementation of this project will take approximately 24 months from commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

Nassau County Office of Emergency Management

## Proposed Project: Business Continuity Program

Superstorm Sandy significantly impacted Community businesses; some were flooded and suffered substantial physical damage, while others were indirectly effected by public misperception that businesses were closed when they were, in fact, open. Working hours were reduced in many cases, causing financial hardship to employees.

According to data from the U.S. Small Business Administration (SBA), 105 Community businesses, representing 314 employees, applied for disaster management assistance after Superstorm Sandy. These applications verified a total of \$7.5 million in real property damage, \$1.2 million of machinery damage, an inventory loss of \$409,722, and a leaseholder improvement loss of \$554,485. Of these applications, only 37 (35.2%) were approved for an amount totaling just over \$7.1 million, roughly three quarters of the \$9.6 million in verified damage assistance applied for by the Community.

According to testimony received from Committee Co-Chairs and Members and from business owners at the Public Engagement Events, some businesses did not back up their files or were not able to access and forward phone calls in order to quickly return to business activities after Superstorm Sandy, leading to increased loss of business. Challenges in the aftermath of the storm, such as the lack of power and communications, displaced workers, fuel shortages, and a lack of access to inventory, compounded recovery challenges. Initial repairs were paid for out-of-pocket using credit cards, family loans, and personal savings. Operating losses have continued long after reopening due to loss of customers and incomplete repairs. Because of delays in access to recovery funding, most businesses are not incorporating flood mitigation elements into their repairs.

Business continuity planning ensures that businesses have the capability to maintain essential functions during a range of potential emergencies and could be implemented immediately. The assistance provided by a Business Continuity Program would include planning assistance, access to alternative spaces or facilities, communications provisions, and provisions for vital record backup and management. At the base of this program is the creation of a part-time business continuity facilitator responsible for educating the local business community in south



CVS Pharmacy on Merrick Road, which abuts Meroke Preserve, had extensive interior damage from Superstorm Sandy (source: Neil Yeoman)



The Dakota Design Center building on Merrick Road has been vacant since Superstorm Sandy (source: Joe Baker)

shore Nassau County on crisis preparedness and management, organizational structure, and policies and procedures, as well as the following roles and responsibilities:

- Educational sessions for the business community;
- Creation of a Risk Assessment Checklist and audit assistance;
- Individualized business continuity plan assistance; and
- Maintenance and monitoring through annual exercises and continuous improvements.

The program proposes working with Adelphi University and the Business Continuity Institute to lead training sessions for local business owners. Through ongoing coordination with local Chambers of Commerce and/or related business organizations, the Business Continuity Program facilitator would help small businesses to create their own plans for continuing operations under adverse conditions, such as a major storm, as well as being responsible for identifying and assisting in the pursuit of future funding opportunities. The Program will help business owners identify their backup power needs in advance of an emergency, which will allow owners to procure emergency power generation supplies.

### **Estimated Project Cost**

This project has also been proposed in the neighboring NYRCR Communities of Baldwin, Freeport, Seaford/Wantagh, and Massapequas. The approximate total project cost is \$200,000, with an estimated contribution of \$40,000 by NYRCR Bellmore/Merrick Community.

### **Project Benefits**

This project addresses the Economic Recovery Support Function (RSF). Given this is a shared project across multiple NYRCR areas, the Community get the full benefits of the program at a lower level of cost than if the project were undertaken solely in the direction of the Community.

### **Economic Benefits**

The Community's commercial sector is largely comprised of retail businesses. When these businesses close, even for a short period of time, it is disruptive to the local economy and affects wholesalers and other businesses in the supply chain. Loss in sales across a number of businesses can lead to considerable lost sales tax revenue for Nassau County. Employees may lose wages or even their jobs. In addition, better preparedness and education can lead to a reduction in post-disaster business claims for financial assistance from state and federal programs.

For many Community business owners, damage caused by Superstorm Sandy was a serious financial burden, one that owners could not rebound from if

it happened again. A business continuity plan would assist business owners in knowing what the best resiliency-related investments would be and how to plan for their future. Program staff would also help to connect business owners to grants, incentives, and other funding sources, helping to strengthen the local economy.

### **Health and Social Benefits**

Businesses such as supermarkets, drug stores, and gas stations are essential to the Community for the supply of food, medicines, and fuel on a day-to-day basis. If these essential Community businesses cannot reopen quickly enough after a storm, the Community can be severely affected. The impacts are even more severe for the local senior population and those without access to a car, who may have more difficulty in traveling a farther distance to get prescriptions or food.

### **Environmental Benefits**

For businesses that handle environmentally hazardous material, flooding can cause widespread environmental damage. Better education about the risks of flooding and how to plan for storm events can help to prevent this type of environmental damage from occurring by helping business owners adapt their operations to store and operate hazardous materials in a manner that removes the risk of contaminating floodwaters.

### **Cost-Benefit Analysis**

Given this is a shared and programmatic project, the costs are relatively low at \$40,000, yet the benefits can be tremendous in getting businesses back in operation faster after a storm event. Benefits are realized when business owners understand and mitigate against risks their businesses may present to local areas should flood waters intrude the property or building, such as securing fuel tanks, raising sensitive chemicals to higher floors, or dry or wet flood proofing their operation.

Furthermore, the revenue losses to local, State, and Federal governments when businesses are closed, even temporarily, are significant. The benefit of

educating businesses to better prepare for storm events, thereby reducing closure times and lost business revenue, far outweighs program costs.

### **Risk Reduction Analysis**

Ensuring a stable economic base reduces the risk of loss of jobs and loss of identity along commercial corridors.

### **General Timeframe for Implementation**

The implementation of this project will take approximately 24 months from commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

None.

## Proposed Project: Key Intersection Streetlight Retrofit

The NYRCR Bellmore/Merrick Community (Community) seeks to strengthen evacuation, transportation, circulation, and safety in case of another major disaster. Following Superstorm Sandy, Community residents were without power for up to 16 days, which also impacted many of the local streetlights, leaving many areas in complete darkness. The lack of functioning streetlights was reported to be a safety hazard by Community members and negatively impacted first responders' ability to carry out their duties. Resilient streetlights, powered independently and with battery backup, can provide the Community with a source of light that improves the safety of those traveling within the neighborhood by car or by foot.

Streetlights in the Community are predominantly mounted on utility poles. Freestanding streetlights in the Community, such as those along parts of Merrick Road, are maintained by the Town of Hempstead. The pilot project proposes to retrofit streetlights on existing streetlight poles at 60 key intersections with LED lights that include a solar photovoltaic (PV) panel and battery backup. To sufficiently light 60 intersections, the project assumes the installation of 480 kits, which include a LED light, PV panel, and battery.

Backup batteries for these units can typically store enough energy to function for three days. It is hoped that future power outages will not last this long, given the new power generation, distribution protections, and revised response capacities being put into place by utility providers as a result of Superstorm Sandy. If future undergrounding of utility lines occurs and new separate streetlights are installed, the LED/PV streetlight heads could be relocated to other parts of the Community.

### Estimated Project Cost

The total estimated project cost is \$4,630,000.

### Project Benefits

This project will improve public safety at night for emergency responders, officials, residents, and businesses who may require access to shelter, supplies, or assistance after a storm event – be it a hurricane, wind storm, major rainfall, or winter weather



Installation of a solar and wind powered streetlight in Blandensburg, MD (source: flickr.com - thisisbossi)

event. This project addresses the Recovery Support Functions of Infrastructure, Community Planning and Capacity Building, and Health and Social Services.

### Economic Benefits

This project reduces government expenditures by reducing the cost of power supply to public facilities.

### Health and Social Benefits

The solar power and battery backup systems for streetlights will improve public safety at night for emergency responders, officials, residents and businesses in the Community who may require access to shelter, supplies, or assistance after a storm event – be it a hurricane, wind storm or major rainfall.

These events often knock out power lines and render entire areas dark, making movement after sunset difficult and treacherous. A lack of street lighting also increases the risk of criminal activity, which is one of the main reasons people choose not to leave their homes during storms – they want to protect their primary place of residence. With solar backup, nighttime movement of emergency responders, officials, or local residents can be accomplished in a safe manner. Access to critical assets will be secured, including key routes from coastal areas to Community Assistance Centers. Recovery efforts can continue after daylight hours, improving the pace at which access to roadways and properties can be restored, which has multiple co-benefits, including improving access to Community facilities, reducing roadway congestion, improving travel time and fuel efficiency, and expediting local economic recovery.

#### **Environmental Benefits**

Replacing grid-powered streetlights with a 100% renewable power source reduces the Community's reliance on fossil fuels, which contribute to global climate change through the production of greenhouse gases.

#### **Cost-Benefit Analysis**

The issues of street lighting, public safety, and mobility after both storm events were often cited as significant concerns and contributing factors in the decision by some households to remain in place and disregard the order to evacuate. This small investment has a significant return on the public safety of the area where these streetlights are located and allows for the protection of the key asset classes of housing, public facilities, and infrastructure. The project will allow for emergency responders to move to the necessary locations at night quickly and safely. This would allow them to respond to calls for help, fires, potential threats to personal property, and to secure neighborhoods. It would also allow residents to safely move at night once they are allowed to return to an area and has the potential to reduce the number of residents who stay behind to ensure their home or business is secure.

#### **Risk Reduction Analysis**

This project will reduce public safety risk to the population by illuminating the roads at night and by securing access to evacuation routes and Community facilities during and after a storm. If it also lowers the number of people who choose not to heed warnings or evacuation orders to secure their private property, it reduces the number of people in high risk areas during a major storm event.

#### **General Timeframe for Implementation**

This project has the potential for implementation within 24 months of commencement.

#### **Regulatory Requirements Related to Project**

The Town of Hempstead (Town) will need to coordinate with and obtain permission from utility provider LIPA/PSEG Long Island.

#### **Jurisdiction**

Town of Hempstead Traffic Control and Street Lighting Department, Nassau County Department of Public Works, and LIPA/PSEG.

## Proposed Project: South Shore Stormwater System Modeling and Analysis



Watersheds that encompass NYRCR Baldwin, Bellmore/Merrick, Seaford /Wantagh and Massapequa (source: Arup)

During Hurricane Irene and Superstorm Sandy, the stormwater systems within the NYRCR Communities of Baldwin, Bellmore/Merrick, Seaford/Wantagh, and Massapequa were overwhelmed by flooding from rainfall and storm surge. In addition, localized flooding is observed regularly after heavy rainfall or at monthly spring tides. These four NYRCR Communities fall within the following watersheds: Milburn Creek-Middle Bay Watershed, Bellmore Creek-East Bay Watershed, Seaford Creek Watershed, Massapequa Creek Watershed, and South Oyster Bay Watershed. These watersheds encompass an area much larger than the political boundaries of the NYRCR Communities. This study would look at the portion of these watersheds that fall within the four aforementioned NYRCR Communities.

There is currently limited information available about the existing stormwater infrastructure. A hydrologic and hydraulic (H&H) model would provide a catchment-wide understanding of where runoff is coming from, how much there is, specific areas where the current system is inadequate and what improvements could be made. This model could be used to:

- Determine the causes of localized flooding issues across the catchment and identify measures to prevent the flooding;
- Understand the impacts of stormwater runoff on water quality and determine the benefits of flooding mitigation measures in order to identify implementation of projects; and
- Identify green infrastructure solutions to provide the most effective investment to reduce surface water flooding.

This project will involve the following four phases:

- **Phase 1:** An initial phase of key stakeholder meetings, including Nassau County, Town of Hempstead, Town of Oyster Bay, Village of Massapequa Park, and NYS Department of Transportation (NYS DOT), U.S. Geological Survey, and other appropriate agencies and organizations, to collate all the existing drainage datasets.
- **Phase 2:** Survey a portion of the drainage system to inform the model. The survey will include manhole surveys and connectivity surveys to determine level, size, line, and condition of the pipes.
- **Phase 3:** An integrated catchment model will be built, verified, and then used to determine the cause of flooding and the most appropriate solutions. These solutions can range from traditional drainage improvement projects to innovative green infrastructure projects. Using the most recent high-resolution LiDAR data of the ground surface available, this phase will involve processing the data, building and calibrating the model, and installing and collecting data from four stream gauges for an eight-month period.
- **Phase 4:** A geographic information system (GIS) study of the physical ground conditions to determine the most appropriate location for green infrastructure in order to maximize infiltration and water quality benefits, as well as choose the most appropriate green infrastructure solutions. Potential green infrastructure solutions include permeable paving, bioswales, green roofs, stormwater ponds, and wetlands.

### Estimated Project Cost

This Proposed Project has also been proposed in the neighboring NYRCR Communities of Baldwin, Seaford/Wantagh, and Massapequa. The approximate total project cost is \$2,900,000, with an estimated contribution of \$725,000 by the NYRCR Bellmore/Merrick Community.

### Project Benefits

This project addresses the Natural Resources and Infrastructure Recovery Support Functions (RSF).

#### Risk Reduction & Resiliency Benefits

Modeling and analysis is necessary to help identify and focus solutions for stormwater management, which will include capital projects, updated maintenance requirements, regulatory improvements, public awareness programs, and other property owner assistance measures. These outcomes of modeling and analysis would improve the functionality of the stormwater system and reduce flooding issues in the region, reducing damage to buildings from flooding and increasing the chance that buildings will remain habitable. An informed model can also predict and estimate the costs and benefits of a proposed capital improvement, providing more certainty that a project will reduce flood risk. Subsequently, the risk of constructing a project that will not provide the anticipated benefit will also be reduced.

#### Economic Benefits

Stormwater drainage projects that would come out of this tool would reduce the exposure to damages from flooding, which will reduce the risk for economic loss associated with rebuilding and repair in future flood events. It also reduces the risk of economic loss associated to road closure, which would affect access to businesses in the area. The model also offers a platform for improved coordination between the multiple jurisdictions of ownership. It will encourage more proactive management of infrastructure through preventative management, rather than reactive management, which relies on deferred, and often more costly, maintenance.

#### Health and Social Benefits

This project will improve access to information on critical assets and facilities during storms, while other projects that result from this project will improve access for fast and safe evacuation. By reducing the amount of standing water on roadways, this project will improve vehicle operation during all types of inclement weather, as well as reduce road congestion. During major storms, improved drainage will

increase the amount of time that roads are available to emergency services at the storm's outset and will shorten the recovery time for road access after a storm event.

### **Environmental Benefits**

The modeling and analysis will help to identify and optimize green infrastructure projects. Green infrastructure provides many environmental benefits to the region by attenuating storm surge and helping to reduce the quantity and improve the quality of stormwater that reaches the Estuary, reducing pollution effects on wetlands, which, when healthy, provide a natural barrier. This project has the potential to lead to the reduction of pollutants carried by stormwater runoff entering tributaries and the South Shore Estuary. The findings from the study can be used for the next State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s) managed by the NY State Department of Environmental Conservation.<sup>82</sup>

### **Cost-Benefit Analysis**

With the ability to focus drainage improvements using a comprehensive and effective modeling tool, the benefits of the expenditure will be realized. Strategic drainage improvements that prevent flooding along key roadways will prevent any delays as well as subsequent economic effects of impeding movement of goods and labor. Better-informed and strategic investments in drainage improvement projects can also lead to cost savings. Through supporting SPDES, this project has the potential to reduce local government expenditures for future stormwater improvement projects.

### **Risk Reduction Analysis**

Undertaking the modeling and analysis will help to identify key vulnerabilities in the storm drainage system, allowing Communities to develop and identify projects that will ultimately reduce the risk of flooding to the Community. In addition, the project can lead to stormwater system improvements, which reduce the risk of pollution to the South Shore Estuary.

### **General Timeframe for Implementation**

The implementation of this project will take approximately 24 months from commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

A multi-jurisdictional committee/consortium, consisting of municipalities, could be considered. This form of governance and administration has proven successful on Long Island, as represented by both the Hempstead Harbor Protection Committee and Manhasset Bay Protection Committee. Potential actions of such a multi-jurisdictional committee/consortium might include appointing a fiduciary to be responsible for grant management, with the committee/consortium itself responsible for project management. The recent New York-Connecticut Sustainable Communities Consortium, a program funded by a HUD Sustainable Communities Regional Planning Grant, used this structure and was successful in carrying out the planning program over a wide geographic area and across numerous municipal boundaries.

## Featured Project: Resilient Streetscape Implementation

This project comprises capital projects recommended in the Lifeline Corridor Study and Guidelines (Proposed Project). The following resilient streetscape amenities will be installed in the Community on approximately seven miles of roadways, corresponding to the “Lifeline” roads identified in the previous study:

- Move utility lines underground along seven miles of road in the Community.
- Install new solar powered streetlights with battery backup on seven miles of roads in the Community.
- Improved emergency evacuation signage, assumes 30 new signs.

The Resilient Streetscape Implementation project addresses the Infrastructure and Economic Recovery Support Functions.

### Estimated Project Costs

The proposed project will cost an estimated \$58,000,000.

### Project Benefits

#### Risk Reduction & Resiliency Benefits

By maintaining a stable energy supply along key roads through undergrounding, emergency response facilities will have a better chance of remaining operational, thereby reducing risk to the population through faster emergency response. Buildings and homes throughout the community, including those housing vulnerable populations, will have a better chance of retaining electricity and remaining habitable, reducing the need for immediate emergency response or shelter.

Solar power and battery backup systems for streetlights will improve public safety at night. Access to critical assets will be secured, including key routes from coastal areas to Community Assistance Centers. Recovery efforts can be accomplished at night, improving the pace at which access to roadways and properties can be restored, which has co-benefits of improving access to community facilities, reducing roadway congestion, improving travel time and fuel efficiency, and improving local economic

recovery. This project also reduces government expenditures by reducing the cost of power supply to public facilities.

#### Economic Benefits

Undergrounding of utility wires provides a substantial aesthetic improvement that benefits adjacent property owners, particularly those in retail business districts where well-designed streetscapes and storefronts lead to increased business.

The economic benefit related to increased power dependability is particularly pronounced when implemented on key commercial corridors like Merrick Road and Sunrise Highway, as it assists businesses in remaining open following storm events.

This project also reduces government expenditures by reducing the cost of power supply for streetlights.

#### Health and Social Benefits

Improved power reliability reduces the risk of power failure at food stores, pharmacies, doctor’s offices, and a hospital annex within the Community, which provides health benefits to residents.

This project will improve public safety at night for emergency responders, officials, residents, and businesses who may require access to shelter, supplies, or assistance after a storm event – be it a hurricane, wind storm, major rainfall, or winter weather event. These events often result in downed power lines,



Above-ground utility poles on Merrick Avenue (source: Arup)

rendering entire areas dark and making movement after sunset difficult and treacherous. A lack of street lighting also increases the risk of criminal activity, which is one of the main reasons people choose not to leave their homes during storms – they want to protect their primary place of residence. With solar backup, nighttime movement of emergency responders, officials, or local residents can be accomplished in a safe manner. Access to critical assets will be secured, including key routes from coastal areas to Community Assistance Centers. Recovery efforts can continue after daylight hours, improving the pace at which access to roadways and properties can be restored, which has co-benefits of improving access to community facilities, reducing roadway congestion, improving travel time and fuel efficiency, and expediting local economic recovery.

#### **Environmental Benefits**

Replacing grid-powered streetlights with a 100% renewable power source reduces the Community's reliance on fossil fuels, which contribute to global climate change through the production of greenhouse gases.

#### **Cost-Benefit Analysis**

The benefits of undergrounding power lines include a substantial increase in power reliability during storm events, more flexibility in streetscape design, and improved aesthetics. These economic and life safety benefits are commensurate with cost of implementation.

#### **Risk Reduction Analysis**

Undergrounding power lines reduces the vulnerability of all residential and commercial assets connected with that particular grid, which could potentially suffer from blocked transportation access and debris. Independent streetlight power sources, proposed for the pilot project, will improve public safety along the road at night, reducing risks to the population.

#### **General Timeframe for Implementation**

This project has the potential for implementation within 12 months of commencement.

#### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

#### **Jurisdiction**

The Town of Hempstead Traffic Control and Street Lighting Department, Nassau County Department of Public Works, and utility provider LIPA/PSEG Long Island have jurisdiction.

## Featured Project: Bellmore road raising: Army Place, Navy Place, Marine Place and Shore Road

Army Place, Navy Place, Marine Place, and Shore Road are a cluster of roads in western Bellmore near Shore Road Elementary School. Elevations of approximately two to four feet, combined with adjacency to the canals, have led to routine flooding during high tides or minor storm events. Tidal flooding inhibits travel to and from Shore Road Elementary and is therefore disruptive to local parents, children, and homeowners. Superstorm Sandy heavily damaged homes in this area, and as a result several have been raised.

Large portions of these streets are below four feet above sea level, making them susceptible to varying levels of tidal flooding from the adjacent Grandview Canal and Baldwin Creek/East Bay. Such tidal flooding occurs on a monthly basis, along with significant flooding when major rainstorms coincide with a high tide period, resulting in roadway closures. In addition to the costs to the Town of Hempstead caused by the necessary reaction to these events, there is a disruption in sanitary curb-side garbage collection, mail services, school bus routes, and more.

A general loss of productivity and enjoyment by Community residents is experienced when they are forced to plan departing and returning to home around the tide schedule, but more importantly there is also the threat to safety, especially to the elderly and handicapped population of the area who may need access to doctors, hospitals and/or pharmacies. The tidal flooding has often caused damage to vehicles parked and/or driven through the salt water on roadways. Residents also experience damage to private property, including, but not limited to, their lawns and landscaping. The continual flooding has directly affected the quality of life throughout the Community and property values have suffered.

To help alleviate some of the above issues, the proposed project will include the reconstruction of approximately 5,225 feet of local residential streets. The intent of the project is to reconstruct the roads with a minimum gutter elevation of 5.5 feet to prevent routine tidal flooding, as well as elevating up to 3,250 feet of roadway that currently is below FEMA's 10-year still water level. The project design will include the replacement of concrete curbs and sidewalks, improvements to the storm drain system, installation of check valves, and the reconstruction of street



Bellmore roads that experience regular tidal flooding (source: Arup)



Tidal flooding on Marine Place in Bellmore due to a full moon tide (source: Ali Beller Frankel)

end bulkheads to a minimum elevation of six feet to decrease storm wave energy. The raising of the roadway grade will have a direct impact on the frontages of the private properties throughout the project area. The design will include the re-grading and installation of storm drain inlets on private property, necessitating preparation and approval of Work Easements from the individual property owners affected.

### **Estimated Project Costs**

The Proposed Project will cost an estimated \$3,150,000.

### **Project Benefits**

This project, which addresses the Infrastructure Recovery Support Function (RSF), will reduce the risk of flooding to transportation infrastructure and residences in this section of Bellmore.

#### **Risk Reduction and Resiliency Benefits**

The drainage system improvements will reduce episodic flooding and reduce the likelihood of the road flooding during a storm event. The reduced risk extends to private property in the neighborhood, reducing the likelihood of recurring property damage to buildings and vehicles.

#### **Economic Benefits**

Reduction of flood risk will decrease repair and maintenance costs of street and stormwater infrastructure incurred by the Town of Hempstead, and has the potential to improve local property values.

#### **Health and Social Services**

Maintaining clear roads will improve access for residents who may require shelter, supplies, or assistance. It will also improve access for recovery crews and equipment following a storm, improving emergency response times and accelerating local recovery. The reduction in flooding will reduce the likelihood of the presence of mold in local homes.

#### **Environmental Benefits**

Reduced instances of flooding on residential property will decrease the likelihood of household contaminants entering local waterways.

#### **Cost-Benefit Analysis**

This investment will bring existing infrastructure into a state of good repair and offer another line of defense against flooding from rainfall, storm surge, and high tide. This line of defense would directly protect roads, helping to provide reliable performance on a day-to-day basis. This project would improve access to transportation routes for the local community, provide greater protection for property in vulnerable areas, and reduce the harm caused by storm events.

#### **Risk Reduction Analysis**

The roadway reconstruction in flood-prone neighborhoods will reduce the risk of flooding to one mile of local streets. In addition, the drainage system improvements will extend benefits to private property in the neighborhood, reducing the likelihood of recurring property damage or the risk of injury for 154 residential parcels.

#### **General Timeframe for Implementation**

This project has the potential for implementation within 36 months of commencement.

#### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

#### **Jurisdiction**

Town of Hempstead has jurisdiction of these roads.

## Featured Project: Bellmore Road Raising: Koft-Boundary Road Area

The Kopf-Boundary Road area of Bellmore is a residential neighborhood directly adjacent to the Beach, Alder, Hairpin, and Landing canals in eastern Bellmore. Elevations of approximately two to four feet, combined with adjacency to the canals, have led to routine flooding during high tides or minor storm events. Homes in this area were heavily damaged by Superstorm Sandy and as a result several homes have been raised.

The Kopf Road - Boundary Road project would include a comprehensive approach towards designing the reconstruction of the roadways to reduce the frequency of tidal flooding. In addition to the typical road reconstruction project, which includes the removal and replacement of the concrete curbs, sidewalks, driveway aprons, storm drain improvements, and asphalt pavement, the project would include a review of the existing road elevations to establish a minimum road elevation to mitigate roadway flooding in future storm events.

To undertake a grade raise project there will be an impact on private properties; these impacts will have to be evaluated to determine the extent of the raise. The project would also include the installation of catch basin filters to improve the quality of the stormwater discharge and the installation of check valves, if shown to be effective, to further reduce the tidal flooding.

### Estimated Project Costs

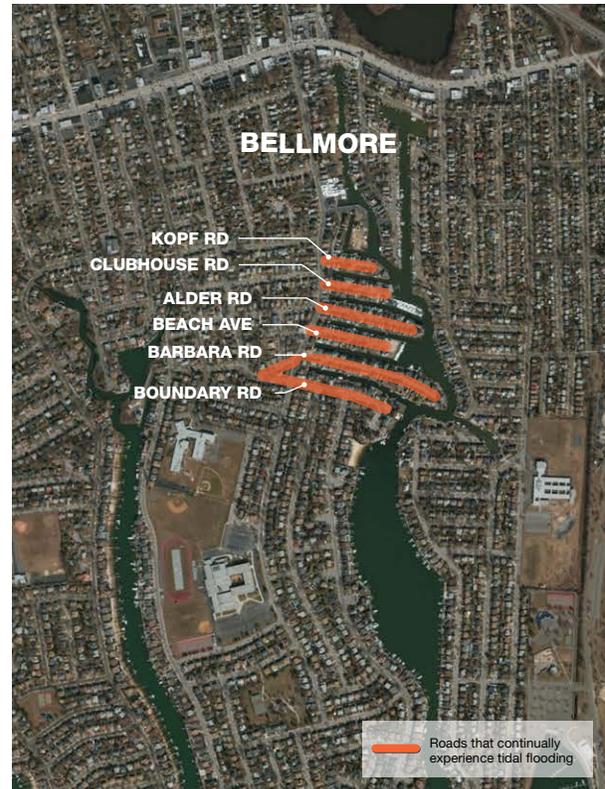
The proposed project would cost \$2,950,000.

### Project Benefits

This project, which addresses the Infrastructure Recovery Support Function (RSF), will reduce the risk of flooding to transportation infrastructure and residences in this section of Bellmore.

### Risk Reduction and Resiliency Benefits

The drainage system improvements will reduce episodic flooding and reduce the likelihood of the road flooding during a storm event. The reduced risk extends to private property in the neighborhood, reducing the likelihood of recurring property damage to buildings and vehicles.



Bellmore roads that experience regular tidal flooding (source: Arup)



Barbara Road after Superstorm Sandy (source: Eileen Casazza)

### Economic Benefits

Reduction of flood risk will decrease repair and maintenance costs of street and stormwater infrastructure incurred by the Town of Hempstead, and has the potential to improve local property values.

### Health and Social Benefits

Maintaining clear roads will improve access for residents who may require shelter, supplies, or assistance. It will also improve access for recovery crews and equipment following a storm, improving emergency response times and accelerating local recovery. The reduction in flooding will reduce the likelihood of the presence of mold in local homes.

### Environmental Benefits

Reduced instances of flooding on residential property will decrease the likelihood of household contaminants entering local waterways.

### Cost-Benefit Analysis

This investment will bring existing infrastructure into a state of good repair and offer another line of defense against flooding from rainfall, storm surge, and high tide. This line of defense would directly protect roads, helping to provide reliable performance on a day-to-day basis. This project would improve access to transportation routes for the local community, provide greater protection for property in vulnerable areas, and reduce the harm caused by storm events.

### Risk Reduction Analysis

The roadway reconstruction in flood-prone neighborhoods will reduce the risk of flooding to 4,000 feet of local streets. In addition, the drainage system improvements will extend benefits to private property in the neighborhood, reducing the likelihood of recurring property damage or the risk of injury for 197 residential parcels.

### General Timeframe for Implementation

This project has the potential for implementation within 36 months of commencement.

### Regulatory Requirements Related to Project

There are no regulatory requirements related to this project.

### Jurisdiction

The Town of Hempstead has jurisdiction of these roads.

## Featured Project: Merrick Road Raising: George Court to Leslie Lane

Helen Court project area currently experiences a roadway flooding problem during rainstorms and high tide events. This project would include a comprehensive approach towards designing the reconstruction of the roadways to reduce the frequency of the flooding. In addition to the typical road reconstruction project; which includes the removal and replacement of the concrete curbs, driveway aprons, and asphalt pavement; the project will include a review of the existing road elevations and storm drain capacity in order to establish the required drain system and road elevation to mitigate roadway flooding in future storm events. In addition, the project will include the installation of catch basin filters to improve the quality of the stormwater discharge and the installation of check valves to further reduce tidal flooding.

The project will impact several adjacent private properties; these impacts will have to be evaluated to determine the extent of the project. The setbacks on the homes in this neighborhood are very shallow – a condition that requires special consideration when designing the drainage system. In addition, this is a neighborhood in transition, as several homes are in the process of being raised.

### Estimated Project Cost

The total estimated cost of this project is \$1,250,000

### Project Benefits

This project, which addresses the Infrastructure Recovery Support Function (RSF), will reduce the risk of flooding to transportation infrastructure and residences in this section of Merrick.

### Risk Reduction and Resiliency Benefits

The drainage system improvements will reduce episodic flooding and reduce the likelihood of the road flooding during a storm event. The reduced risk extends to private property in the neighborhood, reducing the likelihood of recurring property damage to buildings and vehicles.



Merrick roads that experience regular tidal flooding (source: Arup)

### Economic Benefits

Reduction of flood risk will decrease repair and maintenance costs of street and stormwater infrastructure incurred by the Town of Hempstead, and has the potential to improve local property values.

### Health and Social Benefits

Maintaining clear roads will improve access for residents who may require shelter, supplies, or assistance. It will also improve access for recovery crews and equipment following a storm, improving emergency response times and accelerating local recovery. The reduction in flooding will reduce the likelihood of the presence of mold in local homes.

### **Environmental Benefits**

Reduced instances of flooding on residential property will decrease the likelihood of household contaminants entering local waterways.

### **Cost-Benefit Analysis**

This investment will bring existing infrastructure into a state of good repair and offer another line of defense against flooding from rainfall, storm surge, and high tide. This line of defense would directly protect roads, helping to provide reliable performance on a day-to-day basis. This project would improve access to transportation routes for the local community, provide greater protection for property in vulnerable areas, and reduce the harm caused by storm events.

### **Risk Reduction Analysis**

The roadway reconstruction in flood-prone neighborhoods will reduce the risk of flooding to approximately one mile of local streets. In addition, the drainage system improvements will extend benefits to private property in the neighborhood, reducing the likelihood of recurring property damage or the risk of injury for 186 residential parcels.

### **General Timeframe for Implementation**

This project has the potential for implementation within 36 months of commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

The Town of Hempstead has jurisdiction of these roads.

## Featured Project: Marina and Dock Resilience Guidelines

The Community is home to three commercial marinas and over 750 privately owned docks. During Superstorm Sandy many boats, either at marinas or private docks, were damaged and, in some cases, caused damage to neighboring properties. Residents complained of receiving guidance from insurance companies that sometimes resulted in increased damage to their property.

Currently, the Town of Hempstead Conservation and Waterways Department provides staff to consult with marina owners, but best practices have not yet been documented or presented in guideline format. This project involves the creation of marina and dock resiliency guidelines to assist boat owners in preparing for future storms and learning how they will be impacted by sea level rise.

The guidelines will include the following:

- Marina and dock design and siting, such as recommended pile height, in-water structures, bulkheads, and dredging;
- Emergency preparedness education, such as methods for protecting human life, reducing damage to boats, reducing damage to property that cannot be relocated, and restoring normal business operations;
- Evacuation procedures, such as procedures for securing vessels; and
- Climate adaptation education, such as storm frequency and severity awareness, tracking wave height and frequency, and identifying infrastructure exposed to storm events.

Insurance companies will be invited to assist in the creation of the guidelines to reduce conflicts and confusion around best practices and proper procedures.

### Estimated Project Cost

The proposed project will cost an estimated \$100,000.

### Project Benefits

This project addresses the Community Planning and Capacity Building and Economic Development Recovery Support Functions (RSF).



Boats that drifted from canal to Bellmore Avenue during Superstorm Sandy (source: Eileen Casazza)

### Risk Reduction and Resiliency Benefits

Improving the resilience of marinas as well as the procedures for securing them will reduce the chance that boats, fuel tanks, and other debris will be released from marinas during high wind and high water events. This will decrease the risk potential property damage as well as reduce resources needed for debris removal.

### Economic Benefits

The reduction in risk to property, including boats, marina facilities, streets, utility poles, and nearby homes, provides an economic benefit in the reduction of claims to insurance companies as well as State and Federal programs that provide financial assistance following a natural disaster.

### Health and Social Benefits

The project's education component will increase the knowledge and awareness of people responsible for managing facilities and property. Reduced risk of environmental contamination from damaged fuel tanks or debris provides a health benefit.

### **Environmental Benefits**

This project will reduce the chance that boats, fuel tanks, and other debris will be released from marinas during high wind and high water events, the risk of environmental contamination to local waterways is reduced.

### **Cost-Benefit Analysis**

Agreed and consistent guidelines will help marina operators and Town planners with the design, construction, and retrofit of public and private marinas in a more resilient way. Consistency will ensure a level playing field amongst operators and best practice will ensure that all potential risks will be addressed with current understanding of resilient design. With three marinas and over 750 privately owned docks in the Community, the benefits of reduced damage to personal property during a storm event, reduced costs of recovery and debris removal, and the ability to more readily restore waterfront activities and tourism, the benefits of the expenditure will be realized.

### **Risk Reduction Analysis**

This project will help to protect life and property by reducing physical damage to boats, fuel tanks, public infrastructure, and residential property. Environmental risk of contamination from damaged boats and fuel tanks will be reduced.

### **General Timeframe for Implementation**

This project has the potential for implementation within 12 months of commencement.

### **Regulatory Requirements Related to Project**

There are no regulatory requirements related to this project.

### **Jurisdiction**

The Town of Hempstead and New York State Department of Environmental Conservation have jurisdiction over these areas.

This page intentionally left blank



## Section V: Additional Materials

The following section provides supporting information for the NYRCR Bellmore/Merrick Plan (NYRCR Plan):

**A. Additional Resilience Recommendations:** This section describes resiliency projects and actions for NYRCR Bellmore/Merrick (Community) that the NYRCR Planning Committee (Committee) would like to highlight that are not categorized as Proposed or Featured Projects.

**B. Master Table of Projects:** This table provides a comprehensive list of Proposed and Featured Projects, as well as Additional Resiliency Recommendations.

**C. Public Engagement Process:** This section provides a detailed description of the public engagement process, including a description of the Community's eight Planning Committee Meetings and three Public Engagement Events. Results from questionnaires and online surveys are also included.

**D. Community Asset Inventory:** This table provides results of the risk assessment for the Community's key assets.

**E. End Notes:** This section includes numerical listing of all NYRCR Plan references.

**F. Glossary:** This glossary comprises a comprehensive list of acronyms used in the NYRCR Plan.

## A. Additional Resiliency Recommendations

**Table 13:** Additional resiliency recommendations

Strategy	Project Name	Short Description	Regional
Establish Programs and Policies for Resilient Planning and Design	Strategic Adaptation Study and Long-term Action Plan	<ul style="list-style-type: none"> <li>- Identify long-term retreat and resilience options for Merrick and Bellmore to protect future residents and business from higher occurrence and more intense storms/surges.</li> <li>- Work with flood insurance providers to study existing models and assumptions.</li> <li>- Use a combination of climate change and sea level rise forecasts and actual events to develop triggers for changes to zoning, planning and building regulations.</li> </ul>	N
Establish Programs and Policies for Resilient Planning and Design	Voluntary Property Acquisition Program Study	<ul style="list-style-type: none"> <li>- Study potential impacts of existing voluntary acquisition program on Bellmore and Merrick.</li> <li>- Focus on strategies to acquire open space in extreme risk areas for public use.</li> </ul>	Y
Establish Programs and Policies for Resilient Planning and Design	Inclusive Housing Plan	<ul style="list-style-type: none"> <li>- Develop a housing plan to accommodate the region's aging population and provide new housing opportunities for first-time buyers.</li> <li>- Maintain and support existing housing programs that provide funds to purchase and rehabilitate vacant or abandoned properties.</li> <li>- Work with Nassau County, the State and private developers to establish a relocation assistance program that gives residents relocated due to strategic adaptation priority in new developments.</li> <li>- Provide tax incentives and direct incentives for residents to assist with the adaptation and relocation process, and work with developers to increase density in less vulnerable areas and provide more housing options for community residents.</li> </ul>	Y
Enhance Communication, Education, and Awareness	Senior Education Campaign	<ul style="list-style-type: none"> <li>- Study to identify ways to better reach Seniors during storm events and support their needs following events.</li> <li>- Education campaign to increase emergency preparedness awareness.</li> </ul>	Y
Establish Programs and Policies for Resilient Planning and Design	Downtown and Commercial Corridor Resiliency Plan	<ul style="list-style-type: none"> <li>- This project includes a comprehensive planning and resiliency study to re-envision the downtown and commercial corridors in both Merrick and Bellmore.</li> <li>- The study would address opportunities for housing, emergency response and recovery services, alternative energy and microgrid implementation, stormwater management, traffic improvements, and zoning and building code updates.</li> </ul>	N
Improve Transportation Access and Connectivity	Merrick Road Streetscape Improvements and Urban Design Guidelines	<ul style="list-style-type: none"> <li>- Study to identify ways to make Merrick Road more walkable and attractive.</li> <li>- Improved guidelines for commercial development so businesses are oriented to the street and create a better sense of place.</li> <li>- Identify opportunities to plant street trees and underground utilities.</li> </ul>	N

**Table 13 (cont'd):** Additional resiliency recommendations

Strategy	Project Name	Short Description	Regional
Improve Transportation Access and Connectivity	Emergency Parking	- Designate areas outside of flood zones to be used by residents in evacuation zones for off-street parking and storage during emergencies and major storm events without being ticketed or towed. (This may include new structured parking near rail stations).	N
Invest in Resilience Enhancements for Energy Infrastructure	Natural Gas Infrastructure Modernization	- Work with National Grid to modernize natural gas distribution infrastructure. - Identify and invest in implementable technologies to better regulate and isolate natural gas lines in the event of damage or leakage. - Connect residents and businesses to gas lines where service is available, and expand service into areas of need.	Y
Enhance Communication, Education, and Awareness	Emergency Animal Shelters	- Work with local businesses and organizations to establish a refuge center for animals or families with animals to go to during a storm emergency or flood event. - Establish a program to recruit volunteers, such as local veterinary professionals or students, to help manage the facility.	Y
Invest in Resilience Enhancements for Energy Infrastructure	Residential Generator Rebate Program	- Provide rebates for residential installations of natural gas generators. - As part of a homeowner energy education program, provide residents with an overview of the permitting process and outline regulatory requirements for installation.	Y
Invest in Resilience Enhancements for Energy Infrastructure	Home Heating Upgrades	- Develop policy recommendations and an incentive program to convert home heating oil to natural gas in extreme and high risk areas.	Y
Establish Programs and Policies for Resilient Planning and Design	Neighborhood Preservation Guidelines	- Creation of new residential design guidelines for improving architectural quality and functionality in newly raised homes. - Topics covered may include garage and parking design, stairway and entryway design, mechanical systems, home appliance placement, structural reinforcement, materials recommendations, and resilient landscapes.	Y

## B. Master Table of Projects

**Table 14:** Master table of projects

Strategy	Project Name	Short Description	Category	Cost Estimate	Regional
Improve Stormwater Management and Drainage Systems	Bellmore/Merrick Stormwater Drainage, Outfall, and Bulkhead Repair	Assess the entire Bellmore/Merrick drainage system south of Merrick Road, including the 230 outfalls and related bulkheads. Tidal check valves will be installed on 25 critical and appropriate outfalls.	Proposed	\$4,150,000	N
Improve Stormwater Management and Drainage Systems; Establish Programs and Policies for Resilient Planning, Design, and Housing	Southwest Merrick Masterplan and Flood Mitigation Pilot Project	Creation of a Masterplan to re-envision the Town of Hempstead parcels. A newly reconfigured site would provide enhanced flood mitigation for the amenities on-site as well as for Merrick Road. Shoreline stabilization or green infrastructure pilot project upon Masterplan completion.	Proposed	\$2,400,000	N
Improve Stormwater Management and Drainage Systems	Meadowbrook Corridor Improvements Pilot Study	This project would include the reconstruction of five stormwater outfalls currently entering Freeport Creek. And reconnecting the Creek with the natural floodplain. A floating wetland pilot and drainage study would also be conducted for East Meadow Pond to improve water quality and reduce future flooding. A daylighting study for Freeport Creek would examine the potential benefits of uncovering the current underground portion of the Creek.	Proposed	\$1,800,000	N
Enhance Communication, Education, and Awareness; Improve Transportation Access and Connectivity	Bellmore Merrick Community Assistance Centers	Community Assistance Centers are places for residents to gather information about emergency preparedness under normal conditions. During and after a storm, these centers would become a place to gather, collect and distribute resources, charge cell phones, access the internet/TV, and seek comfort.	Proposed	\$1,265,000	N

**Table 14 (cont'd):** Master table of projects

Strategy	Project Name	Short Description	Category	Cost Estimate	Regional
Enhance Communication, Education, and Awareness	Public Communication and Education Gap Analysis	Evaluate existing communication and educational processes and uncover additional needs. Identify public/private partnership opportunities for ongoing communication and education needs.	Proposed	\$20,000	Y
Enhance Communication, Education, and Awareness	Business Continuity Program	Staff person to assist businesses in creating business continuity plans. Education for Chambers of Commerce and other business organization. Identify business assistance funding.	Proposed	\$40,000	Y
Improve Transportation Access and Connectivity	Lifeline Corridor Study and Guidelines	Best practices and guidelines for Resilient Streetscapes, such as green infrastructure, drainage practices, redundant and safe power, resilient street trees and street design.	Proposed	\$120,000	Y
Improve Transportation Access and Connectivity; Invest in Resilience Enhancements for Energy Infrastructure	Key Intersection Street Light Retrofit	Installation of LED/PV streetlights on utility poles along Merrick Road in Merrick and Bellmore	Proposed	\$4,630,000	N
Establish Programs and Policies for Resilient Planning, Design, and Housing	Downtown and Commercial Corridor Resiliency Plan	Study to address opportunities for commercial and/or residential redevelopment out of extreme and high risk zones. Identify microgrid opportunities with alternative power distribution. Identify stormwater and green infrastructure opportunities for new development.	Proposed	\$500,000	N

**Table 14 (cont'd):** Master table of projects

Strategy	Project Name	Short Description	Category	Cost Estimate	Regional
Improve Stormwater Management and Drainage Systems	South Shore Stormwater System Modeling and Analysis	Hydrologic and hydraulic (H&H) model to determine the causes of localized flooding issues across the catchment and identify measures to prevent the flooding	Proposed	\$725,000	Y
Improve Transportation Access and Connectivity; Invest in Resilience Enhancements for Energy Infrastructure	Resilient Streetscape Implementation	Underground 19 miles of utility lines, install new PV/LED street lights and new emergency evacuation signage	Featured	\$58,000,000	N
Improve Stormwater Management and Drainage Systems	Bellmore Road Raising: Army, Navy, Marine and Shore Road	Road raising and associated drainage improvements at Shore Rd, Walters Ct, Horace Ct, Army Pl, Navy Pl, Marine Pl, Surf Dr, Riviera La, Malibu Rd, Driftwood La, Seaview La, and May Ct.	Featured	\$3,150,000	N
Improve Stormwater Management and Drainage Systems	Bellmore Road Raising: Kopf-Boundary Road Area	Road raising and associated drainage improvements at North Rd, Kopf Rd, Clubhouse Rd, Alder Rd, Beach Ave, Short St, Barbara Rd, and Boundary Rd.	Featured	\$2,950,000	N
Improve Stormwater Management and Drainage Systems	Merrick Road Raising: George Court to Leslie Lane	Road raising and associated drainage improvements for George Ct, Helen Ct, Leonard La, Edward La, Leslie La, and Julian La.	Featured	\$1,250,000	N
Establish Programs and Policies for Resilient Planning, Design, and Housing	Marina and Dock Resilience Guidelines	Emergency preparedness guidelines, recommendations and education	Featured	\$100,000	N

**Table 14 (cont'd):** Master table of projects

Strategy	Project Name	Short Description	Category	Cost Estimate	Regional
Establish Programs and Policies for Resilient Planning, Design, and Housing	Strategic Adaptation Study and Long-term Action Plan	Identify long-term retreat and resilience options for Merrick and Bellmore to protect future residents and business from higher occurrence and more intense storms/surges. Work with flood insurance providers to study existing models and assumptions. Use a combination of climate change and sea level rise forecasts and actual events to develop triggers for changes to zoning, planning and building regulations.	Additional	\$1,000,000	Y
Establish Programs and Policies for Resilient Planning, Design, and Housing	Voluntary Property Acquisition Program Study	Study potential impacts of existing voluntary acquisition program on Bellmore and Merrick. Focus on strategies to acquire open space in extreme risk areas for public use.	Additional	\$50,000	Y
Establish Programs and Policies for Resilient Planning, Design, and Housing	Inclusive Housing Plan	Develop a housing plan to accommodate the region's aging population and provide new housing opportunities for first-time buyers. Maintain and support existing housing programs that provide funds to purchase and rehabilitate vacant or abandoned properties. Work with Nassau County, the State and private developers to establish a relocation assistance program that gives residents relocated due to strategic adaptation priority in new developments. Provide tax incentives and direct incentives for residents to assist with the adaptation	Additional	\$200,000	Y

**Table 14 (cont'd):** Master table of projects

Strategy	Project Name	Short Description	Category	Cost Estimate	Regional
Enhance Communication, Education, and Awareness	Senior Education Campaign	Study to identify ways to better reach Seniors during storm events and support their needs following events. Education campaign to increase emergency preparedness awareness.	Additional	\$50,000	N
Improve Transportation Access and Connectivity	Merrick Road Streetscape Improvements and Urban Design Guidelines	Study to identify ways to make Merrick Road more walkable and attractive. Improved guidelines for commercial development so businesses are oriented to the street and create a better sense of place. Identify opportunities to plant street trees and underground utilities.	Additional	\$120,000	N
Enhance Communication, Education, and Awareness	Emergency Parking Study	Study to designate areas outside of flood zones to be used by residents in evacuation zones for off-street parking and storage during emergencies and major storm events without being ticketed or towed.	Additional	\$20,000	N
Invest in Resilience Enhancements for Energy Infrastructure	Natural Gas Infrastructure Modernization	Work with National Grid to modernize natural gas distribution infrastructure. Identify and invest in implementable technologies to better regulate and isolate natural gas lines in the event of damage or leakage. Connect residents and businesses to gas lines where service is available, and expand service into areas of need.	Additional	N/A	Y

**Table 14 (cont'd):** Master table of projects

Strategy	Project Name	Short Description	Category	Cost Estimate	Regional
Enhance Communication, Education, and Awareness	Emergency Animal Shelter	Local plan to identify temporary refuge centers for animals or families with animals to go to during a storm emergency or flood event. Establish a program to recruit volunteers, such as local veterinary professionals or students, to help manage the facility.	Additional	\$15,000	N
Establish Programs and Policies for Resilient Planning, Design, and Housing	Residential Generator Rebate Program	Provide rebates for residential installations of natural gas generators. As part of a homeowner energy education program, provide residents with an overview of the permitting process and outline regulatory requirements for installation.	Additional	\$2,750,000	Y
Establish Programs and Policies for Resilient Planning, Design, and Housing	Home Heating Upgrades	Incentivize the conversion of home heating systems from fuel oil to electric heat pumps, solar thermal or natural gas in extreme and high risk areas. Amend building and planning regulations to phase out the use of oil fuel tanks south of Merrick Road, and incorporate temporary-intermediary regulations to require proper anchoring requirements based on anticipated inundation levels.	Additional	\$50,000	N
Establish Programs and Policies for Resilient Planning, Design, and Housing	Neighborhood Preservation Guidelines	Creation of new residential design guidelines for improving architectural quality and functionality in newly raised homes. Topics covered may include garage and parking design, stairway and entryway design, mechanical systems, home appliance placement, structural reinforcement, materials recommendations, and resilient landscapes	Additional	150,000	Y

## C. Public Engagement Process

The strategies and projects outlined in the NYRCR Bellmore/Merrick Plan (NYRCR Plan) will ultimately impact the quality of life for those who live, work, and play in NYRCR Bellmore/Merrick (Community). As such, input from residents, business owners, and community leaders has been an important component of the planning process. The NYRCR Bellmore/Merrick Planning Committee (Committee) worked to provide a number of opportunities for public participation and community engagement, including a series of Public Engagement Events, surveys, focus groups, and an online outreach campaign.

### NYRCR Planning Committee

The Committee was comprised of thirteen community representatives who dedicated their time and expertise to work closely with the State. The Committee guided the development of material for the NYRCR Plan and the community engagement process. Committee members had a major role in defining the geographic scope and vision for the Community. They were also critical to the development of strategies and projects. The Committee held numerous Planning Committee Meetings over the course of the project. In addition, the Committee participated in two Joint Committee Meetings with the neighboring NYRCR Communities of Baldwin, Freeport, Massapequas, and Seaford/Wantagh to learn about resilience measures and to explore shared issues and opportunities for collaboration and cooperation.

- **Committee Meeting 1:** The first Committee Meeting was held on September 17, 2013, and was the initial meeting between members from New York State, Planning Committee, and Consultant Team to discuss the purpose of the NYRCR Program and initial goals and objectives.
- **Committee Meeting 2:** The second Committee Meeting was held on October 2, 2013. It included a discussion of existing planning efforts, Community assets, Community needs and opportunities, and the outreach strategy and scheduling of Public Engagement Events.
- **Committee Meeting 3:** The third Committee Meeting was held on October 24, 2013. It included a discussion of the upcoming NYRCR Conceptual Plan, and preparation for the first Public Engagement Event immediately after.
- **Committee Meeting 4:** The fourth Committee meeting was held on November 12, 2013. In this meeting Committee Members reviewed the NYRCR Conceptual Plan and began to discuss opportunities for sustainable reconstruction, recovery, and resilience, and prepared for Public Engagement Event 2.
- **Committee Meeting 5 (Joint Committee Meeting):** The fifth Committee Meeting was held on December 10, 2013, and was attended by Committee Members from neighboring NYRCR Communities. The meeting provided an overview of flood risk scenarios and flood mitigation strategies.
- **Committee Meeting 6:** The sixth Committee Meeting was held on January 13, 2014. In this meeting Committee Members reviewed the Community asset inventory and risk analysis, discussed proposed projects, and reviewed the findings of the business surveys.
- **Committee Meeting 7 (Joint Committee Meeting):** The seventh Committee Meeting was held on February 19, 2014, and was attended by Committee Members from neighboring NYRCR Communities. The meeting addressed housing and economic development opportunities within the five Communities that were represented.
- **Committee Meeting 8 (Joint Committee Meeting):** The eighth Committee Meeting was held on March 11, 2014. In this meeting Committee Members voted on the proposed and featured projects to be included in the NYRCR Plan.

## Public Engagement Events

Community residents and other stakeholders participated in three Public Engagement Events to review the evolving work of the Committee and Consultant Team, and to contribute their voices to the planning process. Outlined below is a brief summary of the proceedings and the outcomes.

### Public Engagement Event 1: Vision, Community Assets, Needs and Opportunities and Project Ideas

The first Public Engagement Event was held on October 24, 2013. The meeting, which included an open house, presentation, and small group discussions, introduced the NY Rising Community Reconstruction (NYRCR) Program to the community and provided numerous opportunities for public input.

Participants viewed project materials at three different Open House-style stations. One provided an overview of the NYRCR Program. The second station presented six Community Asset Maps. The third station presented the draft Vision as prepared by the Committee. Participants were encouraged to provide their feedback to the asset maps and vision statement. Comments received on the vision statement were used to revise it prior to incorporation in the NYRCR Conceptual Plan.

The next portion of the meeting was dedicated to small group discussions; participants cooperatively and creatively considered the future of their community. Participants identified the community's most important needs and generated project ideas for recovery and resiliency. They discussed the following two questions:

- Superstorm Sandy and, before that, Hurricane Irene had profound impacts on our community. Thinking about our community as a whole, what do you believe are the three top issues that need to be addressed to recover and emerge more resilient in the future?
- The NYRCR Plan will include the major projects and programs that need to be undertaken for our community to recover and be more resilient. The plans are an investment; they will

make communities safer and stronger, increase prosperity, improve the quality of life, and drive innovation and competition. You are encouraged to think big to identify the transformative and innovative actions needed to become resilient and grow the economy. What do you believe should be done to create a better future for our community?

Participants at the meeting had clear and specific ideas about what they believed could effectively help the Community to recover and become more resilient. The small groups generated nearly 135 different ideas. These ideas were reviewed to identify emerging themes representing issues of concern and ideas for the future that would inform the development of strategies and projects. Listed below are the emerging themes organized by Recovery Support Function (RSF). The ideas expressed at this first Public Engagement Event have been captured in the vision, goals, critical issues, strategies, and projects of this NYRCR Plan.

- Community Planning & Capacity Building: Evacuation routes and shelters; Effective emergency communication systems; Refurbish/reuse existing buildings before issuing new permits
- Economic: Availability of fuel at gas stations.
- Housing: Vacant/abandoned homes; Support for individual homes to prevent/mitigate flood effects (e.g. landscaping, walls, bulkheads, raising)
- Infrastructure: Back flow devices; Storm drain maintenance; Identify and remedy flood prone areas; Raise streets; Tree trimming program to protect power lines; Solar-powered street lights; Availability of generators and fuel
- Natural and Cultural Resources: Tidal and Storm Water Management; Sink holes

The participants did not provide any comments or ideas related to Health & Social Services. The extent and impacts of the physical damage from Superstorm Sandy were forefront in the input received at the first Public Engagement Event.

## **Public Engagement Event 2: NYRCR Conceptual Plan, Values, Strategies and Projects**

The second Public Engagement Event was held on November 2, 2013. After the opening presentation, participants joined small groups to weigh in on important community issues and to expand upon the strategies and projects included in the NYRCR Conceptual Plan. Participants reviewed material related to two of the six Recovery Support Functions. They completed an independent participant questionnaire. The group members then worked cooperatively to provide reactions and observations on a map of the community. Finally, they reviewed the list of strategies and projects included in the NYRCR Conceptual Plan then discussed and documented what others should be included.

It is important to note that this event sought to solicit reactions from community members on topics and issues that had not been raised by the participants at the first Public Engagement Event but that are important to the long term reconstruction and resiliency of the Community. For example, the questionnaire and small group questions on Health and Social Services were specifically designed to help identify and clarify health and social services issues in the Community since no input on these topics was received at the first Public Engagement Event. Interestingly, the small group assigned to review health and social services at this event stated that “no real health needs were unmet” in the Community. The main concerns and project ideas they generated dealt with ensuring that young and old residents could evacuate safely in case of a future storm event, critical facilities such as pharmacies had backup generators, and that first responder facilities were not themselves threatened in emergency situations by being located in high risk areas.

After the event, all materials were encoded and used by the Consultant Team and the Planning Committee to better understand community conditions and needs as well as to revise and enhance the list of reconstruction and resiliency projects. The number of questionnaire responses generated is relatively small compared to the population of the Community, but



Public Engagement Event 2 (source: Arup)

they do provide an indicator of community sentiment and the qualitative input was crucial to revising and expanding the projects included in the NYRCR Plan.

The full results from the event are too extensive to summarize here, so included below are some highlights from the Community feedback (in addition to the Health and Social Services issues discussed above). The results emphasized the need for increased emergency preparedness and the creation of recourse centers in the Community that could support area residents during future disasters. Feedback on infrastructure identified the Community’s desire for improved stormwater management and utility protection. Most of the participants’ detailed recommendations in this regard have been incorporated into the NYRCR Plan projects, such as check valves, bulkhead improvements, and backup power.

With regards to housing, participant feedback identified the financial implications of Superstorm Sandy on home ownership, i.e., maintaining the value of their homes, ability to sell, affordability of flood insurance, or the cost of raising their homes. Many of these issues are beyond the scope of this NYRCR Plan and are being addressed by other Federal and State Programs. But, through infrastructure investments that improve stormwater management and tide mitigation measures outlined in this NYRCR Plan, residential areas on and near the waterfront will be better protected in the future.

Input related to economic development was less concerned with reconstruction and recovery. These comments and ideas suggested resiliency ideas that could strengthen both the physical and economic conditions in the community, such as housing near the Long Island Rail Road (LIRR), mixed use development, tax incentives and tax reductions, more parking, and beautification of downtowns.

The questionnaire results are included in their entirety in the appendix along with the small groups' project ideas.

### **Public Engagement Event 3: Vision, Community Assets, Needs and Opportunities and Project Ideas**

This event, held on February 27, 2014, was the third Public Engagement Event of the NYRCR Program. The meeting's objectives were to provide the Community with a progress update, gather Community feedback on the projects being considered for inclusion in the NYRCR Bellmore/Merrick Plan, and begin to generate public support for implementation.

Participants viewed a presentation, the main focus of which was the projects to be considered for inclusion in the NYRCR Freeport Plan. The State Consultant Team presented the approach and community issues that informed the preparation of these draft projects as well as the definition of the three types of projects that will be included in the NYRCR Plan.

Participants then learned more details of the projects during the Open House portion of the event. Large Boards were posted throughout the meeting space. Each board included information on projects including description, proposed location, cost estimates, benefits, and more. Committee members and Consultant Team representatives staffed the stations and were available to field participants' questions.

Participants were encouraged to complete Project Comment Cards to provide reactions to and additional information for each of the projects. Participant were also given a questionnaire to rate each Proposed and Featured Project as high (3), medium (2), and low (1) based on the degree to which they believed each project will help better prepare for and recover from storm events. Finally, participants were asked to



Public Engagement Event 3 (source: Arup)

select the five projects they felt were most important to their community by writing them on their questionnaire and then posting stickers on large boards.

After the meeting all input received on Project Comment Cards and participant questionnaires was documented verbatim and tabulated. The rating scores were averaged. The Project Comment Cards were reviewed to make final enhancements to the project descriptions for review by the Committee and potential inclusion in the NYRCR Plan.

Projects were also posted on the NY Rising website and an online survey was released to solicit feedback from people not able to attend the community meeting.

Tables 15 and 16 on the following page present the rating results for featured and proposed projects from both Public Engagement Meeting #3 and the online survey. Projects are sorted from highest to lowest based on their rating from the online survey (since more responses were generated online). A score of 2.34-3 is considered high, a score of 1.67-2.33 is medium, and 1-1.66 is considered low.

Both the questionnaires and the online surveys returned the same two top proposed and featured projects. Stormwater Drainage and Repair, and Outfall Assessment and Tidal Check Valve Installation were the top two proposed projects. Local Flood Diversion and Control, and Lifeline Network Implementation were the top two featured projects.

In general, the results of the questionnaire and survey indicate a strong level of support from respondents. Out of all the Proposed and Featured Projects, only one project received a low rating from the event participants (Business Continuity Program), while online survey respondents rated this project as medium. Interestingly, one Featured Project (Local Flood Diversion and Control) was rated higher than all but one of the Proposed Projects on the questionnaires and was the top-rated project on the online survey.

#### **Public Engagement Event 4: The Bellmore/Merrick NY Rising Community Reconstruction Plan**

The fourth and final public engagement event will present the completed NYRCR Plan – once it is finalized – to community members and stakeholders in order to lay the foundation for implementation.

### **Online Presence and Tools**

The website [www.stormrecovery.ny.gov/nyrcr](http://www.stormrecovery.ny.gov/nyrcr) provides information about the NYRCR Program, and regularly posted material relating to the NYRCR Plan. This included the details for upcoming public engagement events, news and announcements, Committee contacts, and plan-related documents. The website also included a tool for visitors to submit comments, but no comments were received through this platform.

### **Business Surveys**

A survey was deployed by the Consultant Team specifically to businesses in the Community to gather additional information on storm impacts, which have been difficult to quantify from other sources, and to generate ideas that could encourage economic development and support resiliency. Business surveys were open from January 15 to February 25, 2014. The respondents were distributed among many industry types including business/legal/financial, retail, healthcare, warehousing/logistics, and construction, and had varying degrees of damage from Superstorm Sandy. There were, however, many similar issues and recommendations.

Respondents identified potential projects that could help the Community.

- Overall: Parking Improvements, faster permitting process, curb and street repair, and beautification/landscaping.
- Merrick Road Corridor: More and better parking, small business incentives/grants, and cleanup/streetscaping.
- Bellmore's commercial areas (Newbridge Road): Parking, fewer traffic regulations, and streetscaping.
- Merricks' commercial areas: parking, lower taxes, and streetscaping.

Respondents also identified potential resiliency measures.

- Faster response time: Rebuilding permits as well as grants and loans.
- Backup power supplies.
- Plantings/swales to absorb water.

The Consultant Team developed a series of general recommendations based on the input received from respondents to this survey and on the Team's understanding of economic recovery and development in the wake of Superstorm Sandy.

**Table 15:** Questionnaire and online survey results for proposed projects

Featured Project	Event #3 Questionnaire	Online Survey
Bellmore Merrick Community Resource Centers	Medium	Medium
Business Continuity Program (Shared)	Low	Medium
Integrated Communication Network	Medium	Medium
Lifeline Transportation Network	Medium	Medium
Outfall Assessment and Tidal Check Valve Installation	High	High
Priority Local Road Streetlight Retrofit	High	Medium
Regional Energy Action Plan	Medium	Medium
South Shore Shoreline Conditions Analysis and Restoration (Shared)	High	Medium
South Shore Stormwater System Modeling and Analysis (Shared)	Medium	High
Southwest Merrick Masterplan	Medium	Medium
Stormwater Drainage Repair	High	High

**Table 16:** Questionnaire and online survey results for featured projects

Featured Project	Event #3 Questionnaire	Online Survey
Community Resource Center Back up Electricity Generation	Medium	Medium
Home Heating Upgrades	Medium	Medium
Lifeline Network Implementation	High	High
Local Alternative Power Generation and Distribution	High	Medium
Local Flood Diversion and Control	High	High
Local Smart Grid Improvements	Medium	High
Meadowbrook Corridor Improvements Pilot Study	Medium	Medium
Revise Zoning and Building Codes for Resilience	Medium	Medium
Wetlands Restoration Demonstration Project	Medium	Medium

## D. Community Asset Inventory

The asset inventory and risk assessment performed for the NYRCR Plan includes individual information for each Community asset, landscape attributes that may influence risk, and the risk assessment which establishes a risk score based on landscape attributes, a hazard score, an exposure score, and a vulnerability score for each asset. The asset inventory and risk assessment inputs can be seen in Table 17.

### Asset Information

The asset information columns in Table 17 include the following information:

- **Asset Name:** The name of the facility or a descriptive name that serves as a unique identifier.
- **Risk Area:** Identifies the risk area for each asset based on New York State Department of State hazard maps. Risk areas include extreme, high, and moderate zones.
- **Asset Class:** Each asset is categorized by asset class: Economic, Health and Social Services, Housing, Infrastructure Systems, or Natural and Cultural Resources.
- **Critical Facility:** Assets are marked as critical facilities based on critical asset criteria established by the Federal Emergency Management Agency (FEMA) guidelines or Community significance.
- **Community Value:** Assets are given a community value of high, medium, or low based on NYRCR Planning Committee Member input and feedback from Public Engagement Events. Community value can be applied individually or collectively based on certain assets and asset classes.

### Landscape Attributes

The landscape attribute columns in Table 17 include the following information:

- **Erosion Rate:** Marked “yes” if the long-term average erosion rate is 1 ft. or more per year, or unknown.
- **Beach Width:** Marked “yes” if the water line is frequently in contact with a shore defense structure or upland vegetation.

- **Shore Defenses:** Marked “yes” if shore defenses are absent, not constructed to anticipated storm or sea level rise conditions, or are deteriorating.
- **Vegetation:** Marked “yes” if protective vegetation, wetlands, or intervening structures between asset and flood source are absent.
- **Dunes or Bluffs:** Marked “yes” if dunes are absent, below the base flood elevation (BFE), eroding, discontinuous, or have little vegetation. Marked “yes” if bluff slopes are unstable or partially vegetated.
- **Soils:** Marked “yes” if the asset is located on a coastal barrier island or filled wetland.

### Risk Assessment

The risk assessment columns in Table 17 include the following information:

- **Hazard Score:** The hazard score is based on the likelihood an event will occur and the magnitude (destructive capacity) of the event. Likelihood is derived from the storm recurrence interval within the selected planning time frame.
- **Exposure Score:** The coastal risk assessment area maps are used to provide a “base exposure score” for each asset. Generally, assets in the extreme risk area are closer to the shoreline and are more exposed to potential damage. Therefore, assets in extreme risk areas receive a base exposure score of 2; assets in high risk areas receive a base exposure score of 1, and assets in moderate risk areas receive a base exposure score of 0.5. Landscape attributes are used to further exposure scores, contributing an additional 0.5 for each “yes” in the landscape attribute columns.
- **Vulnerability Score:** Each asset receives a vulnerability score based on the impact of its damage relative to its asset class.
- **Risk Score:** Risk scores are based on the formula: Hazard x Exposure x Vulnerability.

**Table 17:** Community asset inventory

Asset Information																
Asset Name	Risk Area	Asset Class	Critical Facility	Community Value	Landscape Attributes						Risk Assessment					
					Erosion Rate	Beach Width	Shore Defenses	Vegetation	Dunes or Bluffs	Soils	Landscape Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	
Bellmore Library	Moderate	Natrual and Cultural	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Bellmore LIRR	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Birch Elementary School	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Blue Water Yacht Club	Extreme	Economic	No	High	No	Yes	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	4	54
Cammanns Pond County Park	Extreme	Natrual and Cultural	Yes	High	No	Yes	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	4	54
Charles A Reinhard School	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Chatterton School	Moderate	Health and Social	No	High	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	4	30
Club House Marina	Extreme	Economic	No	High	No	Yes	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	4	54
CVS	High	Economic	Yes	Medium	No	Yes	Yes	Yes	Yes	Yes	No	2	3	3	3	27
CVS	Moderate	Economic	No	Medium	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Doctors Office Center	Moderate	Health and Social	No	High	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Downtown Bellmore	Moderate	Economic	Yes	Low	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Downtown Merrick	Moderate	Economic	Yes	Low	No	Yes	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
East Bay Park	Moderate	Natrual and Cultural	Yes	Low	No	Yes	Yes	Yes	Yes	Yes	Yes	2.5	3	3	2	18
EMS Headquarters	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
EMS Station 2	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department Chiefs Office	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	Yes	2.5	4	3	5	60
Fire Department District Office	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department Headquarters	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department Hook & Ladder Co 1	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department Station 2	High	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	3	5	60
Fire Department Station 2 Friendship	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department Station 3	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department Station 3 Empire	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Fire Department District Office	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50

**Table 17 (cont'd):** Community asset inventory

Asset Information					Landscape Attributes						Risk Assessment				
Asset Name	Risk Area	Asset Class	Critical Facility	Community Value	Erosion Rate	Beach Width	Shore Defenses	Vegetation	Dunes or Bluffs	Soils	Landscape Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Fire Department Station 1	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Four Towns Fireman's Training Center	High	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	No	2	3	3	5	45
Grand Avenue Middle School	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Gulf Gas Station	Moderate	Economic	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
USPS Postal Inspection Facility	Moderate	Health and Social	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
John F Kennedy High School	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	Yes	2.5	3	3	2	18
Keezac Pharmacy	Moderate	Economic	No	High	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
King Kullen	Moderate	Economic	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
LIPA	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Meroke Preserve	Extreme	Natural and Cultural	No	Medium	No	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	2	27
Merrick Golf Course	Moderate	Natural and Cultural	No	Low	No	Yes	Yes	Yes	Yes	Yes	2.5	3	3	2	18
Merrick Library	Moderate	Natural and Cultural	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Merrick Library Wing	Moderate	Natural and Cultural	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Merrick LIRR	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	No	2	4	2.5	5	50
Merrick Road Park	Moderate	Natural and Cultural	No	Medium	No	Yes	Yes	Yes	Yes	No	2	4	2.5	3	30
Merrick Senior Center	High	Health and Social	No	Low	No	Yes	Yes	Yes	Yes	Yes	2.5	3	3.5	3	31.5
MTA Police Station	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	No	2	3	2.5	5	37.5
NCDPW Garage - Merrick	Extreme	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	2.5	4	4.5	5	90
NCPD Booth E	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	No	2	3	2.5	5	37.5
Newbridge Rd Park	Moderate	Natural and Cultural	No	Medium	No	Yes	Yes	Yes	Yes	Yes	2.5	3	3	3	27
Norman J Levy Lakeside School	Moderate	Health and Social	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Norman J Levy Park & Preserve	Moderate	Natural and Cultural	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Open Bay Marina	Extreme	Economic	Yes	Medium	No	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	4	54
Pumping Station - Merrick & Clubhouse Rd	High	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	No	2	4	3	5	60

**Table 17 (cont'd):** Community asset inventory

Asset Information					Landscape Attributes						Risk Assessment				
Asset Name	Risk Area	Asset Class	Critical Facility	Community Value	Erosion Rate	Beach Width	Shore Defenses	Vegetation	Dunes or Bluffs	Soils	Landscape Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Pumping Station - Newbridge Rd	High	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	2.5	4	3.5	5	70
Retail Corridor - Merrick Rd	High	Economic	Yes	Low	No	Yes	Yes	Yes	Yes	No	2	3	3	3	27
Retail Corridor - Sunrise Hwy	Moderate	Economic	Yes	Low	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Rite Aid	Moderate	Economic	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Rite Aid	Moderate	Economic	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	2	15
Sanitation	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	No	2	4	2.5	3	30
Seneca Fuel Oil Company	Moderate	Economic	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Shore Road Elementary School	Moderate	Health and Social	Yes	Medium	No	Yes	Yes	Yes	Yes	Yes	2.5	3	3	3	27
South Nassau Hospital Annex	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	No	2	4	2.5	3	30
South Shore Dialysis	Moderate	Health and Social	Yes	High	No	Yes	Yes	Yes	Yes	No	2	4	2.5	3	30
Stop and Shop	Moderate	Economic	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Sunrise Plaza Shopping Center	Moderate	Economic	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5
Town of Hempstead Traffic Control Division	Extreme	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	3	40.5
Trader Joes	High	Economic	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	3	3	27
Waldbaums	High	Economic	No	Medium	No	Yes	Yes	Yes	Yes	No	2	3	3	3	27
Water Treatment Plant - Thelma & Sherman St	Moderate	Infrastructure	Yes	High	No	Yes	Yes	Yes	Yes	Yes	2.5	4	3	4	48
Whaleneck Marina Center	Extreme	Economic	No	High	No	Yes	Yes	Yes	Yes	Yes	2.5	3	4.5	4	54
Winthrop Avenue School	Moderate	Health and Social	Yes	Medium	No	Yes	Yes	Yes	Yes	No	2	3	2.5	3	22.5



## E. End Notes

1. Five of the 102 localities in the program – Niagara, Herkimer, Oneida, Madison, and Montgomery Counties – are not funding through the CDBG-DR program.
2. The following localities' allocations comprise the NYRCR Community's total allocation: Bellmore – \$5.7 million; Merrick – \$6.4 million.
3. Google Earth Desk Survey
4. U.S. Bureau of the Census 2010. Census of Population
5. Long Island Index. Places to Grow. January 2010.
6. Zielenziger, David. "Hurricane Irene: After Landfall, Trees Down, Power Off in Nassau County." 28 August 2011. International Business Times
7. Brinton, Scott; Krasula, Deirdre; Weingrad, David. 29 August 2011. "Bellmore-Merrick slowly emerges from Irene." LI Herald Online Edition
8. La Vacca, Laura. "Merrick Takes Hit from Hurricane Irene." Merrick Patch. 28 August 2011.
9. Village of Freeport All Hazard Mitigation Plan 2014
10. "Mangano Orders Mandatory Evacuation of Flood and Storm Surge Zones." Nassau County New York. <www.nassaucountyny.gov>
11. "Mangano Orders Mandatory Evacuation of Flood and Storm Surge Zones." Nassau County New York. <www.nassaucountyny.gov>
12. Mansmann, Julie. "South Shore Slowly Comes Back To Life After Sandy." LI Herald Online Edition. 12 November 2012.
13. "Long Island Power Authority Investor Update Conference Call." 16 January 2013. Long Island Power Authority. <www.lipower.org>
14. "Mangano Announces Food & Drink Distributions." Nassau County New York. <www.nassaucountyny.gov>
15. "Mangano Opens Additional Warming Centers in Nassau." Nassau County New York. <www.nassaucountyny.gov>
16. Marsar, Stephen. Firefighter Nation. 19 November 2012.
17. Richardson, Todd, and Ben Winter. "Analysis of Communities Impacted by Hurricane Sandy." HUD Office of Policy and Research. Draft, January 29, 2013.
18. Richardson, Todd, and Ben Winter. "Analysis of Communities Impacted by Hurricane Sandy." HUD Office of Policy and Research. Draft, January 29, 2013.
19. <http://www.fema.gov/media-library/assets/documents/30714?id=65> (Sandy Housing Assistance Data for New York and New Jersey Updated, August 28, 2013).
20. <http://www.fema.gov/media-library/assets/documents/30714?id=65> (Sandy Housing Assistance Data for New York and New Jersey Updated, August 28, 2013).
21. Richner, Zachary. SBA DCMS Application Information. Nassau and Suffolk Counties Business Applicant Information. 13 December 2013.
22. Richner, Zachary. SBA DCMS Application Information. Nassau and Suffolk Counties Business Applicant Information. 13 December 2013.
23. "Mangano: Many Roads Still Closed Throughout Nassau County." Nassau County New York. <www.nassaucountyny.gov>
24. <http://new.mta.info/press-releases>
25. "Long Island Power Authority Investor Update Conference Call." 16 January 2013. Long Island Power Authority. <www.lipower.org>
26. Gomez, Karen. "Sandy Clobbers Long Island Home Heating Oil Tanks." June 2013. New England Interstate Water Pollution Control Commission. <www.neiwppcc.org>
27. National Weather Service: [http://www.nhc.noaa.gov/data/tcr/AL182012\\_Sandy.pdf](http://www.nhc.noaa.gov/data/tcr/AL182012_Sandy.pdf), p. 55
28. National Weather Service: <http://www.erh.noaa.gov/okx/StormEvents/storm08282011.html>
29. Long Island 2035 Study Team. LI 2035 Visioning Initiative. December 2009.
30. South Shore Estuary Reserve Council. South Shore Estuary Reserve Comprehensive Management Plan. 2001.
31. Regional Plan Association. Places to Grow – An Analysis of the Potential for Transit-Accessible Housing and Jobs in Long Island's Downtowns and Station Areas. January 2010.
32. South Shore Estuary Reserve Council. South Shore Estuary Reserve Comprehensive Management Plan. 2001.
33. New York State Department of State. NYS Coastal Management Plan. 2006.
34. Nassau County. Draft Nassau County Master Plan. October 2010.
35. Nassau County. Draft Nassau County Master Plan. October 2010.
36. Regional Plan Association. Cleaner Greener LI Regional Sustainability Plan. April 2013.
37. Nassau County. Draft Nassau County Master Plan. October 2010.
38. Nassau County. Nassau County Consolidated Plan. 2010.
39. Long Island Regional Planning Council. Sustainable Strategies for LI 2035. December 2010.
40. Long Island Regional Economic Development Council. New Vision for the LI Economy. November 2011.
41. Long Island 2035 Study Team. LI 2035 Visioning Initiative. December 2009.
42. Regional Plan Association. Cleaner Greener LI Regional Sustainability Plan. April 2013.
43. Long Island Regional Economic Development Council. Strong Island – Recovery & Resurgence – Strategic Economic Development Plan for Nassau and Suffolk Counties (Update). September 2013.
44. Regional Plan Association. Nassau County Infill Redevelopment Feasibility Report. September 2013.
45. Nassau County. Draft Nassau County Master Plan. October 2010.
46. "Nassau Hazard Mitigation Plan." Nassau County New York. <www.nassaucountyny.gov>
47. Nassau County. Multi-Jurisdictional Nassau County Debris Management Plan.
48. Long Island 2035 Study Team. LI 2035 Visioning Initiative. December 2009.
49. United States Census Bureau. 2007-2011 American Community Survey DP04. 2011.

50. Code of Federal Regulations (CFR) Title 44, Chapter 1, Part 201 – Mitigation Planning
51. Guidance for New York Rising Community Reconstruction Plans: A Planning Toolkit for CR Planning Committees (2013).
52. De Bruin Engineering P.C., Technical Design Report: Meroke Pond, Bellmore, February 3, 2009, p.6
53. Intergovernmental Panel on Climate Change, IPCC WGII AR5 Technical Summary: Climate Change 2014: Impacts, Adaptation, and Vulnerability, March 2014, available at: [http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-TS\\_FGDall.pdf](http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-TS_FGDall.pdf)
54. Meeting with Town of Hempstead, March 4, 2014, Meeting with Nassau County, February 25, 2014
55. Urbanomics, Geospatial Join of Nassau County Assessment Data with NYS Risk Zone Layers
56. Ibid.
57. ESRI. Retail Marketplace Profile. 3 January 2014
58. ESRI. Retail Marketplace Profile. 2012.
59. US Bureau of the Census, 2010 Census of Population
60. "METAR/SPECI from KFRG, Farmingdale, Republic Airport (United States)." 31 March 2014. Professional Information About Meteorological Conditions In The World. <[www.ogimet.com](http://www.ogimet.com)>
61. "State of New York Action Plan for Community Development Block Grant Program Disaster Recovery." New York State Homes and Community Renewal. April 2103. 17.
62. US Bureau of the Census, 2007-2011 American Community Survey DP04
63. Low Income Occupants Have Annual Incomes Below \$75,000 or Meet HUD's Low Income Limit at 80% of The AMI (Area Median Income)
64. Urbanomics, Geospatial Join of Census Bureau 2010 Block Group Data and Risk Zone Map
65. "Housing Assistance Data Hurricane Sandy New York & New Jersey." 28 August 2013. Federal Emergency Management Agency <[www.fema.gov](http://www.fema.gov)>
66. "NY Rising Housing Recovery Program Announces 6,388 Homeowners Have Been Issued Checks for Over \$280 Million for Home Rebuilding." The NY Rising Housing Recovery Program. <[www.stormrecovery.ny.gov](http://www.stormrecovery.ny.gov)>
67. <http://www.newsday.com/long-island/data.Realtor.com/search>. Web. Accessed October 9, 2013
68. [http://data.newsday.com/long-island/data/foreclosures/2012-2013/HUD Aggregated US Postal Service Administrative Data on Address Vacancies, Q3 2012 to Q3 2013](http://data.newsday.com/long-island/data/foreclosures/2012-2013/HUD%20Aggregated%20US%20Postal%20Service%20Administrative%20Data%20on%20Address%20Vacancies,%20Q3%202012%20to%20Q3%202013)
69. <http://www.newsday.com/long-island/data.Realtor.com/search>. Web. Accessed October 9, 2013
70. "Long Island Foreclosure Cases." Long IslandNewsday. <[data.newsday.com](http://data.newsday.com)>
71. ESRI forecasts, Demographic and Income Profile, Bellmore-Merrick (CDP 3646668). 03 January 2014.
72. Ibid.
73. "NY Rising Buyout and Acquisition Programs."New York Storm Recovery Resources Center. <[www.stormrecovery.ny.gov](http://www.stormrecovery.ny.gov)>
74. "HOME Investment Partnerships Program (HOME)."Nassau County New York.<[www.nassaucountyny.gov](http://www.nassaucountyny.gov)>
75. "FEMA Storm Damage Mitigation Proposed LIPA Initiatives." Brookhaven National Laboratory. <[www.bnl.gov](http://www.bnl.gov)>
76. "2010 – 2020 Electric Resource Plan." Long Island Power Authority. <[www.lipower.org](http://www.lipower.org)>
77. "Nassau and Suffolk Counties Trends in Wetland Loss." New York State Department of Environmental Conservation.<[www.dec.ny.gov](http://www.dec.ny.gov)>
78. U.S. Environmental Protection Agency, Functions and Values of Wetlands. 2001
79. Barbier EB, Georgiou IY, Enchelmeyer B, Reed DJ (2013) The Value of Wetlands in Protecting Southeast Louisiana from Hurricane Storm Surges. PLoS ONE 8(3): e58715
80. U.S. Environmental Protection Agency, Wetlands: Protecting Life and Property from Flooding. 2006.
81. Galveston Bay Foundation. Living Shorelines: A Natural Approach to Erosion Control. 2011.
82. NY Department of Environmental Conservation. Stormwater MS4 Permit and Forms. <[www.dec.ny.gov](http://www.dec.ny.gov)>

## F. Glossary

BFE: Base Flood Elevation

CDBG-DR: Community Development Block Grant - Disaster Recovery

CHHA: Coastal High Hazard Area

DPW: Department of Public Works

ESRF: New York State Empire State Relief Fund

FEMA: Federal Emergency Management Agency

FD: Fire Department

GIS: Geographic Information System

HRRF: New York State Homeownership Repair and Rebuilding Fund

HUD: U.S. Department of Housing and Urban Development

IHP: Individual and Households Program

kW: Kilowatt

LIPA: Long Island Power Authority

LIRR: Long Island Rail Road

MW: Megawatt

NDRF: National Disaster Recovery Framework

NFIP: National Flood Insurance Program

NGVD: National Geodetic Vertical Datum of 1929

NOAA: National Oceanic and Atmospheric Administration

NOAA-CSC: National Oceanic and Atmospheric Administration Coastal Services Center

NYRCR: New York Rising Community Reconstruction

NWS: National Weather Service

NYS: New York State

NYS CMP: New York State Coastal Management Plan

NYS DOS: New York State Department of State

PD: Police Department

PSEG: Public Service Electric and Gas Company

RSF: Recovery Support Function

SBA: U.S. Small Business Administration

SFHA: Special Flood Hazard Area

SLOSH: Sea, Lake and Overland Surges from Hurricanes

TOD: Transit-Oriented Development

TOH: Town of Hempstead

TSD: Transit-Supportive Development

UFSD: Union Free School District

