SUFFERN NYRCR

NY RISING COMMUNITY RECONSTRUCTION PLAN

December 2014

NY Rising Community
Reconstruction Program

Members of the Suffern NYRCR Planning Committee

Beth Barone, Chair
Trish Abato*
Jo Corrigan*
James Lyons
Bruce McClintlock
Daniel McInerney
Charles Sawicki
Dina Schmidt
Bruce Simon

(non-voting member)

Prepared By

This document was developed by the Suffern NYRCR 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 and NYS Department of State. The document was prepared by the following consulting firms: AKRF, Inc.; MJ Engineering and Land Surveying, P.C.; Nagle, Tatich, Cranston LLC d/b/a Elan.3.Consulting (E.3); Sasaki Associates; Arch Street Communications, Inc.; and CDM Smith.

55
53

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, within the Governor's Office of Storm Recovery (GOSR), empowers the State's most impacted communities with the technical expertise and funding resources needed to develop thorough and 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 $700 million planning and implementation program 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 powerful 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.

Launched in the summer of 2013 and completed in March 2014, Round I of the NYRCR planning process included 50 NYRCR Planning Areas, comprising 102 storm-impacted localities. In January 2014, Governor Cuomo announced a second round of the planning process, serving an additional 22 storm-impacted localities. Four of these localities were absorbed into existing Round I NYRCR Planning Areas, bringing the number of localities participating in Round I up to 106; the other 18 localities formed 16 new Round II NYRCR Planning Areas. Between Rounds I and II, there are 66 NYRCR Planning Areas, comprising 124 localities. The program serves 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.

In Rounds I and II, the State allotted between $3 million and $25 million to each participating locality for the implementation of 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.[1]

Each NYRCR Planning Area is represented by a NYRCR Planning Committee composed of local residents, business owners, and civic leaders. Members

1. Five of the Round I Planning Areas—Niagara, Herkimer, Oneida, Madison, and Montgomery Counties—are not funded through the CDBG-DR program.

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 650 New Yorkers have represented their communities by serving on Planning Committees. Nearly 650 Planning Committee Meetings have been held, during which Planning Committee members worked with the State's team to develop community reconstruction plans, which identify opportunities to make their communities more resilient. All meetings were open to the public. An additional 250+ Public Engagement Events attracted thousands of community members, who provided feedback on the planning process and resulting 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 program's website (www.stormrecovery.ny.gov/nyrcr), providing several ways for community members and the public to submit feedback on the program and materials in progress.

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

The NYRCR Program does not end with this NYRCR Plan. Governor Cuomo has allotted over $700 million for planning as well as implementing eligible projects identified in NYRCR Plans. NYRCR Planning Areas are also eligible for additional funds through the NY Rising to the Top Competition, which evaluates applications from Round II NYRCR Planning Committees across three categories—Regional Approach, Inclusion of Vulnerable Populations, and Use of Green Infrastructure. The winner of each category will be allotted a share of the competition's $3.5 million to fund additional eligible projects.

In April 2014, Governor Cuomo announced that projects identified in NYRCR Plans would receive priority consideration through the State's Consolidated Funding Application (CFA) process and charged the Regional Economic Development Councils (REDCs), which play an advisory role in the CFA process, to support NYRCR projects. In December 2014, Governor Cuomo announced that 24 NYRCR projects received nearly $12 million in CFA funding. This announcement is an example of the Governor honoring his commitment to leverage the work of the NYRCR Planning Committees to incorporate resilience into other State programs and to find additional sources of funding for NYRCR projects. The NYRCR Program is also working with both private and public institutions to identify existing funding sources and to create 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 REDC State Agency Review Teams (SARTs), composed of representatives from dozens of State agencies and authorities, for feedback on projects proposed by NYRCR Planning Committees. 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.

On the pages that follow, you will see the results of months of thoughtful, diligent work by the Suffern NYRCR Planning Committee, which is passionately committed to realizing a brighter, more resilient future for its community.

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 Planning Committee's prioritization of these projects and actions. P**roposed Projects** are projects proposed for funding through an NYRCR Planning Area's allotment 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 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.

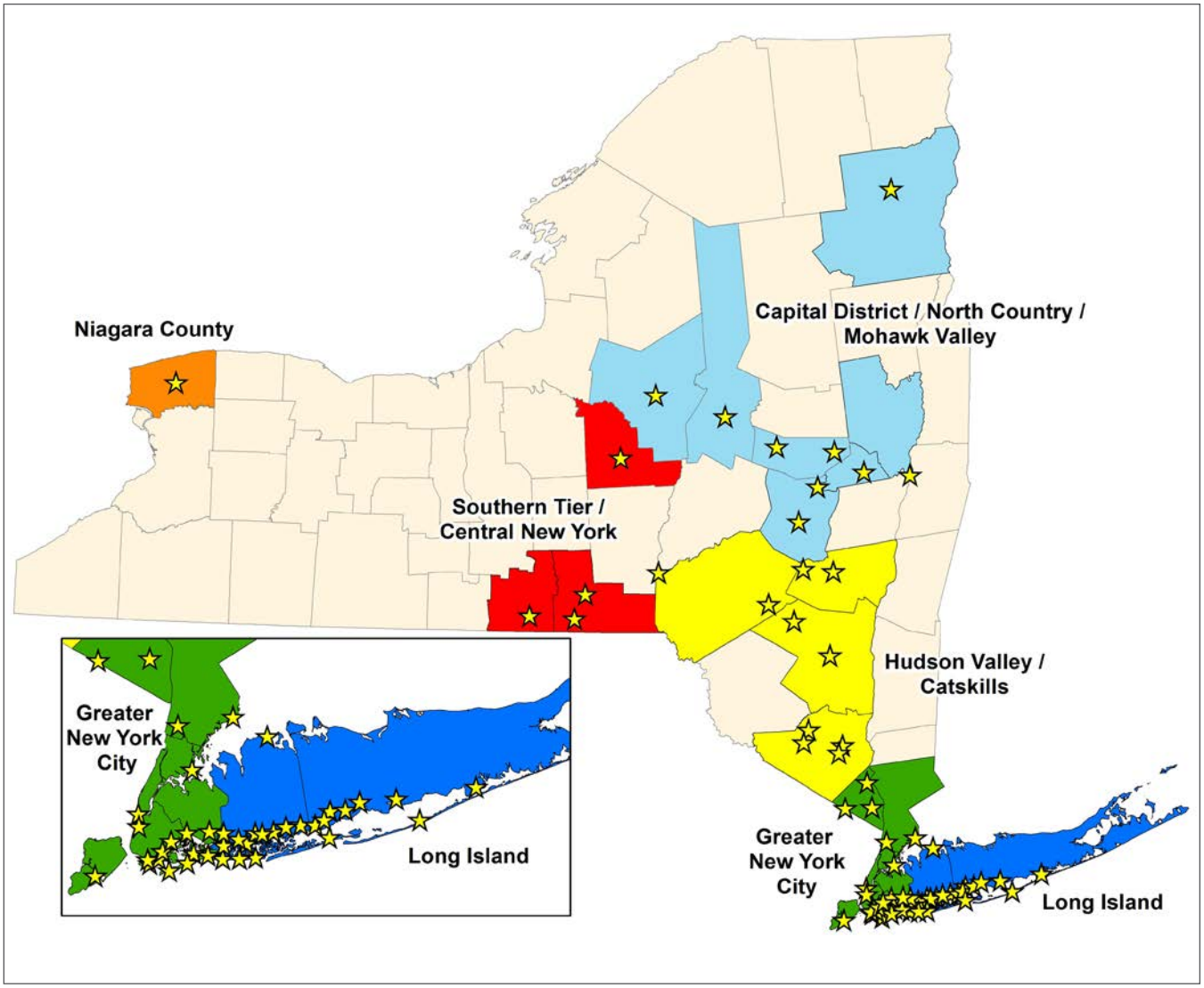
As part of Round II of the NYRCR Program, the Suffern NYRCR Planning Area has been allotted up to $3 million in CDBG-DR funds for the implementation of eligible projects identified in this plan.

While developing projects for inclusion in NYRCR Plans, 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 satisfy a Federally-designated eligible activity category, fulfill a national objective (i.e., 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 GOSR 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 Planning Area's CDBG-DR allotment 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. 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. Projects will be implemented on a staggered timeline, and the NYRCR Program will choose an appropriate State or local partner to implement each project. GOSR will actively seek to match projects with additional funding sources, when possible.

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.

NY Rising Planning Areas



Note: Map displays the 66 NYRCR Planning Areas from Rounds I and II. (Five of the Round I Planning Areas—Niagara, Herkimer, Oneida, Madison, and Montgomery Counties—are not funded through the CDBG-DR program.)

Table of Contents

Section I. Community Overview I-1

A. Geographic Scope I-2

B. Description of Storm Damage I-3

C. Critical Issues..... I-8

D. Community Vision I-13

E. Relationship to Regional Plans I-14

Section II: Assessment of Risk and Needs..... II-1

A. Description of Community Assets and Assessment of Risk..... II-1

i. Description of Community Assets II-1

ii. Assessment of Risk to Assets and Systems II-12

B. Assessment of Needs and Opportunities II-18

Section III: Reconstruction and Resiliency Strategies..... III-1

Section IV: Implementation – Project Profiles IV-1

Backup Power for Critical Community Facilities IV-4

Emergency Railroad Crossing into the West Ward..... IV-7

Drainage Improvements to Transportation Assets IV-9

Flood Mitigation Assessment – Mahwah and Ramapo River Watersheds.....IV-12

Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures.....IV-15

Hardening of Water Treatment Plant and Facilities through Physical Protective Measures IV-18

Homeowner Buyout Program Support and Economic Development Plan IV-21

Homeowner Support for Raising Utility Connections and Mechanicals IV-23

Inventory of Existing Stormwater Management Infrastructure.....IV-25

Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study.....IV-27

Stormwater Management Facilities in Village Parking Lots A and B.....IV-30

VFW Building Emergency Power and Electrical Upgrades IV-33

Section V: Additional Materials V-1

A. Additional Resiliency Recommendations..... V-1

B. Master Table of Projects V-3

C. Public Engagement Process..... V-9

D. Community Asset Inventory..... V-15

E. Endnotes V-19

F. Glossary V-23

Suffern NYRCR Executive Summary

I. Overview

The NY Rising Community Reconstruction (NYRCR) Program was established by New York Governor Andrew M. Cuomo to provide rebuilding and revitalization assistance to communities damaged by Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee. Recovery and reconstruction initiatives began immediately following these storm events. The goal of the program is to rebuild from these storms and to increase communities' physical, economic, and social resilience to future storm events. The NYRCR Program provides an opportunity for residents, business owners, and community leaders to actively participate in planning for a stronger future. The Program empowers communities to prepare locally driven recovery plans to identify innovative reconstruction and resiliency projects and other actions to allow each community not only to survive, but also to thrive in an era when natural risks are becoming increasingly common.

The Suffern NYRCR Plan was developed during six months of community stakeholder engagement. The NYRCR Plan reflects Suffern's vision and goals, honoring its unique qualities and assets for building a safer, more resilient, and sustainable future.

a. Community Location and Allotment Amount

The Village of Suffern, located within the Town of Ramapo in Rockland County, 20 miles west of the Hudson River, measures 2.1 square miles. The community has just over 10,000 residents and maintains true small town charm while being just an hour drive or train ride from the heart of New York City. The Ramapo River Watershed, which is part of the Passaic River Basin, encompasses the entire Village.

Suffern has been allotted up to $3 million in Community Development Block Grant – Disaster Recovery (CDBG-DR) funding through the NYRCR program.

b. Scope of Planning Area

The Suffern NYRCR planning area encompasses the entire Village of Suffern, and a small part of the New Jersey Township of Mahwah at the New York and New Jersey border. The portion of Mahwah contained in the geographic scope includes an important access point for residents and emergency vehicles to the West Ward neighborhood of the Village. The Suffern NYRCR Planning Committee (Committee) agreed that they would include the entire Village in the planning area since important community assets are located throughout. In addition, upland areas have potential for resilient reconstruction and stormwater management practices that can absorb stormwater and potentially reduce flooding impacts in lower lying areas.

c. Summary of Storm Impacts

Hurricane Irene (August 28, 2011) hit Suffern with its full force. The heavy and sustained rains caused the Village's two rivers (Mahwah and Ramapo) to reach historic levels and flow into and beyond their floodplains resulting in significant damage to roads, homes, and businesses throughout the Village. The majority of storm damage from Hurricane Irene was concentrated along the rivers and in the area surrounding Lake Antrim. Roads were flooded, and a bridge washed out severing the link between residents and emergency services providers. The flooding caused the wastewater and water treatment plants to be taken offline, leaving the Village no way to process sewage and unable to produce potable water.

During Superstorm Sandy (October 29, 2012), it was not water but the high speed winds that wreaked havoc throughout the Village. The storm's strong winds took down trees and power lines, blew off roofs, and compromised utilities and Village infrastructure. Following Superstorm Sandy, a State of Emergency was declared at both the County and local level. Throughout Rockland County, over 75,000 homes lost power, some for as long as two weeks.

Unfortunately these storm events are not isolated incidents. Businesses, home owners, and Village government services are barely able to recover financially and structurally in time for the next storm. Today, the Village of Suffern is still working to repair damages caused by Superstorm Sandy and Hurricane Irene.

d. Summary of Critical Issues

Hurricane Irene and Superstorm Sandy caused damage that directly and indirectly impacted homes, businesses, roads, critical infrastructure systems, and natural resources throughout the Village. These storms exposed many vulnerabilities and revealed critical issues affecting the community and its ability to respond to and recover from natural disasters. The key critical issues facing the Village of Suffern include:

- Emergency Access
- Flooding in Residential Neighborhoods
- Road Closures
- Inundation of Critical Facilities
- Stream Bank Erosion
- Business Closures
- Loss of Power

II. Community-Driven Process

All of the material presented in this Suffern NYRCR Plan has been developed collaboratively. The NYRCR Program provided the Community with a unique opportunity to participate in a bottom-up/community-driven planning effort to shape its resilient future.

a. Community Vision and Goals

The Suffern NYRCR Vision Statement:

Suffern is a quaint, resilient, easily accessible community dedicated to building back better. We are a united community that works together to maintain our quality of life, small town charm, multi-modal transportation options, educational framework, and cultural attractions as investments in future generations. Residents are dedicated to restoring, redeveloping, revitalizing, and making more resilient our downtown, infrastructure, stormwater systems, natural and cultural resources, all of which make Suffern a unique, historic, and vibrant place.

Goals:

To realize the vision, NYRCR Suffern has developed the following goals:

- Build closer working relationships with neighboring communities and the State of New Jersey to address flooding issues that do not respect municipal boundaries.
- Continue high level of emergency services and enhance physical access to neighborhoods.
- Enhance infrastructure and stormwater systems where needed.
- Preserve community character to maintain small town charm.
- Protect and clean Lake Antrim and the Mahwah and Ramapo Rivers.
- Protect, promote and enhance cultural attractions that draw people to the village.
- Revitalize downtown businesses and protect from future storm damage.

b. Summary of Public Outreach

The NYRCR Program is fundamentally a grassroots initiative. Initial project recommendations were generated by the Suffern NYRCR Planning Committee, which comprised residents, past and present Village staff, and elected officials. The Committee met 10 times, approximately every other week from the end of June 2014 through mid-November 2014. Materials were circulated to the Committee before and after each meeting and also posted to the Village page on the NYRCR website. Interested members of the public attended each of the Planning Committees Meetings.

Three Public Engagement Events were held throughout the six month planning process, with a fourth to be conducted on January 14, 2015 after the final NYRCR Plan is complete. These meetings provided the opportunity for Suffern residents to learn about the NYRCR planning process, assets, and projects, and provide input to community-driven plans for a more resilient future. The format of the Public Engagement Events varied throughout the process, but generally included PowerPoint presentations, display boards and mapping, workgroups and discussion supported by maps and markers, survey sheets, and a photo booth.

Committee Members also shared information with their community by posting relevant materials to the Village website, leaving materials in the Library and other high traffic areas, posting information throughout the Village, reaching out to friends and neighbors through email and conversation, and attending municipal meetings and functions to report on their NYRCR Plan progress. In addition, Committee Members and the Village spread the word by distributing emails through the Village's network and sending materials home with school-aged students.

III. Final Plan as Blueprint for Implementation

a. Needs and Risks Underpin Projects

The Suffern NYRCR Planning Committee understands where the Village is vulnerable, where the critical assets are located, and what the risks are to those assets. To address their specific vulnerabilities, a comprehensive Needs and Opportunities analysis was prepared through a combination of research, analysis, and Committee and community feedback. A sample of the needs and the opportunities identified to address those needs, follows:

NEEDS:

- Continue high level emergency services operation and communication among responders.
- Improve regional coordination with state, federal, and municipal governments to protect the community and plan for future disasters.
- Investigate floodplain protection/restoration and alternative stormwater management measures (i.e., green technology).
- Protect existing residential neighborhoods and their access points from flooding.
- Protect identified road, bridge, and culvert infrastructure assets.
- Provide businesses with assistance to improve recovery time following a storm event.

OPPORTUNITIES:

- Create a Regional Coordination Committee to address flooding issues across state and municipal boundaries.
- Encourage continued training and education on cutting edge technologies for emergency service operations.
- Evaluate ingress and egress routes to vulnerable neighborhoods to develop safe emergency access and evacuation routes during storm events.
- Examine resources such as low interest loans and/or grants to help small businesses recover from storm events.
- Identify areas where floodplains can be protected and/or restored and where green infrastructure techniques can be used to alleviate flooding from stormwater runoff.
- Inventory infrastructure needs including age and condition of facilities and preparation of a maintenance and/or replacement/relocation plan.

Flooded Wastewater Treatment Plant along Ramapo River (Charles Sawicki)

b. Strategies

The strategies proposed in the NYRCR Plan consider emergency, disaster recovery, long-term resiliency, and economic development needs that remain unmet. They represent statements of action that address how to best fortify community assets, address stated needs, capitalize on opportunities, resolve critical issues, and meet short-, medium-, and long-term goals identified during the planning process.

- Assist residents with preparation for, response to, and recovery from future storm events through emergency communication, outreach, and education initiatives.
- Broaden services at existing storm shelter facilities to more fully cover basic needs, accommodate pets, and, where needed, investigate new shelter opportunities.
- Collaborate with municipal neighbors in New York and New Jersey to manage watershed development and control flooding.
- Develop storm assistance programs and provide consolidated information on financial initiatives that allow residents and businesses to better protect themselves and their assets from future storm damage.
- Improve stormwater management and drainage systems throughout the Village to improve resiliency.
- Promote resilience and flood management practices through land-use planning, policy, and regulation.
- Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts, and bridges.
- Restore, preserve, and augment natural resources—including floodplains, streams, rivers, lakes and wetlands—to help mitigate flooding and support flood resiliency.

c. Projects are the Path to Executing the Strategies

The strategies presented in the Table A, and the Proposed or Featured Projects that implement them, specifically address the stated needs and transform opportunities into action items. While certain Proposed and Featured Projects can be associated with more than one strategy, each of these projects is presented within this NYRCR Plan in conjunction with the most applicable strategy that they fulfill. Projects and Strategies are not presented in any particular order of priority.

PROJECT CATEGORIES:

Proposed Projects are proposed for funding through a community's allotment of CDBG-DR funding.

Featured Projects are innovative projects where an initial study or discrete first phase of the project is proposed for CDBG-DR funding or other identified funding; and regulatory reforms and other programs that do not involve capital expenditures.

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

Table A: Proposed and Featured Projects

Strategy	Project Name	Project Category
Broaden services at existing storm shelter facilities to more fully cover basic needs and accommodate pets, and investigate new shelter opportunities	VFW Building Emergency Power and Electrical Upgrades	Featured Project
Develop storm assistance programs and provide consolidated information on financial initiatives that allow residents and businesses to better protect themselves and their assets from future storm damage	Homeowner Buyout Program Support and Economic Development Plan	Proposed Project
	Homeowner Support for Raising Utility Connections and Mechanicals	Proposed Project
Improve stormwater management and drainage systems throughout the Village to improve resiliency	Inventory of Existing Stormwater Management Infrastructure	Proposed Project
	Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study	Proposed Project
	Stormwater Management Facilities in Village Parking Lots A and B	Featured Project
Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts, and bridges	Backup Power for Critical Community Facilities	Proposed Project
	Emergency Railroad Crossing into the West Ward	Proposed Project
	Drainage Improvements to Transportation Assets	Proposed Project
	Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures	Proposed Project
	Hardening of Water Treatment Plant and Facilities through Physical Protective Measures	Proposed Project
Restore, preserve, and augment natural resources, including floodplains, streams, rivers, lakes, and wetlands, to help mitigate flooding and support flood resiliency	Flood Mitigation Assessment – Mahwah and Ramapo River Watersheds	Proposed Project

2014
NY RISING COMMUNITY RECONSTRUCTION PLAN

SUFFERN NYRCR

Section I
Community Overview

I Community Overview

The Village of Suffern is an incorporated village within the Town of Ramapo in Rockland County, New York. Harriman State Park makes up a portion of the Village's northern boundary, while the Ramapo River flows along its western extent, and Mahwah Township in New Jersey borders it to the south. The Ramapo Villages of Hillburn, Montebello, and Airmont surround Suffern with the Town of Clarkstown located further to the east. Suffern is well served by transportation routes, owing to its position at the "Ramapo Pass." The New York State (NYS) Thruway (I-87), connecting Albany and New York City passes through Suffern, as does I-287, a major connector between Rockland County, New Jersey, Westchester County, and Connecticut. In addition, the area is served by New Jersey Transit (NJT) and Metro-North Railroad commuter lines which stop at the Suffern train station. Freight rail also passes through the Village. It is Suffern's location at this geographically significant intersection that has made it an important crossroads for more than 250 years.

Prior to European settlement, the Village of Suffern was inhabited by the Munsee and Ramapough Indians. Arriving in the early 18th century, the first European settlers were primarily from the Germanic states, Scotland, England, Ireland, and the Netherlands."[1]

John Suffern, the Village's namesake, settled in the area now known as Suffern in 1773. Mr. Suffern worked as a teacher, farmer, and store owner and later served in both houses of New York State government. He initially called the Village, incorporated in 1796, "New Antrim," after the County in Ireland in which he lived. During the Revolutionary War, George Washington, Marquis de Lafayette, and Aaron Burr all conducted operations of the war from the Village. Washington himself is known to have stayed for five days in Suffern's Tavern, while his troops were stationed at what is currently the Salvation Army.[1]

In the 1840s, the New York and Erie railroad was built through the Ramapo Pass, opening up what was still a very rural village. The railroad requested that the station be called "Suffern," after the Suffern family whose land was used for the railroad's right-of-way.[2]

Suffern Village Museum and Police Department (Chris Robbins, AKRF, Inc.)

Owing to the Village's important location along major transportation routes, industry also flourished in the Village. Avon Products settled in the Village in 1897 and after growing for more than a century, constructed a new 225,000-square-foot research and development facility in the Village in 2005. Good Samaritan Hospital, which serves all of Rockland County, has been open since 1902 and is a major employer in the Village. Novartis Pharmaceuticals also has a large manufacturing facility in Suffern; although, in January

2014, the company announced its plans to close operations and move overseas.[3] In addition, the Village is home to the Salvation Army's School for Officer Training campus, which is situated on a 30-acre site just west of the hospital.

Suffern is developed at a generally suburban scale. Higher-density residential neighborhoods are located mostly to the south of NYS Route 59 and in its north and northeast reaches. Commercial and industrial areas are strung predominantly along NYS Route 59 and the freight rail line, with additional retail sporadically sited on US Route 202 and in other areas within the Village. Suffern has a small but defined downtown with a historic theater, retail shops, restaurants and some office uses. The Palisades Interstate Park/Harriman State Park on the Village's northwestern border. The open space surrounding the Stone Hill Quarry and Novartis complex, along with the undeveloped parcels surrounding the hospital, comprise the balance of the landmass in the Village.

As of 2012, Suffern had a population of 10,764. 73% of residents are white, 8% are African-American, and 18% of residents are Hispanic or Latino.[4]

Nearly two-thirds of the Village's housing stock was built between 1960 and 1990, with only 6% being constructed after that time. 30% of the Village's housing units are single-family detached houses, while another 30% are located in buildings housing three to four units. Another 16% of housing units are single-family attached houses, with the remaining roughly 11% of the units being situated in buildings of 20 units or more. More than half of the 28% of Village residents that live in rental housing pay more than 30% of their household income in gross rent.

Suffern is located in the Ramapo River Watershed. The Watershed's namesake, the Ramapo River, flows along the western border of the Village. North of I-287, the Mahwah River, a tributary to the Ramapo River, flows into Lake Antrim. It then continues south through the heart of Suffern and empties into the Ramapo River just south of the Village line in Mahwah, NJ. It is

Ramapo Quarry (Flaam Hardy, AKRF, Inc.)

this stretch of the Mahwah River running through the center of the Village that has caused the most flooding problems for residents and businesses. Flooding along the Ramapo River has also impacted the Village but to a lesser extent. It should be noted that the northern part of the Village is at a much higher elevation than the downtown which sits at the lowest point in Suffern. This contributes to flooding in the Village.

A. Geographic Scope

Defining the physical extent of the area that the NY Rising Community Reconstruction (NYRCR) planning process would address, known as the Geographic Scope, was the key first step taken by the Suffern NYRCR Planning Committee (Committee). This geographic study area forms the basis for all subsequent steps in the NYRCR planning process, including the exercises and analyses that lead to the development of the asset inventory, list of needs and opportunities, risk assessment and ultimately strategies, actions and projects. Committee Members were encouraged to define the Geographic Scope of their NYRCR Plan to include locations that are most vulnerable to storm damage and where assets are most at risk; areas where future development or redevelopment will be discouraged and encouraged; and areas where additional economic investment will help the community's financial resiliency.

"Assets are likely to be most at risk due to future storms in the extreme, high and moderate risk areas of the community. But reviewing current and previous storm damage may indicate that other areas should be included [in the geographic scope]."

Guidance for New York Rising Community Reconstruction Plans, A Planning Toolkit for CR Planning Committees

Although there are areas in Suffern that were not directly impacted by flooding or wind damage, these areas contain important recovery and resiliency assets or have the potential to support redevelopment, providing the Village the ability to move resources out of the path of future storms.

The Committee agreed that boundaries of the Geographic Scope would be coterminous with the municipal boundaries with the exception of a small area that extends into Mahwah, NJ. This portion is approximately 15 acres and includes the rail underpass leading to Ramapo Valley Road, and the intersections of Ramapo Valley Road with North Ramapo Avenue and Catherine Avenue. This inclusion of a small portion of Mahwah is important to the Village as the roads here provide one of two points of access to the Village's West Ward residential neighborhood. During certain storm events including Hurricane Irene, roads in this area as well as those to the north are inundated, thereby limiting or eliminating access to this neighborhood.

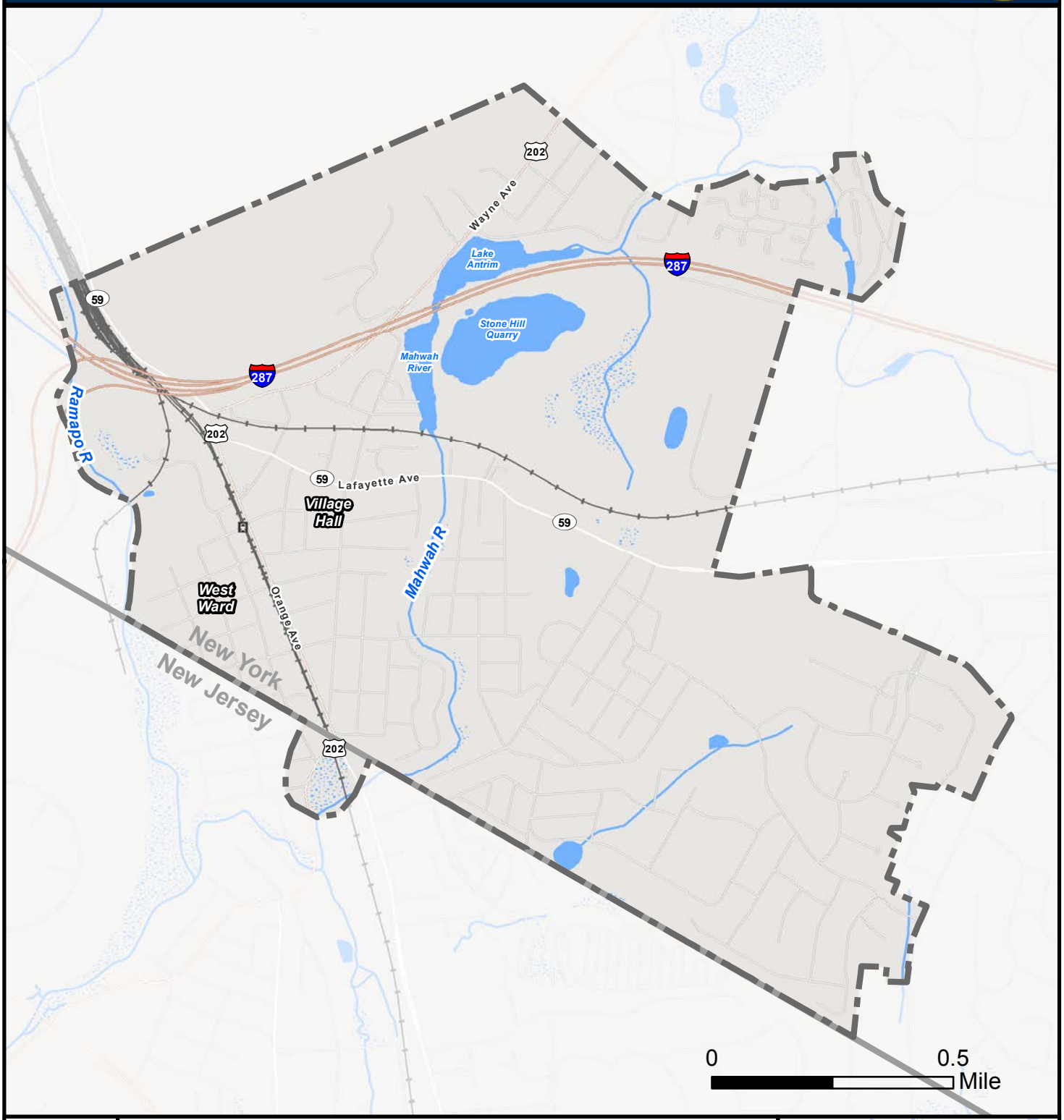
Figure I-1 presents the Geographic Scope developed by the Committee and endorsed by the broader Suffern community at the first Public Engagement Event. More information about public outreach can be found in Section V.C. "Public Engagement Process."

B. Description of Storm Damage

Over recent years, the Village of Suffern has suffered from substantial flood or wind damage as a result of recurring storm events, including Hurricane Irene (August 28, 2011) and Superstorm Sandy (October 29, 2012). Significant rainfall during Hurricane Irene caused the Mahwah and Ramapo Rivers to rise above their banks and flow into their natural floodplains, resulting in flooding of the surrounding areas. High winds damaged buildings, blew down trees, and knocked out power during Superstorm Sandy. Although Tropical Storm Lee did not harm the Village, Hurricane Irene and Superstorm Sandy took an enormous toll on this community, damaging housing and vital infrastructure, impacting business and the Village's economic vitality, and impacting the quality of life in Suffern.

To prepare for Hurricane Irene, on August 26, 2011, a county-wide state of emergency was declared, urging residents to stay off roads and prepare for power outages. All Rockland County transportation services, along with Metro-North, NJ Transit, Amtrak, and New York City subway service, were suspended. The storm left over 11,469 Orange and Rockland Utilities (O&R) customers with service disruptions in Rockland County. Suffern residents lost power for an average of two to three days during Hurricane Irene. Superstorm Sandy, which hit the Village the following fall, brought extreme winds that caused severe damage. Many residents were left without power for up to 10 days. The Federal Emergency Management Agency (FEMA) declared a Major Disaster in Rockland County on October 30, 2012, as first responders struggled to repair utilities and clean up debris. The Village coordinated closely with O&R to restore power to its residents. As soon as O&R confirmed the power was cut in an area, the Village Department of Public Works (DPW) came in to clear trees and storm debris leading the way for repairs to the electrical distribution system and ultimately restoration of power. Superstorm Sandy also disrupted NJ Transit service for more than two weeks, preventing many commuters from returning to work.[5]

Figure I-1
Geographic Scope - Village of Suffern



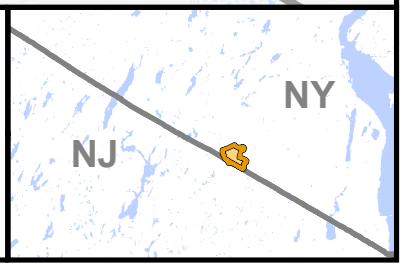
N

Legend

- Study Area (Village of Suffern, NY & portion of Mahwah, NJ)
- Major Highways
- Railroads
- Rail Station
- Rivers & Streams
- Wetlands
- Water Bodies

Data Sources

ESRI, NJGIN, NYSITS, Rockland County, Village of Suffern



Housing in certain neighborhoods across the Village has been devastated by flooding during recent storms, stranding residents, damaging, and even destroying homes. The Squires Gate community in southern Suffern, built adjacent to the west bank of the Mahwah River, has experienced regular flooding due to storms dating back to 1977. During Hurricane Irene, 152 homes were flooded some with as much as eight feet of water. Decks, ancillary structures, fences, and playground equipment were washed away and large portions of the neighborhood were inundated resulting in the loss of many vehicles. The area was evacuated due to the high waters and lack of electricity and the National Guard arrived to police the area for several days after the storm. Possessions within the flooded houses were destroyed and four of the semi-attached homes in this neighborhood were compromised, the water lifting the structures off of their foundations. Since the storm, these two buildings have been razed as part of the FEMA buyout program. Many residents impacted by Hurricane Irene continue to feel the effects over three years after the flood waters subsided.[6]

Past flooding in this community has not only damaged homes, but flooded streets, leaving residents stranded and without power for days at a time. Boats have been used to move residents to and from their homes during and after these flooding events. In addition, such inundation has caused health impacts. Flooded basements are plagued with pollutants and mold and must be entirely gutted and bleached after the water recedes. Residents have described coming down with a rash after wading through or otherwise being exposed to the water in their homes. People living in Squires Gate have described the recurring flooding that occured in their neighborhood to be sudden and extreme. Water entered their homes both from the saturated ground below and from the Mahwah River as it flowed into its adjacent floodplains during Hurricane Irene and other past storm events with significant amounts of precipitation. Power was quickly cut off as distribution lines and transformers are buried underground in this area.[7]

Flooding after Hurricane Irene (Robert Kawaski)

The Squires Gate community is not the only residential neighborhood in Suffern affected by flooding. Lake Antrim and the Mahwah River flowed above their banks and into their natural floodplains during Hurricane Irene, isolating northern Suffern, including apartment complexes, townhomes and single family residences off of Wayne Avenue, Memorial Drive, and Montebello Road, from the rest of the Village. Flooding in this area strands residents and severs access to vital emergency services. As a result of Hurricane Irene, residents on Memorial Drive had to be rescued by boat.

The West Ward residential neighborhood (the area in the Village west of Orange Avenue) is also a very vulnerable part of Suffern. The few access roads to this neighborhood flood frequently due to rainfall, excess stormwater, and the tendency of the Ramapo and Mahwah Rivers to flow into their floodplains during storm events. As a result, the West Ward is cut off from the rest of the Village and the providers of critical services. Even in good weather, larger emergency vehicles are only able to enter the West Ward at

Chestnut Street, close to the ball fields. During Hurricane Irene, the flooding was so severe that this entrance was cut off and residents remained isolated in their homes as emergency services had difficulty reaching them. At Boulevard Road Bridge, water from Hurricane Irene's drenching rains caused the Mahwah River to crest three feet above flood stage, flooding homes on Brook Street.

During Superstorm Sandy, housing stock also experienced damage but, this time from strong winds and falling trees and limbs. In Squires Gate, the roof of one semi-attached house was partially blown away. At another, a tree crashed down through the roof, damaging the attic and top floor. In another location, one of the homes had the electrical service torn from the house when a large tree was toppled by a wind gust.

Flooding along Wayne Ave after Hurricane Irene (Robert Kawasaki)

Hurricane Irene also flooded and physically damaged critical infrastructure throughout the Village. Inundated roads and bridges prohibited residents from evacuating their homes and emergency services from accessing them. During this storm, the Village wastewater and drinking water treatment plants, both located in the 100-year floodplain, in addition to all four of the Village's water supply wells, were flooded for three days. At the wastewater treatment facility, as floodwaters careened down the channel of the Ramapo River, two Village employees worked quickly to prepare the wastewater treatment plant for the coming flood. As water depths increased and filled the basin where Suffern's plants are located more quickly than expected, these men had to be rescued by another Town employee, at risk of his own safety, in the Highway Department's front end bucket loader. The water treatment plant was similarly inaccessible, and staff had to use a rowboat to get to the facility to check on the generator after the storm.

Electrical equipment, pumps, and emergency generators at the treatment plants were damaged during the storm and some service roads behind these facilities have not yet been restored. In addition to the damage to the wastewater treatment plant, pump stations in the Village were also wrecked by the flooding during Hurricane Irene, including the Lake Antrim pump station on Wayne Avenue. Recovery of these systems took weeks. The water treatment plant and well system were off-line for a full month. The wastewater treatment facility fared only slightly better; the Village was able to return it to service after three weeks of inoperation.

Local businesses also experienced flooding during Hurricane Irene. Grasskeeper Landscaping and the businesses located in the Rockland Terrace Building, including Crystal Carwash along South Street, were flooded and unable to open for several days. Downtown businesses along Lafayette Avenue, including Suffern Food Mart, were invaded by floodwaters, forcing them to close for several days. The building that housed a local vacuum shop, a two-tiered industrial structure in the West Ward, also experienced substantial flood damage on the lower level. The business relocated to another municipality since Hurricane Irene and the property is now vacant. The storms hurt the Suffern economy as residents were unable to get to work or patronize unaffected local shops and restaurants. Other businesses were unable to open their doors to employees and customers for varying periods of time due to damage sustained during the flood.

Scars of the raging floodwaters are still visible along the rivers and streams that flow through the Village. This is especially so for certain reaches of the Mahwah River where banks were undermined and severely

Water Treatment Plant during Hurricane Irene (Charles Sawicki)

Flooded Ball Fields after Hurricane Irene (Robert Kawasaki)

eroded by Hurricane Irene, leaving nothing but bare soil and fallen trees in her wake. The result of this is most evident in the River reach just upstream of the NYS Route 59 bridge crossing and specifically in the vicinity of the Avon property. The volume and velocity of floodwaters as they rushed through the deep channel here resulted in the loss of upwards of 10-feet of lawn owned by the company; it was simply washed away. Immediately after the storm passed, large stones were placed on the 15- to 20-foot-high river-bank to provide stability and avoid additional erosion. Just upstream from this repair and below the railroad trestle, a staircase that use to lead to the river bank still hangs in the air with no destination.

Many local amenities, including the ball fields, parks, and Memorial Pool, were submerged under floodwaters. In the West Ward, the ball fields were drowned under eight to 10 feet of water during Hurricane Irene, leaving them unrecognizable but for the tall back stops and score board that were still visible above the floodwaters. Flooding at the Suffern Baseball Complex damaged the fields as well as the Recreational Center. Not only did the water prevent the use of this important recreational resource for weeks, but access to the DPW garage, wastewater and water treatment plants was blocked until the water receded. The nearby NJ Transit commuter parking lot in this area also flooded, damaging cars and stranding commuters. In northern Suffern, overflow from Lake Antrim reached the adjacent parking lot and the community pool. Water levels reached five and a half feet at the pool pump house. The playground at Donna Hallett Park in Squires Gate has been deconstructed since Hurricane Irene as it has flooded too many times and some of the playground equipment was washed away.

Suffern is home to strong and reliable emergency communication systems, and the Village continues to improve their emergency response. The Police Department and Village officials are able to connect with residents through Facebook, Twitter, NY Alert, and NIXLE, keeping residents updated with emergency response and evacuation plans.

Emergency response in Suffern is supported by a strong team of volunteers. It is not uncommon for residents and emergency responders to go door to door to get important emergency messages out to their community, a testimony to the commitment and resolve of the community and those that serve its residents. When power outages have occurred, the police and fire departments drove their vehicles through the neighborhoods using loud speaker systems to alert residents of safety evacuation plans.

The Village Shelter is currently located at the Community Center on Washington Avenue. During Hurricane Irene, they offered beds for volunteer emergency service workers from out of town, supplied power to

residents for charging phones and laptops, and provided refrigerators for food and medicine. The Village is working to acquire the Veterans of Foreign Wars (VFW) building in the West Ward; this building has the potential to be used as an additional shelter. Although residents and emergency services are prepared and ready to help, recurring flood events are taxing and often require more manpower than is available.

Other acts of good have been spoken of. During Hurricane Irene, Avon Research and Development, which is located on the north side of NYS Route 59 and on the west bank of the Mahwah River, allowed residents to use their parking lot to protect their cars from the floodwaters.

Although the most severe flooding came with Hurricane Irene, Suffern is regularly affected by flooding in lesser storms. For example, homes in Squires Gate have historically flooded, and the intersection of US Route 202 and NYS Route 59 must be closed in many storms. High impact, shorter rainfall events have occurred more frequently, highlighting the various areas in the Village most susceptible to repeated inundation. The flooding is due to a variety of factors including topography, development in the watershed, construction of homes, businesses and infrastructure within the floodplain, frequent storm events saturating soils, overwhelmed drainage systems, ageing infrastructure, and stream bank erosion. Suffern has been and will continue to be susceptible to flooding.

Both Hurricane Irene and Superstorm Sandy exposed vulnerabilities in the Village. Storms bring challenges that extend beyond the direct physical damage to roads, bridges, homes, and essential infrastructure, threatening economic vitality, emergency recovery efforts, and the health and well-being of Suffern residents. Suffern continues to learn from its experience during these storms so that it may become more resilient, limit damage, and build back better from future natural disasters.

C. Critical Issues

Hurricane Irene and Superstorm Sandy caused damage that directly and indirectly impacted homes, businesses, roads, critical infrastructure systems, and natural resources throughout the Village. These storms exposed many vulnerabilities and revealed critical issues affecting the community and impacting its ability to respond to and recover from natural disasters.

The Suffern NYRCR Planning Committee identified the issues affecting their community. These were then shared during the first Public Engagement Event, where attendees were asked to supplement the list with additional critical concerns. In the aftermath of these storms, it is crucial that these concerns be addressed so that Suffern may become more resilient in the wake of future disasters.

The seven critical issues facing the Village of Suffern as identified by the Committee and it residents are described below.

Emergency Access

Both Superstorm Sandy and Hurricane Irene isolated residents of the Village of Suffern, cutting them off from their homes and the community. Entire areas of the Village were inaccessible to emergency vehicles and services. In the case of Hurricane Irene, flooding impeded the ability of emergency vehicles to access residents in northern Suffern as well as in the West Ward. Areas in northern Suffern, such as those accessed by way of Wayne Avenue and Memorial Drive, were only accessible by boat, which had to be used for rescue purposes after Hurricane Irene. Emergency access was impeded after Superstorm Sandy by downed trees and power lines that created physical barriers between responders and residents, resultling in dangerous conditions all across Suffern.

There are only two access points to the West Ward, both of which are underpasses with low clearance, and only one of which a standard fire truck is able to navigate. The Village has purchased fire trucks with a lower clearance height than standard trucks to allow for access to this neighborhood. When the one access point for emergency vehicles on Chestnut Street and Orange Avenue is closed due to flooding or some physical barrier, larger emergency service vehicles are precluded from serving this area.

Suffern Police Vehicle (Flaam Hardy, AKRF, Inc.)

To address this issue, the police and fire departments station emergency vehicles in the West Ward in advance of a major storm. Although this is helpful in providing emergency services to this area, during Hurricane Irene, floodwaters became so deep so quickly that even these vehicles were no longer able to exit the area to reach critical facilities such as the hospital. The Village has sought funding through New York State to provide access to the West Ward neighborhood by way of an at-grade crossing of the NJ Transit rail line from US Route 202.

This takes a toll on the already limited supply of manpower and equipment in the respective departments. Stationing services in advance of a flood allows for some attention to high risk areas, but strains the finite resources of the community. Improving emergency access throughout the Village to residents susceptible to isolation during storm events is critical.

Flooding in Residential Neighborhoods

The primary housing issue identified is the protection of residential neighborhoods from future flooding and restricting future development of homes to areas outside the floodplain and flood prone areas.

Repeated flooding from the Ramapo and Mahwah Rivers, during Hurricane Irene but also during smaller, short-duration, high-intensity storms, has damaged homes in various neighborhoods, including Squires Gate, Berkeley Square, and the Knolls at Ramapo, as well as along Memorial Drive. The vast majority of these homes are located within the 100-year floodplain and a significant number, especially in Squires Gate are sited in the floodway, making them extremely vulnerable to flooding. FEMA defines a floodplain as "Any land area susceptible to being inundated by floodwaters from any source." A floodway, which is located within the floodplain, is defined by FEMA as "…the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height." Figure I-2 illustrates the difference between the floodplain and floodway. In addition to water damage, large storms put significant stress on the wastewater systems causing sewers to back up into homes through basements and washing machines.

After such frequent storm events, selling homes in these areas presents a challenge due to declining home values and the costs of rehabilitation of the structures. Repeated claims to flood insurance lead to increased premiums, and denial of coverage. Floodproofing homes, as well as rehabilitating waterways and exploring options for acquisition and relocation are all necessary to promote the safety, health, and well-being of Suffern residents.

FEMA's National Flood Hazard Layer (Official)

Data from Flood Insurance Rate Maps (FIRMs) where available digitally. Try http://bit.ly/1bPpUjq (Unofficial) if this map is down

http://fema.maps.arcgis.com/home/webmap/print.html

DigitalGlobe, GeoEye, Microsoft

Legend

NFHL (click to expand)

LOMRs
- Effective

LOMAs

FIRM Panels

Cross-Sections

Base Flood Elevations

Flood Hazard Boundaries
- Other Boundaries
- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones
- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee

Figure I-2: FEMA's National Flood Hazard Layer Illustrates the Difference between Floodplain and Floodway (FEMA)

Inundation of Critical Facilities

Many critical facilities in Suffern are vulnerable to inundation and flood damage due to their location in a floodplain. These include the wastewater treatment plant, water treatment plant and the DPW garage, which are located near the ball fields in the western portion of the Village, and the wastewater pump stations located at South Street, Wayne Avenue and Orange Avenue. These facilities are key for the day-to-day functioning of Village services while also playing an important role in emergency recovery.

Flooding at the Wastewater Treatment Plant after Hurricane Irene (Charles Sawicki)

During Hurricane Irene, the Ramapo River rose above its banks and into its natural floodplain, inundating the wastewater treatment plant and water treatment plant. These Village services were quickly overwhelmed and unable to provide a safe water supply to Suffern residents or to process wastewater flowing from the Village. The Village was forced to buy water from United Water for one month following Hurricane Irene. The risk of contaminated water from the wastewater treatment plant infiltrating the Village's water supply wells, which are located right next door, is real and has been a concern in the past. Access to the DPW garage, the main location for Village equipment and vehicles, is frequently cut off due to flooding, which makes transportation of equipment to help emergency responders and aid in clean up after storms challenging. The vulnerability of these critical facilities in the Village must be addressed so that the community is more resilient and able to support its own recovery.

Loss of Power

Loss of power in the community has consistently been a critical issue during large storms as it affects homes, businesses and the day-to-day operations of important Village facilities. This was a significant issue during Superstorm Sandy when strong winds uprooted trees and brought down power lines. Superstorm Sandy is evidence that even without major flooding, storms can cause significant damage. During Hurricane Irene, electricity to flooded areas of the Village with underground transmission lines, including Squires Gate, was shut off to protect residents, their homes and the electrical systems.

The lack of power threatens residents' safety. Much of the emergency communication infrastructure depends on power as it is conducted through emails, internet, and texting with Village residents. Without power, residents cannot receive important information from the Village and emergency services.

Repeated Flooding of Businesses

The local Suffern economy is supported by the many small businesses in the Lafayette Street area and by Novartis and Avon Research. Throughout the many storms that have affected the community in recent years, businesses have been directly damaged from flooding and downed trees, but have also had to face power losses for extended periods of time.

Beyond the physical damage that is costly to repair, such business closures in a community with a small downtown can result in the inability of residents to access basic goods and services including food, banking, gas for generators and medication. In addition, if businesses are not able to recover quickly enough, this can have lasting consequences on the local economy by limiting people's ability to return to work and discouraging outside enterprises to look for business opportunities in or relocate to Suffern. After flooding from Hurricane Irene, a local vacuum company closed its doors in Suffern permanently and relocated.

Over time, many businesses have recovered from Superstorm Sandy and Hurricane Irene. Avon Research and Development, on the west bank of the Mahwah River north of NYS Route 59, helped address flooding in their back yard by stabilizing the bank of the Mahwah River. Nonetheless, the repeated flooding of businesses in Suffern and the lasting effect on the local economy is a recurring issue that must be addressed to improve the resiliency, economic and otherwise, of the community.

Road Closures

Many roads in Suffern are subject to flooding during major storm events. These roads are particularly vulnerable to flooding as they cross low points in the landscape and have limited drainage. High use areas such as the commuter parking lots near the rail station are subject to severe flooding, making them inaccessible and unusable.

During Hurricane Irene, many road closures isolated entire parts of the Village and left residents stranded in the West Ward and northern Suffern. In the West Ward, residents were unable to get in or out as the only entrances and exits were flooded. In northern Suffern, US Route 202 and Wayne Avenue flooded, preventing access to the entire northern region forcing residents, and all needing access to the area, to use a long detour route. In addition, Memorial Drive and Montebello Road flooded, stranding residents in their homes in the nearby neighborhoods. Not only are residents inhibited from accessing goods and services, or going to work, but they are also cut off from emergency services. Fire trucks, ambulances, and other emergency vehicles are unable to access the West Ward when the roadways are inundated, and residents in northern Suffern were only accessible by boat for rescue.

The extreme winds of Superstorm Sandy closed roads in some cases for days due to numerous downed power lines throughout the Village. Emergency responders and the power supply company, O&R, had to work together to ensure that the wires were not live in order to safely clear roads and trees before restoring power. As with flooding but on larger scale, roadways closed during Superstorm Sandy trapped residents and created physical obstacles making it difficult for services to respond to or access those residents in case of emergency.

Stream Bank Erosion and Stream Bed Sedimentation

Stress on the Ramapo and Mahwah River banks and beds from storm-associated flooding results in their erosion and has the potential to exacerbate future flood events. Sediment accumulates in Lake Antrim and in the beds of both the Mahwah and Ramapo

Wayne Avenue after Hurricane Irene (Robert Kawasaki)

Eroded banks along the Mahwah River (Sue Rivers)

rivers due to stream bed and bank erosion and the sediments washed off of impervious surfaces, reducing the capacity of the river to carry water downstream. This is of particular concern during significant rainfall events such as Hurricane Irene. In addition, in large storm events, both natural and man-made debris accumulates in the waterbodies, leading to further erosion, scouring, and weakening of the river banks. The debris buildup deteriorates the stream banks and inhibits the river's ability to take its natural course, impacting flows downstream.

The erosion process has also been accelerated by past development along the waterways and throughout the watersheds. A greater volume of stormwater runoff resulting from development and increased impervious surface area is conveyed at a higher velocity into the streams and rivers combining with and increasing the erosive capacity of the water in and outside of the waterway's channel. This increase in erosive capacity is furthered by disturbance to the surrounding riverbank or riparian areas and loss of floodplains surrounding the rivers which, when undisturbed, provide a level of natural protection from advancing floodwaters. The issue of bank erosion was addressed near Avon Research and Development with a partial riverbank stabilization of the Mahwah River. Erosion is further accelerated by culverts and bridges of inadequate size that result in high velocity water flows on the downstream end of these structures. In addition, the steep embankment across from the Squires Gate community, among other areas, leads to increased stormwater runoff, thereby further contributing to flooding in the area leading to the devastation of homes in that neighborhood.

D. Community Vision

The Vision Statement for NYRCR Suffern was developed by the Committee with input from the residents. The Vision Statement relies heavily on Committee Members' familiarity with the Village, the needs of the community relative to the NYRCR study area boundary, and an understanding of the community's values

Vision and Goals Station at Public Engagement Event #1 - July 22, 2014 (Flaam Hardy, AKRF, Inc.)

based on previous planning efforts. A draft of the Vision Statement was shared with the public at the first Public Engagement Event; feedback from that meeting was extremely important in finalizing the Vision Statement. More information about public outreach can be found in Section V.C. "Public Engagement Process."

Through the visioning process, the Committee and the public worked to identify, assess, and conceptualize local and regional opportunities for Suffern. There was general agreement that the vision statement needed to not only describe the village of the future, but also needed to identify specific ways to attain that vision. Hence, the Committee and the public outlined short-, medium-, and long-range goals to help Suffern build back better. These goals were developed to address infrastructure, emergency preparedness, stormwater management, resilience, partnerships, and natural and cultural resource protection.

Residents who provided feedback on the draft Vision Statement at the Planning Committee Meeting also emphasized the importance of having the Statement focus on the unique characteristics of the Village. Additional feedback provided at the Public Engagement Event underscored the need to focus specifically on flood recovery and prevention efforts to restore Suffern to the place they love.

The Suffern NYRCR Vision Statement:

Suffern is a quaint, resilient, easily accessible community dedicated to building back better. We are a united community that works together to maintain our quality of life, small town charm, multi-modal transportation options, educational framework, and cultural attractions as investments in future generations. Residents are dedicated to restoring, redeveloping, revitalizing and making more resilient our downtown, infrastructure, storm water systems, natural and cultural resources, all of which make Suffern a unique, historic, and vibrant place.

Goals:

To realize the vision, NYRCR Suffern has developed the following goals:

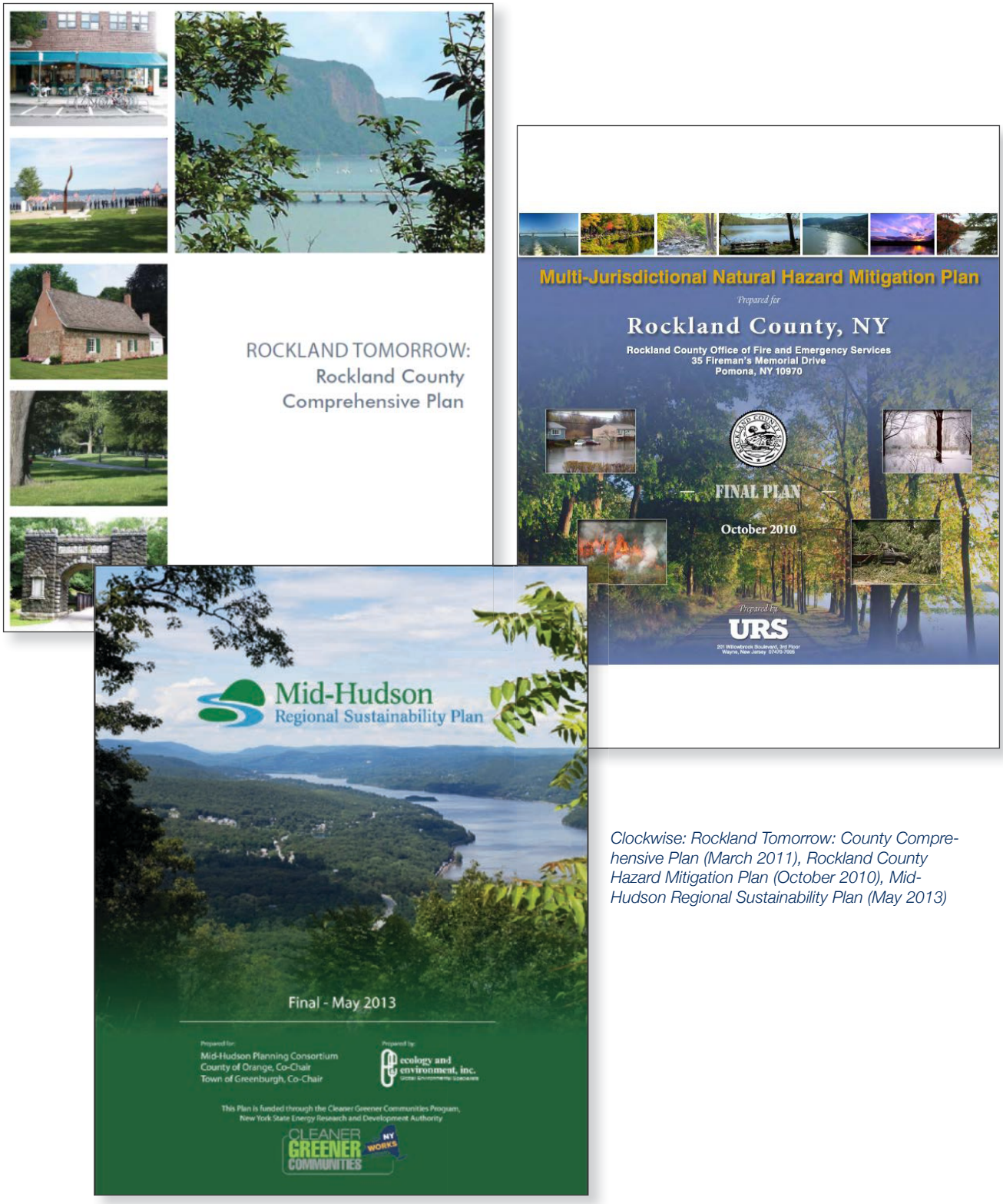
- Build closer working relationships with neighboring communities and the State of New Jersey to address flooding issues that do not respect municipal boundaries;
- Continue high level of emergency services and enhance physical access to neighborhoods;
- Enhance infrastructure and stormwater systems where needed;
- Preserve community character to maintain small town charm;
- Protect and clean Lake Antrim and the Mahwah and Ramapo Rivers;
- Protect, promote, and enhance cultural attractions that draw people to the village; and
- Revitalize downtown businesses and protect from future storm damage.

Breakout Discussion at Public Engagement Event 2 – September 18, 2014 (Arch Street Communications)

E. Relationship to Regional Plans

The storms and resulting damage from Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy highlighted the need for coordinated planning initiatives and policies that can significantly contribute to long-term regional resilience. Many regional planning efforts have been undertaken, both before and after the storms. In 2013, the *Mid-Hudson Regional Sustainability Plan (2013)*[9] was released, laying out short-, mid-, and long-term goals and strategic priorities for the region's development. The Mid-Hudson Regional Economic Development Council also released a *5-Year Strategic Plan*[10] in 2011, which presented specific goals for the regional economy. In addition, Rockland County developed the *Rockland Tomorrow: Rockland Comprehensive Plan*[11] in 2011 and a *Hazard Mitigation Plan*[12] in 2010.

These pre-existing regional planning efforts served as the genesis for many projects that were identified though the NYRCR process. Although Committee Members were tasked with representing the interests of Suffern, they became increasingly aware of the importance of planning in a regional context. Community members worked together to create reconstruction and resiliency strategies and then projects and actions that focused on regional issues and,



Clockwise: Rockland Tomorrow: County Comprehensive Plan (March 2011), Rockland County Hazard Mitigation Plan (October 2010), Mid-Hudson Regional Sustainability Plan (May 2013)

ultimately, were supportive of regional goals, including those goals focused on planning for the effects of severe storms and flooding. Many of the regional planning documents, including the *"Rockland Tomorrow": Rockland Comprehensive Plan (2011)*[10] and the *Mid-Hudson Regional Sustainability Plan (2013)*[8], identified the need for focused coordination and cooperation among communities to achieve their goals. This sentiment is echoed by the Committee and their willingness to work toward the common goal of mitigating future flood damage and creating a more stable and climate resilient local and regional economy.

The challenge for the Suffern NYRCR Planning Committee was to identify initiatives, policies, projects and programs that would not duplicate previously completed plans, but which would address critical needs, and promote long-term resilience.

Table I-1 presents a list of available local and regional planning documents and resources considered. These documents were reviewed for information and data pertaining to the NYRCR planning process and to assist in the identification of potential projects and strategies that could be implemented to help Suffern build back better. Regional goals from the plans that have been incorporated into the NYRCR Plan are listed along with a brief description of how the NYRCR Plan relates to or builds upon the regional plans. The findings are summarized in Table I-1.

There were three goals for comprehensive review of these existing documents. First, the review would highlight previously identified initiatives that could contribute to long-term resiliency. Second, the review would assess the potential synergies between local and regional needs and opportunities while considering how the NYRCR Plan might support and incorporate regional goals and perspectives. Third, analyzing previously completed studies would identify gaps. Had these planning efforts missed anything? Were there any policies and programs that would significantly reduce the Village's or the region's vulnerability that had not been identified? Did the impact and damage of the three storms raise awareness of issues that had not been previously considered?

Key shared local and regional challenges identified by the review of existing plans included:

- Lack of effective planning for long-term resilience and the effects of climate change, including severe storms and flooding, to avoid costly damage to infrastructure, life, and health;
- Lack of funding to implement long-term plans by County, State, and Federal agencies responsible for infrastructure maintenance, repair, and reconstruction;
- Lack of sufficient coordination and cooperation between municipalities and various Local, State, and Federal agencies; and
- Need for additional upgrades and repair of infrastructure to address areas of chronic flooding, reduce roadway and culvert repair costs and limit road closures.

Throughout the planning process, the Committee reviewed many ideas for regional projects, all of which supported goals set forth in the various previously completed regional plans. Additional information on these initiatives can be found in Section V.B. "Master Table of Projects."

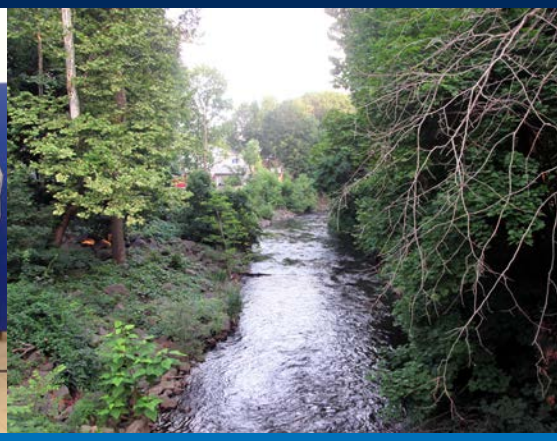
Table I-1: Local and Regional Plans

Plan	Author	Date	Relevance	Key Components for NYRCR Process
Local Plans				
Town of Ramapo Comprehensive Plan	Town of Ramapo with assistance from Frederick P. Clark Associates, Inc.	2004	Establishes community vision and goals for long-term growth and development, focusing on natural resources, housing, community resources, and land use.	Community vision; background data; goals and objectives for each subject area; implementation methods and actions.
Village of Suffern Emergency Operations Plan	Village of Suffern	2014	Provides guidelines and operations plan for planning, managing and coordinating overall response and recovery to minimize potential disasters and their effects, provide for local responses when disasters occur and facilitate local recovery.	Standard operating procedure of each department during emergency and disaster events; information on the functioning of the Emergency Operations Center; list and contact information of relevant county and outside agencies; department personnel contact information; flood management and power outage management checklist
Regional Plans				
Rockland County Hazard Mitigation Plan	Rockland County Office of Fire and Emergency Services with assistance from URS	2010	Extensive analysis of hazards that threaten the County and ways to reduce future damages associated with these hazards.	Demographic data; examples of ideas for outreach activities; inventory of hazards and risks including flooding/storm surge, dam failures, earthquakes, wildfires; summary of FEMA Flood data; National Flood Insurance Program (NFIP) Policy and Claim info; mapping of repetitive loss clusters; summary of historical flood events; inventory of critical and emergency facilities, historical and cultural resources; annual loss estimates for each hazard; land use and development trends questionnaire; regulatory capabilities/ resources; list of prioritized actions
Mid-Hudson Regional Economic Development Council Strategic Plan	Mid-Hudson Region Economic Development Council	2011	Regional economic development strategy and vision for the Mid-Hudson Region that illustrates regional trends, goals and strategies for desirable growth in the region.	Regional context, goals, aspirations; no discussion of impacts of flooding or storm resiliency; no specific discussion of Suffern.
Rockland Tomorrow: County Comprehensive Plan	Rockland County Technical Advisory Committee with assistance from BFJ Planning	2011	County-wide trends and priorities with a focus on development, the economy, and conservation. Includes list of County recommendations and implementation.	Description of Suffern land use, mapping of open space, historic resources, community and emergency resources. Identification of watershed areas, surface water issues and regulated streams, Geographic Information Systems (GIS) data, flood hazards.
Mid-Hudson Regional Sustainability Plan	Mid-Hudson Planning Consortium with assistance from Ecology and Environment, Inc.	2013	Provides a vision for sustainable development that builds on the Region's resources with the goal of promoting economic development, environmental sustainability and enhancing quality of life. Developed strategies, objectives and priority initiatives to achieve the vision.	Regional context, goals, initiatives; very limited discussion of flooding/natural hazards; no specific discussion of Suffern.

2014
NY RISING COMMUNITY RECONSTRUCTION PLAN

SUFFERN NYRCR

Section II
Assessment of Risk and Needs



II Assessment of Risk and Needs

A. Description of Community Assets and Assessment of Risk

i. Description of Community Assets

An important component of the NY Rising Community Reconstruction (NYRCR) process is to assess the risk posed to community assets and systems that have been affected by past flood events or may be impacted by future storms. This evaluation assists in the development of projects and strategies that mitigate risk and make the community more resilient.

The first step in the risk assessment process is to inventory and map assets and system components that provide essential community functions and are proximate to known flood risk areas. Community assets and systems may consist of places, services, groups, facilities or infrastructure networks, and they can be categorized into five asset classes related to their role in the community, which are as follows:

- Economic;
- Health and Social Services;
- Housing;
- Infrastructure Systems; and
- Natural and Cultural Resources.

The Suffern NYRCR Community (Community) asset inventory was developed by compiling existing digital datasets from multiple municipal, State, and Federal agencies. These asset datasets were cross-referenced and supplemented with aerial imagery and address locators, and collated into an asset inventory listing. To streamline the inventory, assets were grouped together if they served the same community function, were located close to one another, or had similar site characteristics. For example, neighborhood businesses could be grouped into a downtown center, or single-family homes into a neighborhood. Asset systems were inventoried by enumerating the principal points and components of those systems, such as pump stations in the wastewater conveyance system and substations in the electric transmission system.

Information was added for each asset, including address, geographic coordinates, risk area, asset class and subcategory, community value, critical facility designation, and whether the asset served socially vulnerable populations, including children, the elderly, people with special needs, and low-income community members. Addresses and geographic coordinates pinpoint the location of assets for mapping, and once mapped allow for risk area identification. Assets are grouped by classes and subcategories, community values rank the overall importance of each asset to the community, and Federal Emergency Management Agency (FEMA) critical facility designations identify assets considered essential to recovery following a storm event. Identifying assets that provide services for socially vulnerable populations can help to further enumerate assets that are particularly important both before and following a storm. In addition, spatial analysis was used to capture landscape attributes, or features of the landscape that could either mitigate or exacerbate the impacts of flooding and erosion on an asset.

A two-tiered process was developed and utilized to ensure collection of a comprehensive inventory. The first tier of the methodology involved culling existing digital datasets and the second tier used local knowledge to refine the list of assets. The preliminary asset inventory and asset map were reviewed by the Suffern NYRCR Planning Committee (Committee) for

refinement and by community residents at Public Engagement Events to gain their input and capitalize on their intrinsic understanding of their community. The dataset analysis supplemented the work of the Committee by identifying assets that may have been hidden in plain sight—i.e., assets vital to the Community's health and resilience that go unnoticed on a day-to-day basis. These assets only become obvious when they fail or close, such as small roadway bridges and smaller government service offices. In addition, assets that may have not been captured in the existing digital datasets or for which digital data did not exist were identified by the community at Public Engagement Events. The full asset inventory is shown in Figure II-1.

Asset Mapping Workstation at Public Engagement Event 1 – July 22, 2014, (Elizabeth Matamoros, AKRF, Inc.)

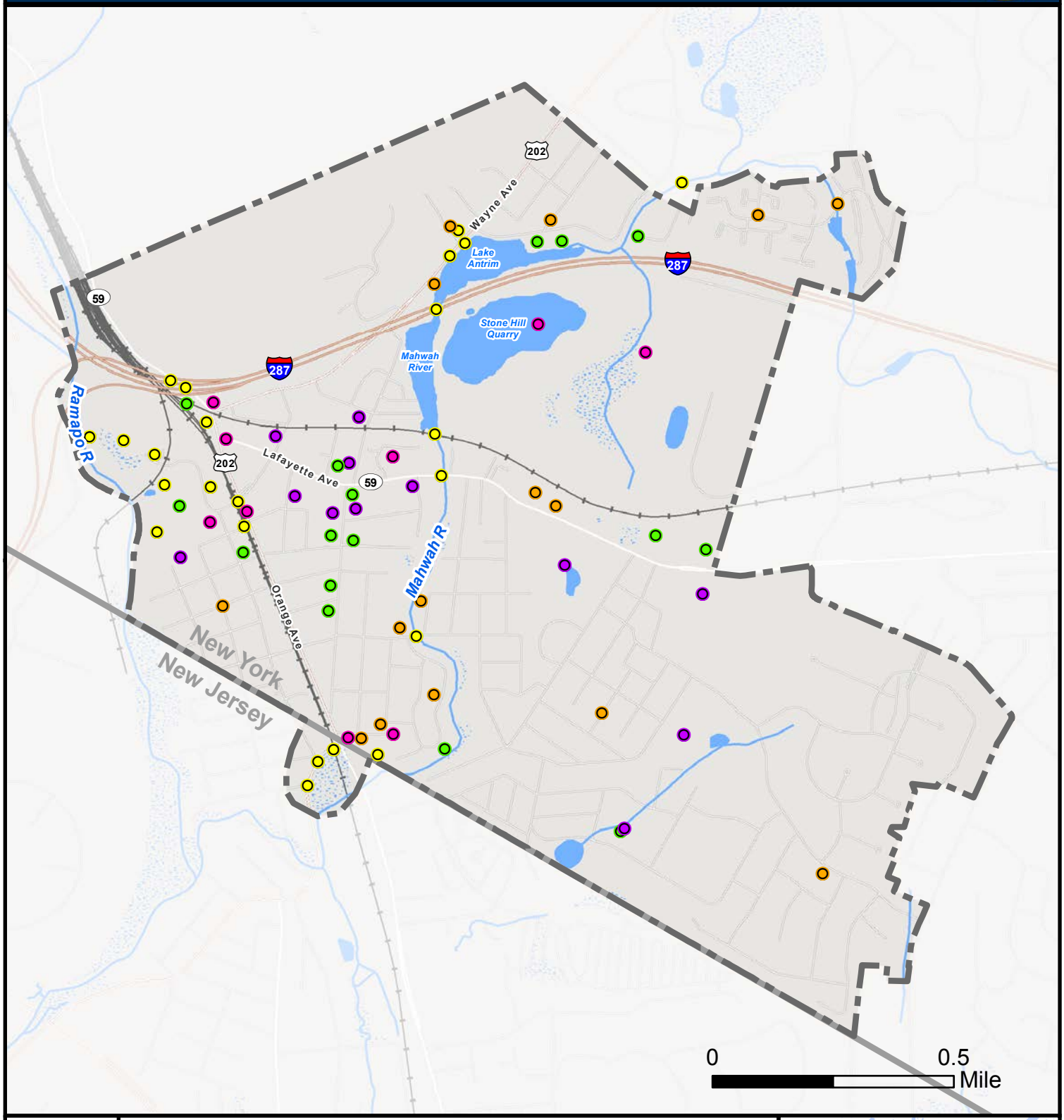
Community Value Scoring

As part of their review of the asset inventory, the Committee and the Community identified the importance of various assets by determining community values. Committee Members were asked to give special attention to assets whose loss or impairment would compromise critical facilities or any essential cultural, social, economic or environmental functions of the Community. The values were consolidated and revealed that assets related to the homes and facilities for vulnerable populations, emergency response, healthcare, and infrastructure (storm sewer, sanitary sewer, electric and gas, communications, and major roads) received the highest community value ratings. All housing assets were determined to have a high community value in relation to community resiliency. Businesses and parks were listed as having a low community value. The community value for each asset is listed in Section V.D, "Community Asset Inventory".

Community value was expressed as follows:

- A **High Value** Community Asset is determined by the Community to be so significant in the support of that Community's day-to-day function that the loss of that asset or extended lack of functioning would create severe impacts to the Community's long-term health and well-being or result in the loss of life or injury to residents, employees, or visitors. High Value Community Assets will also generally be limited in number within a community and be difficult to replace in the short- to mid-term.
- A **Medium Value** Community Asset is determined by the Community to be important to the functioning of the Community's day-to-day life and that the loss of that asset or extended lack of functioning would cause hardship to the Community's well-being but whose function could be replaced or duplicated in a mid-term time frame without significant burden to a Community's long-term health. Median Value Community Assets are generally more common than High Value Assets.
- A **Low Value** Community Asset is determined by the Community to play a role in the functioning of a community's day to day life, but whose loss could be managed and overcome within a community without substantial impact to that community's functioning. These assets can be re-started, replaced, or temporarily duplicated in a short-term time frame with limited burden to a community's long-term health.

Figure II-1
Asset Inventory - Village of Suffern



N

Legend

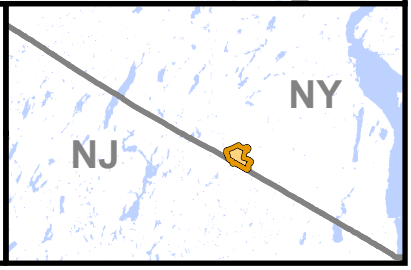
- Study Area (Village of Suffern, NY & portion of Mahwah, NJ)
- Major Highways
- Railroads
- Rail Station

Assets

- Economic
- Health & Social Services
- Housing
- Infrastructure Systems
- Natural & Cultural Resources

Data Sources

ESRI, NJGIN, NYSITS, Rockland County, Village of Suffern



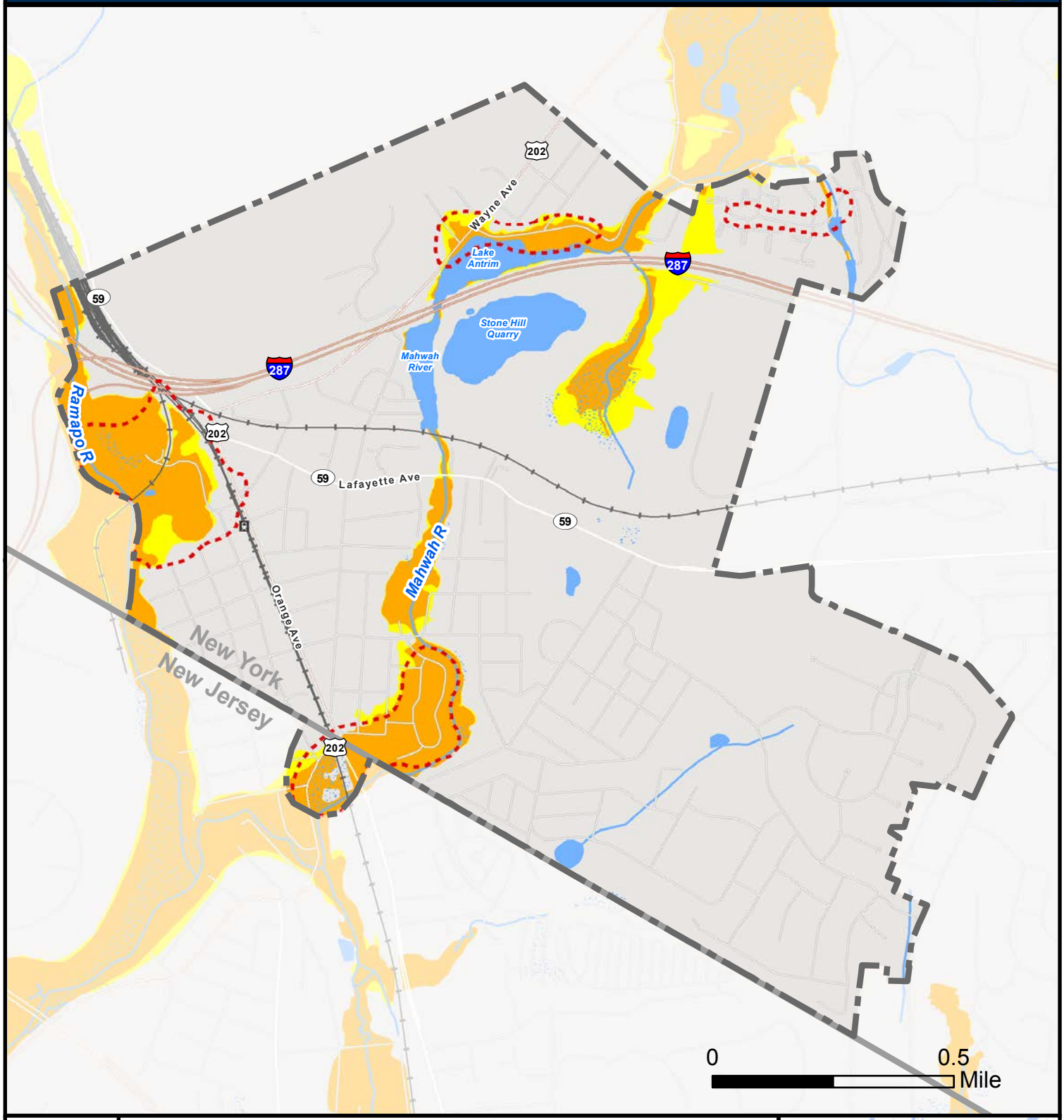
Risk Area Identification

In addition to the asset inventory, a map was also produced to illustrate the geographic distribution of risk areas across Suffern. Risk areas in riverine inland communities such as Suffern are synonymous with the floodplains delineated by FEMA. Preliminary FEMA data was utilized for this study because it represented the most-current and best-available flood zone modeling within the Village. The Risk Areas are defined as follows:

- **Extreme Risk Area:** The most frequently flooded areas are typically found in the 10-year floodplains, which encompass the Extreme Risk Area. In Suffern, the 10-year floodplain had not been digitally modeled by FEMA. Input from members of the Committee and the community as to which places have been frequently and repetitively inundated and damaged by flooding was used to approximately identify the Extreme Risk Areas within the Village. These areas include lands both inside and outside of the mapped floodplain repeatedly impacted by past storms in the hardest-hit areas of the Community.
- **High Risk Area:** The 100-year floodplains encompass the High Risk Area, and are subject to a 1.0% chance of flooding in any given year. These flood zones have been digitally mapped by FEMA in Suffern, and can be found throughout the community along rivers, streams, and water bodies. High Risk Areas are the most prevalent of the risk zones in the Suffern planning area.
- **Moderate Risk Area:** The 500-year floodplains encompass the Moderate Risk Area, and are subject to a 0.2% chance of flooding in any given year. These flood zones have also been digitally mapped by FEMA in Suffern, and are typically found on the fringes of High Risk Areas.

The community assets were analyzed to identify the risk areas they may be exposed to, and are summarized by Recovery Support Function (RSF) as follows. Figure II-2 illustrates the Village of Suffern Risk Areas.

Figure II-2
Risk Areas - Village of Suffern



N

Legend

- Study Area (Village of Suffern, NY & portion of Mahwah, NJ)
- Major Highways
- Railroads
- Rail Station
- Rivers & Streams
- Extreme Risk Area* (repetitively flooded)

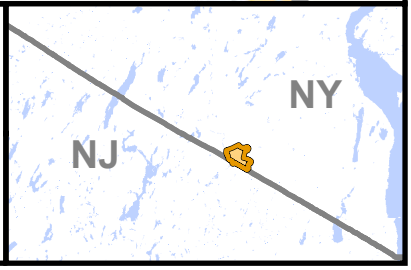
*Extreme Risk Areas identified by Planning Committee

FEMA Floodzones

- High Risk Zone (100-year flood)
- Moderate Risk Zone (500-year flood)

Data Sources

ESRI, FEMA, NJGIN, NYSITS, Rockland County, Village of Suffern



Economic

Assets in the Economic category include downtown centers, business clusters, major employers, industrial and manufacturing centers, and tourism destinations. Protecting and enhancing the downtown centers and commercial areas from flood impacts is important to the economic health of the Village. There are no Economic assets considered FEMA Critical Facilities. Three economic assets are located in the extreme risk areas including a group of vacant industrial buildings, a landscaping business and a multi-tenant commercial building.

Figures II-1 and II-2 illustrate the risk areas and assets, found within the Geographic Scope defined by the Committee Members and community as the entire Village. Table II-1 lists the Economic assets, organized by Asset Subcategories and by Risk Area from Extreme to Low. The complete community asset inventory, which includes addresses of asset locations, can be found in Table V-4 in Section V.D, "Community Asset Inventory".

Economic Asset: Suffern Downtown Business District (Chris Robbins, AKRF, Inc.)

Economic Asset: Avon Global Research and Development Center (Chris Robbins, AKRF, Inc.)

Table II-1: Economic Assets

Asset Name	Risk Area
Businesses	
Grasskeeper Landscaping, Inc.	Extreme
Rockland Terrace Multi-Tenant Commercial Building	Extreme
Lafayette Ave Businesses (Malandra's, Ole-Ole, Suffern Food)	High
Shamrock Hotel	High
Orange Ave Commercial Corridor	Moderate
Avon Research & Development	Low
Industrial, Warehousing and Manufacturing	
Vacant Industrial Buildings (former Rainbow Vacuum)	Extreme
Novartis Pharmaceuticals Parking and Storage	Moderate
Stone Hill Quarry	Low

Health and Social Services

Health and Social Services assets include fire protection, police services, hospitals, and emergency operations facilities as well as schools, health treatment facilities, general purpose shelters, reception centers, post offices, and Village Office Buildings. During a storm event, these facilities may potentially serve as critical disaster response and recovery centers. As such, their identification is essential to future disaster management and preparedness. All 12 of the Health and Social Services assets inventoried are classified as FEMA Critical Facilities with the exception of the post office and all are but one are located in low risk areas.

Figures II-1 and II-2 illustrate the risk areas and assets, in detail, found within the Suffern Geographic Scope. Table II-2 lists the Health and Social Services assets, organized by Asset Subcategories and by Risk Area from Extreme to Low. The complete community asset inventory, which includes addresses of asset locations, can be found in Table V-4 in Section V-D, "Community Asset Inventory".

Health and Social Services Asset: Suffern Hook & Ladder Company No 1 (Chris Robbins, AKRF, Inc.)

Table II-2: Health and Social Services Assets

Asset Name	Risk Area
Emergency Operations/Response	
George J. Parness Suffern Community Center (Shelter)	Low
Suffern Hook & Ladder Company No 1	Low
Suffern Village Hall and Police	Low
Suffern Volunteer Hose Co No 1	Low
Government and Administrative Services, Public Works Facilities	
DPW Garage	Moderate
Post Office	Low
Healthcare Facilities and Hospitals	
Good Samaritan Hospital of Suffern	Low
Daycare and Eldercare	
Tender Loving Care	Low
YMCA - Y's Beginnings	Low
Schools and Higher Educations Institutions	
Richard P Connor Elementary School	Low
Sacred Heart School	Low
Salvation Army College for Officer Training	Low

Housing

A significant number of residential assets within the Village are at risk of future flooding. These assets include single-family and multi-family residential neighborhoods as well as senior and affordable housing. Assets in extreme risk areas include six multi-family residences and two clusters of single-family homes. Affordable and senior housing assets are considered FEMA Critical Facilities and are located in the low risk areas of the Village.

Figures II-1 and II-2 illustrate the risk areas and assets, in detail, found within the Suffern Geographic Scope. Table II-3 lists the Housing assets, organized by Asset Subcategories and by Risk Area from Extreme to Low. The complete community asset inventory, which includes addresses of asset locations, can be found in Table V-4 in Section V.D, "Community Asset Inventory."

Housing Asset: Berkeley Square Apartments (Chris Robbins, AKRF, Inc.)

Housing Asset: Squires Gate Under Water After Hurricane Irene (Blas Gonzalez)

Table II-3: Housing Assets

Asset Name	Risk Area
Single-Family and Attached Residences	
Squires Gate Attached Homes	Extreme
Single-Family Homes - South St and Rockland Terrace	Extreme
Single-Family Homes near Lake Antrim	Extreme
Single-Family Homes - Brook St and Highland Ave	High
Single-Family Homes - Wayne Ave	Moderate
West Ward Residential Neighborhood	Low
Multi-Family Residence	
Apartments on South St	Extreme
Berkley Square Apartments & Rockledge Townhomes	Extreme
Ramapough Cirque Townhomes	Extreme
Single & Multi-Family Homes - Meadow Ave, Ramapo Ave	Extreme
The Knolls of Ramapo Townhomes	Extreme
Abby Park Lanes Multi-Family Homes	High
Senior Housing	
Esther Gitlow Towers	Low
Affordable and Supportive Housing	
Rockland ARC Visions	Low
Ross Towers	Low
Venture Group Home	Low

Infrastructure Systems

Assets in this category include transportation infrastructure, transportation-related facilities and utilities. Utilities include public water supply, stormwater and wastewater systems, power supply, and telecommunications; the distribution and operational networks of which are dispersed through the Village. The distribution of these systems throughout extreme, high, and moderate risk areas makes the assessment of risk to the overall systems difficult to categorize. In general, if a principal component of a system is located in a risk area, the entire system is vulnerable. As such, it is more meaningful to assess the risk to specific components (i.e. plants, pump stations, substations, and other key facilities) that are critical to the functioning of these networks than to focus on the overall system.

Past storms have damaged infrastructure systems in the Village, causing power outages, road washouts, and flooding that impeded travel for residents and emergency service providers. Two transmission towers, an Orange and Rockland natural gas facility, a pump station, a water treatment plant, two park- and-ride lots, two underpasses and three roads and intersections prone to flooding are located within extreme risk areas. The remaining eight infrastructure assets inventoried are located in high risk areas. Principal points of the wastewater, water supply, and power supply networks inventoried are considered FEMA Critical Facilities, such as wastewater treatment plants, water resources, telecommunications facilities, and electric substations.

Aging or nonexistent infrastructure in the Village and municipalities upstream, in particular stormwater management and conveyance systems, has contributed to flooding in Suffern. Stormwater management systems were not required as part of a development program, for the most part, before the 1990's. Since that time practices used to manage stormwater have progressed significantly. Outdated or, in the case of development prior to the 1990s, the lack of stormwater management systems, poses problems for the vast majority of municipalities including the Village of Suffern, that have development within a floodplain.

Figures II-1 and II-2 illustrate the risk areas and assets, in detail, found within the Suffern Geographic Scope. Table II-4 lists the Infrastructure Systems assets, organized by Asset Subcategories and by Risk Area from Extreme to Low. The complete community asset inventory, which includes addresses of asset locations, can be found in Table V-4 in Section V.D, "Community Asset Inventory".

Infrastructure Asset: Rail Bridge Over Mahwah River (Flaam Hardy, AKRF, Inc.)

Table II-4: Infrastructure Systems Assets

Asset Name	Risk Area
Power Supply	
High Voltage Electrical Transmission Tower off Rockledge Drive	Extreme
High Voltage Electrical Transmission Towers South of I-287	Extreme
Orange and Rockland Gas Facility	Extreme
Water Supply	
Lake Antrim Pump Station	Extreme
Village Water Treatment Plant	Extreme
Wastewater	
Village Sewage Treatment Plant	Extreme
Village South Street Wastewater Pump Station	Extreme
Transportation	
Chestnut St Underpass to West Ward	Extreme
Lot A (Park & Ride)	Extreme
Catherine Ave access to West Ward	Extreme
Ramapo Valley Rd Underpass to West Ward	Extreme
Lot F (Park & Ride)	Extreme
N. Ramapo Ave access to West Ward	Extreme
Wayne Ave/NYS Rt. 202 (flood prone area near Rockledge Drive)	Extreme
Orange Ave / NYS Rt. 59 Thruway Underpass	High
New Jersey Transit/Suffern Commuter Rail Station	High
Boulevard Street Bridge Over Mahwah River	High
Lot D (Park & Ride)	High
I-87 Bridge Over Mahwah River	High
Montebello Road Bridge over Mahwah River	High
Rail Bridge over Mahwah River	High
NYS Route 59 Bridge Over Mahwah River	High

Infrastructure Asset: Orange Avenue and Rail Line with Suffern Rail Museum in the Background (Chris Robbins, AKRF, Inc.)

Natural and Cultural Resources

Natural and Cultural Resources include natural habitats, wetlands and marshes, recreation facilities, parks, open space, religious establishments, libraries, museums, historic landmarks, and performing arts venues. Hurricane Irene, Superstorm Sandy and frequent high intensity, short duration storm events have impacted multiple recreational, cultural, and historic assets in Suffern's natural and built environment. Four natural and cultural resources within the Village are located in extreme risk areas, including: Donna Hallett Park, Horton Memorial Field and Toddler Park, Suffern Baseball Complex and Suffern Memorial Pool. Of the Natural and Cultural Resource Assets inventoried, one is a FEMA Critical Facility: the Christ Episcopal Church, which serves as a soup kitchen for vulnerable populations and has provided emergency services during past storm events.

Figures II-1 and II-2 illustrate the risk areas and assets, in detail, found within the Geographic Scope. Table II-5 lists the Natural and Cultural Resources assets, organized by Asset Subcategories and by Risk Area from Extreme to Low. The complete community asset inventory, which includes addresses of asset locations, can be found in Table V-4 in Section V.D, "Community Asset Inventory".

Table II-5:
Natural and Cultural Resources Assets

Asset Name	Risk Area
Community Centers	
Suffern VFW	Moderate
Rockland County YMCA Dance & Activity Center	Low
Libraries, Museums, Performing Arts Centers, Stadiums	
Suffern Railroad Museum	Moderate
Suffern Free Library	Low
Parks and Recreation	
Donna Hallett Park	Extreme
Horton Memorial Field & Toddler Park	Extreme
Suffern Baseball Complex	Extreme
Suffern Memorial Pool	Extreme
Brooklands Park	High
Cultural or Religious Establishments	
All Souls Church	Low
Christ Episcopal Church	Low
Masjid Iqra Darul Ehsan	Low
Sacred Heart Church	Low
St. Mary's Indian Orthodox Church of Rockland	Low
Suffern United Methodist Church	Low
Tagaste Monastery	Low

Natural and Cultural Resource Asset: Donna Hallet Park (Flaam Hardy, AKRF Inc.)

Natural and Cultural Resource Asset: Sacred Heart Church (Chris Robbins, AKRF Inc.)

ii. Assessment of Risk to Assets and Systems

In order to mitigate flood risk associated with local water resources and improve community resiliency, the causes and magnitude of that risk must first be understood. The risk assessment process seeks to identify and analyze the degree of risk to assets and systems throughout Suffern by applying a standardized risk assessment procedure to each. In the Village of Suffern, the Mahwah and Ramapo Rivers are the prime sources of flood water. The Mahwah River runs north to south through the center of Suffern and the Ramapo River borders the western portion of the Village. Various tributaries to these rivers also run through Suffern, contributing to flooding problems. Open water bodies in the Village include Lake Antrim (an impoundment of the Mahwah River), and Union Hill Quarry (fed by groundwater).

Flood risk areas are predominantly located along the Mahwah River, Ramapo River and Lake Antrim. Figure II-2 depicts the location of the flood risk areas. Assets, including many of the community's most important, are situated within these flood risk areas. The highest concentration of identified assets in Suffern is along the southern portion of the Mahwah River, particularly in the vicinity of Lonergan Drive, South Street and US Route 202. This area includes the Squires Gate neighborhood, the South Street Wastewater Pump Station, transportation infrastructure, businesses and other residential neighborhoods. There are also clusters of assets along the Ramapo River (near Pat Malone Drive) and near Lake Antrim located on the northern portion of the Mahwah River (US Route 202 and Memorial Drive) including water, electric and wastewater infrastructure and residential neighborhoods.

Preliminary risk assessment results indicate that the majority of Suffern's assets located within flood risk areas are at high risk, with the remainder at severe or moderate risk. Of the assets evaluated in the preliminary risk assessment, the four that received a severe risk score include one residential neighborhood and three infrastructure assets. High risk assets primarily include those identified as infrastructure and housing. All of the natural and cultural resources (5) and health, and social services (1) assets identified are also in the high risk category. Economic assets were split between the high and moderate risk categories.

Background

The Village of Suffern is vulnerable to flooding primarily from the Mahwah and Ramapo Rivers. Both rivers travel through the Village in a north-south direction. The Mahwah River bisects the Village and has a greater impact on Village neighborhoods and homes during flooding events than the Ramapo River to the west. In the northern part of the Village, single-family homes near Utopian Avenue as well as townhomes and apartments near Rockledge Drive in the vicinity of Lake Antrim experience frequent flooding. The Suffern Memorial Pool and Lake Antrim pump station are also impacted during certain flood events. This entire area is mapped as High Risk, within the FEMA 100-year flood zone, the vast majority of which has been subsequently identified by the Committee as Extreme Risk (frequently flooded) area.

As the Mahwah River travels south through the Village the topography forces floodwaters into neighborhoods west of the River. The neighborhoods east of the Mahwah River are at a higher elevation and therefore do not experience flooding. The Mahwah River frequently rises above its banks, flowing into its natural floodplain in and near the Squires Gates neighborhood along Lonergan Drive, for example. In this area, single-family homes, apartments and multi-family residences west of the Mahwah River are frequently and severely impacted as are commercial buildings. Roadway access is a critical issue in the southern portion of the Village during a flood event; Catherine Avenue, Ramapo Valley Road, and North Ramapo Avenue all flood.

The area surrounding the Knolls of Ramapo and Ramapough Cirque Townhomes in the northeast corner of the Village can also be affected as Mahwah River flooding inundates local roadways. This area

does not often experience impacts directly from flooding and is therefore not located within a FEMA flood zone, but has been identified by the Committee as an Extreme Risk area due to access issues and impacts from downed trees and wind during storm events.

The Ramapo River traverses the Village west of the US Route 202 and the NJ Transit commuter rail line. The area most directly impacted by the Ramapo River is located within a High Risk area or a 100-year FEMA flood zone. Recreation fields, a commuter train parking lot, and key Village infrastructure including the wastewater and water treatment plants are located here. The Extreme Risk area depicted on the map in this portion of the Village is a result of the Ramapo River overtopping its banks. Included in this area are the DPW garage and the Chestnut Street underpass at US Route 202. Businesses along the US Route 202 corridor have also been affected by Ramapo River floodwaters.

Risk Assessment

The standardized risk assessment process strives to not only identify assets that were damaged during past storms, but also to identify assets that may be at risk of damage from future storms. For many Suffern residents, especially those directly affected by past storms, such as Hurricane Irene, specific areas of flood risk within the Village may appear to be obvious. While experiences during past storms reasonably indicate areas most susceptible to flooding, they are not necessarily a good predictor of the level of impact or the type of damage that may result from future storms. Furthermore, the relative degree of risk to one neighborhood or building as compared to another is not always readily apparent. The risk assessment tool developed by the NYRCR Program and the New York State Department of State (NYS DOS) enables quantification and comparison of the identified levels of risk to different community assets. Improved understanding of the severity and distribution of risk to assets throughout the community facilitates more effective resiliency and recovery planning.

As defined in the risk assessment tool, the flood risk of an asset is a product of its exposure to flood sources, its vulnerability during flood events, and the level of hazard associated with a given flood event. Each of these factors was determined through discussion with the Committee; the public and local officials; analysis of local, regional and national datasets; and, examination of maps, aerial imagery, and site imagery.

Based on information from the asset inventory, flood hazard maps and qualitative exposure assessments, the risk assessment tool enables the calculation of Hazard, Exposure and Vulnerability scores. These factors are further defined below.

- **Hazard Score:** Hazard represents the likelihood and magnitude of future storm event impacts. Typically, an asset located in an Extreme risk area experiences hazards with greater frequency and intensity than assets in a High or Moderate risk area. The Hazard Score directly corresponds to the 100-year and 500-year storm events.
- **Exposure:** Exposure characterizes the moderating effect of local topographic and protective features. If assets are more exposed (e.g., situated in low-lying floodplains), they are more likely to suffer storm effects than similar assets located at a higher elevation. The landscape attributes captured during the asset inventory are quantified and summed in the Risk Assessment Tool to produce an Exposure Score.
- **Vulnerability:** Vulnerability expresses the level of impairment or consequences that assets may experience from a storm event. If an asset recovers quickly with limited interruption in service it has low vulnerability, while extended service loss or permanently reduced capacity would be synonymous with high vulnerability. Input from Committee members and at Public Engagement Events was utilized to assess the Vulnerabilities of assets and systems across the County.

This information is further combined into one quantitative risk score. The risk score is calculated by multiplying the Hazard Score, Exposure Score, and Vulnerability Score:

Hazard Score x Exposure Score x Vulnerability Score = Risk Score

The derived risk scores help to quantify the associated risk to each asset and can be used to illustrate and examine the distribution and types of assets least resilient to flooding.

The first step in applying the risk assessment tool is to calculate "unmitigated" risk scores, which represent the risk to assets and systems in their current condition, without proposed mitigation projects in place.

The unmitigated risk scores present a profile of the current risk to assets identified in Suffern. Analysis of these results provides insight into the factors driving flood risk in Suffern and what strategies could be most effective in improving the long-term resiliency of assets.

The second step is to prepare "mitigated" risk scores to reflect the degree to which a mitigation project may reduce risk to specific assets. This analysis is presented in Section V.

Unmitigated Risk Score Results

In total, 41 assets located within extreme, high, and moderate flood risk areas were identified in Suffern and evaluated in the unmitigated risk assessment. These assets are distributed throughout the community, with the highest concentrations along the Mahwah River, Ramapo River, and Lake Antrim. Of these assets, four scored in the extreme risk category and 28 scored in the high risk category, while the remaining nine scored in the moderate risk category. This outcome is not unexpected, as only those assets in high and extreme risk areas were considered for risk assessment. The unmitigated risk score results are presented in Table II-6 by RSF and by Risk Score Level from Severe to Moderate. A severe risk score is highlighted in red, high in orange, and moderate in yellow. Risk Score Levels are indicated by the following shading:

Risk Score Level
Severe
High
Moderate

The geographic distribution of high risk assets is generally uniform across the riverine sections of Suffern. This is consistent with observations of historic flood events, as both the Mahwah and Ramapo Rivers have caused significant flooding and damage to surrounding assets.

Key infrastructure systems in the community are at severe and high risk. Both the wastewater treatment plant and South Street wastewater pump station score in the severe risk category while the Lake Antrim pump station is at a high risk. Given the interconnected nature of the wastewater system, if one component of the system fails, the rest of the system is at increased risk of failure as well. Suffern's transportation infrastructure systems serve a critical function not only within the community, but in the broader regional transportation network as well. At a severe risk is the Montebello Road Bridge, which is currently still out of use due to damage from Hurricane Irene, impeding access to the Knolls of Ramapo Townhomes and Ramapough Cirque Townhomes from the east (US Route 202 and Memorial Drive). A variety of other bridges and roadways are at a high risk including the NYS Route 59 Bridge, a commuter lot and many local roads providing access to neighborhoods. The power supply system, including a high voltage electrical transmission tower and the Orange and Rockland Gas Facility, is at a high risk. Loss of power can negatively affect the safety and health of residents while also hindering communication.

Table II-6: Unmitigated Risk Score Results

Asset Name	Recovery Support Function	Risk Area	Risk Score Level
Montebello Road Bridge over Mahwah River	Infrastructure	High	Severe
Squires Gate Attached Homes	Housing	Extreme	Severe
Village Sewage Treatment Plant	Infrastructure	Extreme	Severe
Village South Street Wastewater Pump Station	Infrastructure	Extreme	Severe
Abby Park Lane Multi-Family Homes	Housing	High	High
Apartments on South St	Housing	Extreme	High
Berkley Square Apartments & Rockledge Townhomes	Housing	Extreme	High
Brooklands Park	Natural and Cultural Resources	High	High
Catherine Ave access to West Ward	Infrastructure	Extreme	High
Chestnut St Underpass to West Ward	Infrastructure	Extreme	High
Donna Hallett Park	Natural and Cultural Resources	Extreme	High
Grasskeeper Landscaping, Inc	Economic	Extreme	High
High Voltage Electrical Transmission Tower	Infrastructure	Extreme	High
Horton Memorial Field & Toddler Park	Natural and Cultural Resources	Extreme	High
Lake Antrim Pump Station	Infrastructure	Extreme	High
Lot F (Park & Ride)	Infrastructure	Extreme	High
N. Ramapo Ave access to West Ward	Infrastructure	Extreme	High
NYS Route 59 Bridge Over Mahwah River	Infrastructure	High	High
Orange and Rockland Gas Facility	Infrastructure	Extreme	High
Ramapo Valley Rd Underpass to West Ward	Infrastructure	Extreme	High
Ramapough Cirque Townhomes	Housing	Extreme	High
Rockland Terrace Multi-Tenant Commercial Building	Economic	Extreme	High
Single-Family Homes - Brook St and Highland Ave	Housing	High	High
Single-Family Homes - South St and Rockland Terrace	Housing	Extreme	High
Single-Family Homes near Lake Antrim	Housing	Extreme	High
Suffern Baseball Complex	Natural and Cultural Resources	Extreme	High
Suffern Memorial Pool	Natural and Cultural Resources	Extreme	High
The Knolls of Ramapo Townhomes	Housing	Extreme	High
Vacant Industrial Buildings (former Rainbow Vacuum)	Economic	Extreme	High
Village DPW Garage	Health and Social Services	Extreme	High
Village Water Treatment Plant	Infrastructure	Extreme	High
Wayne Ave / NYS Route 202 (floodprone area near Rockledge Dr)	Infrastructure	Extreme	High

Table II-6: Unmitigated Risk Score Results

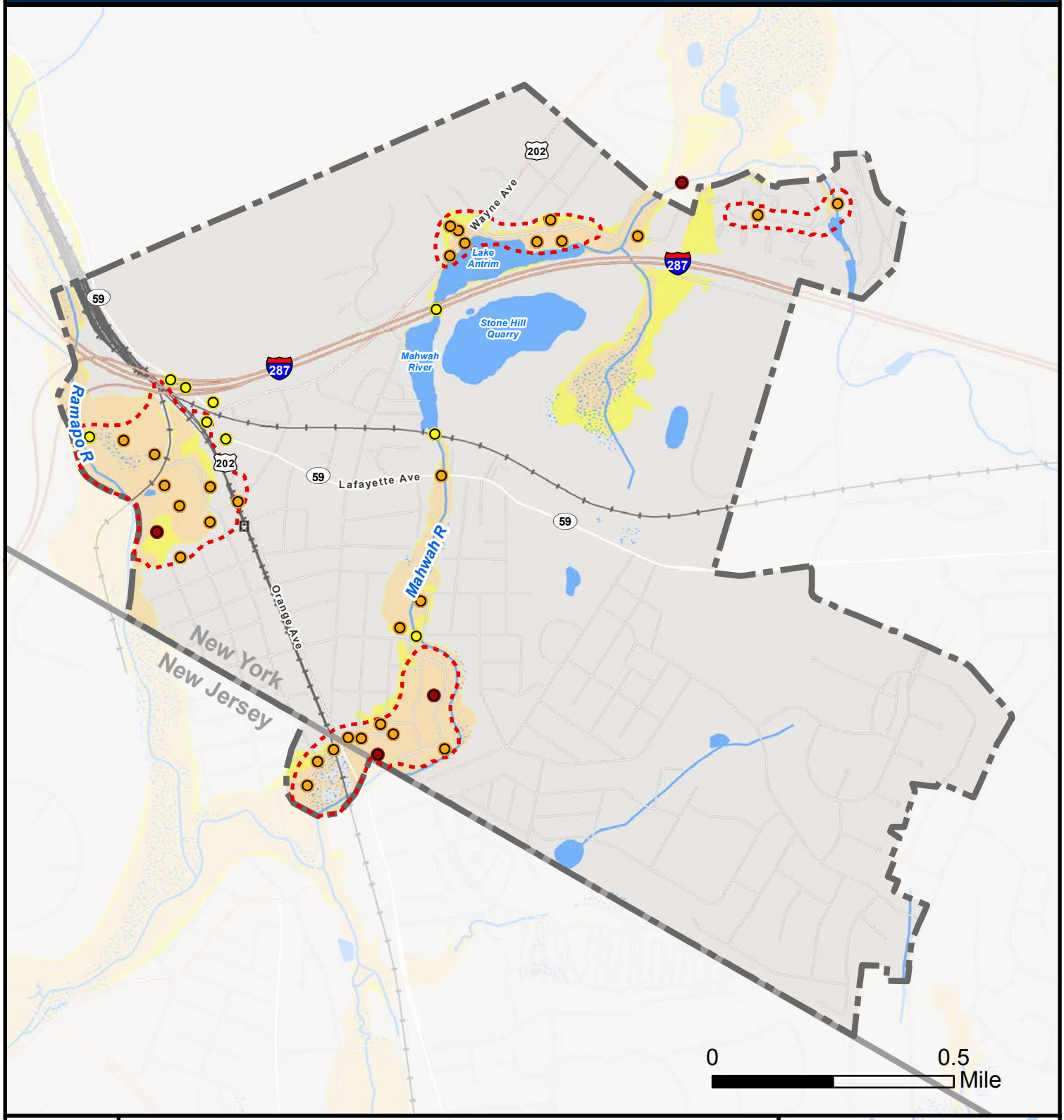
Asset Name	Recovery Support Function	Risk Area	Risk Score Level
Boulevard Street Bridge Over Mahwah River	Infrastructure	High	Moderate
High Voltage Electrical Transmission Towers	Infrastructure	Extreme	Moderate
I-87 Bridge Over Mahwah River	Infrastructure	High	Moderate
Lafayette Ave Businesses (Malandra's, Ole-Ole, Suffern Food Mart)	Economic	High	Moderate
Lot A (Park & Ride)	Infrastructure	Extreme	Moderate
Lot D (Park & Ride)	Infrastructure	High	Moderate
Orange Ave / NYS Route 59 Thruway Underpass	Infrastructure	High	Moderate
Rail Bridge over Mahwah River	Infrastructure	High	Moderate
Shamrock Hotel	Economic	High	Moderate

The unmitigated risk scores for several neighborhoods within the community range from high to severe. These neighborhoods include a combination of single family homes, townhomes, apartments and multi-family homes. The neighborhoods on South Street, Rockledge, Brook Street, Highland Avenue, and near Lake Antrim are all at a high risk. Squires Gate near Lonergan Drive is the one neighborhood at severe risk. This residential area is at direct risk from flooding but is also at risk due to access issues and infrastructure impacts such as loss of power and road closures caused by flooding.

Several of the Village's parks, including Donna Hallett Park, Horton Memorial Field and Toddler Park, Suffern Baseball Complex, and Suffern Memorial Pool, received high risk scores. While these areas are green space, play equipment (jungle gyms), utility and electrical infrastructure supporting ball fields and courts as well as the pool and its support systems all sustained damage during Hurricane Irene.

The geographic distribution of preliminary unmitigated risk scores is presented in Figure II-3. There are three locations containing concentrated assets at severe or high risk: the area near the Village's southern border along the Mahwah River, the area near the western boundary of the Village along the Ramapo River and the area in the north of the Village proximate to Lake Antrim and the Mahwah River. The high risk scores in these areas are driven by the asset's proximity and exposure to the primary flood sources in the community and their location within high and or extreme flood hazard areas as identified by FEMA and the Committee respectively. These areas of concentrated risk require targeted attention in the evaluation of potential mitigation measures.

Figure II-3
Risk Assessment - Village of Suffern



N

Legend

Assets

- Severe Risk
- High Risk
- Moderate Risk

- Study Area (Village of Suffern, NY & portion of Mahwah, NJ)
- Major Highways
- Railroads
- Extreme Risk Areas* (repetitively flooded)

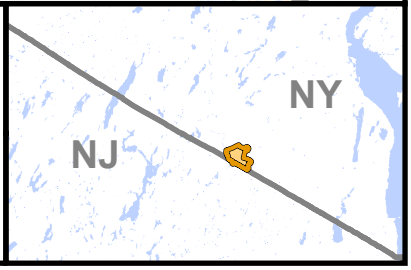
FEMA Floodzones

- High Risk Zone (100-year flood)
- Moderate Risk Zone (500-year flood)

Data Sources

ESRI, FEMA, NJGIN, NYSITS, Rockland County, Village of Suffern

*Extreme Risk Areas identified by Planning Committie



B. Assessment of Needs and Opportunities

The compilation and assessment of Needs and Opportunities was undertaken to identify the issues that must be addressed in the Village of Suffern in the aftermath of Hurricane Irene and Superstorm Sandy, and to identify the opportunities that are available to address these issues. For the purposes of the NYRCR program, Needs and Opportunities can relate to direct damage caused by the storms, lost opportunities resulting from the storms, efforts to make existing assets more resilient, or issues that predate the storms entirely.

In general, the process for developing a list of Needs and Opportunities is grounded in the results of the efforts described in Section I of this NYRCR Plan. Initially, the NYRCR Planning Committee, with input from residents who attended the first Public Engagement Event, developed a Vision Statement and Goals to guide the Committee's decision-making process and to serve as a basis for the identification of key Needs and Opportunities for the Village. The Committee then developed the asset inventory and map and the list of critical issues with input from the public and Village officials. This information helped the Committee focus on Needs and Opportunities of important resources, exposed systems and vulnerable uses. By concentrating on the identified challenges and considering how they may be addressed, numerous opportunities to develop a more resilient community are revealed.

From this baseline, the first draft of the list of Needs and Opportunities was generated by the Committee. The Committee worked to identify successful systems throughout the municipality while pinpointing deficiencies in existing protective and recovery measures and procedures. Short-term, mid-range and long-term needs critical to improving resiliency in the Village were discussed. After further exploring their community's needs, the Committee Members identified opportunities that responded to these needs and that can be leveraged to improve preparedness, recovery and long-term resiliency. The resulting list was refined further through in-depth discussions with Village officials, community stakeholders, the general public, and others at Planning Committee Meetings and the first Public Engagement Event. Through this effort, key systems that support the community's storm preparation, response and recovery, and opportunities to strengthen them were identified.

During and in the aftermath of Hurricane Irene and Superstorm Sandy, the vast majority of Suffern's emergency response systems proved effective. The emergency service providers, Village staff and dedicated volunteers rely on efficient and timely warning and response protocols to protect Suffern residents. When the ability to provide needed services during these events exceeded the Village's resources, the emergency service command network coordinated directly with regional and Federal agencies to supplement their response capabilities. Even with these protocols in place, it became evident that challenges and constraints exist that are beyond the emergency providers' control, and that these issues must be addressed to provide all members of the community full protection during significant storm events.

As the Committee Members worked to formulate a list of specific needs, certain issues became the focus of the discussion. A critical issue was the flooding of the Mahwah and Ramapo Rivers, and the need to control the volume and velocity of water through these systems. Those neighborhoods that remained relatively accessible, but where floodwaters caused significant damage to homes and displaced residents, were identified as areas of major concern. In addition, ensuring access to neighborhoods susceptible to being cut off by floodwaters during storms was also flagged as an important issue. As flooding was not limited to residential areas, many businesses had to be shuttered during and after these storms, driving at least one to relocate outside of the Village. Also of critical importance are key Village infrastructure assets

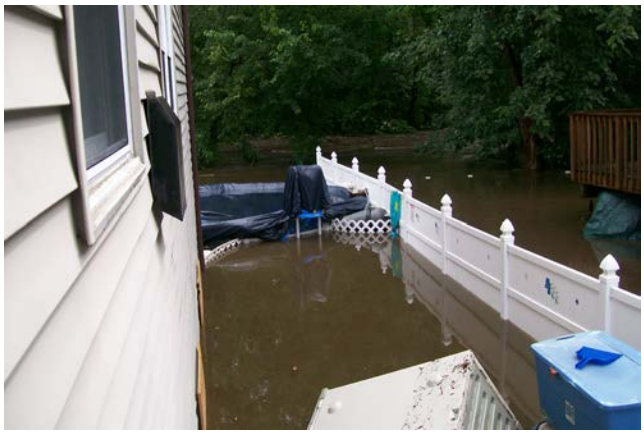
such as the wastewater treatment and water supply plants, which were inundated, causing disruptions in essential Village services. Moreover, these storm events highlighted the inadequacies of existing stormwater management systems.

The final Needs and Opportunities identified by the community and documented on the following pages are the basis for the strategies, projects, programs and actions documented in this NYRCR Plan. To summarize, recurring themes of primary concern to the community include:

- Repetitive flooding in various residential neighborhoods needs to be addressed;
- Access to residential areas otherwise cut off during storm events must be provided;
- Aging village infrastructure including stormwater and drainage systems are contributing to flooding; and
- As flooding in Suffern is exacerbated by development in municipalities located further up the watersheds, regional coordination with adjacent municipalities and the state of New Jersey regarding flooding issues on the Ramapo and Mahwah Rivers should be pursued to better manage flooding.

In 2011 President Obama established the National Disaster Recovery Framework (NDRF) including the six NYRCR Recovery Support Functions (RSFs). The objective of the Recovery Support Functions is to facilitate the identification, coordination and delivery of Federal assistance needed to supplement recovery resources and efforts by local, State, Tribal, and Territorial governments, as well as private and nonprofit sectors. The six RSFs and the core recovery capability of each RSF and the relevance to the Village of Suffern are described below. The following section also provides an overview of the identified Needs and Opportunities organized by the six RSFs.

The RSFs were designed to "support local governments by facilitating problem solving, improving access to resources and by fostering coordination among State and Federal agencies, nongovernmental partners and stakeholders."[13]



Flooded Homes after Hurricane Irene (Blas Gonzalez)

Community Planning and Capacity Building Recovery Support Function

This RSF addresses a communities' ability to respond to and implement short- and long-term recovery measures, including: policy initiatives, laws, regulations, and planning activities, as well as civic engagement and public education.

Needs:

- Improve regional coordination with State, Federal, and municipal governments to protect the community and plan for future disasters;
- Develop public education and outreach campaigns for residents to increase awareness of disaster preparedness, response, and recovery; and
- Update the Village's Emergency Operations Plan to be compliant with the National Incident Management System (NIMS).

Opportunities:

- Create a Regional Coordination Committee to address flooding issues across state and municipal boundaries;
- Review strategic planning documents annually and update when needed; and
- Obtain funding and expertise to update the Emergency Operations Plan to be compliant with NIMS.

Economic Recovery Support Function

This RSF looks to identify ways to fortify the current local and regional economy to make businesses more resilient during acute storm events and help them employ measures to recover quickly and efficiently after the storms have subsided. As shown in Figure II-4, the Village has several key economic and commercial clusters, some of which have been subject to damage due to repetitive flooding. The ability of a community to recover from disasters is inherently tied to its capacity to return to business-as-usual following these events. Helping businesses that have suffered irreplaceable losses and re-opening businesses that have been closed due to lack of power and/or flood damage as soon as possible is critical to recovery.

Needs:

- Protect the business and commercial centers subject to repetitive flooding from future flood damage; and
- Provide businesses with assistance to improve recovery time following a storm event.

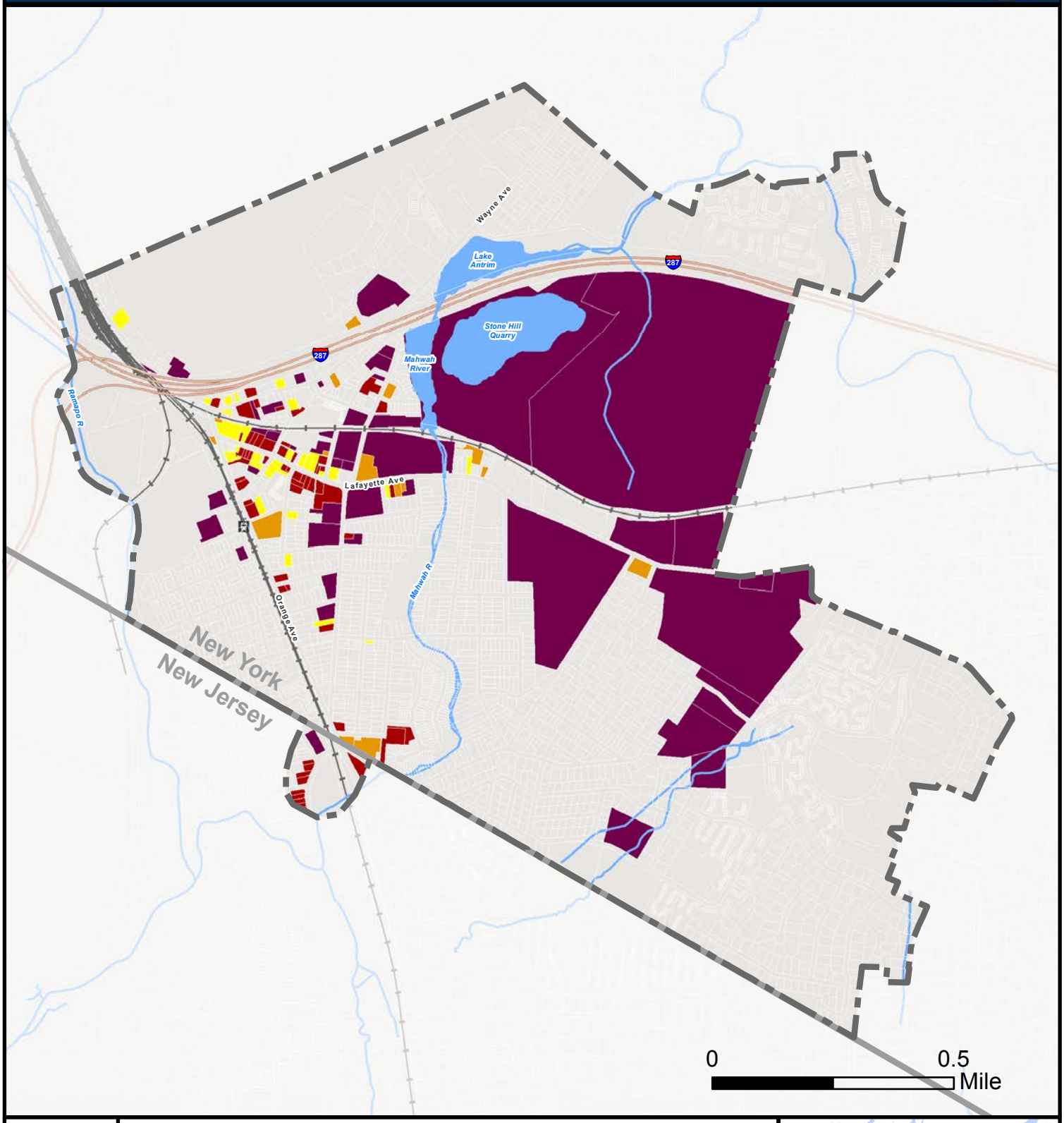
Opportunities

- Ensure stormwater systems are maintained and operational to alleviate flood impacts to businesses;
- Examine various technologies such as portable flood barrier walls to protect businesses during storm events; and
- Examine resources such as low interest loans and/or grants to help small businesses recover from storm events.

Housing Recovery Support Function

This RSF considers the current residential (rental and for-sale) housing stock for all income levels and evaluates its vulnerability with regard to storm events. In its evaluation, the community considers: retrofits and other measures to mitigate flooding and damage by inundation and winds; revisions to codes to protect existing and future housing stock; the adequacy of emergency preparedness and evacuation plans for all residents; measures to reduce the loss of historic homes and the adequacy of emergency preparedness plans to affect the safe evacuation of residents, especially vulnerable populations.

Figure II-4
Economic Land Uses - Village of Suffern



Legend

- Study Area (Village of Suffern, NY & portion of Mahwah, NJ)
- Major Highways
- Railroads
- Rail Station

Land Uses

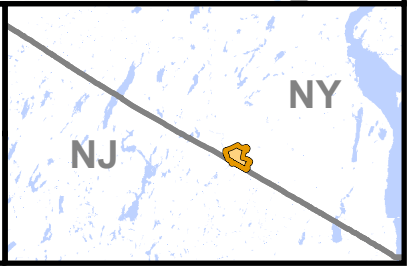
- Mixed-Use
- Office
- Retail
- Industrial
- Other Land Use

Data Sources

ESRI, NJGIN, NYSITS, Rockland County, Village of Suffern

October 2014

N



Needs:

- Educate homeowners regarding pre-storm preparedness, storm protection procedures, and post-storm recovery initiatives;
- Complete the ongoing tree inventory and maintenance plan to prevent tree damage to power lines and homes and to ensure access is maintained to neighborhoods during storms;
- Ensure that homeowners are receiving fair and equitable pricing from licensed contractors during storm recovery;
- Protect existing residential neighborhoods and their access points from flooding; and
- Protect key power lines and power sources from flooding and ensure new power sources are flood proof.

Opportunities:

- Provide assistance and information to homeowners and renters regarding mitigation measures, building elevation, acquisition and relocation programs, and flood proofing;
- Provide flood related publications and materials produced by the Village of Suffern, FEMA and NYS Office Emergency Management (OEM) to homeowners regarding storm event preparedness and recovery assistance programs;
- As part of the Village's participation in the Arbor Day Foundation's Tree City USA Program, continue coordination with Orange and Rockland and the Village's consulting professional arborist to finalize the ongoing inventory and assessment of tree health, size, and number of trees in the public right-of-way and develop a tree maintenance plan for protection of key Village resources;
- Provide guidance on proper tree maintenance, tree ownership responsibilities and jurisdiction;
- Work with the contracting community to provide an annual list of County and/or Village approved contractors with list of appropriate costs for repairs or wage rates or scales;
- Evaluate ingress and egress routes to vulnerable neighborhoods to develop safe emergency access and evacuation routes during storm events;
- Investigate and pinpoint causes of neighborhood flooding (i.e., stormwater systems, stream alignment, watershed development, location in mapped floodplain, etc.); and
- Develop guidance on protection of power sources and backup power supplies (i.e., underground utilities in new construction).

Health and Social Services Recovery Support Function

This RSF addresses the community's ability to rebuild and improve vital health and social services, particularly those serving vulnerable populations. Restoring such networks, and making them more resilient, will promote the well-being of residents, ultimately improving the overall health and independence of the whole community.

Needs:

- Install backup generators at key facilities;
- Continue high level emergency services operation and communication among responders;
- Maintain access to health and social service facilities for all residents during storm events;
- Provide shelter for residents with pets during storm events; and
- Upgrade shelter(s) (Community Center, VFW Building).

Opportunities:

- Identify key facilities in need of a backup generator and investigate potential funding sources;
- Encourage continued training and education on cutting edge technologies for emergency service operations;
- Ensure access by emergency providers to at risk residents in flooded neighborhoods thereby maintaining uninterrupted access to health and social service facilities during storm events; and
- Identify pet friendly shelters and develop education materials to be made available prior to storm events (through veterinary clinics and the Village office responsible for dog licensing etc.).

Infrastructure Systems Recovery Support Function

This RSF seeks to identify the community infrastructure that was damaged during the storms, components and facilities that have been patched up until permanent repair and replacement can occur, facilities that have been replaced, and those that remain untouched since the storm events that still require significant improvement.

Needs:

- Develop comprehensive stormwater improvements to help alleviate flooding, lessen erosion, and reduce pollutant transport;
- Protect identified road, bridge, and culvert infrastructure assets;
- Safeguard identified water supply and wastewater conveyance and treatment infrastructure assets including alternate power sources; and
- Protect transportation infrastructure assets (train stations, rails, buses, roads).

Opportunities:

- Evaluate the Village's stormwater system and identify improvements including opportunities for the implementation of green infrastructure;
- Inventory infrastructure needs including age and condition of facilities and prepare a maintenance and/or replacement/relocation plan;
- Secure and install generators at vulnerable infrastructure facilities;
- Identify measures to protect water supply and wastewater conveyance and treatment infrastructure during major storm events; and
- Proactively coordinate with New Jersey Transit Authority and New York State Department of Transportation to ensure rail, bus, and road related transportation assets are protected during storm events and, if forced offline, return them to operation as quickly as possible.

Natural and Cultural Resources Recovery Support Function

This RSF focuses on protecting and restoring natural systems and cultural resources for continued provision of benefits to the community. These benefits can include stormwater management, recreational opportunities and tourism. Conserving and rehabilitating natural and cultural resources will contribute to reducing the Village's vulnerability during storm events while promoting economic development, ultimately having lasting benefits on the community's environmental and economic well-being.

Needs:

- Investigate floodplain protection/restoration and alternative stormwater management measures (i.e., green technology);
- Coordinate with New York and New Jersey State agencies, Rockland and Bergen County agencies

and neighboring communities as well as the U.S. Army Corps of Engineers, on flooding and flood control issues; and

- Protect and clean Lake Antrim and the Mahwah and Ramapo Rivers; and
- Identify historic resources susceptible to flooding.

Opportunities:

- Identify areas where floodplains can be protected and/or restored and where green infrastructure techniques can be used to alleviate flooding from stormwater runoff;
- Create a Regional Coordination Committee to address flooding and flood control issues across state and municipal boundaries and coordinate with the Rockland-Bergen Bi-state River Commission;
- Prepare a Watershed Protection Plan(s) focused on Lake Antrim and Mahwah and Ramapo Rivers; and
- Explore options to minimize flood damage and protect vulnerable historic resources.

2014
NY RISING COMMUNITY RECONSTRUCTION PLAN

SUFFERN NYRCR

Section III
Reconstruction and Resiliency Strategies

III Reconstruction and Resiliency Strategies

The Suffern NY Rising Community Reconstruction (NYRCR) Planning Committee (Committee), with the help of valuable feedback from the public and discussions with the Consultant Team, developed reconstruction and resiliency strategies that will assist the Village with building back better. The community's vulnerabilities revealed during and after Superstorm Sandy and Hurricane Irene were considered in the development of these strategies, including vulnerabilities related to preparation, response, damage and recovery.

The Vision and Goals, Critical Issues, and Needs and Opportunities identified and refined by the Committee with input from the larger Suffern NYRCR Community (Community) provide the foundation for this list of strategies.

The reconstruction and resiliency strategies proposed help resolve the critical issues identified in Section I of this NYRCR Plan, address risks to assets explored in Section II, and consider emergency, disaster recovery, long-term resiliency, and economic development needs that remain unmet by existing planning and rebuilding initiatives. The strategies represent statements of action that address how to strengthen the community against future extreme weather events, capitalize on valuable reconstruction opportunities, and meet short-, medium-, and long-term goals identified during the planning process.

The strategies are organized into the six Recovery Support Functions (RSFs), as defined in Section II.B, "Assessment of Needs and Opportunities," of this NYRCR Plan. The following section presents a description of each strategy followed by a table listing and/or text documenting projects that help realize that strategy.

Strategy A: Broaden services at existing storm shelter facilities to more fully cover basic needs and accommodate pets, and investigate new shelter opportunities

With the increasing frequency of major storm events in New York State, the Committee expects that the number of residents requiring access to emergency shelters will only grow in the coming decades. With this in mind, increasing the capacity and resilience of existing storm shelters while building more shelter capacity is important for the Village.

The George J. Parness Suffern Community Center, the location of the current storm reception center and shelter, is in need of additional equipment and supplies to better offer important services. The issue of backup power will also be considered. In order to provide a second shelter location and one within the West Ward, a neighborhood that is historically cut-off during flood events, the Village and the Committee indicated that the Veterans of Foreign Wars (VFW) building, located in the West Ward could be converted into a reception center and shelter facility thereby providing redundancy and offering more options for residents during storm events. One or both of these facilities will also be made "pet friendly" to allow those residents with animals the opportunity to bring their pets along. This will eliminate the need for pet owners to decide between riding out the storm in their home with their pets or leaving them unattended in potentially perilous conditions.

In addition to the Featured Project presented in Table III-1, the Committee also identified one Additional Resiliency Recommendation to pursue this strategy; the procurement and storage of additional storm

shelter equipment and supplies at each of the Villages designated reception and storm shelter facilities. This measure is listed with full details in Section V.A, "Additional Resiliency Recommendations."

Table III-1:
Strategy A: Broaden services at existing storm shelter facilities to more fully cover basic needs and accommodate pets, and investigate new shelter opportunities

Project Name	Short Project Description	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
VFW Building Emergency Power and Electrical Upgrades	Retrofit the VFW facility to develop it as a Storm Response Shelter by upgrading the electrical system and installing back up power and fuel storage.	Costs to complete this project are estimated to be $180,000 in total including $30,000 for engineering and design and $150,000 for electrical upgrades, purchase, and installation of the emergency power generator and fuel storage.	Featured Project	N

Strategy B: Assist residents with preparation for, response to, and recovery from future storm events through emergency communication, outreach, and education initiatives

Developing more resilient homes and a more informed citizenry in the face of future storms has three key components: preparation for, response during and recovery from the storm event. All three are considered in this strategy.

As a result of Hurricane Irene and Superstorm Sandy, residents' homes suffered damage including flooded basements and the destruction of mechanical equipment, holes in and loss of roofs, and compromised house foundations that required the demolition of four homes. Residents whose homes suffered damage had to seek shelter in unfamiliar environs, some with very few personal belongings in tow, or live in their damaged homes without services, with inoperable utilities and, in many cases, with moldy basements. The stress associated with such a dramatic upheaval is significant and compounded by many things including the uncertainty associated with when, or worse, if their homes would be habitable.

With regard to preparation for a storm, it became clear, based on input received from the Committee and the community that Suffern will benefit greatly from the distribution of information on and assistance with pre-storm preparations. Homeowner education on flood damage prevention was acknowledged as a key housing issue and the desire to address the vulnerability of the existing housing stock was identified. Homeowners require information on planning upgrades, re-building, and modernizing their homes to withstand future storm events. Actions could include education regarding flood-proofing, armoring, and home elevation to safeguard homeowners and their most important assets.

While the emergency services providers were exemplary in their response and in their efforts to protect the Village's residents during Hurricane Irene and Superstorm Sandy, improvements to the dissemination of information and the provision of assistance by

trained personnel and residents during the storm will benefit all in the Village. To achieve this goal, the Committee identified projects and actions that will improve and build on the Village's existing emergency preparedness, response, and communications systems. The proposed improvements will include revision of the Village's Emergency Operations Plan to be compliant with National Incident Management System (NIMS).

In the aftermath of the storms, residents were frustrated with a lack of available information and/or the wait times associated with recovery initiatives and the release of funds. While some homes have been repaired and one elevated, four were lost to Hurricane Irene's flooding. Residents need to understand all recovery options to ensure that they will have the ability to make the most informed decision for the best path forward. This strategy envisions multiple pathways for the dissemination of information related to physical recovery assistance offered by the Village, information on contractors who can provide needed rebuilding services as well as information on financial assistance and incentives offered by County, State, and Federal agencies.

Although the Committee did not raise any projects for this strategy to the level of Proposed or Featured, they did identify Additional Resiliency Recommendations to pursue this strategy including, but not limited to, the development of a comprehensive Village-wide education and outreach program for storm preparation, preparedness, and recovery, and the purchase and implementation of emergency communications systems upgrades. All "Additional Resiliency Recommendations" are listed in their entirety in Section V.A of this NYRCR Plan.

Strategy C: Develop storm assistance programs and provide consolidated information on financial initiatives that allow residents and businesses to better protect themselves and their assets from future storm damage

To become a more resilient community, the Village of Suffern's NYRCR Planning Committee, residents and elected officials identified and defined details of past storm impacts on their residences and businesses. Out of this effort arose an understanding that some impacts could be minimized, even prevented, through the installation of permanent protective equipment and measures. Others, and these are the focus of this strategy, require a concerted effort to lessen or eliminate impacts by way of short- and long-term planning for storm events.

Much of the business and residential property losses were in the form of damage to goods and personal effects that were stored in areas prone to flooding. It became evident to the NYRCR Planning Committee that in the short-term, many of these assets could be easily moved out of harm's way with assistance from a group of volunteers prior to the onset of a storm. Semi-permanent equipment, that would not be easily relocated, could be protected by temporary measures immediately in advance of a storm, including sand bags and temporary flood walls, or, with the proper planning, permanently moved to a higher floor or an area of the building above the flooding. Finally, those assets that are considered permanent, buildings and homes, could be protected using portable flood barriers or removed from areas that flood using a long-term, managed retreat approach through a buyout program coupled with an economic development plan to offset the potential loss of tax ratables. Projects developed in support of this Strategy offer solutions to all of these problems.

In addition to the Proposed Projects presented in Table III-2, the Committee also identified one Additional Resiliency Recommendation to pursue this strategy; a volunteer storm assistance program that will help residents and business owners move possessions out of harm's way prior to the arrival of a storm. This measure is listed with full details in Section V.A, "Additional Resiliency Recommendations."

Table III-2: Strategy C: Develop storm assistance programs and provide consolidated information on financial initiatives that allow residents and businesses to better protect themselves and their assets from future storm damage

Project Name	Short Project Description	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Homeowner Buyout Program Support and Economic Development Plan	Provide support to the Village to explore various buyout and relocation program opportunities, identify eligible properties, and administer the buyout program, and prepare an economic development plan to offset reduction in tax revenues resulting from a buyout.	Costs are estimated to be $94,000 including $54,000 for the buyout program support and $40,000 for the Economic Development Study.	Proposed Project	N
Homeowner Support for Raising Utility Connections and Mechanicals	Encourage homeowners in areas susceptible to flooding to move utility and mechanicals from basements to upper floors. Hire an architect to develop schematic plan options for raised utility rooms, facilitate the use of preapproved plans through the approval process for homeowners and help identify funding sources for the retrofit of existing homes.	Costs to have an architect prepare plans are estimated to be $35,000.	Proposed Project	N

Strategy D: Collaborate with municipal neighbors in New York and New Jersey to manage watershed development and control flooding

Initial responses to damages resulting from a significant storm event typically tend to focus solely on the local conditions that contributed to the flooding. However, a broader assessment is necessary to understand the dynamics of, and to better address, the problems specific to the overall surface water system(s). A regional effort that looks at the watershed or sub-watershed (depending on the area it encompasses) is vital to effective resiliency planning.

The assessment and modelling of a watershed is a key first step to documenting existing conditions and understanding the stressors in place that can be addressed to reduce impacts of future storms. The Mahwah River runs roughly 11 miles from its source north of Suffern to its confluence with the Ramapo River just south of the Village in New Jersey. The Planning Committee and Village Officials have indicated their desire and willingness to participate in a consortium of Mahwah River Watershed communities to coordinate efforts and manage development, assess stormwater impacts, and reduce flooding in the watershed. The Village of Suffern will reach out to its neighbors in the Mahwah River watershed to initiate this discussion and begin to build an inter-municipal group that could benefit from a broader, more regional perspective. The proposed "Mahwah River Watershed Management Group" will use a holistic approach to planning for resiliency.

Coordination with County, State and possibly Federal agencies to set forth the requirements of a watershed management plan and better understand the constraints of permitting required for projects derived from a comprehensive watershed assessment will be undertaken by the proposed "Management Group." Recommendations for improving stormwater management, mitigating flooding and managing development will focus on a suite of improvements with varying costs that could be implemented in both the short- and long-term.

In 2012, recognizing the need for comprehensive flood prevention approaches to ensure the preservation of the environmental benefits of various watersheds, the State of New Jersey endorsed and passed legislation to create a bi-state organization and framework for regional coordination of potential flood hazards along the Hackensack River, Sparkill Brook/Creek, Saddle River, Ramapo/Mahwah River, and their tributaries. Similar legislation was passed by New York State in 2013 and in April, 2014, the NYS legislature included $100,000 in the 2014-2015 Budget to realize the Rockland-Bergen Bi-state River Commission (Commission). The Commission is mandated to issue a report by June 2016 to include recommendations for legislation, administrative action, and local government action. This legislation furthered a long history of cooperation among State and local governmental entities and various private organizations and individuals in the vicinity of these water bodies and watersheds.

The Village of Suffern and the proposed "Mahwah River Watershed Management Group" will reach out to the Rockland-Bergen Bi-state River Commission to develop a collaborative working relationship between the two groups from the outset to ensure a comprehensive and coordinated approach to watershed management and flood control.

Although the Committee did not raise any projects for this strategy to the level of Proposed or Featured, they did identify an Additional Resiliency Recommendation that will establish an inter-municipal organization for the management of the Mahwah River Watershed, which will coordinate with the Bi-state River Commission. This action, along with all other "Additional Resiliency Recommendations," is listed in their entirety in Section V.A of this NYRCR Plan.

Strategy E: Improve stormwater management and drainage systems throughout the Village to improve resiliency

When considering the causes of flooding in a community, it becomes evident that stormwater runoff plays a significant role. Stormwater infrastructure and drainage systems, or the lack thereof, are usually identified as a source for the discharge of water into already stressed surface water systems; this added volume then contributes to the inundation of certain areas downstream. Existing stormwater conveyance systems can be old, unmaintained, nonfunctioning or, in the case of older development, nonexistent. Options for improving the management of runoff are varied and include structural systems like pipes and storage vaults as well as green infrastructure practices such as vegetated bioswales, rain gardens, and porous pavement to name a few. Green infrastructure, which also includes the enhancement of natural systems such as stream buffers, wetlands, and floodplains, not only delays runoff discharged into the receiving surface waters, thereby lessening its contribution to flooding, but also improves water quality. To provide stormwater management where it does not exist and improve it where it does, but is inadequate, requires an assessment of the existing systems as well as determining the viability of various stormwater management practices across the Village.

The Committee and community identified a suite of projects to address stormwater issues in Suffern including the preparation of a comprehensive digital inventory of the Village's infrastructure, which will document the size, date of installation, inspection and maintenance schedules of stormwater infrastructure. This effort will result in the identification of stormwater management and drainage infrastructure that needs to be updated, upgraded, resized or replaced as well as identification of those areas not now served where drainage infrastructure should be constructed. Other projects chosen to manage stormwater include the assessment of the feasibility of installing subsurface storage below, pervious pavement on top and bioswales in or around existing municipal parking lots as well as in other locations throughout the Village.

Table III-3: Strategy E: Improve stormwater management and drainage systems throughout the Village to improve resiliency

Project Name	Short Project Description	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Inventory of Existing Stormwater Management Infrastructure	Supplement the existing data within the County GIS database with information on condition and location of critical stormwater infrastructure.	Costs are estimated to be $225,000, including software upgrades, data collection, and analysis.	Proposed Project	N
Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study	Conduct a feasibility study to determine appropriate locations to implement green infrastructure practices and stormwater storage systems throughout Suffern.	Costs to complete this project are estimated to be $900,000 including $30,000 for the study; $135,000, for engineering and design; and $735,000 for construction of porous pavement and rain gardens.	Proposed Project	N
Stormwater Management Facilities in Village Parking Lots A and B	Assess the feasibility of the installation of underground stormwater storage systems with controlled flow orifices at Village Parking Lots A and B. Evaluate Green Infrastructure elements to further improve stormwater management in the parking lots.	Costs to complete this project are estimated to be $1,920,000 in total including $25,000 for the study; $270,000 for engineering and design; and $1,625,000 for construction of porous pavement.	Featured Project	N

Strategy F: Promote resilience and flood management practices through land-use planning, policy, and regulation

In the face of storm damages and with a significant number of municipal assets, homes and business in vulnerable locations, changes to land-use planning regulations, policies, and documents can be used to increase storm resiliency in Suffern. The Committee is interested in exploring opportunities to reduce or avoid the impacts of natural disasters by revisiting its existing planning regulations with an eye toward sustainability and resilience. The Committee feels that a review of the building, zoning, tree and flood protection ordinances and codes, will be required.

Revisions will be expected to codify the use of the latest flood resistant materials and building techniques to ensure more resilient housing. Building and zoning codes will be updated to facilitate the redesign, retrofit, and rebuilding of damaged homes, buildings and infrastructure in a more resilient and protective way. Language maximizing flood protection, increasing the requirements for stormwater management, and limiting development and redevelopment in flood zones will be considered. A comprehensive management and maintenance plan for trees within public rights of way will also be assessed. Finally, the Village can assess revisions that will enhance the protection of open space and natural resources including surface waters and surrounding lands in the Village.

Although the Committee did not raise any projects for this strategy to the level of Proposed or Featured, they did identify an Additional Resiliency Recommendation that will improve flood protection and resiliency through revisions to the Village Code. This, along with all other "Additional Resiliency Recommendations," is listed in its entirety in Section V.A of this NYRCR Plan.

Strategy G: Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts, and bridges

Suffern's critical infrastructure—including roadways, wastewater and water treatment facilities, electricity, and stormwater management—was adversely affected by Hurricane Irene and Superstorm Sandy. With these damages in mind, the visioning process established the goal to "enhance infrastructure and storm water systems where needed." Repairing and fortifying critical infrastructure to better withstand future storm events and protecting transit and the electrical supply network are important priorities for the Committee and the community.

Resiliency initiatives that enable Suffern's infrastructure systems to continue operating with minimal interruptions during and after future storm events are essential to the ongoing viability of the Village. Of the critical infrastructure systems seriously affected by Hurricane Irene and Superstorm Sandy, most notable were the wastewater and water treatment systems. Roads, culverts, and utilities, electric in particular, were also impacted by these disasters. Repairing, upgrading, and fortifying these infrastructure systems is imperative, as is the development of new and enhanced capabilities including new back-up power supplies for the DPW garage and the South Street pump station. Projects proposed to address this strategy focus on protecting, and making more resilient, key infrastructure assets in the Village.

In addition to the Proposed Projects presented in Table III-4, the Committee also identified an Additional Resiliency Recommendation to pursue this strategy. This project is listed with full details in Section V.A, "Additional Resiliency Recommendations."

Table III-4: Strategy G:
Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts and bridges

Project Name	Short Project Description	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Backup Power for Critical Community Facilities	Provide permanent emergency power generators at the DPW Garage to maintain operation of the fuel pumps and at the South Street Pump Station to allow for uninterrupted service of the facility.	Costs are estimated to be $125,000 including $90,000 to purchase and install a generator at the DPW Garage and $35,000 to replace and elevate the generator at the South Street Pump Station.	Proposed Project	N
Emergency Railroad Crossing into the West Ward	Provide access to the West Ward by way of an at-grade Emergency Railroad Crossing over the NJ Transit Commuter Rail Line.	Costs to design and construct this project are estimated at $250,000.	Proposed Project	N
Drainage Improvements to Transportation Assets	Install drainage improvements at the Chestnut Street underpass, along Orange Ave and along US Route 202 to better protect these transportation assets and to ensure that emergency services have access to these areas.	Costs are estimated to be $1,500,000 including $700,000 for the Chestnut Street underpass; $750,000 for Orange Avenue; and $50,000 for the US Route 202 feasibility study.	Proposed Project	N
Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures	Protect the wastewater treatment plant and related facilities through installing appropriate physical protective measures such as flood doors, windows and vents and installing new electrical equipment at a higher location within the plant.	Costs to complete this project are estimated to be $450,000 including $20,000 for the engineering assessment; $300,000 for design and installation of the floodproof windows and doors; and $130,000 for design and construction of the electrical modifications and recommendations of the engineering assessment.	Proposed Project	N
Hardening of Water Treatment Plant and Facilities through Physical Protective Measures	Protect the water treatment plant and related facilities, including wells, by installing appropriate physical protective measures such as new pumps and emergency generators, floodproof doors, windows and vents in the plant and well houses. Install aerial electric service to the well and raise the well heads above the FEMA BFE.	Costs to complete this project are estimated to be $625,000 including $20,000 for the engineering assessment; $90,000 for the design and installation of aerial power supply; $190,000 to elevate the three wells; $325,000 for floodproof doors and windows.	Proposed Project	N

Strategy H: Restore, preserve, and augment natural resources, including floodplains, streams, rivers, lakes and wetlands, to help mitigate flooding and support flood resiliency

The visioning process in Suffern identified a strong desire in the Village to "Protect and clean Lake Antrim and the Mahwah and Ramapo Rivers" and to "… restore, redevelop, revitalize and make more resilient… natural resources" in Suffern. The Committee recognized the importance of Suffern's natural resources, especially their role in managing stormwater and providing opportunity for passive recreation.

The Committee acknowledged the potential options to limit future damage through enhancement and augmentation of the Village's natural resources such as wetlands, rivers, lakes, and floodplains. The preservation and restoration of these natural systems will allow them to serve as flood banking systems and buffer zones during storms and otherwise protect the people and assets of Suffern. Such a strategy will offer numerous co-benefits depending on the means used. Stream bank restoration to prevent erosion and protect nearby roads and buildings will also provide passive recreation and a more aesthetically pleasing upland environment for residents; restored wetlands and expanded floodplains along the rivers will clean the water and provide habitat while reducing flooding by storing stormwater.

To determine all potential opportunities to improve the rivers and lake with an eye toward flood control, habitat restoration and flood mitigation, the Community has determined that a watershed study should be conducted to better understand the existing conditions and develop a holistic approach to improving these systems.

In addition to the Proposed Projects presented in Table III-5, the Committee also identified Additional Resiliency Recommendations to pursue this strategy including the cleaning and maintenance of the river channels and restoration of Lake Antrim. These projects are listed with full details in Section V.A, "Additional Resiliency Recommendations."

Table III-5: Strategy H:
Restore, preserve, and augment natural resources, including floodplains, streams, rivers, lakes and wetlands, to help mitigate flooding and support flood resiliency

Project Name	Short Project Description	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Flood Mitigation Assessment – Mahwah and Ramapo River Watersheds	Conduct a comprehensive evaluation of the Mahwah River Watershed in conjunction with the Ramapo River Watershed to identify mitigation goals and associated performance metrics, assess existing conditions with respect to erosion and deposition patterns, identify local and watershed-scale stressors, understand patterns of channel evolution, and make recommendations regarding flood mitigation.	Costs are estimated to be $1,000,000.	Proposed Project	Y

2014
NY RISING COMMUNITY RECONSTRUCTION PLAN

SUFFERN NYRCR

Section IV
Implementation – Project Profiles

IV Implementation – Project Profiles

The Village of Suffern, through the NY Rising Community Reconstruction (NYRCR) Program, is eligible to receive up to $3 million in U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Disaster Recovery (CDBG-DR) funds to implement reconstruction and resiliency projects. While developing projects for inclusion in this NYRCR Plan, the Planning Committee took into account alignment with reconstruction and resiliency strategies, cost estimates, cost-benefit analyses, the effectiveness of each project in reducing risk to residents and critical assets, feasibility, and community support. The projects listed in the NYRCR Plan are not ranked nor listed in order of priority.

This section presents a complete project profile for each Proposed and Featured Project identified by the Committee throughout the six-month planning process. The NYRCR Plan also includes "Additional Resiliency Recommendations" presented in Section V.A.

- Proposed Projects are proposed for funding through a Community's allotment of CDBG-DR funding.
- Featured Projects are innovative projects where an initial study or discrete first phase of the project is proposed for CDBG-DR funding or other identified funding; and regulatory reforms and other programs that do not involve capital expenditures.
- Additional Resiliency Recommendations are resiliency projects and actions the Committee would like to highlight and are not categorized as Proposed or Featured Projects.

Risk Mitigation Analysis

Projects with potential flood risk reduction benefits were analyzed through a mitigated risk assessment process. The project location, geographic area of the particular project, and anticipated effects were examined to assess the potential risk mitigation to nearby flood-prone assets.

Projects with potential flood risk reduction benefits were analyzed through a mitigated risk assessment process. Project locations were mapped using available documentation, designs, and plans to establish the geographic area to be analyzed for each project and the proximity to assets. Additional data including aerial imagery, flood risk areas, and topography were also utilized to gain a more complete understanding of the surrounding site characteristics. After the project locations were mapped, project documentation was reviewed to identify how proposed project actions may decrease flood risks to nearby assets through improvements to stormwater conveyance systems and flood mitigation measures.

Once projects were reviewed, asset locations mapped previously in the Asset Inventory and Unmitigated Risk Assessment tasks were analyzed to locate and evaluate those assets that will be affected by each project. The Mitigated Risk Assessment task builds on the Unmitigated Risk Assessment by analyzing how proposed projects may decrease flood risks to assets. Assets are entered into the New York State Department of State (NYS DOS) Risk Assessment Tool; however the flood risk areas, landscape attributes, and vulnerability rankings are modified to reflect anticipated effects of proposed projects. For example, localized flooding on a poorly-drained street could be remedied with a proposed catch basin and culvert pipe; thereby reducing risk to assets or eliminating an

existing flood risk area. In the Risk Assessment Tool, removing that flooding hazard will result in a Mitigated Risk Score lower than the original Unmitigated Risk score. By generating and comparing the Mitigated / Unmitigated Risk Scores, the potential risk reduction benefits of projects can be assessed.

The Project Profiles provide an overview of Anticipated Reduction of Risk. For details on the Mitigated Risk Assessment results, see Section V.D, "Community Asset Inventory."

Cost-Benefit Analysis Methodology

The Cost-Benefit Analysis (CBA) developed the benefits and costs associated with Proposed and Featured Projects. The CBA provides the anticipated cost of implementation and an evaluation of the benefits of the various Proposed and Featured Projects. The purpose of the CBA is to inform the Suffern NYRCR Planning Committee as they formulate and identify projects for implementation, and to help the community prepare grant applications for CDBG-DR funds and other funding opportunities identified in the future. The effectiveness of each project in reducing risk to residents and critical assets, feasibility, and community support were taken into account as well as discussions with Committee members, community members and Village staff. Based on this, the cost-effectiveness of a project was assessed.

The costs and benefits used to evaluate projects through the CBA are explained further below.

Project Costs

The Proposed and Featured Project Profiles include a summary of anticipated project costs. For some Proposed and Featured Projects, estimated costs were provided by the municipal staff and/or consultants. For instances where information was not available, the Consultant Team developed preliminary project cost estimates, which included evaluation, design and/or construction where appropriate. Due to various uncertainties, the estimates are just that—estimates: they provide the community with a practical understanding of the potential estimated costs of project implementation.

The following three factors were used to evaluate costs and benefits:

- Capital Cost;
- Life-Cycle Cost – annual maintenance cost for upkeep and operations for the useful life of the project (if applicable); and
- Useful Life of Strategy – number of years before replacement is required (if applicable).

The CBA not only provides an assessment of the cost of implementing the projects, but also provides a description of the future costs of not implementing the Proposed and Featured Projects. If projects are not implemented, long-term viability of municipalities to withstand and rebound following significant storm events may be negatively impacted. The costs of not implementing projects are more difficult to quantify, but are nonetheless critical to the analysis and are therefore addressed qualitatively. These costs include: repetitive damage to personal property and public infrastructure resulting from frequent recurring flooding and storm events; economic loss to residents, local and regional employers as a result of the inability to work; and inability to access areas of the community, resulting in obstacles or limitations to the provisions of life safety and emergency services.

Project Co-Benefits

The types of benefits evaluated in the CBA are summarized below:

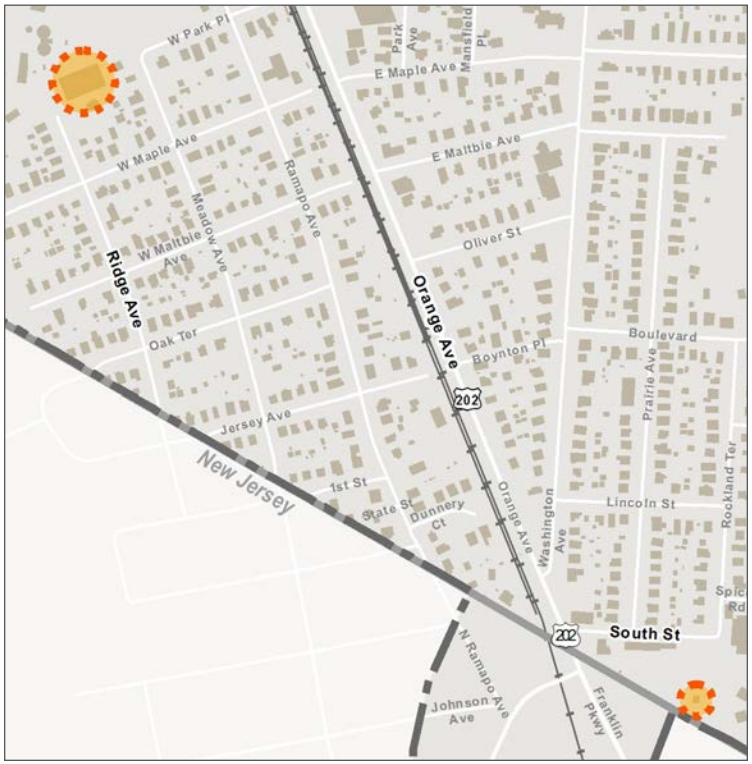
Risk Mitigation: The extent to which a Proposed or Featured Project mitigates the risk of damage to an identified community asset from a future storm event.

Economic Impacts: The potential for a Proposed or Featured Project to minimize costs and reduce the time required for the local economy to rebound from a storm event. Economic assessment data included, where applicable: an estimate of jobs secured/added; relationship to, and/or furtherance of, plans in the *Mid-Hudson Regional Economic Development Council Strategic Plan*[9] *(2011)* and the *Mid-Hudson Regional Economic Development Council's Progress Report*[14] *(2014)*; potential for additional economic activity; and the net effect on local municipal expenditures.

Environmental Benefits: The potential for a Proposed or Featured Project to protect critical environmental assets, high-priority habitat, threatened and endangered species, migration or habitat connectivity; any clean-up resulting from the action; creation of open space or a new recreational assets.

Health and Social Benefits: The potential for a Proposed or Featured Project to benefit the overall population due to 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 implementation of a Proposed or Featured Project.

Backup Power for Critical Community Facilities



DPW Garage and Pump Station Project Area (MJ Engineering and Land Surveying, P.C.)

Project Description:

Electric supply to critical community facilities has been lost during past storm events, including Superstorm Sandy and Hurricane Irene. Two facilities, the Department of Public Works (DPW) garage and the South Street Pump Station are the focus of this project. Loss of power at the DPW Garage has rendered the fuel pumps for gasoline and diesel tanks inoperable. These fuel sources are critical to the operations of the Village's response and recovery vehicle fleet. The South Street Wastewater Pump Station lost power, causing wastewater to back up. Had this condition persisted, the wastewater would eventually have flooded out of the pump station into the surrounding area including the wetlands behind. This condition could have also lead to the backup of the effluent in the conveyance system forcing it out of manholes as well as into residents' basement. This project will (1) Install an emergency generator at the DPW Garage to allow for continued operation of the fuel pumps during all interruptions in electrical service; and (2) Replace and elevate the generator at the South Street Pump Station, a key component in the wastewater conveyance system, to prevent the impacts associated with the loss of power.

Project Location

DPW Garage, South Street Wastewater Pump Station

Estimated Cost

Costs are estimated to be $125,000 including $90,000 to purchase and install a generator at the DPW Garage and $35,000 to replace and elevate the generator at the South Street Pump Station.

Economic Benefits

Installation of permanent generators at the DPW Garage and the upgrade/installation of the generator at the South Street pump station will allow for continued operation of these facilities during storm events. Economic benefits are realized when DPW crews can continue to provide services such as clearing roads during the storm and assist with cleanup post storm thereby reducing the initial impact and shortening the time to full recovery for residents and businesses. By raising the generator, damage to it and interruption of the pump station's operation will be avoided resulting in a

Backup Power for Critical Community Facilities (cont'd)

Village of Suffern Department of Public Works Garage (Elizabeth Matamoros, AKRF, Inc.)

South Street Pump Station (Elizabeth Matamoros, AKRF, Inc.)

reduction in repair cost and avoidance of potential fines from New York State Department of Environmental Conservation (NYS DEC) for the release of wastewater into the environment.

Environmental Benefits

This project will protect the wastewater pump station and ultimately the treatment plant from the effects of power outages associated with flooding, thereby reducing the potential for failure of the plant and the release of of untreated sewage leading to potential degradation of the adjacent Ramapo River and all other connected surface waters in the immediate vicinity as well as those downstream.

Health and Social Service Benefits

Installation of generators at the DPW Garage and the South Street pump station will allow for continued operation during storm events, thereby protecting these critical facilities and the important operations of the DPW. Maintaining a fuel source for Village DPW vehicles and equipment will allow continued operation of vehicles so that roads can be cleared and access to healthcare facilities can be maintained or restored quickly. Public health is further protected by ensuring continued pumping of wastewater, which may help reduce the possibility of effluent from backing up into streets and homes. This both limits the threat to public health from diseases carried by wastewater and helps maintain water quality within the Village and downstream.

Cost-Benefit Analysis

The purchase and installation of fixed power generators is a low cost measure, where the benefits considerably outweigh the costs of not having this essential power source during an emergency. This project will allow both the DPW Garage and South Street Pump Station to operate and provide vital services uninterrupted to the Village during emergencies. In addition, the generators used for the wastewater supply system will help decrease the vulnerability of the system. This will create savings in local government expenditures by reducing emergency efforts and repair costs needed at the DPW Garage and Pump

Backup Power for Critical Community Facilities (cont'd)

Station. According to the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report, *Economic Impact of Hurricane Sandy Potential Economic Activity Potentially Lost and Gained in New Jersey and New York*[15], the estimated job creation from recovery spending on infrastructure projects in New York reported 7.15 Full Time Equivalent (FTE) construction jobs per $1,000,000 in construction spending. Using this methodology the project will create an estimated 0.9 (FTE) construction jobs. This is based on an assumption that approximately 80% of the total cost ($125,000) will be construction cost ($100,000).

The generators have a useful life of 10 to 20 years. The anticipated routine maintenance of these improvements will be scheduled within the existing maintenance programs of the community and are anticipated to be covered within existing or future operating budgets without a specific cost increase required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

The Backup Power for Critical Community Facilities project involves two key community assets at which power has been lost during past storm events: the DPW Garage located off Pat Malone Drive and the South Street Wastewater Pump Station. The DPW Garage is located within an extreme risk area identified by the Suffern NYRCR Planning Committee, while the Pump Station lies within a Federal Emergency Management Agency (FEMA) high-risk flood zone. The project will install an emergency generator at the DPW Garage and replace and elevate the generator at the Pump Station.

Risk mitigation analysis anticipates that this Project will reduce the Vulnerability conditions of the DPW Garage and South Street Wastewater Pump Station to power outages, resulting in a mitigated risk score for these assets.

General Timeframe for Implementing Actions

The Community anticipates this to be a short-term project, which will take approximately 14 months. Once the project is approved, design and construction can begin.

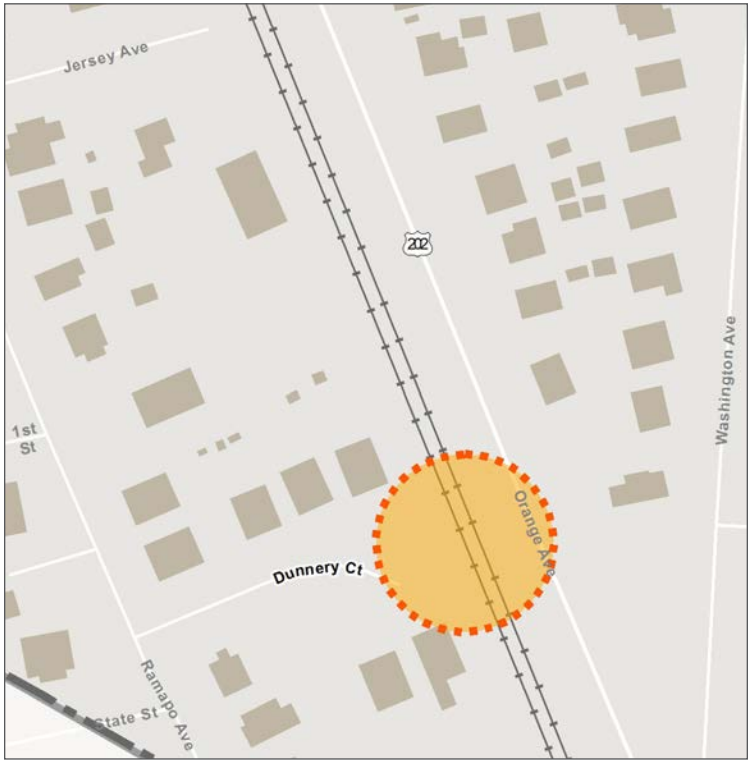
Government Regulatory Requirements

No permits will be necessary to implement this project.

Entity with Jurisdiction

Village of Suffern

Emergency Railroad Crossing into the West Ward



Railroad Crossing Project Area (MJ Engineering and Land Surveying, P.C.)

Project Description

In past storm events, including Hurricane Irene, access to the West Ward neighborhood was severed completely by flooding of the surrounding road network. The project will provide emergency service providers access to the West Ward (which includes upwards of 150 residences) by constructing a minimum 20-foot wide and approximately 120-foot long Emergency Railroad Crossing over the New Jersey Transit (NJT) Commuter Rail Line Right of Way from Orange Avenue to Ramapo Avenue by way of Dunnery Court. This at-grade railroad crossing will be gated with use restricted to emergency service vehicles during times when flooding or other disasters prevent access to the West Ward neighborhood over the existing roadway network.

Project Location

Emergency Railroad Crossing, Orange Avenue (US Route 202) and Dunnery Court in Suffern

Estimated Cost

Costs to design and construct this project are estimated at $250,000.

Economic Benefits

During large storm events, major ingress and egress points for the West Ward become impassable. By creating an emergency access into this neighborhood, responders and emergency service personnel will be able to aid and assist residents in a timely fashion, reduce response time, and reduce potential loss of property should a fire or other similar type emergency occur.

Health and Social Service Benefits

By creating an emergency access to the West Ward neighborhood, responders and emergency service personnel will be able to provide medical aid as necessary and assist residents in an area which has traditionally been cut off from emergency help during storm events.

Cost-Benefit Analysis

Implementation of this project will result in long-term sustainable benefits by greatly reducing the risk to the West Ward neighborhood during severe storm events. Uninterrupted and unimpeded access to this residential area will allow emergency vehicles to efficiently reach residents, including vulnerable populations in need of services, thereby increasing the Village's resiliency and ability to recover more quickly. Emergency response efforts will also be made more efficient.

Construct an Emergency Railroad Crossing into the West Ward (cont'd)

Emergency Railroad Crossing Sketch Plan (Suffern DPW)

Location for Emergency Vehicle Crossing on Train Racks (Susan Rivers)

According to the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the project will create an estimated 1.8 Full Time Equivalent (FTE) construction jobs. This is based on an assumption that approximately 80% of the total cost ($250,000) will be construction cost ($200,000).

The anticipated maintenance and operations of this improvement will be coordinated with NJT. It is anticipated costs to the community will be covered within existing or future operating budgets without a specific cost increase required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

It is anticipated that this project will reduce risk to residents in the West Ward by providing safe access of emergency vehicles to the neighborhood during severe weather events through improved Vulnerability conditions.

General Timeframe for Implementing Actions

This is anticipated to be a short-term project, which will take approximately 22 months. Once the project is approved, design and construction can begin.

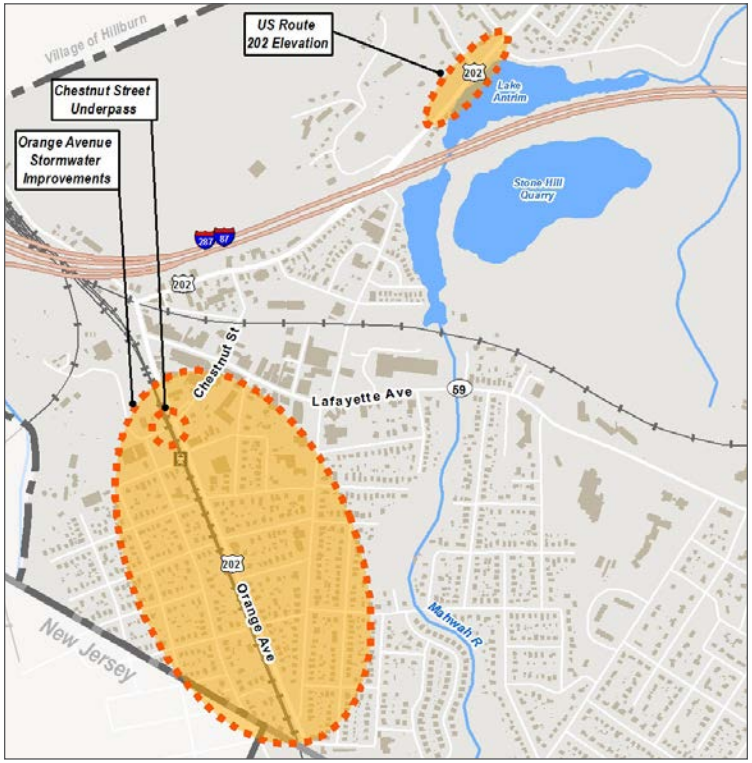
Government Regulatory Requirements

The railroad tracks to be crossed are located on land owned by NJT and will require compliance with their regulations. This project may also require permitting from New York State Department of Transportation (NYS DOT) or the U.S. Federal Highway Administration (US FHWA) for the connection to Route 202.

Entity with Jurisdiction

Village of Suffern, New Jersey Transit, possibly NYS DOT or US FHWA.

Drainage Improvements to Transportation Assets



Orange Avenue, Route 202, Chestnut Street Underpass Project Areas (MJ Engineering and Land Surveying, P.C.)

Project Description

This project will include three components to better protect transportation assets within the Village and ensure that residents do not get cut off from emergency service response during flood events:

1) Chestnut Street underpass – install a larger storm sewer directed to a new underground concrete vault detention system in Parking Lot "F," which will also service Ramapo Avenue and various side streets;

2) Orange Avenue stormwater, including all side streets from Chestnut Street to the New Jersey line – direct storm sewer flow by utilizing a series of new catch basins and a new storm sewer conveyance system to an underground concrete vault detention system in Parking Lot "F"; and

3) US Route 202 elevation – produce an engineering feasibility study raising US Route 202 and/or upgrading/replacing the stormwater drainage system along the roadway near Lake Antrim and along Memorial Drive.

Project Location

Chestnut Street Underpass, Orange Avenue, US Route 202

Estimated Cost

Costs are estimated to be $1,500,000 including $700,000 for the Chestnut Street underpass; $750,000 for Orange Avenue; and $50,000 for the US Route 202 feasibility study.

Economic Benefits

By maintaining vehicle access to all areas in the Village, residents and non-residents alike will have uninterrupted access to local businesses and those who work in the Village will be able to get to their jobs. Without these improvements, residents who are cut off by flood waters will not be able to patronize local businesses.

Environmental Benefits

This project will reduce flooding of these heavily used roads by capturing and storing stormwater in these areas using underground storage systems. By managing runoff through storage and processing it, water volume and velocity in the receiving waters will be reduced, limiting erosion. Additional environmental benefits are derived from an improvement in the quality of the water that is released from these areas.

Drainage Improvements to Transportation Assets (cont'd)

Health and Social Service Benefits

During large storm events, several areas of the Village were inundated with storm water, which flooded streets, making them impassable and inaccessible to emergency services personnel and preventing residents from leaving those areas. This project will protect/improve transportation assets within the Village and ensure that emergency service providers have access to all residents during flood events. It will also allow residents in those areas to travel freely to access or to leave their homes. Implementation of drainage and roadway improvements will significantly improve the conveyance of stormwater around the roadways identified by the community as being at extreme risk, thereby maximizing efficiency of the surrounding municipal infrastructure, protecting homes, businesses and residents, and maintaining emergency vehicle access to vulnerable neighborhoods.

Cost-Benefit Analysis

Implementation of this project will result in long-term, sustainable benefits by reducing the risk of flooding of many roadways in the Village including US Route 202 (Wayne Avenue and Orange Avenue), which is a primary corridor through the Village, Chestnut Street, and the side streets of Orange Avenue from Chestnut Street to the Village boundary. Risk will not only be reduced to the roadways, but also to adjacent infrastructure components and systems, homes and other property for the foreseeable future. In addition, the reduction in flooding on roadways, infrastructure and property will result in more efficient emergency response to residential areas that would be otherwise cut off during flooding events, increasing the Village's resiliency and ability to recover more quickly.

Using the methodology of the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the project will create an estimated 8.3 Full Time Equivalent (FTE) construction jobs. This is based on an assumption that approximately 80% of the cost for the Chestnut St. and Orange Ave. projects ($1,450,000) will be construction cost ($1,160,000).

Although final design has not been completed, with the large geographic scope of the project, it can be expected that many assets such as dense residential neighborhoods, infrastructure, businesses, and community facilities will experience a reduction in risk through improved Vulnerability conditions. Risk to the transportation system and roadway network will especially be mitigated. The useful life of these projects will vary but 40 years can be expected for storm sewer piping and 80 years can be expected for the concrete vault detention system. The anticipated routine maintenance of these improvements will be scheduled through the existing maintenance programs within the community, and is anticipated to be covered within existing or future operating budgets without a specific cost increase required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Chestnut Street Underpass at Route 202 (Elizabeth Matamoros, AKRF, INc.)

Drainage Improvements to Transportation Assets (cont'd)

Anticipated Reduction of Risk

The proposed improvements are located within an extreme risk area identified by the Planning Committee and within the Federal Emergency Management Agency (FEMA) high- and moderate-risk flood zones. Flooding of the roadways in these areas during past storm events hindered emergency responder's and residence's mobility. The Project aims to increase the resiliency of the Village's transportation system against flooding by reducing the likelihood of inaccessibility to and from residences and emergency services during storm events. Proposed actions involve a preliminary study of US Route 202 in the Lake Antrim area and design of improvements to the stormwater conveyance system including installation of storm sewers, detention infrastructure, and roadway redesign.

Orange Avenue and Wayne Avenue (both US Route 202) are key transportation arteries for accessing the western and northern portions of the Village. This includes a multitude of assets such as numerous densely populated residential areas off Orange Avenue, downtown businesses on Lafayette Avenue, and public works facilities. Given the large project area and design of improvements yet to be completed, the risk mitigation effects of the project are anticipated to be Village wide. By reducing Vulnerability conditions to flooding of key components of the Village's transportation network and infrastructure, the system as a whole experiences a reduction in risk. A more resilient transportation system holistically benefits the Village, allowing emergency personnel and citizens greater mobility during severe storm events.

General Timeframe for Implementing Actions

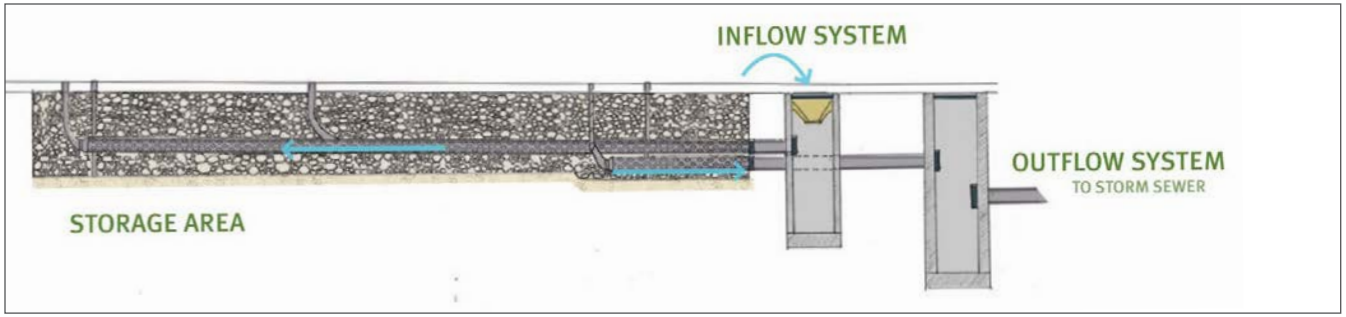
This is anticipated to be a mid-term project, which will take approximately 28 months. Once the project is approved, design and construction can begin.

Government Regulatory Requirements

Work on a State or Federal roadway/highway within the Village will likley require a highway work permit(s) from New York State Department of Transportation (NYS DOT) and U.S. Federal Highway Administration (US FHWA). Drainage improvement work may require permits from the Village Department of Public Works (DPW). Depending on the location and the specific details of the project there is potentially a need for an Article 15 Permit from the New York State Department of Environmental Conservation (NYS DEC), for disturbance to any protected streams as well as potential referral to U.S. Army Corp of Engineers (USACE) should the project result in disturbance of federally regulated resources.

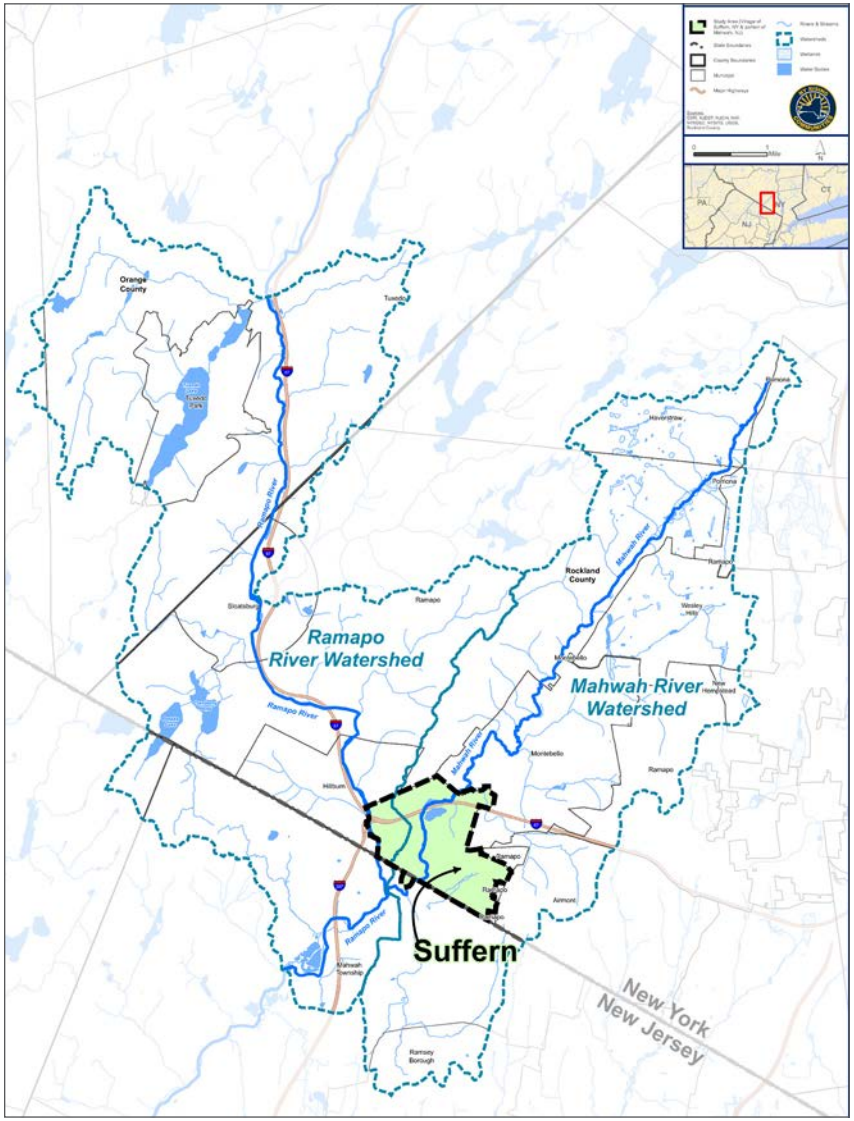
Entity with Jurisdiction

Village of Suffern, NYS DOT, US FHWA, NYS DEC, USACE



Example of a Sub-Surface Storage Cross-Section (Stormwater Management Practice Operation & Maintenance Manual)

Flood Mitigation Assessment – Mahwah and Ramapo River Watersheds



Mahwah River and Ramapo River Watersheds Project Area (MJ Engineering and Land Surveying, P.C.)

Project Description

This Flood Mitigation Assessment will result in a comprehensive evaluation of the Mahwah River Watershed in conjunction with the Ramapo River Watershed and its contribution to flooding at the confluence of the two rivers. This evaluation will identify mitigation goals and associated performance metrics, assess existing conditions with respect to erosion and deposition patterns, identify local and watershed-scale stressors, understand patterns of channel evolution, and determine and diagnose root-causes of observed problems. The assessment will use hydrologic modeling and analysis to develop a mitigation plan which will describe and locate specific projects and preliminary cost estimates to improve resiliency and the health of the waterway. Coordination with the U.S. Army Corps of Engineers (USACE) and the New York State Department of Environmental Conservation (NYS DEC) will be paramount.

A full range of potential solutions to flood related problems will be investigated. Structural and nonstructural alternatives as well as combinations of these measures will be reviewed and considered including, but not limited to, channel and floodplain restoration or redesign, bank stabilization, in-stream flow modification, water storage, bridge redesign or modification, and/or watershed restoration activities. Recommendations will include engineering feasibility, costs, benefits, community compatibility and environmental impact. The assessment will also look at the broader effects on neighboring communities, such as Mahwah, NJ and the Town of Ramapo, NY.

The assessment will recommend measures that are effective, economical, and environmentally appropriate for substantially reducing or preventing flooding and the attendant damage to public and private property. A detailed implementation strategy for the recommended mitigation measures will also be described, including preliminary design and cost benefit analysis.

Flood Mitigation Assessment – Mahwah and Ramapo River Watersheds (cont'd)

Lake at Suffern Quarry, Mahwah River Watershed (Chris Robbins, AKRF, Inc.)

Example of Erosion on Stream Bank along the Mahwah River (Chris Robbins, AKRF, Inc.)

Project Location

Mahwah River and Ramapo River Watersheds, including their confluence. The specific project boundaries will be determined as part of the initial scoping of the assessment.

Estimated Cost

Costs are estimated to be $1,000,000.

Economic Benefits

This comprehensive project seeks to understand the functioning of the Mahwah and Ramapo Rivers. With this understanding, actions could be taken to address flooding and thus lessen economic impacts of storm events in the watersheds. One mechanism could be minimizing the impact of existing development or prohibiting new development in streamside and riparian buffer areas to secure the natural flood control offered by these natural features. When natural flood control is ensured, the need for man-made infrastructure is minimized. This is economically more cost effective than repairing damaged businesses, residences and infrastructure after flood events all of which requried repair after Hurricane Irene.

Environmental Benefits

Flooding associated with the Mahwah and Ramapo Rivers has long been a problem in the Village and beyond. This comprehensive project will evaluate these river systems and make recommendations on how to restore, preserve, and augment natural resources, including the rivers themselves, Lake Antrim, and associated floodplains and wetlands located with the watersheds. This will help to mitigate flooding and support flood resiliency thus lessening adverse environmental impacts of storm events.

By examining the health of the system and restoring the natural flood control provided by the floodplains along the Mahwah and Ramapo Rivers, a balance will be restored with the watersheds, enhancing the diversity of flora and fauna located within the rivers and in riparian buffers. Deer and other terrestrial animals use streams as water sources and for safe passage away from exposed fields and urban developments. Birds, insects and aquatic organisms rely on streams for food, nesting and protection. Riparian vegetation is critically important to the organisms living within the stream. Protective measures, which will minimize development in and disruption to stream banks and corridors, will result in significant environmental benefits throughout the ecosystem of the rivers and their associated floodplains. The project

also has the potential to stabilize the river channels which will reduce erosion and sedimentation in the systems.

Health and Social Service Benefits

Human health benefits will be derived from healthy functioning riverine systems in at least two ways: (1) the river/waterbody will be less likely to flood, decreasing risk of injury, illness or death, and enabling greater access to emergency responders; and (2) water quality will be improved.

Cost-Benefit Analysis

Depending on the scale of projects to be implemented, improvements will reduce the risk of flooding throughout the Village and watersheds with the goal of providing long-term flood mitigation. The watershed modeling included in this project will identify and allow for a comprehensive understanding of the critical areas affected by flooding. The knowledge gained from this project will be invaluable, ultimately making the Village and neighboring communities significantly more resilient to flooding and severe weather events. A long-term reduction in flooding throughout the community will decrease the need for emergency response efforts (e.g., evacuation), reduce vulnerability of public facilities and infrastructure, and lower reconstruction and rehabilitation costs following future storm events, all of which result in local government expenditure savings.

Projects will likely benefit numerous assets and systems including residential neighborhoods such as Squires Gate, infrastructure, businesses, natural resources, and community facilities by mitigating associated flood risk. The anticipated useful life and maintenance and operation costs of these improvements will be determined once the assessment and specific projects are recommended for implementation. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of assessment and implementation.

Anticipated Reduction of Risk

Floodwater damage can be devastating to a community—destroying assets, property, and infrastructure. It is imperative for communities at risk, such as Suffern, to implement projects that reduce the risk of floodwater damage to important assets and to increase the resiliency and vitality of the community. This project will evaluate and recommend the most effective and context appropriate mitigation measures to reduce flooding and Vulnerability, thereby reducing risk to the entire Village and its residents.

Although specific projects to be implemented are yet to be determined by the study, it is expected the Village will experience a significant reduction in risk through dramatically improved Vulnerability and Exposure factors.

General Timeframe for Implementing Actions

This project is the first step in understanding the options available, both short- and long-term, for improving stormwater management and flood control in the Village and beyond. This is estimated to be a 24-month project that will commence upon project approval.

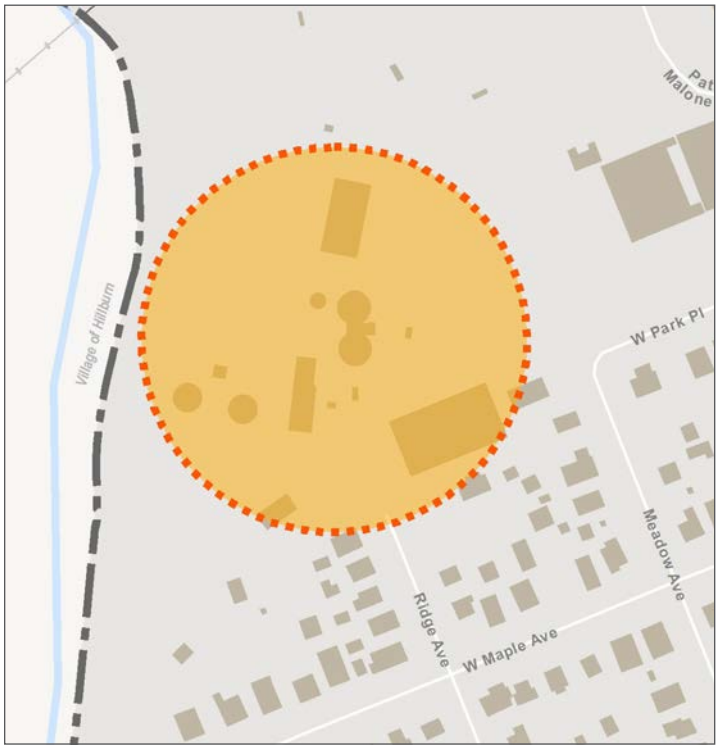
Government Regulatory Requirements

A comprehensive evaluation of the Ramapo and Mahwah Rivers and watersheds will not require permitting. However, implementation of potential solutions to address flooding may require a Wild, Scenic, Recreational Rivers, Part 666 and/or additional local, State and Federal agency approvals including from the Village of Suffern Department of Public Works (DPW), Rockland County Drainage Agency (RCDA), NYS DEC Article 15 and/or 24 permits, Federal Emergency Management Agency (FEMA) authorization for work in the floodplain and USACE nationwide or individual permit, depending on the action.

Entity with Jurisdiction

Village of Suffern

Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures



Wastewater Treatment Plant Project Area (MJ Engineering and Land Surveying, P.C.)

Project Description

The Village's wastewater treatment plant flooded during Hurricane Irene and other large precipitation events. This project proposes to protect the wastewater treatment plant and related facilities through appropriate physical protective measures such as installing flood doors and other flood-proofing to help prevent water intrusion. The project will include two phases:

1) Conduct an engineering assessment of the facilities to assess the opportunities to harden against future flooding and recommend protective measures; and

2) Implement recommendations from the engineering assessment, as well as the following previously identified improvements:

   a) the design and installation of electrical modifications, and

   b) the design and installation of six flood doors, including a garage door, three windows and three vents.

Electrical equipment in the Village's wastewater treatment plant has been damaged or destroyed during past flood events including Hurricane Irene. An electrical switch gear and a breaker for the plant will be replaced with new equipment that will be relocated/elevated to safe height above finished floor in the process building.

Project Location

Wastewater Treatment Plant, at the end (north) of Ridge Avenue as shown in the location map

Estimated Cost

Costs to complete this project are estimated to be $450,000 including $20,000 for the engineering assessment; $300,000 for design and installation of the flood-proof windows and doors; and $130,000 for design and construction of the electrical modifications and recommendations of the engineering assessment.

Economic Benefits

This comprehensive project will protect the Village of Suffern wastewater treatment plant during heavy precipitation events. When flooding occurs, service is interrupted which can affect businesses and residences in the Village depending on the severity of the damage and the duration of inoperability. In addition, if untreated sewage is released into the Ramapo River, it leaves the Village subject to fines by the New York State Department of Environmental Conservation (NYS DEC). By evaluating what is needed to reduce or eliminate the effects of flooding and implementing protective measures such as the installation of flood doors and windows, the plant will be able to continue to function without disruption in service

Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures (cont'd)

which will lessen the potential of adverse economic impacts associated with plant shutdown, damage repair and the clean up raw sewage.

Environmental Benefits

When flooding of the wastewater treatment plant occurs, service is interrupted and the potential exists for raw and/or partially treated sewage to spill into waterways. This will adversely affect the health of the water system including the flora and fauna of the area and their habitats. By evaluating what is needed to ensure continuity of operation and implementing "hardening" protective measures, the plant will be able to continue to function without disruption and thus preclude the contamination of waterbodies and the surrounding environment.

Health and Social Service Benefits

Operation of the wastewater treatment plant is interrupted during flooding events resulting in the potential contamination of surrounding surface waters as waste bypasses the plant and enters the adjacent waterbodies. This is dangerous for both workers at the wastewater treatment plant and nearby residents. By evaluating what is needed to ensure continuous operation and implementing protective measures, the plant will be able to continue to function without disruption in service which will lessen the potential of adverse health impacts associated with plant malfunction.

Cost-Benefit Analysis

Implementation of this project is expected to increase resiliency and durability of the facility in the long-term, without any negative effects on natural resources. A properly functioning and protected wastewater treatment system will benefit the community by providing services essential for daily activities while reducing the risk of damage, contamination and disease. Savings in local government expenditures are expected because the installation of protective measures will reduce the potential for equipment to sustain damage during flood events limiting the need for future repairs and the replacement of damaged/destroyed equipment.

Using the methodology of the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the project will create an estimated 2.5 Full Time Equivalent (FTE) construction jobs. This is based on an assumption that approximately 80% of the total cost less the engineering assessment ($430,000) will be construction cost ($344,000).

This project will mitigate the risk to the wastewater system and infrastructure through improved Vulnerability conditions, thereby also reducing the risk to the Village and residents. The anticipated routine maintenance of these improvements will be scheduled within the existing maintenance programs within the community and are anticipated to be covered within existing or future operating budgets without a specific cost increase required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Wastewater Treatment Plant Facilities (Elizabeth Matamoros, AKRF, Inc.)

Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures (cont'd)

Flooding at the Wastewater Treatment Plant during Hurricane Irene (Charles Sawicki)

Anticipated Reduction of Risk

This project will reduce the risk of sewer overflow during storm events. By providing properly controlled and treated sanitary sewage, the risk to public health, residents, the community and the environment will be reduced. It can be expected this project will reduce Vulnerability and Exposure conditions within the Village.

General Timeframe for Implementing Actions

This project is anticipated to take approximately 24 months. Once the project is approved, the engineering assessment, facility improvement design and construction can begin.

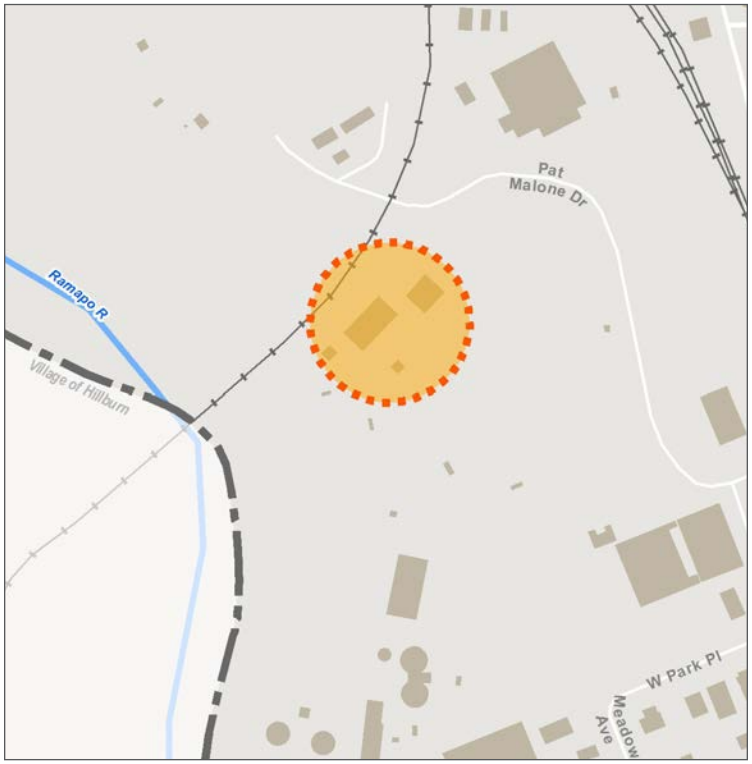
Government Regulatory Requirements

Improvements to the wastewater treatment plant may require an approval from the New York State and/or Rockland County Department of Health (DOH) depending on the changes proposed for the system. According to the NYS DEC, this project may also require an amendment to the FEMA (Federal Emergency Management Agency) Maps, depending on the work proposed.

Entity with Jurisdiction

Village of Suffern, NYS and/or Rockland County DOH

Hardening of Water Treatment Plant and Facilities through Physical Protective Measures



Water Treatment Plant Project Area (MJ Engineering and Land Surveying, P.C.)

Project Description

The water treatment plant and water wells flooded during Hurricane Irene and other large precipitation events. This project proposes to protect the water treatment plant and related facilities through appropriate physical protective measures such as installing new pumps and emergency generators to remove water from basements and installing flood-proof doors and windows to prevent water from entering into the plant and the well houses. This project includes two phases:

1) Conduct an engineering assessment of the facilities to determine opportunities to harden against future flooding and recommend protective measures; and

2) Implement recommendations from the engineering assessment. It is anticipated that these recommendations will address issues with the power supply and three underground wells and include but not be limited to:

   a) The design and installation of an aerial power supply, located at considerable height above the Federal Emergency Management Agency (FEMA)'s base flood elevation (BFE), to supply electricity to three water supply wells currently located in the floodplain (existing power service of these water wells is buried, resulting in the supply of electricity being interrupted during significant rainfall events);

   b) The elevation of the three wells that become submerged and rendered inoperable during significant rainfall events such as Hurricane Irene, to a minimum height of three feet above the FEMA-designated BFE;

   c) The installation of six (6) flood-proof doors and two (2) flood-proof garage doors in the plant; and

   d) The installation of one (1) flood-proof door and two (2) flood-proof windows in Well House #1;

   e) The installation of one (1) flood-proof door and two (2) flood-proof windows in Well House #2; and

   f) The installation of one (1) flood-proof door and one (1) flood-proof vent in Well House #4.

Hardening of Water Treatment Plant and Facilities through Physical Protective Measures (cont'd)

Village of Suffern Water Treatment Plant (Elizabeth Matamoros, AKRF, Inc.)

Project Location

Water Treatment Plant, Wells and Related Facilities, located on Pat Malone Drive.

Estimated Cost

Costs to complete this project are estimated to be $625,000 including $20,000 for the engineering assessment; $90,000 for the design and installation of aerial power supply; $190,000 to elevate the three wells; $75,000 for floodproof doors and windows on the three wells houses; and $250,000 for the floodproof doors and windows for the plant facility.

Economic Benefits

During Hurricane Irene and other large precipitation events, the water treatment plant and water wells flooded interrupting service for 23 days. During this time, the Village purchased potable water to supply to its residents and businesses. The project will protect the water treatment plant and related facilities through appropriate physical measures thereby ensuring that the facility remains viable during storm events and thus decreases potential for the Village to incur additional costs associated with the purchase of water and repair/replacement of failed system components. This project will also ensure that the many restaurants in the Village have a reliable and accessible source of potable water.

Environmental Benefits

The Village of Suffern's water treatment plant and water supply wells flood during significant precipitation events. When flooded, service is interrupted and the potential exists for the water supply for the Village to be contaminated by floodwaters. By implementation of physical protective measures that will help prevent interruptions in operation, the Water Treatment Plant will be able to continue to function and protect the drinking water supply.

Health and Social Service Benefits

During Hurricane Irene and other large precipitation events, the water treatment plant and water wells flooded forcing the Village to shut down the system. The interruption in service creates hardship by prohibiting people from using their baths and kitchens in their homes and causes business owners hardship especially those heavily reliant upon the supply of potable water. Potential contamination of the wells could lead to adverse health effects and the need to purchase boil water. Implementing these protective measures will ensure that residents are provided with an uncontaminated water supply thus protecting public health.

Hardening of Water Treatment Plant and Facilities through Physical Protective Measures (cont'd)

Cost-Benefit Analysis

Implementation of this project is expected to increase resiliency and durability of the facility in the long-term, without any negative effects on natural resources. Properly functioning and protected water systems will benefit the community by providing services essential for daily activities while reducing the risk of damage, contamination, and disease. Savings in local government expenditures are expected because the installation of protective measures will reduce the potential for equipment to sustain damage during flood events, limiting the need for future repairs and replacement of damaged/destroyed equipment.

Using the methodology of the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the project will create an estimated 3.5 Full Time Equivalent (FTE) construction jobs. This is based on an assumption that approximately 80% of the total cost less the engineering assessment ($605,000) will be construction cost ($484,000).

This project will mitigate the risk to the water system and infrastructure through improved Vulnerability conditions, thereby also reducing the risk to the Village and residents. The anticipated routine maintenance of these improvements will be scheduled within the existing maintenance programs within the community and are anticipated to be covered within existing or future operating budgets without a specific cost increase required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

Both the plant and wells are located within an extreme risk area identified by the Committee and a Federal Emergency Management Agency (FEMA) high-risk flood zone. Flooding and flood-related power outages during past storm events have rendered both the plant and wells inoperable.

Risk mitigation analysis anticipates that the protective measures preliminarily identified by this project will reduce the risk of power outages and interruption in service at the three Village Water Wells off Pat Malone Drive, resulting in lowered risk to assets due to the reduced Vulnerability and Exposure conditions of these assets to power outages, and safer site conditions by raising the well structures and electrical supply above the base flood elevation. By providing continuous service of clean water, the risk to public health, residents, and the community as a whole will also be reduced. Risk is not entirely mitigated, however, because the wells will still be located within the floodplain of the Ramapo River (an area principally at-risk), and access to these sites during a flood event will likely remain an issue.

General Timeframe for Implementing Actions

This project is anticipated to take approximately 22 months. Once the project is approved, design and construction can begin.

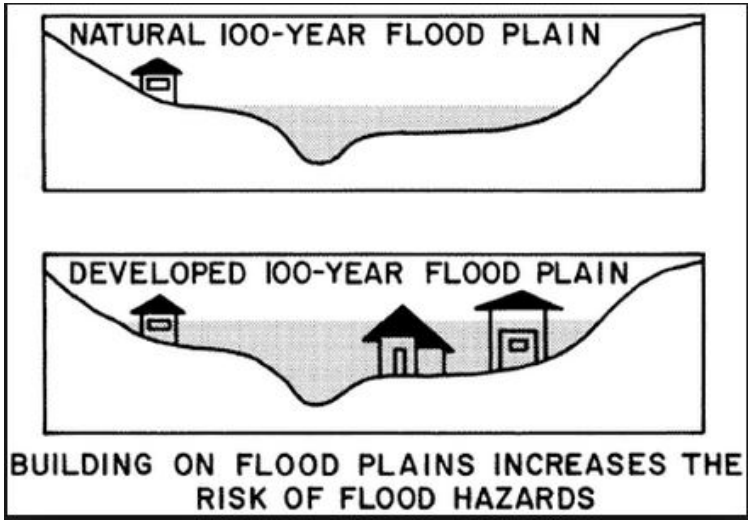
Government Regulatory Requirements

Improvements to the water supply and treatment system may require an approval from the New York State and/or Rockland County Department of Health. According to New York State Department of Environmental Control (NYS DEC), this project may also require an amendment to the FEMA Maps, depending on the work proposed.

Entity with Jurisdiction

Village of Suffern, NYS and/or Rockland County DOH, FEMA

Homeowner Buyout Program Support and Economic Development Plan



Schematic of Flood Risk to Residences within the Floodplain (USGS)

Project Description

Individual homeowners in Suffern who have experienced losses and damage due to flooding have expressed interest in participating in a homeowner buyout program. In support of the Village as the potential applicant for buyout funding and the residents who might choose to participate in such a program, this project will include hiring a consultant to (1) research various buyout and relocation program opportunities available at the State, and Federal level applicable to Suffern residents and identify eligible properties; and (2) administer the buyout program including coordination of document submission from interested property owners and the preparation of materials needed to support a grant application(s).

This project also includes conducting an economic development study to explore economic development opportunities and generating an economic development plan following the homeowner buyout program. This economic development plan will identify potential development opportunities within the Village to offset the loss of tax revenues resulting from home acquisitions in the Village of Suffern.

Project Location

Village-wide

Estimated Cost

The costs to complete this project are estimated to be $94,000 in total. This includes $54,000 for Items 1) and 2) based on the buyout of 20 homes. The cost of the project may increase if the number of homeowners participating in the buyout increases. The Economic Development Study is estimated at $40,000.

Economic Benefits

Homes that are repetitively flooded and meet certain criteria are eligible to participate in State and Federal recovery and buyout programs. This project will facilitate participation in these programs. Removing the physical structure from harm's way will reduce the chance of insurance claims and loss of property. Also, new development opportunities identified by the economic development study may potentially offset the loss of tax base in the Village.

Homeowner Buyout Program Support and Economic Development Plan (cont'd)

Environmental Benefits

If the homes are purchased and razed through funding provided from Federal Emergency Management Agency (FEMA) through the Hazard Mitigation Grant Program (HMGP), restrictions on future use are placed on the property prohibiting any new development. Because no new development is allowed on the "buyout" parcels, this project will increase the amount of land available for flood storage in the neighborhood and increase open space within the Village. It will also eliminate the source of pollution and debris that comes with the flooding of homes and vehicles.

Health and Social Service Benefits

By participating in a homeowner buyout program, people and homes are physically removed from at-risk areas and the possibility of physical harm by storm-related activities is greatly reduced.

Cost-Benefit Analysis

The recommendations from the research and economic development plan could eliminate flooding to residences by removing them from the floodway and the floodplain. This will lead to savings in local government expenditures by reducing the level of emergency response needed during storm and flood events. This project will also take a proactive approach to offset potential loss of tax revenues from the buyout of homes through identification of new economic development opportunities.

The risk to homes in the buyout area will be eliminated as they are removed, and risk to adjacent assets will decrease as parcels are returned to greenspace, aiding in flood mitigation. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

This project will support and be an integral component of a buyout program for homes located within the floodway and floodplain. The support proposed will assist the Village, as the applicant for the buyout funds, and the residents that choose to participate, in moving their homes and possessions out of harm's way. As homes are taken out of the flood zones, the land on which they were sited could be made available for stormwater storage or other hazard mitigation measures that can be designed to help protect properties in adjacent streets and neighborhoods, thereby increasing community resiliency.

General Timeframe for Implementing Actions

Within the past year, the Village completed the buyout of four homes in Squires Gate damaged during Hurricane Irene. That effort took roughly two years. Based on this experience, the Village estimates that the project will require 24 months. Once the project is approved, research on available programs and preparation of the Economic Development Plan can begin.

Government Regulatory Requirements

The application will be made to the appropriate entity (e.g., the New York State Office of Emergency Management (NYS OEM) or the HMGP) on behalf of the residents interested in pursuing the buyout program. Review by FEMA may be required, as work will be performed within mapped flood zones.

Entity with Jurisdiction

Village of Suffern, FEMA

Homeowner Support for Raising Utility Connections and Mechanicals

Project Description

During storm events such as Hurricane Irene, flooded basements cause the loss of utility connections and mechanical equipment (furnaces, hot water heaters, electrical panels, washers/dryers, etc.). To limit these types of losses in the future, the Village will encourage homeowners in areas susceptible to flooding (Squires Gate, Lake Antrim area, etc.) to consider raising utility rooms and mechanicals out of the basement. It is anticipated that this project will be laid out in three steps: (1) Village hires an architect to provide various schematic plan options for raised utility rooms within structures or appended to main structure of a home; (2) Homeowners that use preapproved schematic plans can fast forward through the approvals process; and (3) Village helps identify funding sources for the retrofit of existing homes.

Project Location

Village-wide in areas where homes are at risk of flooding

Estimated Cost

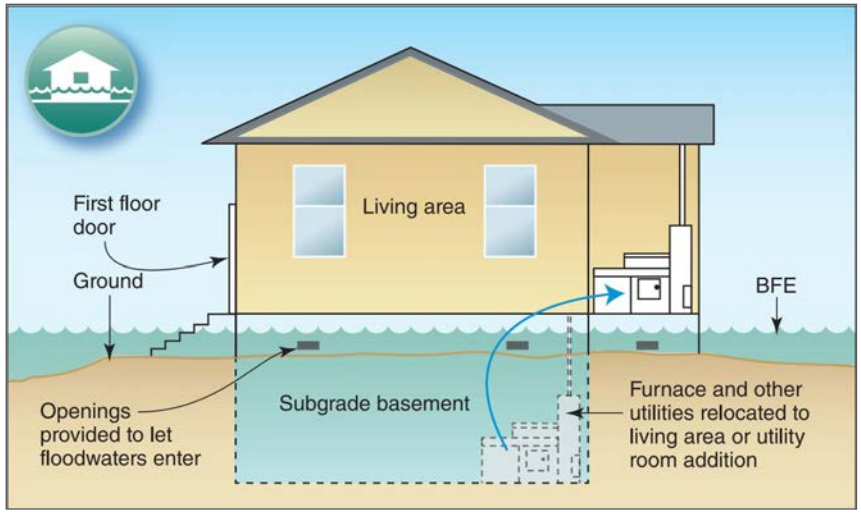
Costs to have an architect prepare plans and the Village to identify funding sources for upgrades are estimated to be $35,000.

Economic Benefits

Providing support to homeowners to help raise utilities and mechanical equipment offers the homeowners a proactive way of avoiding damage within their homes. This will help limit damage and loss of property, reduce the need to replace damaged mechanicals and utilities, and reduce the time needed for a full recovery after storm events.

Health and Social Service Benefits

Having the Village be proactive by offering schematic design and an expedited approvals process will help encourage homeowners to raise utilities and mechanicals within their homes. This will help to alleviate the immediate need to pump out flooded basements after storm events and will allow emergency service providers to distribute limited pumps and resources to locations in the community with the most immediate need. Raising utilities and mechanicals will ensure uninterrupted heat, electricity, and water and sewer connections, which will permit residents, including the elderly and children, to return to their homes more quickly after a flood. It will also reduce the number of residents who are exposed to potentially contaminated water in their basements, as they will not need to enter that area of their home to restore it to full operation. This project may also reduce the number of residents that are forced to leave their homes or need to be rescued on account of the loss of utilities.



A Home with Relocated Utilities (FEMA P-312)

Homeowner Support for Raising Utility Connections and Mechanicals (cont'd)

Cost-Benefit Analysis

This project will result in long-term resilient and sustainable benefits. By elevating utilities and mechanical equipment in homes, there will be less damage, demolition, material debris removal, and repair necessary after storm events. This will lead to savings for residents and in local government expenditures by reducing the risk of flooding to residences and the level of needed emergency response during and after storm and flood events.

Residences who participate in raising utility and mechanical connections will experience a lower flood risk through improved Vulnerability and Exposure conditions. Maintenance costs will fall to the homeowner but will likely not be an additional cost to existing home maintenance expenses. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

Floodproofing assistance will reduce Vulnerability and Exposure factors and thereby flood damage to residences in the Village.

General Timeframe for Implementing Actions

Short-term, 0 to 2 years. Once the project is approved, the architectural design and construction can begin.

Government Regulatory Requirements

Work on homes will require review by the Village Code Enforcement Officer or Building Inspector.

Entity with Jurisdiction

Village of Suffern

Inventory of Existing Stormwater Management Infrastructure

Project Description

The Village of Suffern has no comprehensive database or map of stormwater related infrastructure. The Suffern Department of Public Works (DPW) currently uses the Rockland County Geographic Information Systems (GIS) database that maps only existing catch basins; no other information such as size, date of installation, inspection, and maintenance schedules for replacement or upgrades has been documented. In addition, manhole covers, outfalls, and other connections with the conveyance system are not stored electronically or mapped. This project will provide funding to supplement the existing Village data within the County GIS database with information on condition and location of critical stormwater management infrastructure, such as manholes, culverts, detention basins, pipes and other storage, detention, retention and conveyance systems. A vendor will be hired to conduct the inventory and develop a monitoring system. The data will be provided to the County for incorporation into its database. The system will also be used to track the status of individual projects through final design, permitting, construction, inspection, maintenance, and performance monitoring, as well as used track various funding initiatives and grant programs to evaluate success. It is important to note that an assessment of individual culverts/bridges as they relate to flooding was suggested by the New York State Department of Environmental Conservation (NYS DEC) as a result of their review of this project.

Project Location

Village-wide

Estimated Cost

Costs to inventory the existing stormwater management infrastructure are estimated to be $225,000, including software upgrades, data collection and analysis.

Economic Benefits

This database will help better track infrastructure and maintenance/management schedules, thereby automating the process and ultimately reducing financial costs of stormwater infrastructure management and upkeep by the DPW and the Village. Mapping manhole covers, outfalls and other components of the conveyance systems will help simplify emergency repairs to the systems, ultimately reducing costs for emergency services and the DPW. Appropriate inspection, maintenance and management of these systems will reduce the frequency and costs of replacing the infrastructure. Also, as a result of tracking maintenance, repair and replacement, businesses and homes will be protected from economic loss due to flooding related to improper drainage resulting from unmaintained or failed stormwater management features. Once the comprehensive database of stormwater management infrastructure is complete, the ongoing costs to update and maintain the system will be minimal.

Examples of GIS-based Inventory of Stormwater Management Infrastructure (MJ Engineering and Land Surveying, P.C.)

Inventory of Existing Stormwater Management Infrastructure (cont'd)

Environmental Benefits

A digital inventory makes scheduling easier for maintenance of stormwater infrastructure across the Village resulting in systems functioning at a level closer to their original designs. A properly functioning stormwater system will reduce the volume and velocity of water discharged into the streams and rivers resulting in a potential decrease in erosion in river beds and banks and commensurate disruption and potential loss of habitat.

Health and Social Service Benefits

This database will allow for improved management and maintenance of stormwater infrastructure in the Village; help reduce flooding throughout the Village and surrounding areas, thereby reducing the burden on emergency services and protecting the general public from injury, including being trapped by or caught in fast moving stormwater.

Cost-Benefit Analysis

This project will save time and resources when locating, assessing, maintaining and repairing infrastructure throughout the Village, thereby providing significant cost savings. Village personnel and emergency responders will have the resources necessary to pinpoint infrastructure problems and address them efficiently and accurately. Post-storm damages will likely be diminished and where repairs are warranted they could be done in a cost-efficient manner.

This project will have a very long useful life with inventory updates as needed, likely annually. Risk to the Village's stormwater management system and infrastructure will be reduced through improved Vulnerability conditions. The anticipated maintenance and performance monitoring of the inventory will likely be a joint effort with the County's ongoing GIS system and the Village's DPW. Some costs involved in obtaining GIS software updates for the Village and training for Village staff may be required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

This project is anticipated to reduce risk to assets by providing a comprehensive stormwater infrastructure inventory to utilize for regular maintenance and in emergency events.

General Timeframe for Implementing Actions

Short-term, 0 to 2 years for the initial inventory and ongoing updates as necessary. Once the project is approved, the inventory and development of a monitoring plan can begin.

Government Regulatory Requirements

Survey work on a State or Federal roadway within the Village may require a permit from the New York State Department of Transportation (NYS DOT) or US Federal Highway Administration (FHWA).

Entity with Jurisdiction

Village of Suffern, NYS DOT, US FHWA

Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study

Project Description

The existing stormwater management and conveyance systems, and the lack thereof in certain areas, exacerbated flooding during Hurricane Irene along the rivers in the Village by discharging large volumes of uncontrolled and untreated stormwater runoff directly into the already taxed surface waters. To minimize the flow of uncontrolled stormwater in the Village during future storm events, this project proposes to conduct a feasibility study to determine appropriate locations to implement green infrastructure practices and other stormwater storage systems throughout Suffern. The study will recommend specific measures such as infiltration beds, rain barrels, green roofs, green streets, vegetated bioswales, rain gardens, bio-retention curb extensions, stream buffer enhancement, and porous pavement to better manage stormwater. The focus will be on areas where stormwater runoff is not currently being managed adequately, to reduce runoff in the Village and to the adjacent rivers and lakes. This will include downtown areas, parks, public parking lots (other than Lots A and B), older residential neighborhoods, and Village-owned properties. The goal of this project is to provide storage, infiltration, and treatment of stormwater, as well as to intercept and reduce the volume and velocity of stormwater discharge to the Mahwah and Ramapo Rivers. Once completed, the Village will look to implement the study's recommendations beginning with: 50,000 SF of porous pavement, 1,000 SF of rain gardens, and 500 SF of bioretention.

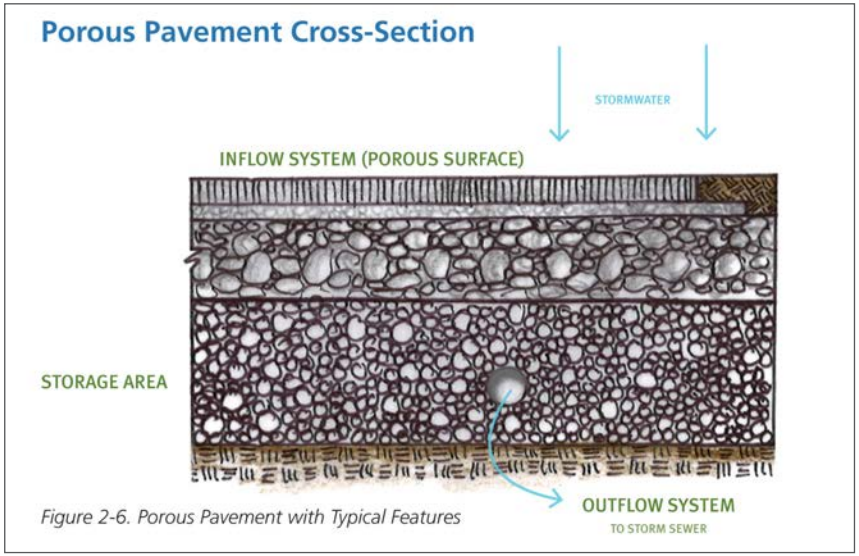
Project Location

Village-wide

Estimated Cost

The capital costs to complete this project are estimated to be $900,000 in total. This includes $30,000 for the study; $135,000, for engineering and design; and $735,000 for construction as follows:

- 50,000 SF Porous Pavement @ $12.50/SF = $625,000
- 1,000 SF Rain Gardens @ $75/SF = $75,000
- 500 SF bioretention $70/SF = $35,000



Porous Pavement Cross-Section
(Stormwater Management Practice Operation & Maintenance Manual)

Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study (cont'd)

Economic Benefits

In many cases, green infrastructure improvements are more cost effective to install and maintain than traditional "gray" stormwater infrastructure. This project will reduce flooding and associated storm damage to nearby businesses and homes, thereby lessening costs to repair and rebuild. In addition, green infrastructure projects provide both direct and indirect energy-related benefits. By increasing urban green spaces, heating and cooling demands, and energy consumption are decreased, which, in turn, decreases the amount of money households, businesses, and local government spend on energy. Subsurface storage also has the potential to lessen the impacts of stormwater runoff on downstream residences, businesses and infrastructure, thereby reducing the cost to repair and time to recover and improve business retention in the Village.

Environmental Benefits

Using natural hydrologic features to manage stormwater results in significant environmental benefits. Preserving and reclaiming open space, requiring the planting of native (non-invasive) species, maximizing the use of pervious surfaces, and installing rain gardens and bioswales, all improve overall water quality, while protecting existing and reintroducing lost habitats. This project will reduce flooding and associated storm damage and lessen erosion, and sedimentation which degrade water quality.

Health and Social Service Benefits

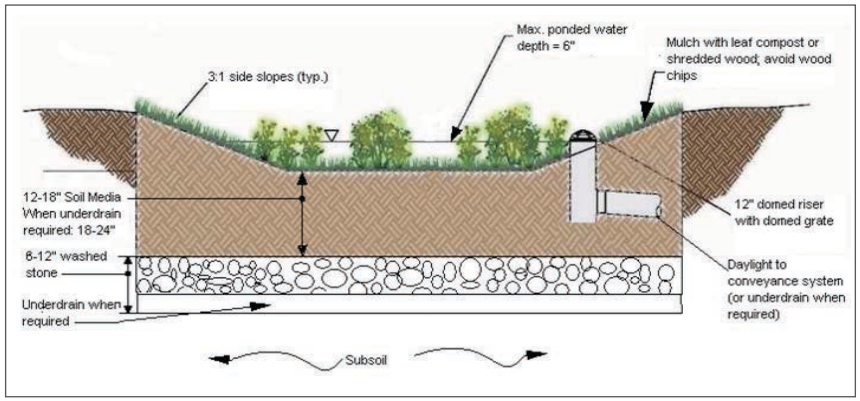
Green infrastructure improvements reduce discharge of pollutants to receiving waters which contributes to improved water quality and overall health and well-being of the population. Increased vegetation will improve air quality which will benefit overall health. Additionally, increased green space inspires people to walk and exercise benefiting both physical and mental well-being.

Cost-Benefit Analysis

This project will reduce the risk of flooding in areas of the Village identified in the feasibility study by providing long-term, sustainable flood mitigation. Utilizing the green infrastructure practices of porous pavement, rain gardens, and bioretention will result in environmental benefits, such as reduced erosion and runoff rates, as well as higher quality stormwater discharge. With proper design, green infrastructure can provide more benefits at lesser costs than single-purpose gray infrastructure. Local government will realize a reduction in reconstruction and rehabilitation costs following storm events because public facilities and infrastructure will be less vulnerable.

Risk to adjacent assets such as homes, businesses, roadways, and infrastructure will be mitigated as a result of this project. The existing stormwater system will also experience a reduction in risk through less runoff entering the system. The useful life of the pervious pavement will be over a period of 15 to 20 years. The anticipated maintenance of the pervious pavement includes biannual vacuum sweeping to maintain infiltration rates and is estimated to be $1,000 per year. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Using the methodology of the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the $735,000 for construction of the project will create an estimated 5.3 Full Time Equivalent (FTE) construction jobs.



Example of Schematic Design of a Rain Garden (NYS DEC Stormwater Design Manual)

Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study (cont'd)

Anticipated Reduction of Risk

Stormwater management and green infrastructure have the ability to decrease the extent and severity of localized flash flooding throughout the Village while reducing the risk to drainage systems and adjacent land from erosion and flooding. The project will also reduce the risk of flood damage to assets, property, and infrastructure by controlling the flow of excess stormwater with strategically-placed green infrastructure that has a high saturation and retention capacity. The use of subsurface storage systems will increase the volume of stormwater runoff captured and stored for release after the storm event. Vulnerability conditions to adjacent assets and the stormwater infrastructure system will be improved.

General Timeframe for Implementing Actions

Mid-term, 2 to 5 years. Once the project is approved, the feasibility study can begin, followed by the siting, design and finally construction/installation of the stormwater management practices.

Government Regulatory Requirements

This project will require review by the Village Department of Public Works (DPW) and may require Village permits. A New York State Department of Environmental Conservation (NYS DEC) stormwater general permit may be required depending on the amount of land disturbance required to implement this project.

Entity with Jurisdiction

Village of Suffern and possibly NYS DEC

Stormwater Management Facilities in Village Parking Lots A and B

Lot A and Lot B Project Area (MJ Engineering and Land Surveying, P.C.)

Project Description

This project will reduce stormwater runoff and associated flooding by assessing the feasibility of the installation of underground stormwater systems with controlled flow orifices and/or green infrastructure practices at Village parking lots A and B. Parking Lot A is on the west side of the intersection of Wayne Avenue and Orange Avenue and is approximately 50,000 square feet. Parking Lot B is located on the east side of Chestnut Avenue, north of Lafayette Avenue (New York State (NYS) Route 59) and is approximately 80,000 square feet. Green infrastructure measures such as porous pavement, vegetated swales and rain gardens will be evaluated along with the potential for an underground storage system. This project will include two phases:

1) An engineering feasibility analysis; and

2) Design and Implementation of recommended stormwater management facilities.

Project Location

Village Parking Lots A and B. Parking Lot A is on the west side of the intersection of Wayne Avenue (US Route 202) and Orange Avenue (US Route 202/NYS Route 59). Parking Lot B is located on the east side of Chestnut Avenue, north of Lafayette Avenue (NYS Route 59).

Estimated Cost

Costs to complete this project are estimated to be $1,920,000 in total. This includes $25,000 for the study, $270,000, for engineering and design, and $1,625,000 for construction as follows:

- Lot A 50,000 SF Porous Pavement @ $12.50/SF = $625,000
- Lot B 80,000 SF Porous Pavement @ $12.50/SF = $1,000,000

Economic Benefits

Portions of Village Parking Lots A and B experience flooding during storm events. Runoff from these lots also contributes to downstream flooding. This project will reduce flooding by capturing, storing, and infiltrating stormwater in Lots A and B by installing underground storage and green infrastructure measures. These measures will significantly reduce damage to vehicles parked in these lots and will provide

Stormwater Management Facilities in Village Parking Lots A and B (cont'd)

Parking Lot B (Elizabeth Matamoros, AKRF, Inc.)

Parking Lot A (Elizabeth Matamoros, AKRF, Inc.)

much needed flood storage capacity to alleviate flooding in this area and downstream. By reducing flooding in this area, patrons wanting to access the adjacent downtown business district will be less affected.

Environmental Benefits

This project will reduce flooding by capturing and storing stormwater by way of underground storage and green infrastructure measures, including porous pavement and bioswales. Runoff from flash flood events will be better managed through storage and processing using green infrastructure. Water volume and velocity in the receiving waters will be reduced, limiting erosion and sedimentation, which can damage habitats along the Ramapo and Mahwah Rivers. This will attenuate the impacts of flash flooding.

Additional environmental benefits are derived from an improvement in the quality of the runoff from the parking lots.

Health and Social Service Benefits

Green infrastructure improvements reduce discharge of pollutants to receiving waters which contributes to overall health and well being of the population. No longer subject to flooding, these parking lots will also be able to be used as vehicle, equipment, and personnel staging areas in case of an emergency.

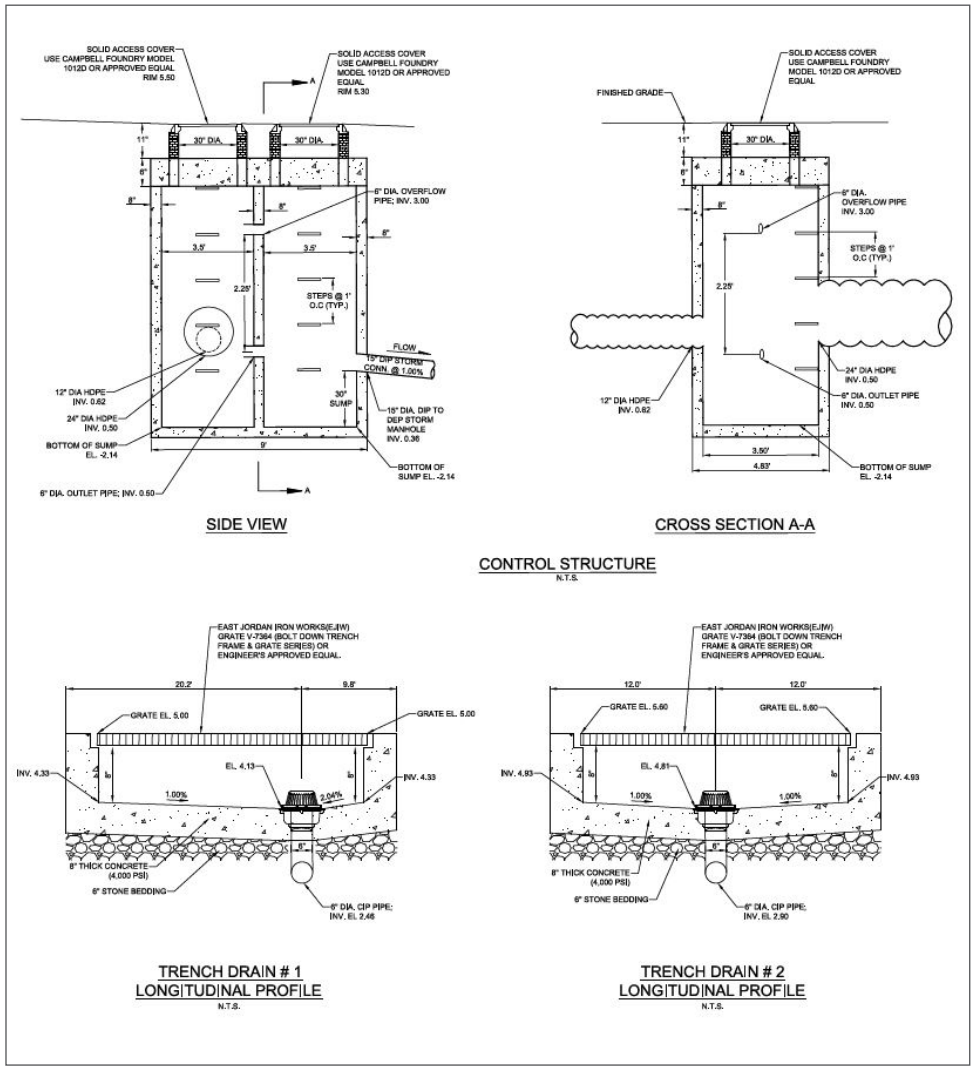
Cost-Benefit Analysis

Implementation of the project will reduce the risk of flooding in Parking Lots A and B as well as adjacent areas by providing long-term and sustainable flood mitigation. With proper design, green infrastructure can provide more benefits at lesser costs than single-purpose gray infrastructure. Utilizing porous pavement (a green infrastructure practice) will result in environmental benefits, such as reduced erosion and runoff rates as well as higher quality stormwater discharge. Economic benefits will be realized through more efficient emergency vehicle response efforts and reduced vulnerability to public facilities and infrastructure, thereby reducing local government reconstruction and rehabilitation costs following storm events.

Using the methodology of the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the $1,625,000 for construction of the project will create an estimated 11.6 construction jobs.

Risk to adjacent assets, such as homes, businesses, roadways, and infrastructure, will be mitigated as a result of this project. The existing stormwater system will also experience a reduction in risk through less runoff entering the system. The useful life of the pervious pavement will be over a period of 15-20 years. The anticipated maintenance of the parking lots includes biannual vacuum sweeping to maintain infiltration rates and is estimated to be $1,500-$2,000 per year. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Stormwater Management Facilities in Village Parking Lots A and B (cont'd)



Cross-Section of Storm Detention System (AKRF, Inc)

Anticipated Reduction of Risk

Green infrastructure and subsurface storage systems have the ability to decrease the extent and severity of localized flash flooding in the Village while reducing the risk of damage to drainage systems from being overwhelmed or washed away and to adjacent land from erosion and flooding. The project will also reduce the risk of flood damage to assets, property, and infrastructure by controlling the flow of excess runoff. Vulnerability conditions to adjacent assets and the stormwater infrastructure system will be improved.

General Timeframe for Implementing Actions

Short-term, 0 to 2 years. Once the project is approved, the engineering assessment, design and construction can begin.

Government Regulatory Requirements

This project will require review by the Village Department of Public Works (DPW) and may require a Village permit. A New York State Department of Environmental Conservation (NYS DEC) stormwater general permit may be required depending on the amount of land disturbance required to implement this project.

Entity with Jurisdiction

Village of Suffern and possibly NYS DEC

VFW Building Emergency Power and Electrical Upgrades

VFW Facility Project Area
(MJ Engineering and Land Surveying, P.C.)

Project Description

The Village is working to acquire the Veterans of Foreign Wars (VFW) facility located at 16 Ramapo Avenue in the West Ward neighborhood. The building will act as a storm response and short-term shelter, cooling center and reception area for Village residents. Residents in the West Ward neighborhood are vulnerable to isolation when access roads are inundated by flood waters. During Hurricane Irene, residents were not able to access the existing shelter at the Suffern Community Center. Providing an accessible shelter and appropriate community services to West Ward residents during storms is critical due to this neighborhood's susceptibility to isolation from the rest of the Village during flood events. This project will fund the design services for and the installation of a permanent generator, associated fuel storage tank, and related upgrades to the electrical system.

Project Location

Veterans of Foreign Wars Building, 16 Ramapo Avenue, Suffern, NY

Estimated Cost

Costs to complete this project are estimated to be $180,000 in total including $30,000 for engineering and design and $150,000 for electrical upgrades, purchase, and installation of the emergency power generator and fuel storage.

Economic Benefits

Providing a reception area within the West Ward will allow residents to access a power source to recharge phones, laptops, tablets, etc. thereby helping residents resume work more quickly. In a society that depends on these tools to for everyday live, without power they are rendered useless. A small business could continue to maintain operations and/or communicate with their customers and a large corporation could stay connected with their employees to let them know when it is safe to return to work. By providing shelter during storm events residents will have the ability to resume various aspects of everyday life thereby helping them reintegrate into the workplace more quickly and efficiently.

Health and Social Service Benefits

This project serves an area generally isolated from the rest of the Village during flood events. This project will allow the Village to offer a reception area to these residents who otherwise are cutoff from access to the Suffern Community Center, currently the main

VFW Building Emergency Power and Electrical Upgrades (cont'd)

emergency shelter in the Village. The improvements proposed will serve an area that is isolated from the rest of the Village by flood waters. In addition, residents needing assistance with medications and those with electrical medical equipment will have a place to receive assistance and access to electricity.

Cost-Benefit Analysis

The community's storm response capabilities will be enhanced through conversion of the VFW into an emergency storm shelter, as it will provide a reception areas to residents who lack power in their homes and ensure their safety. The benefits of having a generator and fuel storage outweigh the costs of not having power which is vital during an emergency. The emergency power generator will also improve the resiliency of the electrical distribution system, enabling it to properly function as an emergency operations facility and shelter. Maintaining electrical power in an emergency shelter that serves a vulnerable neighborhood will benefit flood victims in need of refuge until the floodwaters recede.

Using the methodology of the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report[15], the $150,000 for construction of the project will create an estimated 1.1 Full Time Equivalent (FTE) construction jobs.

Risk to Village residents, the emergency shelter, and the electrical system will be mitigated as a result of this project through improved Vulnerability conditions. The generators have a useful life of 10 to 20 years. The anticipated routine maintenance of these improvements will be scheduled within the existing maintenance programs within the community and are anticipated to be covered within existing or future operating budgets without a specific cost increase required. Based on this analysis, the potential benefits of this project are believed to outweigh the financial investment of implementation.

Anticipated Reduction of Risk

This project will reduce risks to the community, including socially vulnerable populations and an at-risk neighborhood, by providing uninterrupted emergency shelter, services, and power. The Vulnerability conditions of the Village's residents will be improved.

General Timeframe for Implementing Actions

This is anticipated to be a short-term project, which will take approximately 22 months. Once the project is approved, design of the electrical system and installation of the generator and fuel storage can begin.

Government Regulatory Requirements

The Village Code Enforcement Office and Building Inspector will need to review the proposed improvements to the building. This project may require VIllage permits. No State or Federal permits will be necessary to implement this project.

Entity with Jurisdiction

Village of Suffern

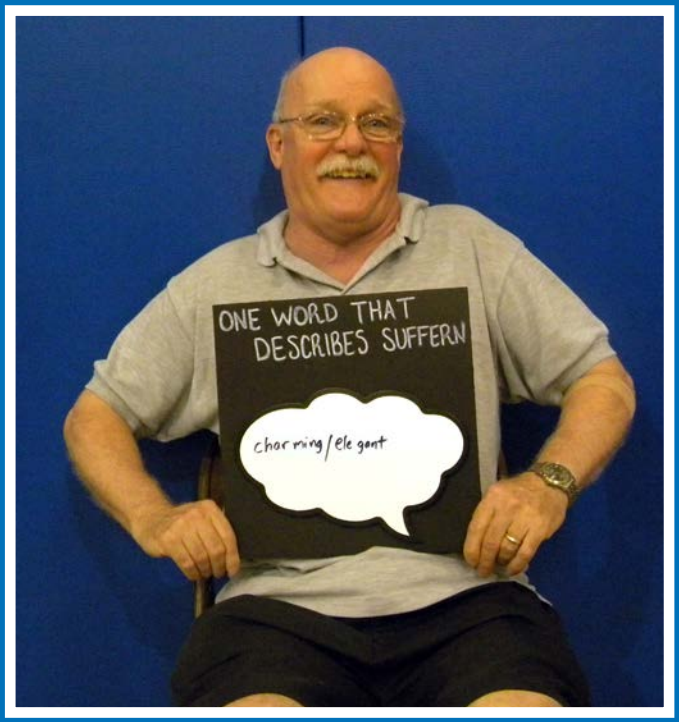
VFW Building (Elizabeth Matamoros, AKRF, Inc.)

2014
NY RISING COMMUNITY RECONSTRUCTION PLAN

SUFFERN NYRCR

Section V
Additional Materials

ONE WORD THAT
DESCRIBES SUFFERN
Community


ONE WORD THAT
DESCRIBES SUFFERN
charming/elegant

MY VISION FOR SUFFERN
IS ...
ELIMINATE/MITIGATE
FUTURE FLOODS.
ONE WORD THAT
DESCRIBES SUFFERN
GREAT PLACE
TO LIVE!

V Additional Materials

A. Additional Resiliency Recommendations

Throughout the NY Rising Community Reconstruction (NYRCR) Planning process, the NYRCR Planning Committee (Committee) developed the Additional Resiliency Recommendations listed in Table V-1. These recommendations were developed as projects and actions that the Committee would like to highlight but are not categorized as Proposed Projects or Featured Projects. Additional Resiliency Recommendations are not ranked or prioritized, and they are presented in no particular order of importance.

Table V-1 Additional Resiliency Recommendations

Strategy	Project Name	Short Description	Estimated Cost	Regional (Y/N)
Assist residents with preparation for, response to, and recovery from future storm events through emergency communication, outreach, and education initiatives	Comprehensive Village-wide Education and Outreach Program for Storm Preparation, Preparedness, and Recovery	Develop a comprehensive Village-wide education and outreach program for storm preparation, response and recovery. The project involves a series of outreach mechanisms including proactive homeowner and business registration for event communications, education, and outreach on storm preparedness and evacuation protocols, and Emergency Preparedness Community Meetings to be held annually by the Village.	$20,000	N
	Emergency Communications Systems Upgrades	Upgrade the Village's NIXLE system to notify residents and businesses during Village-wide emergencies. Update the Village's Emergency Operations Plan to comply with the National Incident Management System (NIMS).	< $50,000	N
	Flood Hazard Signage	Purchase and install signage in commuter lots (including Lots A, B, F, and Lake Antrim/Memorial Pool parking) to warn about flooding risk to cars and help educate residents and commuters about the risks of flooding in the area.	< $50,000	N
	Village CERT Team	Develop a Community Emergency Response Team (CERT) to educate people about disaster preparedness and train citizen volunteers to assist their community when professional responders are not immediately available to help. The CERT is an initiative sponsored by the Federal Emergency Management Administration.	< $50,000	N
	Volunteer Storm Assistance Program	Develop and maintain a volunteer roster to help homeowners and businesses that may need assistance in moving valuable resources out of harm's way before predicted storms move into the region and update the Village's Emergency Operations Plan.	< $50,000	N

Table V-1 Additional Resiliency Recommendations (cont'd)

Strategy	Project Name	Short Description	Estimated Cost	Regional (Y/N)
Broaden services at existing storm shelter facilities to more fully cover basic needs and accommodate pets, and investigate new shelter opportunities	Shelter/Reception Area Equipment and Supplies	Develop emergency kits, purchase materials to accommodate pets, and install kitchen equipment, where needed, at shelters in the Village.	< $50,000	N
Collaborate with municipal neighbors in New York and New Jersey to manage watershed development and control flooding	Intermunicipal Organization for the Management of the Mahwah River Watershed.	Establish a Mahwah River Watershed Management Group that will collectively address development pressures, stormwater runoff issues and flood control mitigation projects at a watershed (regional) scale. Coordination with the Rockland-Bergen Bi-state River Commission will be part of the group's tasks.	< $50,000	Y
Promote resilience and flood management practices through land-use planning, policy, and regulation	Flood Protection and Increased Resiliency through Zoning Code and Ordinances	Conduct a diagnostic review of the existing Village zoning code and other ordinances and provide recommendations to maximize flood protection and stormwater management, promote green infrastructure practices and protect surface water resources and flood plains. Assess the potential for revisions to further protect surface water resources and floodplains in the code.	< $50,000	N
Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts, and bridges	Flood Protection Equipment for Village Facilities	Research options and purchase portable flood barrier walls for protection of Village facilities.	$50,000 - $500,000	N
Restore, preserve, and augment natural resources, including floodplains, streams, rivers, lakes and wetlands, to help mitigate flooding and support flood resiliency	Maintenance of Lake Antrim, Mahwah and Ramapo Rivers	Coordinate between the Village, County, and State to develop an environmentally sensitive program to (1) clear the channels of the Mahwah and Ramapo Rivers by removing debris and detritus from their bed and banks as well as from the shores of Lake Antrim; (2) develop a program for the ongoing maintenance of these the rivers.	$1,000,000 +	Y
	Lake Antrim Restoration and Improvements	Restore Lake Antrim by designing and installing improvements to the surrounding bank and floodplain.	$50,000 - $500,000	N

B. Master Table of Projects

Table V-2 presents all projects developed by the Suffern NYRCR Planning Committee throughout the planning process. This comprehensive list includes Proposed Projects, Featured Projects, and Additional Resiliency Recommendations. Projects are listed by Reconstruction and Resiliency Strategy. Projects are not ranked or prioritized, and they are presented in no particular order of importance.

- Proposed Projects are proposed for funding through a Community's allotment of CDBG-DR funding.
- Featured Projects are innovative projects where an initial study or discrete first phase of the project is proposed for CDBG-DR funding or other identified funding; and regulatory reforms and other programs that do not involve capital expenditures.
- Additional Resiliency Recommendations are resiliency projects and actions the Committee would like to highlight and are not categorized as Proposed or Featured Projects.

Table V-2 Master Project Table

Strategy	Project Name	Short Description	Project Category	Estimated Cost	Regional (Y/N)
Assist residents with preparation for, response to, and recovery from future storm events through emergency communication, outreach, and education initiatives	Comprehensive Village-wide Education and Outreach Program for Storm Preparation, Preparedness, and Recovery	Develop a comprehensive Village-wide education and outreach program for storm preparation, response and recovery. The project involves a series of outreach mechanisms including proactive homeowner and business registration for event communications, education, and outreach on storm preparedness and evacuation protocols, and Emergency Preparedness Community Meetings to be held annually by the Village.	Additional Resiliency Recommendation	$20,000	N
	Emergency Communications Systems Upgrades	Upgrade the Village's NIXLE system to notify residents and businesses during Village-wide emergencies. Update the Village's Emergency Operations Plan to comply with the National Incident Management System (NIMS).	Additional Resiliency Recommendation	< $50,000	N
	Flood Hazard Signage	Purchase and install signage in commuter lots (including Lots A, B, F, and Lake Antrim/Memorial Pool parking) to warn about flooding risk to cars and help educate residents and commuters about the risks of flooding in the area.	Additional Resiliency Recommendation	< $50,000	N

Table V-2 Master Project Table (cont'd)

Strategy	Project Name	Short Description	Project Category	Estimated Cost	Regional (Y/N)
Assist residents with preparation for, response to, and recovery from future storm events through emergency communication, outreach, and education initiatives (cont'd)	Village CERT Team	Develop a Community Emergency Response Team (CERT) to educate people about disaster preparedness and train citizen volunteers to assist their community when professional responders are not immediately available to help. The CERT is an initiative sponsored by the Federal Emergency Management Administration.	Additional Resiliency Recommendation	< $50,000	N
	Volunteer Storm Assistance Program	Develop and maintain a volunteer roster to help homeowners and businesses that may need assistance in moving valuable resources out of harm's way before predicted storms move into the region and update the Village's Emergency Operations Plan.	Additional Resiliency Recommendation	< $50,000	N
Broaden services at existing storm shelter facilities to more fully cover basic needs and accommodate pets, investigate new shelter opportunities	VFW Building Emergency Power and Electrical Upgrades	Retrofit the VFW facility to develop it as a Storm Response Shelter by upgrading the electrical system and installing back up power and fuel storage.	Featured Project	Costs to complete this project are estimated to be $180,000 in total including $30,000 for engineering and design and $150,000 for electrical upgrades, purchase, and installation of the emergency power generator and fuel storage.	N
	Shelter/Reception Area Equipment and Supplies	Develop emergency kits, purchase materials to accommodate pets, and install kitchen equipment, where needed, at shelters in the Village.	Additional Resiliency Recommendation	< $50,000	N
Collaborate with municipal neighbors in New York and New Jersey to manage watershed development and control flooding	Intermunicipal Organization for the Management of the Mahwah River Watershed.	Establish a Mahwah River Watershed Management Group that will collectively address development pressures, stormwater runoff issues and flood control mitigation projects at a watershed (regional) scale. Coordination with the Rockland-Bergen Bi-state River Commission will be part of the group's tasks.	Additional Resiliency Recommendation	< $50,000	Y

Table V-2 Master Project Table (cont'd)

Strategy	Project Name	Short Description	Project Category	Estimated Cost	Regional (Y/N)
Develop storm assistance programs and provide consolidated information on financial initiatives that allow residents and businesses to better protect themselves and their assets from future storm damage	Homeowner Buyout Program Support and Economic Development Plan	Provide support to the Village to explore various buyout and relocation program opportunities, identify eligible properties, and administer the buyout program, and prepare an economic development plan to offset reduction in tax revenues resulting from a buyout.	Proposed Project	Costs are estimated to be $94,000 including $54,000 for the buyout program support and $40,000 for the Economic Development Study.	N
	Homeowner Support for Raising Utility Connections and Mechanicals	Encourage homeowners in areas susceptible to flooding to move utility and mechanicals from basements to upper floors. Hire an architect to develop schematic plan options for raised utility rooms, facilitate the use of preapproved plans through the approval process for homeowners and help identify funding sources for the retrofit of existing homes.	Proposed Project	Costs to have an architect prepare plans are estimated to be $35,000.	N
Improve stormwater management and drainage systems throughout the Village to improve resiliency	Inventory of Existing Stormwater Management Infrastructure	Supplement the existing data within the County GIS database with information on condition and location of critical stormwater infrastructure.	Proposed Project	Costs are estimated to be $225,000, including software upgrades, data collection, and analysis.	N
	Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study	Conduct a feasibility study to determine appropriate locations to implement green infrastructure practices and stormwater storage systems throughout Suffern.	Proposed Project	Costs to complete this project are estimated to be $900,000 including $30,000 for the study; $135,000, for engineering and design; and $735,000 for construction of porous pavement and rain gardens.	N

Table V-2 Master Project Table (cont'd)

Strategy	Project Name	Short Description	Project Category	Estimated Cost	Regional (Y/N)
Improve stormwater management and drainage systems throughout the Village to improve resiliency (cont'd)	Stormwater Management Facilities in Village Parking Lots A and B	Assess the feasibility of the installation of underground stormwater storage systems with controlled flow orifices at Village Parking Lots A and B. Evaluate Green infrastructure elements to further improve stormwater management in the parking lots.	Featured Project	Costs to complete this project are estimated to be $1,920,000 in total including $25,000 for the study; $270,000 for engineering and design; and $1,625,000 for construction of porous pavement.	N
Promote resilience and flood management practices through land-use planning, policy, and regulation	Flood Protection and Increased Resiliency through Zoning Code and Ordinances	Conduct a diagnostic review of the existing Village zoning code and other ordinances and provide recommendations to maximize flood protection and stormwater management, promote green infrastructure practices, and protect surface water resources and flood plains. Assess the potential for revisions to further protect surface water resources and floodplains in the code.	Additional Resiliency Recommendation	< $50,000	N
Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts, and bridges	Backup Power for Critical Community Facilities	Provide permanent emergency power generators at the DPW Garage to maintain operation of the fuel pumps and at the South Street Pump Station to allow for uninterrupted service of the facility.	Proposed Project	Costs are estimated to be $125,000 including $90,000 to purchase and install a generator at the DPW Garage and $35,000 to replace and elevate the generator at the South Street Pump Station.	N
	Emergency Railroad Crossing into the West Ward	Provide access to the West Ward by way of an at-grade Emergency Railroad Crossing over the NJ Transit Commuter Rail Line.	Proposed Project	Costs to design and construct this project are estimated at $250,000.	N

Table V-2 Master Project Table (cont'd)

Strategy	Project Name	Short Description	Project Category	Estimated Cost	Regional (Y/N)
Repair, protect, and improve resiliency of critical infrastructure and transportation assets such as water and wastewater systems, utilities, roads, culverts, and bridges (cont'd)	Drainage Improvements to Transportation Assets	Install drainage improvements at the Chestnut Street underpass, along Orange Ave and along US Route 202 to better protect these transportation assets and to ensure that emergency services have access to these areas.	Proposed Project	Costs are estimated to be $1,500,000 including $700,000 for the Chestnut Street underpass; $750,000 for Orange Avenue; and $50,000 for the US Route 202 feasibility study.	N
	Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures	Protect the wastewater treatment plant and related facilities through installing appropriate physical protective measures such as flood doors, windows and vents and installing new electrical equipment at a higher location within the plant.	Proposed Project	Costs to complete this project are estimated to be $450,000 including $20,000 for the engineering assessment; $300,000 for design and installation of the floodproof windows and doors; and $130,000 for design and construction of the electrical modifications and recommendations of the engineering assessment.	N
	Hardening of Water Treatment Plant and Facilities through Physical Protective Measures	Protect the water treatment plant and related facilities, including wells, by installing appropriate physical protective measures such as new pumps and emergency generators, floodproof doors, windows and vents in the plant and well houses. Install aerial electric service to the well and raise the well heads above the FEMA BFE.	Proposed Project	Costs to complete this project are estimated to be $625,000 including $20,000 for the engineering assessment; $90,000 for the design and installation of aerial power supply; $190,000 to elevate the three wells; and $325,000 for design and installation of floodproof doors and windows.	N
	Flood Protection Equipment for Village Facilities	Research options and purchase portable flood barrier walls for protection of Village facilities.	Additional Resiliency Recommendation	$50,000 - $500,000	N

Table V-2 Master Project Table (cont'd)

Strategy	Project Name	Short Description	Project Category	Estimated Cost	Regional (Y/N)
Restore, preserve, and augment natural resources, including floodplains, streams, rivers, lakes and wetlands, to help mitigate flooding and support flood resiliency	Flood Mitigation Assessment – Mahwah River and Ramapo River	Conduct a comprehensive evaluation of the Mahwah River Watershed in conjunction with the Ramapo River Watershed to identify mitigation goals and associated performance metrics, assess existing conditions with respect to erosion and deposition patterns, identify local and watershed-scale stress-ors, understand patterns of channel evolution, and make recommendations regarding flood mitigation.	Proposed Project	Costs are estimated to be $1,000,000.	Y
	Maintenance of Lake Antrim, Mahwah and Ramapo Rivers	Coordinate between the Village, County, and State to develop an environmentally sensitive program to (1) clear the channels of the Mahwah and Ramapo Rivers by removing debris and detritus from their bed and banks as well as from the shores of Lake Antrim; (2) develop a program for the ongoing maintenance of these the rivers.	Additional Resiliency Recommendation	$1,000,000 +	Y
	Lake Antrim Restoration and Improvements	Restore Lake Antrim by designing and installing improvements to the surrounding bank and flood-plain.	Additional Resiliency Recommendation	$50,000 - $500,000	N

C. Public Engagement Process

The goal of the public engagement process of the NYRCR Program was to involve a representative cross-section of the public and garner input from community members, stakeholders, and local governments and agencies, to advance the key components of the Suffern NYRCR Plan. A broad public engagement outreach process was developed as an essential component of the NYRCR Program for the Village. The public and stakeholder engagement process incorporated a range of techniques to involve as many of the Village's residents in the shaping of their NYRCR Plan as were willing to participate. Public Engagement Events provided an opportunity for the community to learn about the NYRCR Planning process and to provide input that informed the final elements of the NYRCR Plan. Opportunities for the public to hear about and provide their thoughts included 10 biweekly Planning Committee Meetings, to which the public was invited, and four Public Engagement Events at which public input on all aspects of the NYRCR Plan was directly solicited. Details of meetings and events, as well as materials produced for them, were posted on the NYRCR Program website (www.stormrecovery.ny.gov/nyrcr).

A list of the meetings and events held throughout the Suffern NYRCR Planning process is presented in Table V-3.

Suffern NYRCR Planning Committee

The Suffern NYRCR Planning Committee (Committee) initially was composed of eight voting members (it finished with seven) representing past and present public sector employees (fire department, department of public works) and residents from the Village, some of whom have experienced repetitive loss due to flooding. Two non-voting members, the mayor, and the deputy mayor of the Village, were invited and participated in the process.

The Committee met approximately every other week at the George J. Parness Suffern Community Center from late June 2014 through December 2014. In advance of each meeting, the Committee received a reminder email, an agenda with explanatory information, worksheets, and summary notes from previous meetings. The notice for the meeting was also provided by Constant Contact directly to attendees of all previous meetings. Each Planning Committee Meeting was also advertised on the Village's and State's NYRCR websites.

Committee meetings generally involved a presentation that summarized progress made since the previous meeting and an outline of the goals for the current meeting. This was followed by a work session on specific NYRCR Program tasks during which members provided input on every aspect of the NYRCR Plan. Tasks included: providing a description of storm damage; formulating a vision; identifying goals and objectives; creating a list of community assets and associated map; compiling and developing a list of Needs and Opportunities; formulating strategies; and developing specific projects and actions. Work sessions typically took the form of group conversations, with key points and decisions recorded in meeting summaries.

Speakers were invited to address the Committee to educate them on the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant–Disaster Recovery (CDBG-DR) Program and the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP). The Committee also participated in a joint meeting with the Town of Clarkstown NYRCR Planning Committee in Clarkstown to learn about green infrastructure practices and how they could be utilized. In addition, Committee Members and the public heard from the engineer who designed a siphon project on the Mahwah River that would utilize a closed quarry for flood water storage during storm events. For years this project has been seen as a way to alleviate, if not eliminate, flooding in the Squires Gate neighborhood and beyond. The presentation allowed all in attendance to better understand the project, its benefits,

costs and limitations. This information was used by the Committee in developing their list of projects.

Summaries and PowerPoint presentations for all Committee Meetings were made available in a timely fashion on the NYRCR website at www.stormrecovery.ny.gov/nyrcr.

Planning Committee Meeting 1 – June 30, 2014 (Flaam Hardy, AKRF, Inc.)

Suffern NYRCR Planning Committee – November 6, 2014 (Arch Street Communications)

Public Engagement Events

Four Public Engagement Events were held at key milestones during the six month planning process. Interested residents, public and private agencies, community organizations, and local businesses were invited to participate in and attended these events. The outreach campaign developed to inform residents, business owners, and stakeholders of each Public Engagement Event used a variety of formats including; a stakeholder email list which was updated after each Planning Committee Meeting and Public Engagement Event; posting of press releases on the Village website; distribution of a tri-fold brochure to public places (Village Library, Village Hall, Police Station, public schools) around the Village; flyers, and posters hung and handed out throughout the community; display of information regarding the NYRCR Program at Suffern Day; notices sent home with school children; and direct outreach through phone calls, social media and email by the Committee Members to their contacts and neighbors in the Village. Details of all events were also posted on the NYRCR Program website at www.stormrecovery.ny.gov/nyrcr/meetings. This multi-pronged outreach approach brought a cross-section of interested individuals to each of the meetings.

All Public Engagement Events were held at the George J. Parness Suffern Community Center at 41 Washington Avenue in the Village.

Public Engagement Event 1 (July 22, 2014)

At Public Engagement Event 1 citizens learned about the NYRCR Program, its funding source, the planning process, the program schedule and milestones, as well as what had been accomplished by the Planning Committee to date. The presentation also included information on how to get involved outside of the Public Engagement Events.

Attendees were encouraged to visit each of the three breakout stations to learn more about the NYRCR Program and to provide input on the Committee-developed vision statement and asset inventory, as well as critical issues and storm damage. Maps of Suffern with critical assets identified by the Committee were displayed around the event space. Residents were informed about the mapping process and encouraged to add information directly to maps. The public provided comments by filling out the handouts at each station, drawing on the maps, and sticking

Post-its to the boards with their thoughts and comments. The Consultant Team, Planning Committee, and Governor's Office of Storm Recovery (GOSR) and NYS Department of State (NYS DOS) representatives discussed the process, the information presented, and other related storm and resiliency issues with members of the public at each of the stations. Participants were also encouraged to capture the essence of Suffern in one word via a "photo booth." General information on the NYRCR Program and how to stay involved was provided at the welcome table.

Public Engagement Event 1 – July 22, 2014 (Arch Street Communications)

Details related to the break-out stations are as follows:

Station #1 – Vision Statement: The public was asked to fill out a worksheet to provide comments on the vision statement and list of goals for the NYRCR planning process to ensure that the community's values and vision for the future are accurately portrayed.

Station #2 – Storm Damage & Critical Issues: Members of the public were invited to provide input on the list of critical issues and areas susceptible to storm damage and flooding already developed by the Committee. They were asked to describe how the storms affected them, their families, and their neighbors.

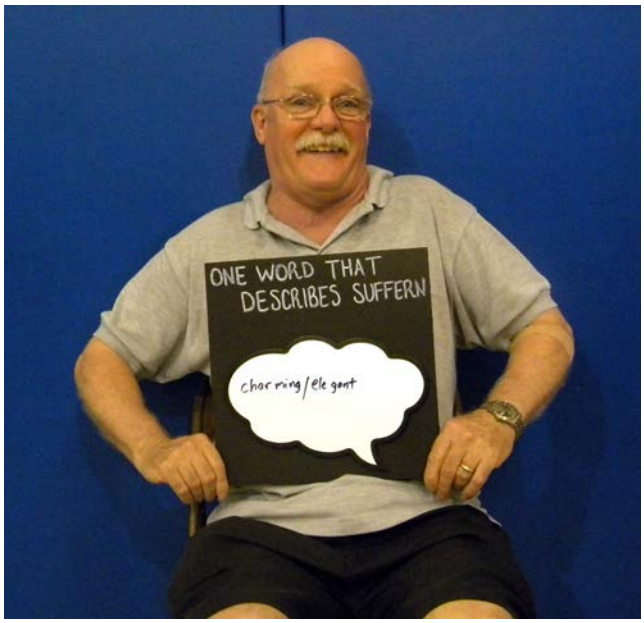
Station #3 – Asset Inventory: The public was encouraged to view the Suffern asset map and to provide further clarification on identified assets and to provide information on additional assets. Attendees were also asked to assess the community value of each of the assets listed.

Station #4 – Photo Booth: A photo booth was set up where attendees could answer one of the questions listed below on a white board and have their photograph taken holding the board. This provided a visual representation of the community values and vision for the future.

— *One word that describes Suffern…*

— *My Vision for Suffern is…*

— *What does "Building Back Better" mean to you?*



"One Word that describes Suffern… Charming/Elegant" - Trustee Frank Hagen at the Photo Booth at Public Engagement Event 1 – July 22, 2014 (Arch Street Communications)

Input received at this event was compiled by the Planning Firm and used by the Committee to revise their Vision and Goals, the list of Critical Issues, description of Storm Damage, and the Asset Inventory.

Asset Inventory Mapping at Public Engagement Event 1 – July 22, 2014 (Elizabeth Matamoros, AKRF, Inc.)

Public Engagement Event 2 (September 19, 2014)

As with Public Engagement Event 1, citizens learned about the NYRCR program, its funding source, the planning process and, the program schedule and milestones, as well as what had been accomplished by the Committee to date. The six FEMA Recovery Support Functions (RSFs)— Community and Capacity Building, Economic Development, Health and Social Services, Housing, Infrastructure Systems, and Natural and Cultural Resources—were outlined and explained. The presentation concluded with a description of the difference between a critical issue, need, opportunity, strategy, and potential project.

Members of the public then gathered at a breakout station to learn more about these important aspects of the NYRCR planning process and to express their thoughts on materials drafted by the Committee. Attendees provided input by filling out handouts and engaging in round table discussion about each of the critical issues, needs, opportunities, strategies and potential projects assigned to the six RSFs. On their way in or out of the event, attendees were encouraged to stop by the "Photo Booth" where they could answer one of the questions listed below on a white board, and have their photograph taken.

— *One word that describes Suffern…*

— *What are Suffern's Greatest Needs?*

— *My vision for Suffern is…*

General information on the NYRCR Program and how to stay involved was provided at the welcome table.

Input received at this event was used by the Planning Committee to revise their needs, opportunities, and strategies. Public feedback solicited at this event established the baseline for identifying and developing resiliency projects.

Public Engagement Event 2 – September 19, 2014 (Arch Street Communications)

Suffern Day 2014 (September 22, 2014)

The Village of Suffern holds an annual community celebration, Suffern Day, featuring samplings of free food from local restaurants, drink, music, entertainment, inflatables, hay rides, and an emergency services vehicle display. The day concludes with a fireworks display. Committee Members set up display boards and a table from which they handed out materials about the NYRCR Program, answered questions, provided information on upcoming meetings, and gathered names and contact information from the public. All were encouraged to participate in an upcoming meeting or provide their thoughts by way of the NYRCR Program website.

Richard P. Connor Elementary School Parent Teacher Association Meeting (November 5, 2014)

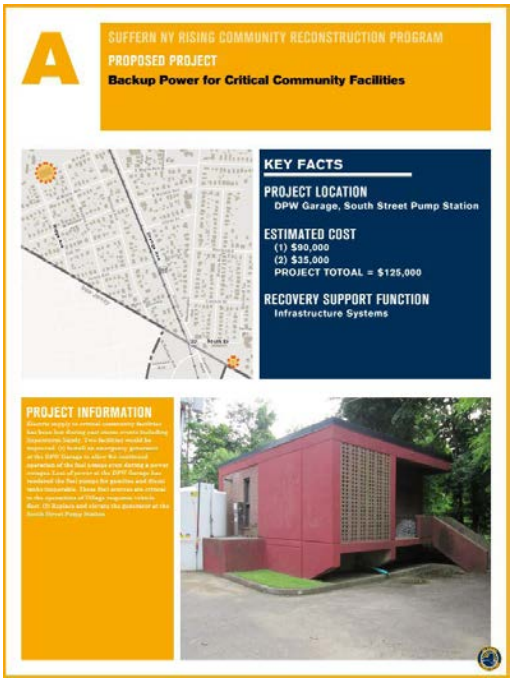
One Committee Member gave a presentation on the NYRCR Program, planning process, and timeline to the PTA of the Richard P. Conner Elementary School. Tri-fold brochures were handed out at this meeting and all in attendance were encouraged to participate in Public Engagement Event 3 to be held the following night.

Public Engagement Event 3 (November 6, 2014)

Attendees Discuss Projects at Public Engagement Event 3 – November 6, 2014

Public Engagement Event 3 – November 6, 2014 (Arch Street Communications)

Public Engagement Event 3 was advertised using many of the same outlets and approaches utilized for Public Engagement Events 1 and 2. The primary focus of Public Engagement Event 3 was to solicit community input on projects, programs and actions developed by the Committee. The format for this event included a brief presentation about the NYRCR



Example of Project Poster at Public Engagement Event 3 – November 6, 2014

Program, after which meeting attendees were provided a "passport" that detailed project information and provided space for comments. Attendees were encouraged to circulate throughout the room and view posters and maps, upon which information on the Proposed and Featured Projects as well as the Additional Resiliency Recommendations was displayed. Meeting attendees filled out the "passports" indicating their thoughts and concerns regarding Committee-developed projects, and providing suggestions on other projects to be considered in the NYRCR Program. The passport also provided respondents the opportunity to indicate their level of support (high or low) for each of the 23 projects.

Public Engagement Event 4 (January 2015)

The fourth and final Public Engagement Event will be held on January 14, 2015 to present the final NYRCR Plan to the Suffern Community.

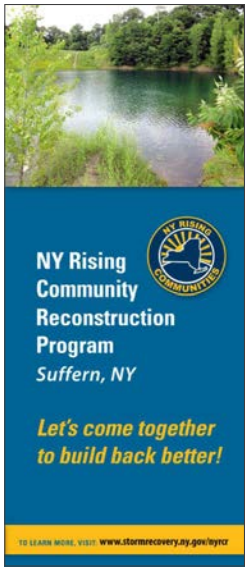
Additional Outreach Efforts

The Suffern NYRCR Planning Committee worked to develop many opportunities for community participation and public engagement, an important piece of the planning process.

The Consultant Team developed a tri-fold brochure that provided an overview of the NYRCR process. Committee Members left these brochures throughout the community in key locations, including Village Hall, the Suffern Free Library, and local businesses. They were also handed out at Suffern Day and a PTA meeting. These brochures provided general information on the NYRCR Program, the Committee, program progress, contact information for the GOSR and links to the NYRCR Program website. The brochures were also distributed at the three Public Engagement Events.

In order to involve Suffern's diverse community in the planning process, flyers were developed for the Public Engagement Events in both Spanish and English. Committee Members, Village representatives, and the Consultant Team posted and handed out hard-copies of the flyers throughout the Village to encourage participation by all populations. The Spanish language materials were developed and distributed to invite an important, but traditionally underrepresented sector, of the community to participate. The Consultant Team also provided flyers to the School District in order to reach the Community's youth as well as a more diverse range of parents. Age-appropriate worksheets were prepared for younger attendees at the Public Engagement Events to promote youth engagement in the NYRCR planning process.

The use of a wide variety of public engagement methods helped solidify the community outreach process for the NYRCR Plan and allowed residents to share their opinions through many different methods.



Tri-fold Brochure for Public Engagement (AKRF, Inc.)

Online Survey

To reach a wider audience of Suffern residents, the Committee and Consultant Team prepared an online survey to gauge community support for projects developed throughout the NYRCR planning process. This enabled residents otherwise unable to attend community meetings to provide valuable feedback. The survey listed the projects developed by the Suffern NYRCR Planning Committee and asked survey participants to express their preference for each project by selecting "high" or "low," thereby gauging community support for each project. A comment box was also provided next to each project.

The survey was distributed via email to the NYRCR email list, posted on the Suffern NYRCR webpage, distributed via handout at the Public Engagement Event 3 and available to the public on the Village website from November 3, 2014 to November 24, 2014. The survey responses were combined with the feedback gathered at the third Public Engagement Event on November 6, 2014.

This successful public outreach method enabled the Planning Committee to incorporate the perspectives of residents in Suffern who may not have been able to attend Public Engagement Events.

D. Community Asset Inventory

Table V-4 Community Asset Inventory

Asset Information								Landscape Attributes							Risk Assessment			
Asset Name	Address	Asset Class	Asset Subcategory	Socially Vulnerable Populations	Critical Facility	Community Value	Risk Area	Lack of Defensive Flood Protection Measures	Elevation Below BFE	Occupied <= 2 ft. above BFE	At Confluence of Two or More Streams	Flood Risk from Storm Water	Lack of Vegetated Stream Bank Buffer	Landscape Attribute Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Abby Park	Abby Park, Suffern, NY 10901	Housing	Multi-Family Residence	No	No	High	High	Yes	Yes	Yes	No	No	Yes	2	3	3	4	36
All Souls Church	81 Washington Ave, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	No	No	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Apartments on South St	1-7 South St, Suffern, NY 10901	Housing	Multi-Family Residence	No	No	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
Avon Research & Development	1 Avon Place, Suffern, NY 10901	Economic	Large Business	No	No	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Berkley Square Apartments & Rockledge Townhomes	Berkley Cir, Suffern, NY 10901	Housing	Multi-Family Residence	No	No	High	Extreme	Yes	Yes	No	Yes	No	Yes	2	3	4	3	36
Boulevard Street Bridge Over Mahwah River	Boulevard Rd, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	High	High	Yes	Yes	No	No	No	Yes	1.5	3	2.5	1	7.5
Brooklands Park	7 Brooklands Dr, Suffern, NY 10901	Natural and Cultural Resources	Parks and Recreation	No	No	Low	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27
Catherine Ave access to West Ward	Catherine Ave, Mahwah, NJ 07430	Infrastructure Systems	Transportation	No	No	Medium	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
Chestnut St Underpass to West Ward	Chestnut Street, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	High	Extreme	Yes	No	No	No	No	Yes	1	3	3	3	27
Christ Episcopal Church	65 Washington Ave, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	Yes	Yes, FEMA	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Donna Hallett Park	Lonergan Dr, Suffern, NY 10901	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
DPW Garage	Ridge Ave, Suffern, NY 10901	Health and Social Services	Public Works Facilities	No	Yes, FEMA	High	Extreme	Yes	No	No	No	No	Yes	1	3	3	3	27
Esther Gitlow Towers	200 Lafayette Ave, Suffern, NY 10901	Housing	Senior Housing	Yes	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
George J. Parness Suffern Community Center (Shelter)	41 Washington Ave, Suffern, NY 10901	Health and Social Services	Emergency Operations/ Response	No	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Good Samaritan Hospital of Suffern	255 Lafayette Ave, Suffern, NY 10901	Health and Social Services	Primary/Regional Hospitals	No	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grasskeeper Landscaping, Inc	212 Orange Ave, Suffern, NY 10901	Economic	Small Business	No	No	Low	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
High Voltage Electrical Transmission Tower	Off Rockledge Dr, Suffern, NY 10901	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	Extreme	Yes	Yes	No	Yes	No	Yes	2	3	4	2	24
High Voltage Electrical Transmission Towers	Between Brook Ave and I-87 on-ramp	Infrastructure Systems	Power Supply	No	Yes, FEMA	High	Extreme	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.5	1	13.5

*Assets in Extreme and High Risk Areas were advanced through the Risk Assessment Process and had Landscape Attributes analyzed to produce Risk Scores. Assets within Moderate and Low Risk Areas were not evaluated by the Risk Assessment.

Table V-4 Community Asset Inventory (cont'd)

Asset Information								Landscape Attributes							Risk Assessment			
Asset Name	Address	Asset Class	Asset Subcategory	Socially Vulnerable Populations	Critical Facility	Community Value	Risk Area	Lack of Defensive Flood Protection Measures	Elevation Below BFE	Occupied <= 2 ft. above BFE	At Confluence of Two or More Streams	Flood Risk from Storm Water	Lack of Vegetated Stream Bank Buffer	Landscape Attribute Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Horton Memorial Field & Toddler Park	50 Memorial Dr, Suffern, NY 10901	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Extreme	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.5	3	40.5
I-87 Bridge Over Mahwah River	I-87, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	High	High	Yes	No	No	Yes	No	Yes	1.5	3	2.5	1	7.5
Lafayette Ave Businesses (Malandra's, Ole-Ole, Suffern Food Mart)	Lafayette Ave, Suffern, NY 10901	Economic	Small Business	No	No	Low	High	Yes	No	No	No	No	No	0.5	3	1.5	3	13.5
Lake Antrim Pump Station	Route 202, Suffern, NY 10901	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Extreme	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.5	3	40.5
Lot A (Park & Ride)	Orange Ave, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	Medium	Extreme	Yes	No	No	No	No	No	0.5	3	2.5	3	22.5
Lot D (Park & Ride)	Rt 59, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	Medium	High	Yes	No	No	No	No	No	0.5	3	1.5	2	9
Lot F (Park & Ride)	Pat Malone Dr, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	Medium	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
Masjid Iqra Darul Ehsan	6 Suffern Pl, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	No	No	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Montebello Road Bridge over Mahwah River	Montebello Rd, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	Low	High	Yes	Yes	Yes	Yes	Yes	Yes	3	3	4	5	60
N. Ramapo Ave access to West Ward	N Ramapo Ave, Mahwah, NJ 07430	Infrastructure Systems	Transportation	No	No	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	2	24
Novartis Pharmaceuticals Parking and Storage	25 Old Mill Rd, Suffern, NY 10901	Economic	Industrial, Warehousing and Manufacturing	No	No	Low	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	0	3	0.5	0	0
Orange and Rockland Gas Facility	Brook Ave, Suffern, NY 10901	Infrastructure Systems	Power Supply	No	No	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	4	48
Orange Ave / Rt. 59 Thruway Underpass	Orange Ave, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	Medium	High	Yes	No	No	No	No	No	0.5	3	1.5	2	9
Orange Ave Commercial Corridor	Orange Ave, Suffern, NY 10901	Economic	Small Business	No	No	Low	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	0	3	0.5	0	0
Post Office	15 Chestnut St, Suffern, NY 10901	Health and Social Services	Government and Administrative Services	No	No	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rail Bridge over Mahwah River	Mahwah River, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	Medium	High	Yes	Yes	No	No	No	Yes	1.5	3	2.5	1	7.5
Ramapo Valley Rd Underpass to West Ward	Ramapo Valley Rd, Mahwah, NJ 07430	Infrastructure Systems	Transportation	No	No	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	2	24
Ramapough Cirque Townhomes	Ramapough Cirque Blvd, Suffern, NY 10901	Housing	Multi-Family Residence	No	No	High	Extreme	Yes	No	No	No	Yes	Yes	1.5	3	3.5	3	31.5
Richard P Connor Elementary School	17 Dunham Ln, Suffern, NY 10901	Health and Social Services	Schools	Yes	Yes, FEMA	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockland ARC Visions	19 Yorkshire Dr, Suffern, NY 10901	Housing	Affordable Housing	Yes	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Assets in Extreme and High Risk Areas were advanced through the Risk Assessment Process and had Landscape Attributes analyzed to produce Risk Scores. Assets within Moderate and Low Risk Areas were not evaluated by the Risk Assessment.

Table V-4 Community Asset Inventory (cont'd)

Asset Information								Landscape Attributes							Risk Assessment			
Asset Name	Address	Asset Class	Asset Subcategory	Socially Vulnerable Populations	Critical Facility	Community Value	Risk Area	Lack of Defensive Flood Protection Measures	Elevation Below BFE	Occupied <= 2 ft. above BFE	At Confluence of Two or More Streams	Flood Risk from Storm Water	Lack of Vegetated Stream Bank Buffer	Landscape Attribute Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Rockland County YMCA Dance & Activity Center	91 Washington Ave, Suffern, NY 10901	Natural and Cultural Resources	Community Centers	Yes	Yes, FEMA	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockland Terrace Multi-Tenant Commercial Building	2 South St, Suffern, NY 10901	Economic	Small Business	No	No	Low	Extreme	Yes	Yes	Yes	No	Yes	Yes	2.5	3	4.5	2	27
Ross Towers	198 Lafayette Ave, Suffern, NY 10901	Housing	Affordable Housing	Yes	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Route 59 Bridge Over Mahwah River	Route 59, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	High	High	Yes	Yes	No	No	Yes	Yes	2	3	3	3	27
Sacred Heart Church	60 Washington Ave, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	No	No	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sacred Heart School	60 Washington Ave, Suffern, NY 10901	Health and Social Services	Schools	Yes	Yes, FEMA	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Salvation Army College for Officer Training	201 Lafayette Ave, Suffern, NY 10901	Health and Social Services	Higher Education Institutions	No	No	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shamrock Hotel	86 Orange Ave, Suffern, NY 10901	Economic	Small Business	No	No	Low	High	Yes	No	No	No	No	No	0.5	3	1.5	3	13.5
Single-Family Homes - Brook St and Highland Ave	5-11 Brook St & 3-7 Highland Ave , Suffern, NY 10901	Housing	Single-Family Residence	No	No	High	High	Yes	Yes	Yes	No	No	Yes	2	3	3	4	36
Single-Family Homes - South St and Rockland Ter	23-33 Rockland Ter, Suffern, NY 10901	Housing	Single-Family Residence	No	No	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	4	48
Single-Family Homes - Wayne Ave	103-107 Wayne Ave, Suffern, NY 10901	Housing	Single-Family Residence	No	No	High	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	0	3	0.5	0	0
Single-Family Homes near Lake Antrim	1-8 Utopian Ave and Memorial Dr, Suffern, NY 10901	Housing	Single-Family Residence	No	No	High	Extreme	Yes	Yes	No	No	No	Yes	1.5	3	3.5	5	52.5
South Street Wastewater Pump Station	South Street, Suffern, NY 10901	Infrastructure Systems	Wastewater	No	Yes, FEMA	High	Extreme	Yes	Yes	Yes	No	Yes	Yes	2.5	3	4.5	4	54
Squires Gate	Lonergan Dr & Temple Ln, Suffern, NY 10901	Housing	Multi-Family Residence	No	No	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	5	60
St. Mary's Indian Orthodox Church of Rockland	66 E Maple Ave, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	No	No	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stone Hill Quarry	Stone Hill Quarry, Suffern, NY 10901	Economic	Industrial, Warehousing and Manufacturing	No	No	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Suffern Baseball Complex	Ramapo Ave, Suffern, NY 10901	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
Suffern Free Library	210 Lafayette Ave, Suffern, NY 10901	Natural and Cultural Resources	Libraries	No	No	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Suffern Hook & Ladder Company No 1	143 Lafayette Ave, Suffern, NY 10901	Health and Social Services	Emergency Operations/ Response	No	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Assets in Extreme and High Risk Areas were advanced through the Risk Assessment Process and had Landscape Attributes analyzed to produce Risk Scores. Assets within Moderate and Low Risk Areas were not evaluated by the Risk Assessment.

Table V-4 Community Asset Inventory (cont'd)

Asset Information								Landscape Attributes							Risk Assessment			
Asset Name	Address	Asset Class	Asset Subcategory	Socially Vulnerable Populations	Critical Facility	Community Value	Risk Area	Lack of Defensive Flood Protection Measures	Elevation Below BFE	Occupied <= 2 ft. above BFE	At Confluence of Two or More Streams	Flood Risk from Storm Water	Lack of Vegetated Stream Bank Buffer	Landscape Attribute Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Suffern Memorial Pool	1 Memorial Dr, Suffern, NY 10901	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	4	48
Suffern Commuter Rail Station	96 W Park Pl, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	High	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	0	3	0.5	0	0
Suffern Railroad Museum	Orange Ave, Suffern, NY 10901	Natural and Cultural Resources	Museums, Performing Arts Centers, Stadiums	No	No	Low	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	0	3	0.5	0	0
Suffern United Methodist Church	18 Parkside Dr, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	No	No	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Suffern VFW	16 Ramapo Ave, Suffern, NY 10901	Natural and Cultural Resources	Community Centers	No	No	Low	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	0	3	0.5	0	0
Suffern Village Hall and Police	61 Washington Ave, Suffern, NY 10901	Health and Social Services	Emergency Operations/ Response	No	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Suffern Volunteer Hose Co No 1	35 Washington Ave, Suffern, NY 10901	Health and Social Services	Emergency Operations/ Response	No	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tagaste Monastery	220 Lafayette Ave, Suffern, NY 10901	Natural and Cultural Resources	Cultural or Religious Establishments	No	No	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tender Loving Care	40 Park Ave, Suffern, NY 10901	Health and Social Services	Daycare and Eldercare	Yes	Yes, FEMA	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The Knolls of Ramapo	Pawnee Ct, Suffern, NY 10901	Housing	Multi-Family Residence	No	No	High	Extreme	Yes	No	No	Yes	No	Yes	1.5	3	3.5	4	42
Vacant Industrial Buildings (former Rainbow Vacuum)	1 Ramapo Ave, Suffern, NY 10901	Economic	Industrial, Warehousing and Manufacturing	No	No	Low	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	3	36
Venture Group Home	13 Willow Dr, Suffern, NY 10901	Housing	Supportive Housing	Yes	Yes, FEMA	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Village Water Wells (3) off Pat Malone Drive	Pat Malone Dr, Suffern, NY 10901	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Extreme	Yes	Yes	Yes	No	No	Yes	2	3	4	4	48
Wastewater Treatment Plant	Ridge Ave, Suffern, NY 10901	Infrastructure Systems	Wastewater	No	Yes, FEMA	High	Extreme	Yes	Yes	No	No	Yes	Yes	2	3	4	5	60
Water Treatment Plant	Pat Malone Dr, Suffern, NY 10901	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Extreme	Yes	Yes	No	No	No	Yes	1.5	3	3.5	4	42
Wayne Ave / Rt. 202 (floodprone area near Rockledge Dr)	Wayne Ave, Suffern, NY 10901	Infrastructure Systems	Transportation	No	No	High	Extreme	Yes	Yes	No	Yes	No	Yes	2	3	4	3	36
West Ward Residential Area (access issue only)	Maltbie Ave and Meadow Ave, Suffern, NY 10901	Housing	Single-Family Residence	No	No	High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
YMCA - Y's Beginnings	18 Parkside Dr, Suffern, NY 10901	Health and Social Services	Daycare and Eldercare	Yes	Yes, FEMA	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Assets in Extreme and High Risk Areas were advanced through the Risk Assessment Process and had Landscape Attributes analyzed to produce Risk Scores. Assets within Moderate and Low Risk Areas were not evaluated by the Risk Assessment.

E. Endnotes

Photo Credits

Cover Page:

Welcome to Village of Suffern
(Chris Robbins, AKRF, Inc.)

Dividers:

Section I

Flooding in Squires Gate (Blas Gonzalez)

Planning Committee Meeting
(Chris Robbins, AKRF, Inc.)

Suffern Utilities Flooded (Charles Sawicki)

Flooded Ball Field (Robert Kawasaki)

Section II

Flooding in Residential Street (Alex Co)

Suffern Planning Committee
(Arch Street Communications)

Mahwah River (Chris Robbins, AKRF, Inc.)

Wastewater Treatment Plant Flooding
(Charles Sawicki)

Section III

Lake Antrim (Chris Robbins, AKRF, Inc.)

Public Engagement Event 1
(Arch Street Communications)

Flooding in Squires Gate (Blas Gonzalez)

Wastewater Treatment Plant Flooding
(Charles Sawicki)

Section IV

Flooded Ball Fields (Charles Sawicki)

Planning Committee Meeting 1
(Flaam Hardy, AKRF, Inc.)

Flooding on Wayne Avenue (Robert Kawasaki)

Mahwah River by Squires Gate Park
(Chris Robbins, AKRF, Inc.)

Section V

Mahwah River by Lonergan Drive
(Flaam Hardy, AKRF, Inc.)

Damaged Household Items for Trash (Blas Gonzalez)

Road to Quarry (Flaam Hardy, AKRF, Inc.)

Beth Barone (Arch Street Communications)

Frank Hagen (Arch Street Communications)

Robert Waiter (Arch Street Communications)

Methodology

Cost-Benefit Analysis Full Time Equivalent (FTE) Job Projections

Backup Power for Critical Community Facilities

According to the U.S. Department of Commerce (DOC) Economics and Statistics Administration (ESA) report, *Economic Impact of Hurricane Sandy Potential Economic Activity Potentially Lost and Gained in New Jersey and New York*[15],the estimated job creation from recovery spending on infrastructure projects in New York reported 7.15 construction jobs per $1,000,000 in construction spending . Using this methodology the project will create an estimated 0.9 FTE construction jobs. This is based on an assumption that approximately 80% of the total cost ($125,000) will be construction cost ($100,000).

Emergency Railroad Crossing into the West Ward

Using the methodology from the U.S. DOC ESA report[15], the project will create an estimated 1.8 FTE construction jobs. This is based on an assumption that approximately 80% of the total cost ($250,000) will be construction cost ($200,000).

Drainage Improvements to Transportation Assets

Using the methodology from the U.S. DOC ESA report[15], the project will create an estimated 8.3 FTE construction jobs. This is based on an assumption that approximately 80% of the cost for the Chestnut St. and Orange Ave. projects ($1,450,000) will be construction cost ($1,160,000).

Flood Mitigation Assessment – Mahwah River and Ramapo River

N/A

Hardening of Wastewater Treatment Plant and Facilities through Physical Protective Measures

Using the methodology from the U.S. DOC ESA report[15], the project will create an estimated 2.5 FTE construction jobs. This is based on an assumption that approximately 80% of the total cost less the engineering assessment ($430,000) will be construction cost ($344,000).

Hardening of Water Treatment Plant and Facilities through Physical Protective Measures

Using the methodology from the U.S. DOC ESA report[15], the project will create an estimated 3.5 FTE construction jobs. This is based on an assumption that approximately 80% of the total cost less the engineering assessment ($605,000) will be construction cost ($484,000).

Homeowner Buyout Program Support and Economic Development Plan

N/A

Homeowner Support for Raising Utility Connections and Mechanicals

N/A

Inventory of Existing Stormwater Management Infrastructure

N/A

Village-wide Stormwater Management: Green Infrastructure and Storage Systems Feasibility Study

Using the methodology from the U.S. DOC ESA report[15], the $735,000 for construction of the project will create an estimated 5.3 FTE construction jobs.

Stormwater Management Facilities in Village Parking Lots A and B

Using the methodology from the U.S. DOC ESA report[15], the $1,625,000 for construction of the project will create an estimated 11.6 FTE construction jobs.

VFW Building Emergency Power and Electrical Upgrades

Using the methodology from the U.S. DOC ESA report[15], the $150,000 for construction of the project will create an estimated 1.1 FTE construction jobs.

Sources

1. "A Guide for Suffern Business Owners." Small Business Guide. (n. d.): Suffern Village. Web. 29 July 2014. <http://www.suffernvillage.com/forms/small_business_guide.pdf>

2. "Suffern Railroad Museum." (n.d.): *Suffern Village*. Web. 30 July 2014. <http://www.suffernvillage.com/forms/SUFFERN%20RAILROAD%20MUSEUM%20INFO.pdf>.

3. Buncher, Ryan. "Closing Suffern Novartis Plant To Impact Rockland County." *Pearl River, New York Patch*. New York Patch, 22 Jan. 2014. Web. 12 Dec. 2014. < http://patch.com/new-york/pearlriver/closing-suffern-novartis-plant-to-impact-rockland-county_515f5de4>.

4. United States Census Bureau / American FactFinder. "DP05 ACS Demographic and Housing Estimates: Suffern village." *2008 – 2012 American Community Survey*. U.S. Census Bureau's American Community Survey Office, 2012. Web. 12 November 2014 <http://factfinder2.census.gov>.

5. Frassinelli, Mike. "More NJ Transit Rail Lines to Resume Monday, 2 Weeks after Sandy." *NJ.com*. The Star Ledger, 10 Nov. 2012. Web. 30 July 2014. <http://www.nj.com/news/index.ssf/2012/11/more_nj_transit_rail_lines_to.html>.

6. "Suffern Still Suffers From Irene, One Year Later - CBS New York." *CBS New York*. N.p., 28 Aug. 2012. Web. 30 July 2014. <http://newyork.cbslocal.com/2012/08/28/suffern-still-suffers-from-irene-one-year-later/>.

7. Matsuda, A. "Irene Damaged Homes in Suffern to be Taken Down." Retrieved June 27, 2014, from *The Journal News: lohud*: 1 Dec. 2013. Web. 30 July 2014. <http://www.lohud.com/story/news/local/rockland/2013/12/01/irene-damaged-homes-in-suffern-to-be-taken-down/3799635/>

8. Baird, Bob. "Irene May Drive out Longtime Suffern Business." *The Journal News.* N.p., 31 Aug. 2011. Web. 30 July 2014. <http://archive.lohud.com/article/20110831/NEWS03/108310346/Irene-may-drive-out-longtime-Suffern-business>.

9. New York State Energy Research and Development Authority. Cleaner Greener Communities Program. *Mid-Hudson Regional Sustainability Plan*. By Mid-Hudson Planning Consortium. Ecology and Environment Inc., May 2013. Web. 9 Dec. 2014.

10. Mid-Hudson Regional Economic Development Council. *Mid-Hudson Region Economic Development Council Strategic Plan*. Governor Andrew Cuomo, Nov. 2011. Web. 9 Dec. 2014.

11. Rockland County. Rockland County Technical Advisory Committee. *Rockland Tomorrow: Rockland County Comprehensive Plan*. Rockland County Executive and County Legislature, 1 Mar. 2011. Web. 9 Dec. 2014.

12. Rockland County Office of Fire and Emergency Services. *Rockland County Multi-Jurisdictional Natural Hazard Mitigation Plan*. Rockland County, Oct. 2010. Web. 9 Dec. 2014.

13. Department of Homeland Security. “Recovery Support Functions.” Federal Emergency Management Agency, 24 July 2014. Web 12 Nov. 2014. <http://www.fema.gov/recovery-support-functions>.

14. Mid-Hudson Regional Economic Development Council. Accelerating Growth, Spearheading Success 2014 Progress Report. 2014. Web. 10 Dec 2014. http://regionalcouncils.ny.gov/themes/nyopenrc/rc-files/midhudson/MHREDC-2014PRa.pdf

15. U.S. Department of Commerce Economics and Statistics Administration Office of the Chief Economist. Economic Impact of Hurricane Sandy Potential Economic Activity Potentially Lost and Gained in New Jersey and New York, September 2013.

F. Glossary

BFE	Base Flood Elevation
CBA	Cost-Benefit Analysis
CDBG-DR	Community Development Block Grant – Disaster Recovery
DOH	Department of Health
DPW	Department of Public Works
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
FTE	Full Time Equivalent
GIS	Geographic Information Systems
HMGP	Hazard Mitigation Grant Program
HUD	U.S. Department of Housing and Urban Development
NDRF	National Disaster Recovery Framework
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NJT	New Jersey Transit
NYRCR	New York Rising Community Reconstruction
NYS	New York State
NYS DEC	New York State Department of Environmental Conservation
NYS DOS	New York State Department of State
NYS DOT	New York State Department of Transportation
NYS OEM	New York State Office of Emergency Management
O&R	Orange & Rockland Utilities Inc.
RCDA	Rockland County Drainage Agency
RSF	Recovery Support Function
USACE	U.S. Army Corps of Engineers
US FWHA	U.S. Federal Highway Administration
VFW	Veterans of Foreign Wars