



## BOROUGH OF HIGHLANDS STRATEGIC RECOVERY PLANNING REPORT



SEPTEMBER 2014

**BOROUGH OF HIGHLANDS**  
**STRATEGIC RECOVERY PLANNING REPORT**

ADOPTED SEPTEMBER 17, 2014



David M. Kutner, PP/AICP  
NJ Professional Planner No.: 33LI00617900

*The original of this document was signed and sealed in accordance with New Jersey Law.*

## Contents

Introduction .....	1
Chapter 1 Background/Context .....	2
Demographics .....	2
Land Use and Zoning.....	3
Chapter 2 Initial Impacts Assessment.....	5
Flooding.....	5
Impacts on Pump Stations .....	5
Damages to Buildings.....	6
Damages to Parks.....	8
Impacts on Households and Most Vulnerable Households .....	8
Post-Storm Issues.....	8
Long-Term Recovery Efforts .....	9
Enhancing Resiliency and Public Safety and Stimulating Revitalization .....	9
Chapter 3 Risk Assessment .....	10
Introduction .....	10
The hazards that Highlands and the New Jersey coast face .....	10
Vulnerability and Exposure .....	11
Vulnerability.....	11
1. Flood Zones .....	12
2. Federal Recovery Assistance.....	14
3. Critical Services and Infrastructure.....	17
4. Zoning and Land Use.....	19
5. Socially Vulnerable Populations.....	20
Estimation of Exposure .....	24
Conclusion.....	29
Chapter 4 Getting To Resilience Process and Report .....	31
Chapter 5 Assessment of Existing Planning and Zoning Documents.....	32
Existing Planning Document Analysis .....	32
1. A Clam-tastic Plan (Rutgers Studio 2014) .....	33
2. Adapting to Climate Change in Coastal Monmouth County (Rutgers Studio 2011).....	33
3. Bayshore Region Strategic Plan (2006) .....	33
4. FEMA Community Recovery Plan (2013) .....	33
5. Getting to Resilience Report and Recommendations (2014) .....	34
6. Intra-Borough Bicycle Plan (2011) .....	34
7. Master Plan (original 2004 and re-examination 2008).....	34
8. Comprehensive Plan for Borough, updated in 2008.....	34
9. Monmouth County Hazard Mitigation Plan (2009, to be updated 2014).....	34
10. Recreation & Open Space Plan (2008).....	34
Assessment of Zoning Ordinance for Borough’s Recovery Strategies.....	35
Coastal Area Facilities Review Act (CAFRA) .....	35
Chapter 6 Recommendations for Action .....	37
Chapter 7 Implementation Matrix.....	41

## List of Figures

Figure 1: Regional Location.....	2
Figure 2: Existing Zoning Map.....	4
Figure 4: Highlands Borough FEMA Flood Zone .....	12
Figure 5: Residential Areas/FEMA Flood Zones .....	14
Figure 6: Repetitive Loss Payouts .....	15

Figure 7: Public Assistance Payouts .....	16
Figure 8: Individual Assistance Payouts .....	17
Figure 10: Zoning/FEMA Flood Zones .....	20
Figure 11 Census Block Group Map .....	21
Figure 12: 2050 Sea-Level Rise.....	28
Figure 13 2050 Sea Level Rise with 1% Annual Storm Scenario .....	29
Figure 14: CAFRA Planning Areas.....	36

List of Tables

Table 1: Existing Zoning (Generalized).....	4
Table 2: Land Use Type By Flood Zone .....	13
Table 3: Zoning Districts in Flood Zones .....	19
Table 4: Exposure- Inundated Parcels 2050 Sea Level Rise Scenario .....	26
Table 5: Exposure Value- Inundated Parcels 2050 Sea Level Rise Scenario .....	26
Table 6: Exposure- Inundation Parcels 2050 Sea-Level Rise with 1% Annual Chance Flood .....	28
Table 7: Exposure Value- Inundated Parcels 2050 Sea-Level Rise with 1% Annual Chance Flood .....	29
Table 8 : Planning Documents Examined.....	32
Table 9: Summary of Plans Assessment.....	35
Table 10: Highest Priority Actions.....	37

Appendices

Appendix 1: FEMA Flood Zones Definitions.....	I
Appendix 2: Getting To Resilience Report and Recommendations .....	III
Appendix 3: Alternatives Assessment.....	XXXIV
Appendix 4: Potential Priority Actions.....	XLIII
Appendix 5 : Conceptual Site Planning for Possible Action - Relocate Borough Hall .....	XLVI
Appendix 6: Highlands Borough Hurricane Sandy Payout per Census Block.....	L
Appendix 7: Pre-Sandy Payout Maps.....	LIII
Appendix 8 : Roadways In AE and VE FEMA Flood Zones.....	LV

**NOTE: The figures and tables presented in this report have been developed for Planning Purposes only and should be used exclusively for Planning Purposes only.**

## Introduction

This Strategic Recovery Planning Report (SRPR) serves as a blueprint for use by the Borough of Highlands to address conditions created or exacerbated by Hurricane Sandy. It is intended to identify specific recovery and rebuilding strategies the Borough can take to help ensure that the community will be more resistant to damage from future storm events, and encourage sustainable economic growth.

Accordingly, the report:

1. Evaluates Hurricane Sandy's impacts on community features;
2. Addresses conditions that Hurricane Sandy created or exacerbated;
3. Describes the existing and potential vulnerabilities that the Borough faces from significant storm events, and sea-level rise;
4. Articulates planning goals, strategies, and actions to improve public safety, develop resistance to future storms, and stimulate economic recovery; and,
5. Describes each proposed project at a level of detail that:
  - Demonstrates how it relates to the storm's impacts;
  - Explains why it is important to the Borough's economic and environmental health;
  - Lists the major tasks with which it may be associated;
  - Includes an estimation of the cost of implementation;
  - Identifies potential or actual funding sources; and
  - Provides a timeline for implementation.

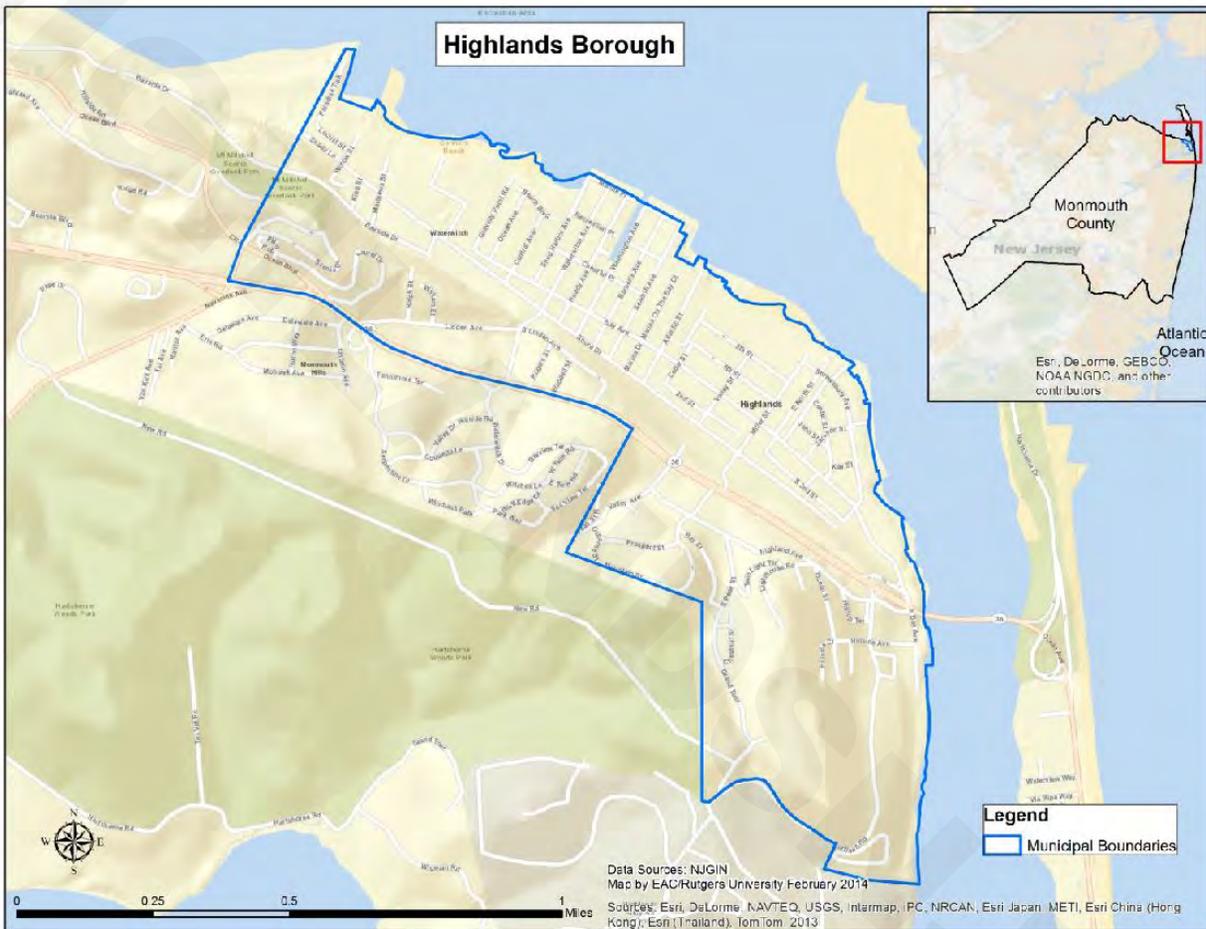
In the course of preparing this SRPR, the Borough participated in the Getting to Resilience (GTR) process, developed by the New Jersey Department of Environmental Protection and adapted and enhanced by the Jacques Cousteau National Estuarine Research Reserve (JCNERR). Through this process, the Borough was able to identify specific actions that will enhance long term resiliency in the town. These recommendations are integrated into this Report.

This Report was prepared under the direction of New Jersey Future staff, with assistance from T&M Associates.

## Chapter 1 Background/Context

Highlands Borough is located in northern Monmouth County, at the confluence of the Shrewsbury River and Sandy Hook Bay, just west of Sandy Hook Gateway National Recreation Area. The area of the town is 0.86 square miles (550 acres). Due to a prominent escarpment that NJ Route 36 runs along, the Borough has a low-lying area along the bay and river, as well as an uplands area. **Figure 1** shows the Borough and its regional location.

**Figure 1: Regional Location**



## Demographics

The demographic, land use and housing data contained herein is presented for a pre-Sandy period. No current, reliable land use, demographic or housing unit estimates have been developed that reflects changes in the town's characteristics after the Hurricane.

Highlands Borough has a year-round population of 5,005 (Census, 2010). The town has a total of 3,146 housing units, 2,868 of which are year-round units and 278 are seasonal units (Census 2010).

The Borough had an older and less wealthy population than Monmouth County as a whole. With a median age of 45.1, the Borough's population was nearly 4 years older than the county's, which had a median age of 41.3 (2010 Census). The Census' American Community Survey (ACS) 2008-2012 estimated

median household income in Highlands at \$67,292<sup>1</sup>, however, it should be noted that this figure has a significant margin of error ( $\pm$ \$8,788), and thus may be overstated. As a comparison, ESRI<sup>2</sup> estimated that the median household income in 2012 was only \$53,076. By comparison, Monmouth County's median household income was \$84,746 (ACS 2008-2012, with a small margin of error  $\pm$  \$1,154). Over 97% of the population of the Borough identified themselves as white, with 5.6% of the population identified as Hispanic (ACS 2008-2012).

As noted above, the majority of housing in the Borough is comprised of year-round units. Of these units, nearly 58% are owner occupied while more than 41% are renter occupied (Census 2010). Of all housing units (year-round and seasonal) that existed pre-Sandy, 48% were single family detached, 8% were single family attached, 5% were 2-unit structures, over 11% were 3 to 9 units, and over 24% were 10 or more units (ACS 2008-2012). It was estimated that there were 90 mobile homes in the Borough. The median value of all owner occupied units was \$284,400 (ACS 2008-2012). Hurricane Sandy completely destroyed a 58-unit mobile home park that was located at the northwesterly border of the Borough.

### Land Use and Zoning

Prior to the storm, Highlands Borough was nearly built out and can be characterized as an older suburban, single-family, residential community. On lower elevations within the Borough, adjacent to Sandy Hook Bay, lot sizes range from less than 2,500 square feet to 5,000 square feet. Single-family housing in newer sections of the Borough, south of Route 36 in "the highlands", is predominately located on lots ranging from 5,000 square feet to 14,000 square feet and larger. Transitional zones consisting of medium density condominiums and apartments exist between commercial districts and single-family residential districts. Waterfront commercial uses consisting primarily of marinas and restaurants contribute significantly to Highlands' sense of place.

As depicted in **Table 1**, the boundary of Highlands Borough encompasses 550 acres or 0.86 square miles. Residential land uses comprise almost 73% of the Borough's land area or 400 acres. This development is in the form of single-family residential housing (57%/311 acres), multi-family residential (12%/67 acres), and mobile home parks (2%/13 acres). "Private open space" is defined as deed restricted property located within private condominium or apartment complexes that are regulated by homeowner associations.

Commercial development, principally consisting of marinas, restaurants/bars and retail sales and service comprises 30% percent of land uses within the Borough. Lands associated with streets and rights-of-way represent occupy 8.4% of the area of the Borough.<sup>3</sup> The Borough has 17 zoning districts eight residential districts, seven commercial/business districts, and two mixed use districts. In addition, the Borough has established two commercial overlay districts. All of Highlands zoning districts are shown in **Figure 2**.

---

<sup>1</sup> The American Community Survey (ACS) is an ongoing Census Bureau survey that samples a small percentage of the population every year.

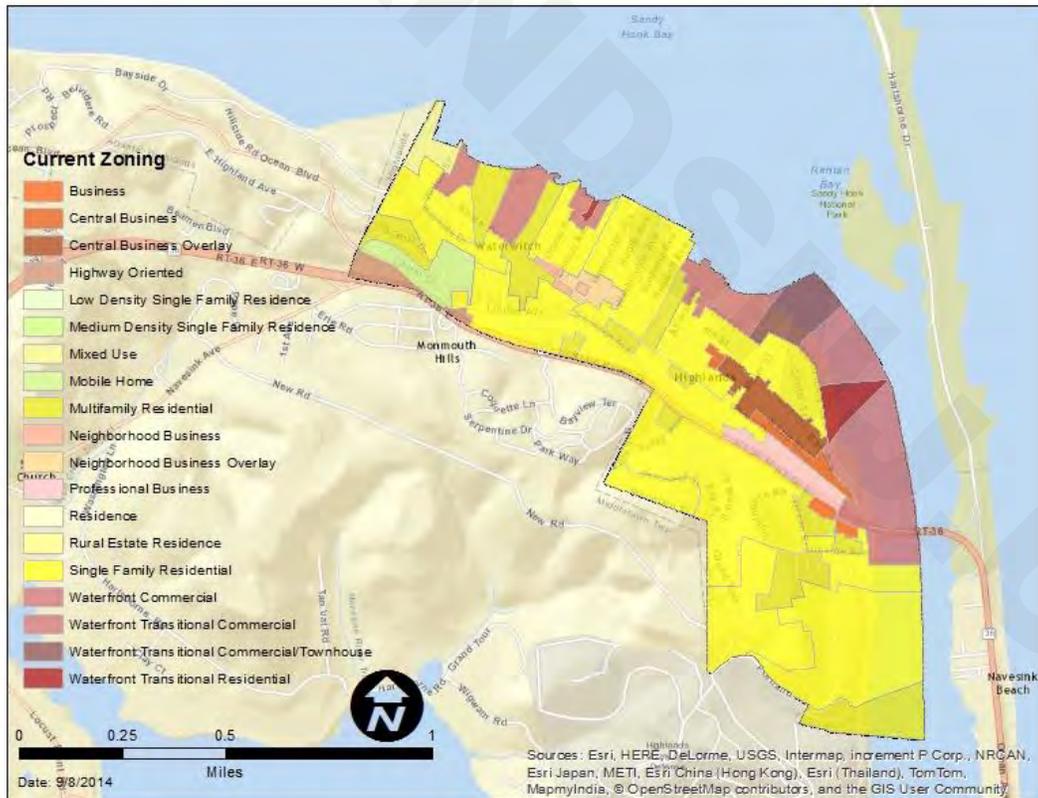
<sup>2</sup> an international supplier of geographic information software , web GIS and geodatabase management applications

<sup>3</sup> Borough of Highlands Master Plan, 2008

**Table 1: Existing Zoning (Generalized)**

Zoning District	Acres	% of Total
Business	2.4	0.4%
Central Business	18.8	3.4%
Highway Oriented	5.6	1.0%
Low Density Single Family Residence	0.0	0.0%
Medium Density Single Family Residence	0.0	0.0%
Mixed Use	6.5	1.2%
Mobile Home	13.4	2.4%
Multifamily Residential	66.9	12.2%
Neighborhood Business	7.0	1.3%
Professional Business	10.8	2.0%
Single Family Residential	311.9	56.7%
Waterfront Commercial	70.4	12.8%
Waterfront Transitional Commercial	14.5	2.6%
Waterfront Transitional Commercial/Townhouse	13.7	2.5%
Waterfront Transitional Residential	8.1	1.5%
<b>Total</b>	<b>550.0</b>	<b>100.0%</b>
Central Business Overlay	12.6	2.3%
Neighborhood Business Overlay	5.0	0.9%

**Figure 2: Existing Zoning Map**



## Chapter 2 Initial Impacts Assessment

Immediately following Hurricane Sandy's landfall, Highlands Borough faced the following devastating impacts that had to be immediately addressed:

- Power was out in the area for up to 14 days.
- Roads were blocked with debris and downed power lines.
- Localized flooding, extensive electrical outages, and blocked roads caused hazardous conditions and a threat to public health and safety throughout the Borough.
- 12,245 cubic yards of vegetative debris, 5,600 cubic yards of construction and demolition debris, and relatively small quantities of a wide variety of non-hazardous wastes (paint, paint-related materials, automotive products, propane tanks, fire extinguishers, etc.) throughout the Borough.

### Flooding

The existing drainage facilities in the low lying areas of the Borough are regularly inundated by floodwaters originating in the New Jersey Route 36 corridor and adjacent up-gradient areas of the Highlands Borough, Middletown Township, and Atlantic Highlands Borough. High intensity rainfall events, coupled with high tides, high stormwater velocities, and head conditions result in the system backing up and extensive flooding of the low-lying areas from Bay Avenue northward. The frequent flooding causes a hardship to area residents due to restricted access to homes in the area, economic losses to businesses, and extensive property and roadway damage. As the water rises during flood events, the storm sewers back up, flooding the streets with water from the river. This water carries countless types of debris and bacteria throughout the Borough.

Part of Highlands Borough sits at a low elevation and does not have a protective beach. The lower area of the Borough is a target for frequent flooding. The entire downtown sits in a major flood zone (the AE Zone). Because of this, Highlands Borough succumbs to flooding during high tides, full moons, and even minor storms.

Hurricane Sandy brought a 12- to 17-foot storm surge that rolled in from Sandy Hook Bay. The impacts of this flooding are described in more detail in the following sections.

### Impacts on Pump Stations

Due to the recurrent flooding noted above, and the elevation of the lower section of the borough, the stormwater management system includes several pump stations that pump water from the borough out to the Bay.

The Waterwitch Avenue Sanitary Sewer pump station is the Borough's main pump station, and was completely submerged in six to eight feet of salt water and heavy debris during Hurricane Sandy. The pump station sustained damages to the following parts: electrical panels, a generator transfer switch, the main disconnect switch, the 200-amp main breaker load center, electrical troughs and conduits, a pump control panel, pump cables, pumps, floats to the wet well, pump chamber lights in both the dry well and wet well, light switches, receptacles, wires and conduits, a generator transfer switch, plug ends, wires, the control room heater, ventilation blowers, two trash pumps, and two impeller pumps.

At the Barberie stormwater pump station (at the southern end of Barberie Avenue close to Shore Drive), a powerful storm surge up to six to eight feet inundated the station and contaminated water and heavy debris. The submersible stormwater pump motor winding shorted due to salt water saturation and debris. Also due to flooding, the splice box and controls, panel breaker, meter pan, and pump controls were damaged.

The South Bay Avenue pump station (located next to the Route 36 bridge) also sustained up to six to eight feet of flooding, as well as damages to the transfer switch, main breaker, and receptacle contact points for the transfer power supply.

The North Street Stormwater pump station was situated at the eastern edge of North Street adjacent to the Shrewsbury River. During the height of Hurricane Sandy, the station and the majority of its components were destroyed and washed away with six to ten feet of tidal flood waters. The North Street watershed basin is comprised of over 90 acres of drainage area in the eastern section of the Borough. The upland area, to the south of Route 36, is high in elevation and contains a mix of wooded and residential areas. Drainage flows generated from this area inundate downstream portions of the Borough, and this was the case during Hurricane Sandy. Damages sustained by the pump station include: the wooden pump enclosure, the wooden dock, pump cable, pump stand, submersible pump, motor starter control box, and by-pass equipment (discharge pipe).

### **Damages to Buildings**

The impact from floods and storm surge resulting from Hurricane Sandy caused significant damage to the Borough, including damage to greater than 60 percent of the businesses within the Borough. Additionally, 14 downtown restaurants were destroyed, of these, six remain closed. The Borough estimates that approximately 1,250 homes were damaged or destroyed.

**Borough Hall** - The Borough Hall and Police Station, located at 171 Bay Avenue, housed the Municipal Offices, Code Enforcement Offices, Police Offices and holding cells, court facilities, and the clerk's office. The building is in a low lying area with an elevation of six feet. Flooding due to stormwater occurs at high tide and during most moderate to severe rain storms and nor'easters. The property regularly becomes inundated with water due to flooding, which causes public health hazards, loss of use, and property damage.

During Hurricane Sandy, the seawater rose to approximately eight inches above the first floor level of the building. Additionally, 48 inches of floodwater damaged the three bay garage areas of the building where the fire trucks used to be staged (though they had been removed prior to the storm). These floodwaters brought in varied debris from the outside and caused significant damage, and/or damage beyond repair to the following major building components: electrical panels and breakers; the building's mechanical system; and various equipment that are integral to the daily operation of the building. In addition, interior walls and finishes were destroyed or lost.

Due to the wide and varied extent of damage, this facility has been left completely inoperable and vacant, and activity has been temporarily relocated for an undetermined amount of time. It is imperative that the Borough has a location that is fully operable during emergency events in order to provide operations, support, and assistance to the residents of the Borough. Therefore, the Borough has temporarily relocated some of its administration offices and the Police Station to the Department of Public Work's Yard, located at 42 Shore Drive. Code Enforcement activity has been temporarily relocated to the small two-story building at 19 Bay Avenue. Police Department activities have been temporarily relocated to a site between Shore Drive and South 2<sup>nd</sup> Street, approximately four hundred feet to the south easterly of Miller Street, where three temporary trailers have been located.

**Fire Department** - The Highlands Borough Fire Department Building also sustained Hurricane damages. During the storm, floodwater entered the building to a height of 15 inches above the finished floor, deposited flood debris and residue on the building's floors and walls, and damaged building contents

and structural elements. Damaged building contents include a beverage freezer, two desktop computers, and two thermal imaging cameras. Structurally, an air compressor system, three air conditioning condensers, an exterior door, garage door elements, and exterior lighting were damaged.

**Department of Public Works Facilities** - The Department of Public Works (DPW) facilities were inundated with 51 inches of flood water and flood debris that caused damage to each of the three separate DPW sites, including the maintenance garage, the soft-sided structure, and the recycling shed. The maintenance garage sustained damages to the following: plywood paneling, various doors and door frames, wall and ceiling insulation, walls, tile flooring, a window unit, and a 20-gallon electric water heater. Damage to the soft-sided structure includes a roll-up overhead door and a PVC entry door and door jamb. The recycling shed also sustained damages to the following: drywall, wall insulation, wall and ceiling paint, and plywood flooring.

**Community Center and Park** - The Robert D. Wilson Community Center, located on the waterfront on Beach Boulevard, also sustained substantial damages from Hurricane Sandy, resulting from storm surge, winds, and heavy rain. Nine inches of water flooded the main floor, consisting of a community room, kitchen, library, storage room, entry area, restrooms, and a janitor's closet. The storm also ruined much of the interior and its contents, including carpeting, floor tiling, base wall molding, wall insulation, doors, toilet partitions, counter tops, a hot water heater, toilets, sinks, air conditioning units, among others. Eleven cubic yards of sand were deposited in the building as well. In addition, the park at the Community Center faced damages to the wood mulch, jungle gym, and tennis court subsurface. As a result of damages to the building, the Center remains vacant and is in need of significant repairs.

**Residential** - Approximately 40 percent of Highlands Borough's homes have been identified by the Borough Construction Official as severely damaged after Hurricane Sandy. Many of the homes are also listed on the 2011 Repetitive Loss List. The subject properties regularly become inundated with water due to street flooding, which created public health hazards, causes loss of use and income, property damage, and creates extra expenses for the property owners to pay National Flood Insurance Program (NFIP) premiums.

Paradise Trailer Park, a three-acre enclave of 58 mobile homes and 3 stick-built homes located in the lower portion of the Borough, was also destroyed. Dozens of families from the borough were evacuated to the military base at Fort Monmouth, where they remained more than a year later.

In the months following Hurricane Sandy, the New Jersey Department of Community Affairs compared 2011 American Community Survey 5-Year Survey Data and FEMA Individual Assistance Data (effective March 12, 2013) with observed storm-related damage in order to identify damages and to determine the most efficient use of Community Development Block Grant Disaster Recovery (CDBG-DR) funds. This effort resulted in the completion of a Statewide CDBG Disaster Recovery Action Plan.

The CDBG Disaster Recovery Action Plan identified the census tract in Highlands Borough (census tract 34025800100) where homes sustained "severe" or "major" damage according to classifications made by HUD. This does not include dwelling units that sustained minor damage, which was far more common. This census tract has 2,455 households, and 40% of these households faced severe or major damage.

As a result of the destruction and damages mentioned above, Highlands Borough faces a significant financial burden. The Borough as a whole has sustained a 4.7% loss in home values, where 2012 Borough-wide pre-Sandy assessed values were at \$606,348,709, and the reduction in assessed values due to Sandy was \$28,265,700. Nine hundred and forty-one properties had their property values

reduced due to damages from Hurricane Sandy, thereby reducing the tax revenue to the Borough, school districts and County.

### **Damages to Parks**

Hurricane Sandy also caused substantial damage to Highlands Borough's parks. At the Veteran's Waterfront Park, located near the intersection of South Street and Bay Avenue, the boardwalk was destroyed by the storm surge, including the octagonal-shaped and hexagonal-shaped areas, and the connecting walkway. The concrete walkways were also undermined. Other areas of the park that experienced damages include: the concrete seawall, the electrical system and enclosure, the 14 underground lights for the monument, and the wood mulch at the playground area.

Huddy Park, located on Waterwitch Avenue between Bay Avenue and Shore Drive, faced damages to two electric enclosures with 20 circuit breakers each, one timer, two twist lock 20 amp receptacles, and one meter. In addition, the wood mulch at the playground area was contaminated with floating debris. The damage to the park adjacent to the Robert D. Wilson Community Center was previously noted.

### **Impacts on Households and Most Vulnerable Households**

A recently-completed analysis by Rutgers University revealed that Highlands Borough lost power for 12 days and that the amount of lost wages of residents totaled over \$17,800,000. Moreover, the analysis identified the impact of Sandy on the most vulnerable households (defined as "those working families that do earn enough to afford a basic household survival budget", or so-called ALICE<sup>4</sup> households). Highlands was among the top 30 municipalities in the state for Sandy's impact on these households. These households experienced total lost wages in excess of \$1,500,000 from the storm. In addition, 70% of these households did not have property insurance, further exacerbating Sandy's impact. According to Rutgers data, these vulnerable households only received an average of \$3,770 in FEMA Individual Assistance funds.<sup>5</sup>

### **Post-Storm Issues**

Hurricane Sandy created and exacerbated a host of issues. The storm reaffirmed the Borough's vulnerability to flooding and storm surge from the Sandy Hook Bay, and highlighted the vulnerability of Borough infrastructure including its electric, natural gas and telecommunications systems. Extensive infrastructure damage inhibited post-storm recovery efforts, hindered emergency communications and operations, and disrupted essential utility services including stormwater and sanitary sewer pump stations. The Borough continues to experience difficulty in providing services to residents, primarily because it is forced to operate from temporary and decentralized offices. These facilities also remain in locations that are vulnerable to coastal storms and flooding.

The Borough's administrative capacity continues to be stretched by an increase in both building/construction and zoning permit applications since Hurricane Sandy. Before the storm, the Borough's five year average for zoning permit applications was approximately 59 per year. From November 1, 2012 to December of 2013, over 129 applications were filed. The Borough's projection of applications anticipated to be filed for 2014 is 130, a 45% increase from the Borough's pre-Sandy average. Construction permits for 2012 stood at 147, and at 659 for 2013. More discussion on the impact from Sandy on Borough administrative staff is found in Chapter 3, under impact on government services.

---

<sup>4</sup>ALICE - Assisted Limited Income Constrained, Employed

<sup>5</sup> Halpin, Stephanie Hoopes; The Impact of Hurricane Sandy on New Jersey Towns and Households; Rutgers School of Public Affairs and Administration; n.d

Prior to the storm, the Borough was experiencing declining economic vitality. Hurricane Sandy exacerbated this vulnerability because it displaced residents and destroyed buildings and businesses. The impacts of the storm also highlighted the vulnerability of the Borough's commercial district to flooding.

Following the storm, the Borough's Police Department was involved in extensive emergency protective measures, search and rescue activities, communicating public safety messages, and emergency evacuation of over 100 residents that were endangered by the storm. Post-storm, the Highlands Elementary School served as the emergency command center and provided shelter for emergency responders. Residents requiring assistance were originally sheltered at Henry Hudson Regional High School, but then moved to the Atlantic Highlands Field House Shelter.

### **Long-Term Recovery Efforts**

The State of New Jersey invited FEMA's Long-Term Community Recovery team to assist the Borough in completing a strategic recovery plan, which involved over 1,000 volunteer hours by Highlands residents, business owners, and partners. These efforts resulted in the creation and endorsement of the Highlands Long-Term Community Recovery Plan. This Plan establishes recommendations for projects that are intended to revitalize the Borough and help residents and business owners recover from the impacts of flooding. In addition, the Borough is collaborating with Monmouth County in the development of a county-wide Multi-Jurisdictional Hazard Mitigation Plan. The Borough has also entered into an agreement with New Jersey Future, a state-wide non-profit planning organization, which has provided a Local Recovery Planning Manager who will work directly with Borough staff for up to 18 months to assist the community to plan, manage and implement recovery strategies.

Highlands Borough has also applied for FEMA Public Assistance Grants to fund repairs and improvements to: the Borough's community center; Fire Department; Public Works facilities; Borough parks; and pump stations. These funds are also being used to establish temporary Borough offices (for municipal functions and Police Department activity) and for debris removal

### **Enhancing Resiliency and Public Safety and Stimulating Revitalization**

Hurricane Sandy highlighted the Borough's vulnerability to storm events and the need to strengthen critical infrastructure and post-storm emergency response and communications. The Borough recognizes a need to develop backup systems and protocols to ensure that critical infrastructure and emergency communications systems remain in operation. This may involve the installation of redundant infrastructure and communications equipment and the development of plan to minimize communications interruptions during emergency events.

The Borough also recognizes the importance of increasing resiliency as it relates to the protection of public and private property. Developing strategies to promote resiliency for private property is integral to revitalizing the local economy and continuing Borough-wide recovery efforts. To this end the Borough recognizes the need to harden existing infrastructure including bulkheads and pump stations. The Borough also acknowledges the need to reevaluate existing zoning and land use regulations to integrate resiliency measures in reconstruction and rebuilding, which may involve redevelopment planning, community education and outreach, and acquisition of frequently flooded properties.

## Chapter 3 Risk Assessment

### Introduction

Over the past nine years New Jersey has experienced eleven flood-related events that were declared Federal Disasters by the President of the United States. Currently there is consensus among numerous scientifically-based studies that the state can expect to experience an increasing rate and intensity of storms in the foreseeable future<sup>6</sup>. Given New Jersey's settlement patterns, with extremely high-density residential and commercial development along its coastal fringe, and in light of the economic return the state depends upon from tourism at the shore – approximately \$35.9 billion of state GDP in 2013, or 6.9% of the state's economy<sup>7</sup> - it's particularly important to evaluate the **potential** risk and vulnerabilities inherent in exposure to such storms. The extent of vulnerability has considerable consequences for the health of the state's residents, ecosystems, natural and built environments. And understanding risk is particularly important in guiding rebuilding and recovery strategies and financial investment.

The technical definition of the term "**risk**" is expected future losses; **vulnerability** is the tendency of something to be damaged when exposed to a hazard and **exposure** is the value of structures and number of people exposed to hazards. This assessment is intended to provide a basis for Highland Borough's recovery and mitigation strategies by evaluating vulnerability and quantifying exposure.

This chapter will present information on the type of hazards that coastal towns like Highlands face, as well as its vulnerability and potential impacts from those hazards.

### The hazards that Highlands and the New Jersey coast face

A report published by Kenneth Miller and Robert Kopp, of Rutgers University indicates that over the past century, sea levels along the New Jersey coast have risen at a rate of approximately 3.8 mm (.15 inches)/year, roughly half of which is attributable to geological factors related to land subsidence. This rate has gradually accelerated into the current century.<sup>8</sup> According to Kopp, 70,000 more people were affected by Hurricane Sandy in the NY/NJ area due to sea level rise (SLR) than would have been the case had there been no such increase<sup>9</sup>. Rising sea levels will likely mean permanent inundations of areas that currently are frequently flooded and frequent inundations of areas that only episodically flood currently.

Permanent inundation from sea level rise is only one of the hazards that climate change presents to New Jersey's coastal property and infrastructure. Higher average sea levels lead to higher storm surges and increased flooding risks<sup>10</sup>, even if the intensity or frequency of storms remains unchanged<sup>11</sup>. Kemp and Horton (2013) found that, while the record 13.9 foot storm tide in New York Harbor during Hurricane Sandy was primarily due to the coincidence of the strongest winds with high tide, SLR driven

---

<sup>6</sup> See "What We Know, The Realities, Risks And Response To Climate Change", American Association for the Advancement of Science, 2014. "Climate Change 2013, The Physical Science Basis" Intergovernmental Panel on Climate Change. Climate Change 2014, Impacts, Adaptation and Vulnerabilities", Intergovernmental Panel on Climate Change. "State of the Climate, New Jersey", 2013, Rutgers Climate Institute.

<sup>7</sup> The figure represents direct, indirect and induced impacts. Source: "The Economic Impact of Tourism in New Jersey, Tourism Satellite Account, Calendar Year 2013", Tourism Economics

<sup>8</sup> "A Geological Perspective On Sea-Level Rise and Its Impacts Along the U.S. Mid-Atlantic Coast", K. G. Miller, R.E. Kopp, B.P. Horton, J.V. Browning, A. C. Kemp, AGU Publications, Department of Earth and Planetary Sciences, Rutgers University, 5 Dec. 2013

<sup>9</sup> Robert Kopp interview, WHYY "Radio Times" interview, July 1, 2014

<sup>10</sup> Frumhoff et al. 2007

<sup>11</sup> Frazier et al. 2010

by historical climate change added more than one foot to that 13.9 foot total<sup>12</sup>. The impact of climate change on flooding during coastal storms is greater and more immediate than the impacts of inundation from gradually rising sea levels<sup>13</sup>. Potential damage of flooding from hurricanes and Nor'easters is projected to increase by 14%-36% in New Jersey by 2030, due to sea level rise. By 2100, it is predicted that damage from these storms will increase 200-400%<sup>14</sup>.

Another anticipated impact of climate change is increasing storm intensity. Recent research indicates that New Jersey is receiving more of its annual precipitation from intense storms than it has in the past<sup>15</sup>, as has the northeastern US in general<sup>17</sup>. This increases the risk of flash floods, urban flooding, and coastal flooding, which are all closely tied to heavy precipitation events<sup>18</sup>.

Over the longer term, there has been an upward trend in annual precipitation in New Jersey. Since 1895, annual precipitation has increased at a rate of 4.1 inches (or about 9%) per century. It's important to note, however, that the decade-to-decade variability in annual precipitation is quite large and can overwhelm any long-term trends.<sup>19</sup> It is anticipated that this trend will continue. As noted in a 2013 report on climate change: *"Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent by the end of this century, as global mean surface temperature increases."*<sup>20</sup>

### Vulnerability and Exposure

The purpose of a risk assessment is to evaluate vulnerability to likely hazards and to identify and prioritize those actions that most effectively reduce or avoid future losses. As mentioned previously, the most significant hazard faced by Highlands is flooding, which is caused by SLR, extreme rainfall events, storm surge, or all three. This section of the SRPR is divided into two parts - a Vulnerability Assessment and an Estimation of Exposure.

### Vulnerability

In this section, various factors of vulnerability to flooding from future storm events are examined including:

- The extent of the Borough's flood zones;
- The amount Federal disaster recovery assistance that has been made available to the municipality and individual property owners to address damage from prior hazards the Borough has experienced;
- The relationship of the location of community facilities and infrastructure and flood zones;
- The relationship of the Borough's zoning districts and its flood zones;
- The number and location of socially vulnerable populations; and
- Impacts to the local economy, public health, demand for government services, and community cohesion

---

<sup>12</sup> American Climate Prospectus, Economic Risks in the US, 2014

<sup>13</sup> Ibid

<sup>14</sup> Ibid

<sup>15</sup> "Adapting to Climate Change" webinar, Duke Farms, June 24, 2014

<sup>16</sup> Leichenko, McDermott, Bezborodko, Brady and Namendorf; Economic Vulnerability to Climate Change in Coastal New Jersey: A Stakeholder-Based Assessment; Journal of Extreme Events, Vol 1 No 1, June 16, 2014

<sup>17</sup> Rutgers Climate Institute; "State of the Climate, New Jersey, 2013"; Rutgers Climate Institute

<sup>18</sup> American Climate Prospectus, Economic Risks in the US, 2014

<sup>19</sup> Rutgers Climate Institute, op cit

<sup>20</sup> Alexander, L., and Coauthors, 2013: Summary for policymakers. Climate Change 2013: The Physical Science Basis, Working Group I Contribution to the IPCC Fifth Assessment Report, available online at [climatechange2013.org/images/uploads/WGIAR5-SPM\\_Approved-27Sep2013.pdf](http://climatechange2013.org/images/uploads/WGIAR5-SPM_Approved-27Sep2013.pdf).

## 1. Flood Zones

The Federal Emergency Management Agency (FEMA) defines flood zones as geographic areas subject to varying levels of flood risk and types of flooding. These zones are delineated on Flood Insurance Rate Maps (FIRMs) and Flood Hazard Boundary Maps (FHBM). In February, 2014, FEMA released Preliminary Flood Insurance Rate Maps (PFIRMS) for Monmouth County, which are the first step in the official regulatory process to update the FIRMs. The data presented in the maps that follow are from PFIRM maps.

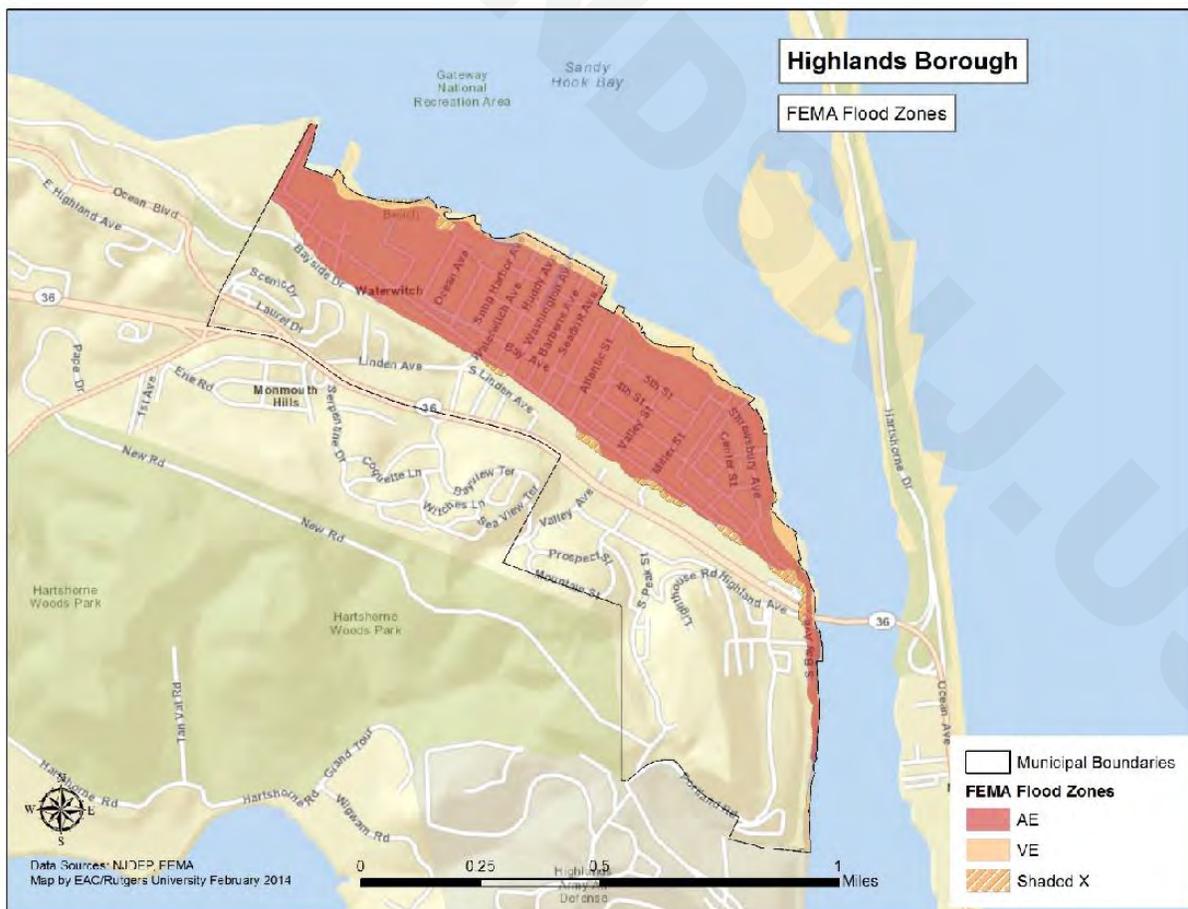
FEMA delineates four different flood hazard areas:

- Special Flood Hazard Areas – High Risk;
- Coastal High Hazard Areas – High Risk;
- Moderate and Minimal Risk Areas; and
- Undetermined Risk Areas.

Each of these areas has an associated series of flood zones defined by FEMA and presented in **Appendix 1: Flood Zones Definitions** of this report:

In total, slightly more than 51%, or just over 282 acres of the area of the Borough, is located within a Special Flood Hazard Area. The remainder of the Borough is either designated as a minimal risk zone or is outside flood zone boundaries.

**Figure 3: Highlands Borough FEMA Flood Zone**



**AE Zone:** Special Flood Hazard Areas (SFHAs) have a 1% annual probability of being inundated by flooding and structures located in these zones have a 26% chance of flooding within the life of a standard 30-year mortgage. These are areas of highest vulnerability to flooding inundation. The AE zone, one of two SFHA zones within the Borough, encompasses 33% (181 acres) of the total area of the municipality.

**VE Zone:** The Borough’s VE Flood Zone extends along the community’s coastal border between the ocean and the easterly boundary of the AE zone. In total, this zone covers more than 18% (101 acres) of the area of the Borough.

**X Zones:** The Minimal Risk X (shaded) Zone overlays more than 4 acres of the area of the Borough, in small pockets along the *southerly* boundary of the AE Zone. Areas mapped as “Unshaded X” are “Minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains.”<sup>21</sup>

**Table 2: Land Use Type By Flood Zone**

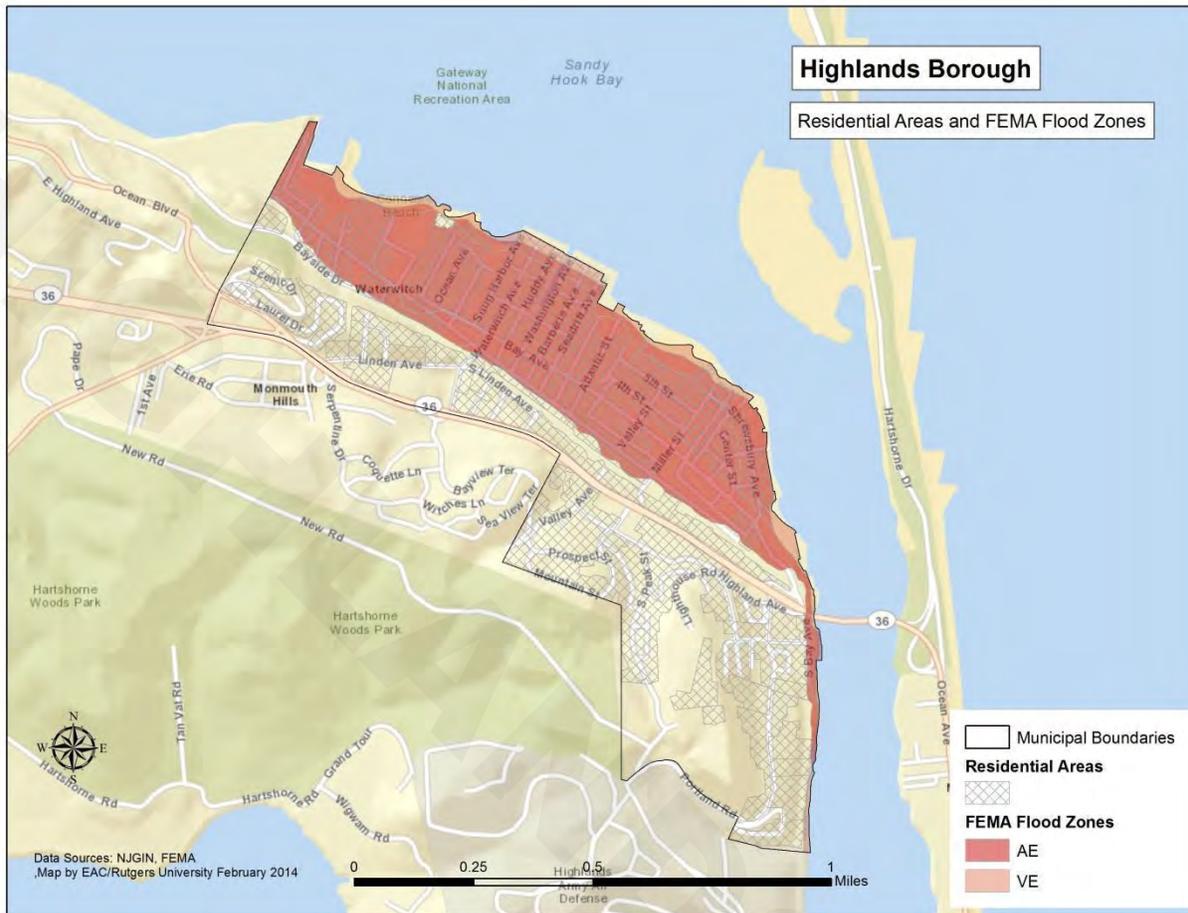
Land Use Type	Area (acres)	Area in AE Flood Zone	% in AE Flood Zone	Area in Flood Zone VE	% in VE Flood Zone	Area in Shaded X Flood Zone	% in Shaded X Flood Zone
Agriculture	0.0	0	0.0%	0	0.00%	0	0.00%
Barren Land	9.6	4.36	45.2%	5.26	54.59%	0.01	0.12%
Forest	62.3	1.25	2.0%	0.07	0.12%	0.11	0.18%
Developed	386.8	173.24	44.8%	6.71	1.73%	4.24	1.10%
Water	89.9	1.15	1.3%	88.78	98.72%	0	0.00%
Wetlands	1.5	1.02	67.9%	0.29	19.03%	0.05	3.21%
Total	550.1	181.02	32.9%	101.11	18.4%	4.41	0.8%

Over 32% of the Developed Area of Highlands Borough (180 acres) is located in AE, or VE FEMA flood zones. As noted above, these zones have the highest vulnerability to regular flooding inundation. **Figure 5** illustrates that 44.8% of the area zoned for residential development with the Borough (126.6 acres) is located within these zones. Over 96% of this residential area (122.8 acres) is located within the AE Flood Zone and the remainder, 3.78 acres, is located in the VE Zone. Residential areas in these highly vulnerable zones constitute over 23% of the total area of Highlands Borough. Homeowners in these areas are required to have flood insurance if they have a mortgage and they have a 26% chance of experiencing a flood over the course of a 30-year mortgage term<sup>22</sup>.

<sup>21</sup> ibid

<sup>22</sup> FEMA Map Service Center at <https://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA+Flood+Zone+Designations>

Figure 4: Residential Areas/FEMA Flood Zones



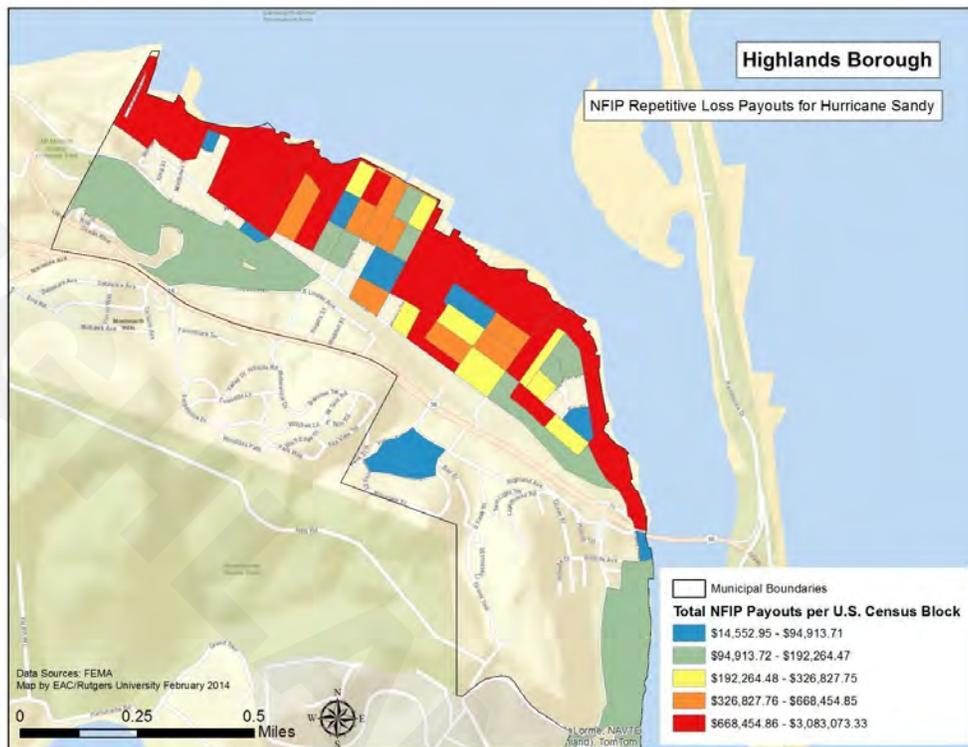
## 2. Federal Recovery Assistance

There are three principal sources of Federal assistance available to municipalities and individual property owners for disaster recovery. *It's important to note that all payout figures quoted below are provided at the census block group or tract level to ensure data anonymity.* Tables that reflect payouts per census block for damages relating to Hurricane Sandy for each Federal Assistance Source described below are included in **Appendix 6: Highlands Borough Hurricane Sandy Payouts per Census Block Group**.

### A. National Flood Insurance Program (NFIP)

The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the program. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding. NFIP classifies certain properties that have submitted claims to it on multiple occasions as “repetitive loss” properties. Information on payouts from Superstorm Sandy to repetitive loss property owners who had flood insurance is shown in Figure 6.

Figure 5: Repetitive Loss Payouts



According to the information on NFIP payouts in the Repetitive Loss database held by the state of New Jersey (which includes all properties classified as repetitive loss properties), as of October 2103, there were 219 repetitive loss claims payments totaling \$22,245,628 made to properties in Highlands, concentrated within the low-lying coastal areas of the Borough. This included 187 single-family severe repetitive loss property claims that totaled over \$15.6 million.<sup>23</sup> Not unexpectedly, an examination of the payout data maps reveals that several of the census block group areas where payouts were made in the Borough following Sandy were the same areas where payouts were made following Hurricane Irene, which occurred in August 2011, and a March, 2010 storm (titled “Storm #1897” by FEMA) which was declared a major disaster on April 2, 2010 (see **Appendix 7: Pre-Sandy Payout Maps**).<sup>24</sup>

#### B. Public Assistance (PA)

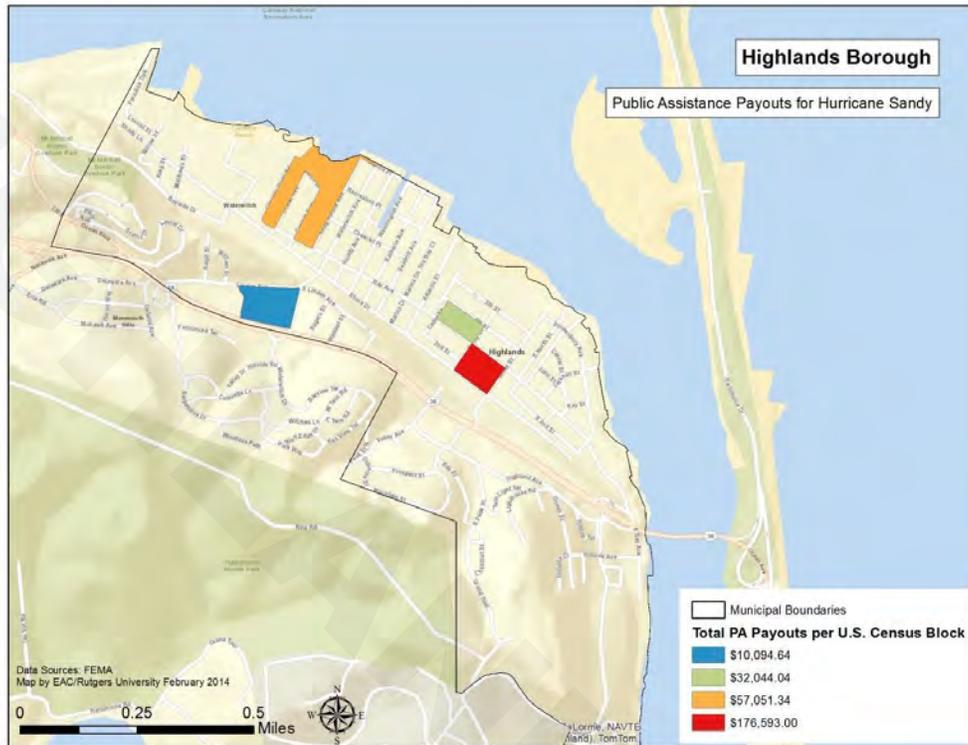
FEMA’s Public Assistance (PA) Grant Program provides assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. This program provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the

<sup>23</sup> *ibid*

<sup>24</sup> Storm Event # 1897 refers to the incident period of March 12, 2010 to April 15, 2010, a Nor’easter for which Governor Christie requested a declaration of Public Assistance for 12 counties on March 26, 2010 and for which President Obama declared a major disaster on April 2, 2010.

recovery process. Following Hurricane Sandy, there were a total of 6 public assistance grants made to the Borough for a total amount of \$275,783<sup>25</sup>.

Figure 6: Public Assistance Payouts

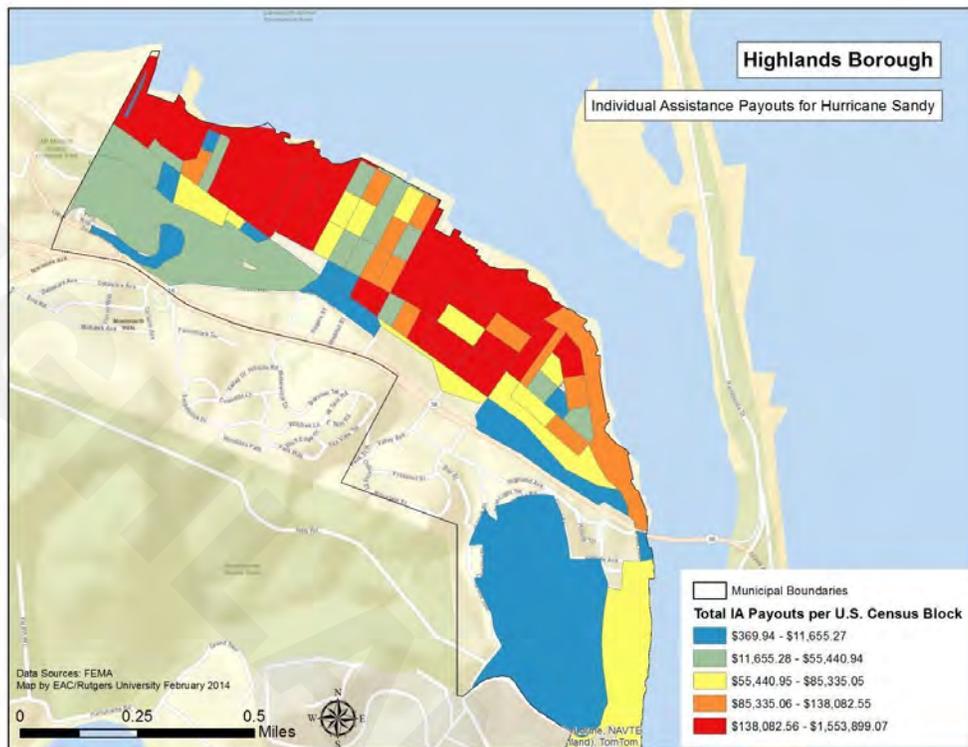


C. Individual Assistance (IA)

FEMA Individual Assistance (IA) program provides financial or direct assistance to individuals and families whose property has been damaged or destroyed as a result of a federally-declared disaster, and whose losses *are not* covered by insurance. It is meant to help meet critical expenses that cannot be covered in other ways. This assistance provides for temporary housing, repair or replacement of a primary residence that is not covered by insurance. Following Sandy, a total of 1,864 individual assistance payouts were made to qualifying individual and families living in Highlands, for a total payout of \$7,003,174. Payment amounts ranged from \$369 to \$1,553,899 per census block group, with an average payment per census block of \$3,757.

<sup>25</sup> FEMA map service, op cit

Figure 7: Individual Assistance Payouts



### 3. Critical Services and Infrastructure

Highland Borough's capacity to respond to severe storms and flooding events is, to a large extent, predicated on the extent to which these events are likely to impact critical infrastructure - such as evacuation routes – and emergency services – such as police and fire services. **Figure 9** shows the location of critical facilities throughout Highlands and their proximity to areas of probable inundation in the event of future storms. It should be noted that this map shows the previous location of the fire station (which was co-located in Borough Hall), and does not reflect the current location of the fire station, on Shore Drive.

Highlands has storm sewers and pump stations as part of its stormwater management system, and the entire municipality has central sewer service, connected to the Township of Middletown Sewerage Authority. Jersey Central Power and Light distributes electricity, natural gas is supplied by New Jersey Natural Gas.

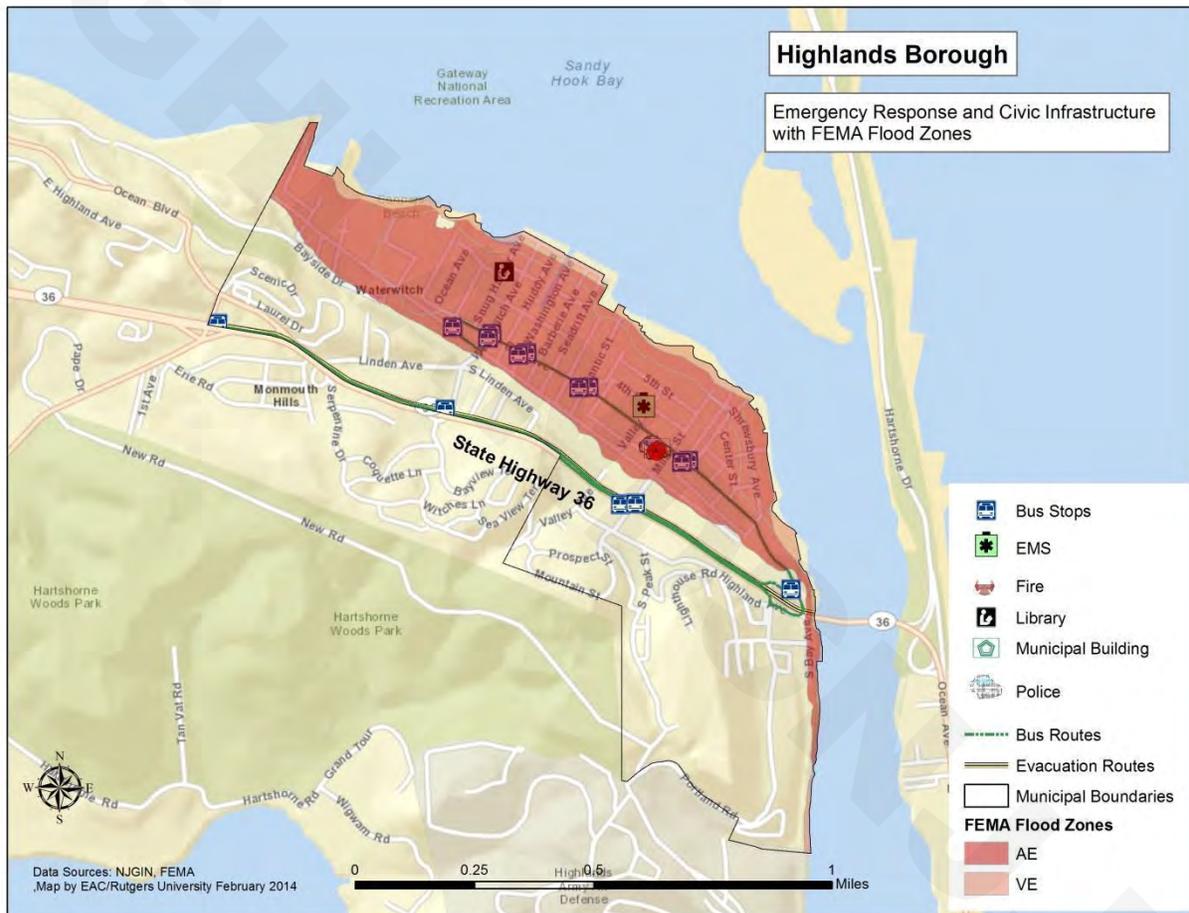
Pre-storm, the Borough had a municipal building with a police station, a community center/library, fire station, an EMS station, a public works building and a post office. There were 2 schools (Highlands Elementary and Henry Hudson Regional High School), and no hospitals, nursing homes, or prisons in the Borough. However, there is a senior housing building - Ptak Towers located on Shore Drive. Sandy significantly damaged the municipal building, community center/library, EMS station and public works buildings. More details on municipal facilities can be found in Chapter 2, Initial Impact Assessment.

Transit service is limited in Highlands. There are 2 bus lines that traverse the town, along Route 36 and Bay Avenue. New Jersey Transit operates one bus line, Route 834, which travels between Highlands and Red Bank, via Atlantic Highlands, Leonardo and Middletown, operating hourly during the weekday. This bus line terminates at Bay Avenue and Waterwitch Street and does not serve the Sea Streak ferry

terminal. Academy Bus Lines operates the second bus line and it links Highlands to the Port Authority in Manhattan. It generally runs twice an hour during AM peak hours and every 2 hours off-peak on weekdays and every hour on Saturdays. In addition, a privately run ferry, the Sea Streak, runs between Highlands and Manhattan, providing limited service during the AM peak, and generally hourly service during the remainder of the day.

According to the Monmouth County Sheriff's office, there are 2 evacuation routes from Highlands, both along NJ Route 36, one towards the west and Atlantic Highlands, and other towards the east and south towards Sea Bright and Long Branch.

**Figure 9: Infrastructure and Flood Zones**



**Figure 9** shows that the AE and VE Special Hazard Flood (1% annual flood risk) Zones run along the coast of the Borough extending from the Borough's western border with that Atlantic Highlands to the south-easterly border with Sea Bright Borough. The map indicates that the AE zone extends inland through the Borough, generally following and overlapping either side of Shore Drive. The AE and VE flood zones overlap a section of Bay Avenue that extends under the Route 36 Bridge, which crosses the Highlands Reach of the Navesink River. Consequently access to the bridge is likely to be impeded from Bay Avenue at this point during flooding events. This is significant because Route 36 is Highlands's principal east/west evacuation route. In addition, the following facilities and services are within the AE Zone:

- 10 bus stops and 1.84 miles of the Bay Avenue bus route:
  - Bay Ave at North Avenue (2 stops)

- Bay Ave at Atlantic Street (2 stops)
- Bay Ave at Washington Avenue (2 stops)
- Bay Ave at Waterwitch Avenue (3 stops)
- Shore Drive at Central Avenue
- The Highlands First Aid Squad at 32-34 Valley Street
- The Highlands Public library at 22 Snug Harbor Avenue
- The Borough’s Municipal building and Police Department located at 171 Bay Avenue<sup>26</sup>

As is evident from **Figure 9**, several roadways, either segments or entire lengths, are within flood hazard areas. A list of the names of these roadways is provided in **Appendix 8: Roadways within AE and VE FEMA Flood Zones**.

#### 4. Zoning and Land Use

A municipality’s zoning regulations determine where certain land uses will occur, and how buildings will be configured on lots within a range of use zones. For generations New Jersey’s coastal communities have permitted relatively dense residential and commercial development patterns within close proximity to coast lines to take advantage of the attractive and unparalleled natural resource of the state’s shore areas. This development has largely occurred without regard to exposure to storms and flooding. However, as sea levels rise and the probability of more intense and frequent storm events increases, it will be necessary to evaluate the extent to which these historic development patterns put people and property in increasing jeopardy and consider alternatives to minimize or avoid such risk.

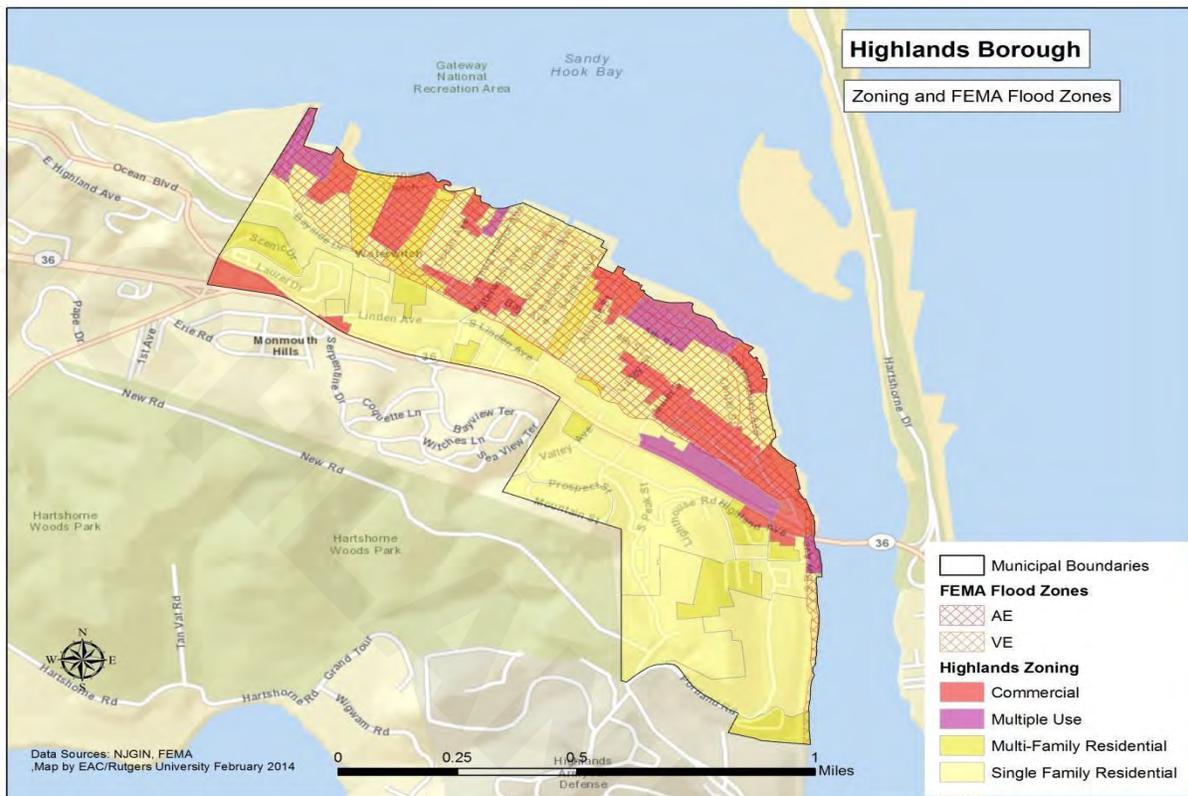
**Table 7, Zoning District in Flood Zones**, reveals that substantial portions of Highlands Borough’s zoning districts are located within FEMA flood zones. Overall, 75% (414 acres) of the area of the Township are zoned for some form of residential use. A total of 81% (337 acres) of areas zoned for residential uses are located within the AE or VE flood zones. Of the 150 acres of the Township that are zoned for commercial activity, 81% (121 acres) is located within the AE or VE flood zones and 95% of the Township’s 18.8 acre Central Business District (17.9 acres) is located within the AE flood zone.

**Table 3: Zoning Districts in Flood Zones**

Zoning District	AE	VE	X Shaded	X unshaded	Total
Business			2.4		2.4
Central Business	17.9		0.1	0.8	18.8
Highway Oriented			5.6		5.6
Low Density Single Family Residence			0.0		0.0
Medium Density Single Family Residence			0.0		0.0
Mixed Use	6.2	0.3			6.5
Mobile Home			13.4		13.4
Multifamily Residential	19.2	10.8	35.7	1.2	66.9
Neighborhood Business	6.9		0.1		7.0
Professional Business	0.2		10.3	0.3	10.8
Single Family Residential	90.7	26.1	193.9	1.3	311.7
Waterfront Commercial	25.9	41.6	2.0	0.9	70.4
Waterfront Transitional Commercial	7.2	7.3		0.0	14.5
Waterfront Transitional Commercial/Townhouse	3.7	10.0			13.7
Waterfront Transitional Residential	3.3	4.8			8.1
<b>Grand Total</b>	<b>181.0</b>	<b>101.0</b>	<b>263.6</b>	<b>4.4</b>	<b>550.0</b>
Central Business Overlay	12.6				12.6
Neighborhood Business Overlay	5.0		0.1		5.0

<sup>26</sup> The Borough’s Fire Station was relocated shortly before Hurricane Sandy and is now located at 17-1 Shore Drive

Figure 8: Zoning/FEMA Flood Zones



## 5. Socially Vulnerable Populations

The preceding analysis speaks to the vulnerability of the built environment in Highlands, however, the vulnerability of the residents and their social environment must also be considered. Social vulnerability can be defined as: *“the susceptibility of social groups to potential losses from hazard events”*<sup>27</sup> Research has shown that certain social, demographic, economic, and housing characteristics influence a community’s ability to respond to, cope with, recover from and adapt to natural hazards<sup>28</sup>. This may be due to relative wealth and access to resources, insurance, family care responsibilities, ability to move out of harm’s way, and/or lack of information. Research focused on social vulnerability in New Jersey has identified the most significant characteristics as: low socioeconomic status, race and ethnicity, linguistic isolation, low educational attainment, gender (female), age (the very young and very old), compromised health and cognitive constraints, family structure (single parents and/or high number of dependents), housing tenure (renters) and occupation (service sector)<sup>29 30</sup>

A review of census data for Highlands Borough reveals that there are significant concentrations of these more vulnerable groups in the lower parts of town. In particular, census block groups 1, 2, 3 and 4, all located north of Route 36, contain populations that are more vulnerable to hazards such as sea level rise and coastal flooding.

<sup>27</sup> Bickers, Kelly M., Vulnerable Populations to Climate Change in New Jersey, Rutgers Univ, Feb 2014

<sup>28</sup> University of South Carolina, Hazards and Vulnerability Research Institute, <http://webra.cas.sc.edu/hvri/products/sovifaq.aspx>

<sup>29</sup> Vickers, op cit

<sup>30</sup> University of South Carolina, op cit

Figure 9 Census Block Group Map



Median household income in these 4 block groups range from less than \$32,610 to \$77,043 (Census, from [www.policymap.com/tables](http://www.policymap.com/tables)), well below the County’s median income figure of \$84,746. Single parent households total 143 households (Census 2010), there are 477 people over the age of 65, 206 people under the age of 5 and there are 870 year-round rental units in this area (Census 2010). Moreover, the one senior citizen housing development in the Borough, Ptak Towers, which has 97 apartment units, is located at the edge of the FEMA AE Zone at 215 Shore Drive. It should be noted that Shore Drive in this part of the Borough is within the AE Zone and thus susceptible to flooding from a 1% annual chance flood.

Recent research focusing on Sandy impacts found that, due to insufficient insurance coverage and lack of personal financial assets, middle income homeowners are another socially vulnerable group.<sup>31</sup> 2010 census data reveals that there were 1,027 homeowners in the 4 block groups north of Route 36. Based on median income data mentioned above, it is assumed that significant numbers of these families are middle-income homeowners.

### Potential Impacts

The potential impacts from sea level rise, higher storm surges and more intense storms can be grouped into 2 broad categories: primary impacts and secondary impacts. Primary impacts are the direct result of the events; secondary impacts are those that are subsequently experienced by the community.

### Primary Impacts

The immediate effect of sea level rise, higher storm surges and more intense storms may include:

- loss of land and wetlands from inundation
- loss of buildings and infrastructure from inundation
- loss of power/power interruptions from storms
- decreased usability of structures due to flooded access roads and supporting infrastructure

<sup>31</sup> *ibid*

- increased structural damage from repetitive storm damages

### Secondary Impacts

Although termed “secondary impacts”, the impacts discussed below can have significant and long lasting effects on a community, as Highlands has seen with the aftermath of Hurricane Sandy. These secondary impacts may include economic, health, community cohesion and governmental service effects.

#### *a. Economic Impacts -Tourism, Bay Ave businesses and water dependent businesses*

In general, coastal areas are important to the local economy because they tend to contain numerous natural and man-made resources. However, recent reports on climate change caution that: “*Tourism, aquaculture, fisheries, ... recreation, and infrastructure will all be strongly affected by the effects of rising sea levels*”<sup>32</sup> Highlands is no exception, its economy is highly dependent upon the water and its beaches, whether it is retail services catering to visitors, marinas, or fishing. According to pre-Sandy ESRI data, retail is Highlands’ largest employment sector, with 135 employees, accounting for nearly 14% of the Borough’s total employment. Estimates from ReferenceUSA show that prior to Sandy there were 18 restaurants, and 9 marinas in the town.<sup>33</sup>

Most Borough employers are very small firms. According to data from ReferenceUSA , of the 234 companies in Highlands, 146 employ 4 or fewer employees<sup>34</sup>. Typically, small businesses have fewer resources than larger companies and are thus are likely to be more vulnerable to disruptive impacts of SLR and extreme weather events. In addition to typical issues associated with loss of property and contents, severe storms are likely to cause prolonged business interruption and disrupt supply chains linked to the affected businesses. Power outages from extreme events not only directly affect business operations, but also cause a drop in demand as customers are also without power and thus unlikely to shop.<sup>35</sup>

Highlands Borough’s recent experience with Hurricane Sandy demonstrated the effects of extreme weather events. There was extensive storm damage to Bay Avenue, Highlands’ main business district. According to local reports, 14 restaurants along the street were forced to close due to the storm surge and resultant flooding, six have not re-opened.

Research also shows that bay-oriented businesses, such as those in Highlands, are particularly vulnerable<sup>36</sup> to severe storms which tend to damage to shore access points, piers and other shore infrastructure and result in beach closure.<sup>37</sup>

The adverse effect of SLR and extreme weather events on regional tourism are likely to have negative impacts on Highlands’ economy, in part due to its proximity to the National Gateway Recreation Area – Sandy Hook Unit and the millions of visitors that travel there annually. In Monmouth County, tourism spending in 2013 amounted to over \$2.2 billion, with \$433 million spent on lodging, \$573 million on

---

<sup>32</sup> Nicholls, R.J., P.P. Wong, V.R. Burkett, J.O. Codignotto, J.E. Hay, R.F. McLean, S. Ragoonaden and C.D. Woodroffe. “[Coastal systems and low-lying areas.](#)” In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds. (Cambridge, UK: Cambridge University Press, 2007): 315–356

<sup>33</sup> ReferenceUSA, <http://www.referenceusa.com/>

<sup>34</sup> *ibid*

<sup>35</sup> Leichenko, et al, *op cit*

<sup>36</sup> *ibid*

<sup>37</sup> *ibid*

food and beverages, \$417 million on retail goods, and \$489 million on recreation. In addition, tourism employed 21,000 people in Monmouth County in 2013.<sup>38</sup> But rising sea levels, more intense storms and subsequent flooding are likely to discourage visitors who might otherwise travel to the bay and ocean and frequent the Borough's restaurants. Recent research in nearby Ocean County confirms that tourism activities are highly vulnerable to extreme weather events.<sup>39</sup>

*b. Public Health impacts*

Storm surges and other flooding events can cause injury and death and have significant public health impacts. They can also generate a host of more persistent environmental health hazards, including bacterial, fungal and chemical contamination of drinking water sources, sewage and solid waste system disruption, hazardous materials releases, and increased or displaced populations of insects, rodents and other disease vectors. During and after floods, the imperative to restore impacted areas as quickly as possible can interfere with efforts to identify and address less obvious problems, such as newly contaminated soil or housing. Recovery can be further hampered by gaps in understanding risk factors and treatments for post-flood disease outbreaks.<sup>40</sup>

The May 2013 edition of NJ Monthly described some of the nearby (and upstream) environmental impacts from Sandy: *"The storm surge overwhelmed berms near industrial sites and carried oil into nearby waterways, including Raritan Bay. Two 3.15 million-gallon-capacity tanks at the Motiva petroleum storage facility in Sewaren, for instance, were damaged during the storm. The surge then flooded the gravel-lined containment area around the tanks that was meant to contain spills. Wastewater treatment facilities also flooded and in some cases were knocked off line, sending millions of gallons of raw sewage into the Raritan River and other waterways that drain into the bay."*<sup>41</sup>

Mental health impacts from a catastrophic flood event are also a significant risk. Extreme weather events act as repetitive stressors and more frequent storms and floods are likely to lead to increased incidence of mental health disorders - particularly anxiety, depression, and post-traumatic stress - which communities are often unprepared to address.<sup>42</sup> The Monmouth County Long Term Recovery Group, which has been established to provide direct counseling and social services for victims of Hurricane Sandy, is an acknowledgement of the potential for these outcomes.

*c. Community cohesion*

Flood and storm damage can lead to temporary or permanent loss of services and amenities - hospitals; clinics; community, senior and day care centers; schools; and recreational open space. Highlands experienced just this type of impact from Sandy when the Robert Wilson Community Center (which included a small library) was damaged and rendered uninhabitable. In many cases, communities have invested considerable time and energy to secure these amenities, and their full value may not be reflected in typical vulnerability assessments. Such losses degrade the quality of life for shoreline communities.

Other, more subtle losses that affect a community's ability to recover from flooding may have pronounced long-term consequences. Community cohesion and identity are important indicators of overall community resilience. Communities that have overlapping social networks, organizations that

<sup>38</sup> Tourism Economics, *The Economic Impact of Tourism in New Jersey*

<sup>39</sup> Leichanko, et al; op cit

<sup>40</sup> New York State Sea Level Rise Task Force, Report to the Legislature DRAFT, Nov 2010

<sup>41</sup> <http://njmonthly.com/articles/jerseyshore/down-by-the-bayshore.html>

<sup>42</sup> NJ Climate Adaptation Alliance, *A Summary of Climate Change Impacts and Preparedness Opportunities for the Public Health Sector in New Jersey*, March 2014

work together, and community members who are involved in decision-making, have greater ability to plan for and cope with natural or human-made disasters. The sense of community cohesion and identity can be seriously undermined when treasured commercial streets, landmarks, historic sites, heirlooms, tourist attractions or traditions are lost or altered. Losses of this kind cannot be gauged by simple monetary replacement costs.<sup>43</sup>

#### *d. Impact on government services*

A less-studied impact of extreme weather events relates to the subsequent demand for local government services. Many municipal governments, including Highlands, are stressed by tax-base losses, damage to public facilities and increased demand for services.<sup>44</sup> Hurricane Sandy's created immense demand for emergency services and public safety. And the Borough also faced considerable organizational challenges as government officials were overwhelmed by a surging demand for building permits, expedited planning and zoning board decisions, and other construction-related permitting. Increased coordination with federal and state government agencies was also required, as improvements to Borough infrastructure and buildings were undertaken using federal funds requiring Borough staff to negotiate entirely unfamiliar federal rules and procedures.

A less-obvious impact on government services relates to the day-to-day interactions between residents, businesses and the municipal staff. As recovery commenced people and businesses seeking resources and/or resolution to the myriad issues they faced continually called for answer from municipal offices, despite the fact that the municipality often did not possess the requested resource or resolutions. These demands consumed substantial amounts of staff time, and considerably increased stress as administrators attended to day-to-day work tasks, while attempting to address residents' and businesses' frustrations with levels of governmental entities entirely outside their control.

#### **Estimation of Exposure**

This section of the analysis estimates the value of properties potentially exposed to flooding and sea level rise. It's important to stress that ***the data presented herein are intended for planning purposes only***. In order to assess the extent to which the Highlands Borough is exposed to future flood inundation and storm surge it's necessary to evaluate the probable impacts of near-term sea-level rise for the community. An evaluation for the year 2050 is particularly informative because of the extent of possible impacts of predicted sea-level elevations by that time period. Figure 10 illustrates that these impacts will occur in what is presently the most densely populated residential portions of the Borough.

In estimating the extent of the Borough's future exposure to flood inundation it was necessary to perform a detailed geographic analysis of the community. This analysis began with a determination of the current mean higher high water (MHHW) tide levels at the Borough's coast. MHHW is a measure of the higher of the two high tides that occur each day, averaged over a 19-year period.<sup>45</sup> Once the MHHW was established, it was necessary to determine the extent to which areas within the Borough would be

---

<sup>43</sup> New York State Sea Level Rise Task Force: "Report to the Legislature, DRAFT, Nov 2010"

<sup>44</sup> Leichenko, et al, op cit

<sup>45</sup> The MHHW is the average of all high water heights observed over the National Tidal Datum Epoch - the specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for tidal datums. For the Borough of Highlands, the mean higher high tide was derived from the National Oceanic and Atmospheric Administration vertical datum transformation tool. The higher high tide extent is interpolated from regional tidal stations and is dynamic along the shoreline.

subject to flooding under various future scenarios – for the purpose of this assessment, predicted sea-level rise for 2050 was used, consistent with the Miller and Kopp report.<sup>46</sup>

The next step of the risk assessment was to evaluate specifically which parcels within the Borough were likely to be affected under the 2050 sea-level rise scenario. This was accomplished by joining inundation data with the most current MOD-IV property tax information published by the New Jersey Division of Taxation and comparing the parcel boundaries to the boundaries of the FEMA flood zones as shown in the Preliminary FIRM data released on January 31, 2014. Only parcels with 10% or more inundation were included in this parcel-level calculation, under the assumption that if a parcel was less than 10% inundated it is not likely to experience significant structural damage.

Joining the property tax information and the inundated parcels enabled an assessment of probable damage at the parcel level, under the 2050 sea-level rise scenario<sup>47</sup>, by comparing the predicted depths of inundation throughout the Borough. The scenarios were modeled using 1-meter Digital Elevation data derived from LiDAR (Light Detection and Ranging – a remote sensing technology) collected in 2006. The output from this step was further refined through the application of depth damage curves, which are used to estimate the percentage of structural damage based on relative flood elevation<sup>48</sup>. A critical assumption in the procedure is that all structures were at grade, in other words, elevated structures were treated as if they had not been raised. The percentage of structural damage was then applied to the total assessed value of the structure occupying the subject parcel to derive a total structure damage value per parcel. These values were then aggregated according to MOD-IV property class.<sup>49</sup>

*A. Exposure Analysis: 2050 Sea Level Rise Scenario*

**Tables 4, 5 6** and **7** were developed in accordance with the procedure outlined above and provides a breakdown of exposure value of inundated parcels under the 2050 sea-level rise scenario.<sup>50</sup> It should be noted that, in addition to the improvement value (value of structures) the total land value associated with the inundated parcels is presented in the table. It is possible that structures could be constructed over properties regularly inundated by flood water, but owners of such structures would be unable to obtain flood insurance under FEMA's National Flood Insurance Program. Consequently, for the purpose of this report the remnant land value of regularly inundated parcels was not calculated, so the exposure values presented below should be viewed as conservative estimates.

---

<sup>46</sup> See Footnote 7

<sup>47</sup> The 2050 scenario was determined to be a reasonable planning horizon for the purpose of the detailed assessment of exposure value. According to the Miller and Kopp report, the predicted sea level elevation for 2030 is .82', 2050 it is 1.48' and for 2100 it is 3.48'. For the purpose of this analysis the central value, 1.48' was added to the current day MHHW.

<sup>48</sup> Developed by the U.S Army Corps of Engineers, <http://planning.usace.army.mil/toolbox/library/EGMs/egm04-01.pdf>

<sup>49</sup> For this exercise, a simple additive relationship between sea level rise and FIRM base flood elevations (BFEs) was assumed, i.e. projected changes in sea level were added to current BFEs. In reality, the interaction between higher projected still water sea level and wave setup/runup is more complex.

<sup>50</sup> For the purpose of the analysis the depth damage function for residential, 2-story structures, with at-grade elevations was applied.

**Table 4: Exposure- Inundated Parcels  
2050 Sea Level Rise Scenario<sup>51</sup>**

Property Class (Class Code)	# of Exposed Lots	Total Borough Lots	% Exposed Lots	# of Acres Exposed	Total Borough Acres	% Exposed Acres
Vacant (1)	64	172	37%	26.4	46.5	57%
Residential (2)	13	2,249	1%	1.8	229.1	1%
Commercial (4A)	4	98	4%	3.6	53.5	7%
Apartment (4C)	1	9	11%	0.2	3.6	5%
Public School Property (15A)	0	5	0%	0.0	33.9	0%
Public Property (15C)	16	55	29%	8.4	24.7	34%
Church/Charitable (15D)	0	6	0%	0.0	3.2	0%
Cemeteries and Graveyards (15E)	0	2	0%	0.0	0.3	0%
Other Exempt (15F)	0	34	0%	0.0	15.9	0%
<b>Grand Total</b>	<b>98</b>	<b>2,630</b>	<b>4%</b>	<b>40</b>	<b>411</b>	<b>9.8%</b>
<b>Taxable Properties</b>	<b>82</b>	<b>2,528</b>	<b>3%</b>	<b>32</b>	<b>333</b>	<b>10%</b>

As **Table 4** reveals, under the 2050 sea-level rise scenario, 98 of the Borough's 2,630 parcels and almost 10% of the total area of the community, will be either partially or entirely inundated<sup>52</sup>. **Table 5** reveals that the assessed of properties that would be exposed to inundation represents slightly more than \$7,026,600 in assessed value slightly more than 1% of the total assessed taxable value of the Borough. Although only a relatively small portion of the assessed value of the community will be affected, it is important to note that over 13% of the current total assessed value of the residential areas of the community will be inundated on a regular basis. It is possible that a structure could be constructed over a parcel that is permanently inundated by flood water, but an owner of such structure would be unable to obtain flood insurance under FEMA's National Flood Insurance Program. And, since it's highly speculative to estimate impacts to property values under such circumstances, the remnant land value of permanently inundated parcels was not calculated, so the exposure values presented in **Table 5** should be viewed as conservative estimates.

**Table 5: Exposure Value- Inundated Parcels  
2050 Sea Level Rise Scenario**

Property Class (Class Code)	Value of Exposed Land	Value of Exposed Improvements	Total Exposed Value	Total Borough Value	% of Total Borough Value
Vacant (1)	\$399,800	\$0	\$399,800	\$12,080,500	3.3%
Residential (2)	\$1,771,600	\$884,700	\$2,656,300	\$503,038,000	0.5%
Commercial (4A)	\$2,729,900	\$617,000	\$3,346,900	\$53,235,400	6.3%
Apartment (4C)	\$476,000	\$147,600	\$623,600	\$6,417,800	9.7%
Public School Property (15A)	\$0	\$0	\$0	\$19,892,100	0.0%
Public Property (15C)	\$2,511,200	\$220,900	\$2,732,100	\$12,017,300	22.7%
Church/Charitable (15D)	\$0	\$0	\$0	\$5,933,300	0.0%
Cemeteries and Graveyards (15E)	\$0	\$0	\$0	\$69,600	0.0%
Other Exempt (15F)	\$0	\$0	\$0	\$24,747,700	0.0%
<b>Grand Total</b>	<b>\$7,888,500</b>	<b>\$1,870,200</b>	<b>\$9,758,700</b>	<b>\$637,431,700</b>	<b>1.5%</b>
<b>Net Taxable Value</b>	<b>\$5,377,300</b>	<b>\$1,649,300</b>	<b>\$7,026,600</b>	<b>\$574,771,700</b>	<b>1.2%</b>

The parcel level property values presented in the exposure value tables in this report is obtained from the MOD-IV data set assembled and maintained by the New Jersey Division of Taxation and posted on the New Jersey Geographic Information Network web site<sup>53</sup>. The data available as of September 2014 is an extract from the Division of Taxation's 2012 MOD IV data base.

<sup>51</sup> The total area of the Borough reflected in Table 3.2 is exclusively the Borough's parcel area and does not include area associated with roads or open waters which is included in Table 3.1

<sup>52</sup> All parcels less than 10% flooded were not considered inundated and not included in the exposure value

<sup>53</sup> [https://njgin.state.nj.us/NJ\\_NJGINExplorer/DataDownloads.jsp](https://njgin.state.nj.us/NJ_NJGINExplorer/DataDownloads.jsp)

The 2012 General Tax Rate tables for New Jersey Counties and Municipalities is posted on New Jersey's Department of Treasury, Division of Taxation's web site.<sup>54</sup> The applicable table for Monmouth County indicates that the 2012 General Tax Rate for Highlands Borough was \$2.44 per \$100 of assessed value. Based on this rate, under the 2050 Sea Level Rise scenario, the loss to the Borough of \$7,026,600 of assessed value would result in a potential real estate tax revenue loss of \$171,500, to the Borough<sup>55</sup>. This loss would amount to 1.2% of the Borough's total tax Levy, which, in 2012 was \$14,805,024.<sup>56</sup>

*B. Exposure Analysis: 2050 Sea Level Rise with 1% Annual Chance Flood*

The foregoing analysis of the 2050 sea-level rise scenario is based on a non-storm state. According to the Miller and Kopp report, by 2050, moderate storm activity (e.g. a storm with a 10% annual chance of occurrence, once known as a "10-year storm") is likely to reach far greater flood levels (e.g. flooding equal to a storm with a 1% annual chance of occurrence) as compared to current conditions<sup>57</sup>. Consequently, given the history of storm activity along the northeast Atlantic coast, it is appropriate to consider Highlands Borough's potential exposure in the event of a 2050 1% annual chance of flood storm (a storm equivalent to Super storm Sandy), using the same procedures for the 2050 sea-level rise scenario. Under this scenario the Borough will sustain considerably more flooding exposure when compared to the non-storm 2050 Sea Level Rise Scenario.

---

<sup>54</sup> <http://www.state.nj.us/treasury/taxation/lpt/taxrate.shtml>

<sup>55</sup> The total net taxable valuation calculated using the 2012 MOD IV data tables is \$32,994,22, or 5.7% less than was reported by the New Jersey Division of Local Government Services Municipal Information Sheet for CY 2012/FY 2013 for Highlands Borough. This discrepancy is likely to be related to the different reporting time periods for the two data sets. However, because the Municipal Information Sheet does not provide detail by Property Class, and because the data tables are derived from a parcel-level analysis, it's not possible to directly calculate the difference in exposure values between the two figures.

<sup>56</sup> Includes county, school and municipal taxes levied

<sup>57</sup> K. G. Miller et al, op cit

Figure 10: 2050 Sea-Level Rise



**Table 6: Exposure- Inundation Parcels**  
**2050 Sea-Level Rise with 1% Annual Chance Flood**

Property Class (Class Code)	# of Exposed Lots	Total Borough Lots	% Exposed Lots	# of Acres Exposed	Total Borough Acres	% Exposed Acres
Vacant (1)	140	172	81%	40.7	46.5	87%
Residential (2)	1,255	2,249	56%	124.1	229.1	54%
Commercial (4A)	75	98	77%	32.1	53.5	60%
Apartment (4C)	8	9	89%	2.9	3.6	80%
Public School Property (15A)	0	5	0%	0.0	33.9	0%
Public Property (15C)	44	55	80%	18.6	24.7	75%
Church/Charitable (15D)	2	6	33%	0.4	3.2	14%
Cemeteries and Graveyards (15E)	0	2	0%	0.0	0.3	0%
Other Exempt (15F)	12	34	35%	2.4	15.9	15%
<b>Grand Total</b>	<b>1,536</b>	<b>2,630</b>	<b>58%</b>	<b>221</b>	<b>411</b>	<b>53.8%</b>
<b>Taxable Properties</b>	<b>1,478</b>	<b>2,528</b>	<b>58%</b>	<b>200</b>	<b>333</b>	<b>60%</b>

**Table 6** indicates that after accounting for rising sea levels by 2050, in the event of a 1% annual flood, 1,536 of the Borough's 2,630 parcels, or 58% will be inundated. The area of these parcels exceeds 221 acres, comprising almost 54% of the total area of the community.

**Table 7** reveals that damage to these parcels would total over \$299,373,100 in assessed value, representing over 50% of the assessed value of the entire Borough.

**Table 7: Exposure Value- Inundated Parcels  
2050 Sea-Level Rise with 1% Annual Chance Flood**

Property Class (Class Code)	Value of Exposed Land	Value of Exposed Improvements	Total Exposed Value	Total Borough Value	% of Total Borough Value
Vacant (1)	\$8,423,200	\$1,724,200	\$10,147,400	\$12,080,500	84.0%
Residential (2)	\$139,279,300	\$106,088,000	\$245,367,300	\$503,038,000	48.8%
Commercial (4A)	\$25,622,100	\$13,164,400	\$38,786,500	\$53,235,400	72.9%
Apartment (4C)	\$2,606,900	\$2,465,000	\$5,071,900	\$6,417,800	79.0%
Public School Property (15A)	\$0	\$0	\$0	\$19,892,100	0.0%
Public Property (15C)	\$9,369,100	\$1,591,300	\$10,960,400	\$12,017,300	91.2%
Church/Charitable (15D)	\$558,000	\$618,500	\$1,176,500	\$5,933,300	19.8%
Cemeteries and Graveyards (15E)	\$0	\$0	\$0	\$69,600	0.0%
Other Exempt (15F)	\$3,346,800	\$11,028,600	\$14,375,400	\$24,747,700	58.1%
<b>Grand Total</b>	<b>\$189,205,400</b>	<b>\$136,680,000</b>	<b>\$325,885,400</b>	<b>\$637,431,700</b>	<b>51.1%</b>
<b>Net Taxable Value</b>	<b>\$175,931,500</b>	<b>\$123,441,600</b>	<b>\$299,373,100</b>	<b>\$594,663,800</b>	<b>50.3%</b>

Applying the Borough’s 2012 General Tax Rate of \$2.44 per \$100 of assessed value to the total net value of exposed properties under the 2050 Sea Level Rise with a 1% Annual Flood scenario, amounting to \$299,373,100, as shown in Table 3-5, would result in a potential real estate tax revenue loss of \$7,304,700<sup>58</sup> This loss is equivalent to approximately 50% of Highlands Borough’s total 2012 tax Levy of \$14,805.024

**Figure 11 2050 Sea Level Rise with 1% Annual Storm Scenario**



## Conclusion

This vulnerability and exposure analysis is intended to serve as the basis for an informed discussion among the elected and municipal officials of Highlands Borough and the between the municipal officials and the residents of the community about how best to prepare for and adapt to potential risks

<sup>58</sup> Please see footnote 22

associated with projections of sea level rise and associated increasing flooding. The information presented in this report should better equip the Borough to make sound near and long-term land use planning and development decisions and formulate efficient and effective public investment strategies to guide recovery management, reconstruction, resiliency and adaptation measures. To that end, the data raises several questions, including but certainly not limited to:

- What types of infrastructure should the Borough invest in that are most resistant to flooding, and can improve stormwater management capacity, particularly in those areas that are projected to be at risk?
- What strategies should the Borough pursue to protect residential and commercial development in vulnerable areas along the bayshore as well as the infrastructure that serves these areas?
- What additional emergency response measures can the Borough put in place in the event that flooding makes critical evacuation routes impassable?
- What strategies can be employed to help gradually shift development to areas that would avoid or minimize risks of exposure to future flooding and inundation? How can those strategies be designed to best protect the safety of the residents at risk areas, retain community character and preserve the Borough's economic stability?
- How can the Borough most effectively engage residents in an ongoing discussion about vulnerability as well interim and long-term strategies that would be most suited to respond to potential risk?
- In view of the fact that effect strategies to address vulnerability may entail regional responses, what are the appropriate county, state and federal-level partnerships the Borough needs to foster to help manage future challenges?
- What interim measures are needed, such as modifications/updates to floodplain management regulations, building codes and elevation standards to ensure public safety? Are current standards effective and what monitoring measures should be enacted to gauge the need for regulatory changes over time?

## Chapter 4 Getting To Resilience Process and Report

As noted previously, the Borough participated in a “Getting To Resilience” (GTR) process that used the on-line GTR questionnaire<sup>59</sup> and was facilitated by Jacques Cousteau National Estuarine Research Reserve (JCNERR) staff. The Getting to Resilience process started as a facilitated discussion regarding the Borough’s strengths, weaknesses, and hurdles concerning resiliency, the Borough’s codes, policies and procedures were then analyzed and the finally a series of recommendations for enhance resiliency were developed.

The GTR questionnaire is broken into five sections: Risk and Vulnerability Assessments, Public Engagement, Planning Integration, Disaster Preparedness and Recovery, and Hazard Mitigation Implementation. In order to efficiently answer all of the questions within the questionnaire, participation from a wide array of municipal officials and staff is encouraged. These can include administrators, floodplain managers, emergency managers, stormwater managers, public works officials, town engineers, and appointed and elected officials. For Highlands this team included Tim Hill (Borough Business Administrator), David Parker (OEM Coordinator, CRS Coordinator), Dale Leubner (Floodplain and Zoning official, representing Borough Engineer), and Steven Nelson (NJ Future Local Recovery Manager). The questions in the GTR questionnaire were answered collectively by this group with JC NERR staff recording answers and taking notes on the discussions connected to each question.

The Getting to Resilience questionnaire was started with the town on May 27, 2014. JC NERR staff met with three representatives of Highlands and one representative of NJ Future. A discussion of the towns’ resilience strengths and weaknesses began the meeting and sections one and three of the questionnaire were completed. On June 10, 2014, the questionnaire was completed with five representatives of Highlands and one representative of NJ Future meeting with JC NERR staff.

Upon completion of the GTR questionnaire, JC NERR staff analyzed the answers provided by the Borough, linkages provided by the GTR website, notes taken during the discussion of questions, various municipal plans and ordinances, and mapping of risks, hazards, and vulnerabilities provided by Rutgers University and the NJ Floodmapper website. After reviewing all of this information, this recommendations report was drafted to help assist the Borough of Highlands’s decision makers as the Borough works to recover from Hurricane Sandy and become more resilient.

The majority of the recommendations are related to communications and outreach activities, including ensuring that residents and businesses are aware of their vulnerability to storm events and flooding. However, there are also recommendations related to Borough ordinances, maintaining records of various types in easily accessible locations, preparing a mitigation plan for properties that experience recurring flood damage, and capital improvements such as a continuous dune line.

These recommendations have been integrated into this report’s recommendations chapter and implementation matrix.

This Final Report is attached as **Appendix 2 Getting To Resilience Report and Recommendations**.

---

<sup>59</sup> See <http://www.prepareyourcommunitynj.org/>

## Chapter 5 Assessment of Existing Planning and Zoning Documents

Ten recent plans and studies were reviewed as a first step in identifying actions that are most urgently needed to improve public safety, increase resistance from damage from future storms and stimulate economic recovery. These included the Borough’s master plan, several topic specific plans, the Borough’s emergency management plan and several studies were that performed as part of academic work. **Table 8** provides a list of the plans and studies reviewed for this SRPR. In addition, the Borough Zoning Ordinance was analyzed as part of the GTR process.

**Table 8 : Planning Documents Examined**

Name	Author	Date
Adapting to Coastal Climate Change	Rutgers Bloustein School	2012
A Clam-tastic Plan	Rutgers Bloustein School	2014
Bayshore Region Strategic Plan	Monmouth County	2006
FEMA Community Recovery Plan	FEMA, community	2014
Emergency Operations Plan	Borough OEM	2013
Getting To Resilience Report	Jacques Cousteau National Estuarine Research Reserve	2014
Intraborough Bicycle Plan	Borough EAC, T&M	2011
Master Plan & Re-examination	T&M	2004, 2008
Monmouth County Multi-Jurisdictional Natural Hazard Mitigation Plan	Monmouth County	2009
Recreation and Open Space Plan	T&M	2008

### Existing Planning Document Analysis

These ten plans and studies recommend nearly 300 separate actions. These recommendations were then vetted to eliminate those that had already been accomplished or were no longer valid and those that were not urgently needed to improve public safety, increase resistance from damage from future storms and stimulate economic recovery.

As an example of some of the activities already completed or underway:

- An open space tax was introduced to acquire and maintain open space and parks,
- A grant is pending to undertake streetscape improvements on Bay Avenue,
- The Borough has been a very active participant in the County’s Hazard Mitigation Plan.

In addition to the review of existing plans and studies performed in conjunction with the SRPR, existing plans and regulations were examined in conjunction with the GTR process to determine how effective they were in helping the community to become resilient to flooding and storm events. Existing municipal procedures and processes, policies and notification actions were included in this review. More details are included in Appendix 1. This process yielded several additions to the list of recommended actions.

This assessment of the Borough’s existing planning documents, land-use regulations and other related regional plans is intended accomplish three objectives:

1. Determine whether such documents contribute to or create obstacles for implementing the municipality’s recovery strategies;
2. Determine the extent to which such documents account for the likelihood of future storms and impacts of climate change, most particularly sea-level rise in the case of coastal communities, and;

3. Recommend opportunities to modify, update and/or strengthen current plans and regulations to better equip the Borough to effectively accomplish recovery strategies and address climate changes.

While the Master Plan is the primary planning policy document for the Borough, and will be assessed as noted above, there have been several other plans and studies that have recently completed that were also reviewed below, as they may have relevance to this SRPR and to the Borough's continuing recovery. A summary of the planning documents with their primary goals is given below.

#### **1. A Clam-tastic Plan (Rutgers Studio 2014)**

*Goals:* Adopt smart responses to flood control and mitigation measures; address under-performing Main St. (i.e. Bay Avenue); facilitate public access to waterfront; increase high-quality waterfront development; enhance streetscapes and public spaces; improve circulation for motorists, cyclists and pedestrians; develop new urban infill prototypes; increase real property values through private investment and public actions; address community equity concerns.

*Recommendations:* Recommendations are for the area bounded by Valley Avenue to Veteran's Park, Shrewsbury River to Shore Drive, a 20 block area. Recommendations from the presentation are to: raise all buildings, re-create Bay Avenue as mixed use corridor with "incubator retail", office and residential, make Miller Street the new "main street" and main gateway to the waterfront, rebuild Borough Hall in another location on Bay Avenue, convert residences to attached units, remake some streets as "green streets" and "shared streets", build several parking garages, extend Shrewsbury Avenue past Valley Avenue, develop more marinas and a hotel on extended Shrewsbury Avenue, write a new Master Plan. No action taken by Council.

#### **2. Adapting to Climate Change in Coastal Monmouth County (Rutgers Studio 2011)**

*Goals:* There were no explicit goals stated, however its intention was to analyze the fiscal impact on Highlands' municipal budget (as well as Middletown and Sea Bright) of a variety of mitigation strategies for various storm events (e.g. a 50 year storm, a 100 year storm, etc.). These strategies included rebuilding in place, relocating homes and properties and reducing subsidies.

*Recommendations:* The recommendations include: implementing policies of gradual retreat, preparing for more severe storms, and encouraging natural mitigation, development away from the coast, permeable ground cover and stormwater mitigation techniques. No action taken by Council.

#### **3. Bayshore Region Strategic Plan (2006)**

Part of the County's Growth Management Guide, this Plan covers 9 municipalities including Highlands. Goal: To create a vision and planning strategy to spur economic development in the region in a manner that recognizes the importance of preserving the region's environmentally sensitive natural resources and beauty.

*Recommendations* (relevant to Highlands): There are 45 recommendations that include economic development, transportation, waterfront and open space, and housing. Recommendations include capital projects, ordinance revisions, and creation of plans.

#### **4. FEMA Community Recovery Plan (2013)**

This report was prepared by FEMA and a committee of elected officials and citizens. While there are no goals articulated, the overall intent was to develop a list of recommended projects to help Highlands recover from the damage that Sandy inflicted.

*Recommendations:* Recommends 12 projects as high priority, as well as a hazard mitigation plan and a communications plan. The 12 projects include stormwater management, seawall/berm/dune structure, housing, economic development, steep slopes, arts and culture, property maintenance/code enforcement, rehab of Community Center, and bicycling improvements. Endorsed by Council.

#### **5. Getting to Resilience Report and Recommendations (2014)**

As discussed in the previous chapter, this is a web based questionnaire and process that was developed by NJ DEP and enhanced by the Jacques Cousteau National Estuarine Research Reserve. In Highlands, the participants were: Tim Hill, Borough Administrator, Dave Parker, OEM Coordinator, Dale Leubner, Borough Floodplain Manager, Zoning Officer and representing the Borough Engineer; and Steve Nelson, New Jersey Future Local Recovery Planning Manager.

*Goal:* To foster municipal resiliency in the face of flooding, coastal storms, and sea level rise.

*Recommendations:* There are 20 recommendations related to potentially increasing the Borough's Community Rating System, improving communications and outreach, physical improvements, resiliency planning, municipal operations and zoning ordinance revisions.

#### **6. Intra-Borough Bicycle Plan (2011)**

This report was prepared by members of the Borough's Environmental Commission, with assistance from Martin Truscott, T&M.

*Goal:* Preparation of a bicycle route plan within the Borough of Highlands that interconnects with the Henry Hudson Trail with municipal, county, state and federal parks as well as community facilities, business areas and other points of interest in the Borough.

*Recommendations:* Has recommended routes with Shore Drive being the main artery, also recommends locations for bike racks, interpretive displays and kiosks. The report does not include actual engineered design of bicycle routes (i.e. bike lane, sharrows, etc). Adopted by Council.

#### **7. Master Plan (original 2004 and re-examination 2008)**

#### **8. Comprehensive Plan for Borough, updated in 2008**

*Goals:* Has general goals and goals for residential land uses, commercial land uses, circulation, economic development, housing, landscaping, community facilities and infrastructure, open space, community identity and cultural.

*Recommendations:* There are over 200 recommendations focusing on: land use, transportation, economic development, housing, infrastructure (including stormwater mgmt.), recreation and parks, parking, urban design, community facilities, historic preservation and waste management; includes some recommendations related to hazard mitigation (i.e. flooding) and Borough communications. Adopted by Council.

#### **9. Monmouth County Hazard Mitigation Plan (2009, to be updated 2014)**

The Monmouth County Multi-Jurisdictional Hazard Mitigation Plan is currently being prepared. Representatives from the Borough have been actively involved in its development.

#### **10. Recreation & Open Space Plan (2008)**

This plan is incorporated by ordinance into the Master Plan, but was prepared after it.

**Goals:** to provide guidance regarding the location, acquisition, development, and improvement of an optimum distribution of neighborhood and Borough wide recreation and open space areas.

**Recommendations:** It includes recommendations for acquisition of recreation land, funding for acquisition and programming, staff reorganization, maintenance, and recreation activities and facilities. Adopted by Council.

**Note:** The Borough Emergency Management Plan was reviewed but did not have any relevant recommended actions, as it is more of an operational plan in times of emergencies.

**Table 9** provides a summary of the assessment that was performed on the planning documents, using the criteria described previously.

**Table 9: Summary of Plans Assessment**

Name of Plan	Contributes to Implementing Recovery Strategy	Accounts for likelihood of SLR	Recommends opportunity to modify/update plans and regs
Adapting to Coastal Climate Change	Y	Y	Y
A Clam-tastic Plan	Y	Y	Y
Bayshore Region Strategic Plan	Y	N	N
FEMA Community Recovery Plan	Y	N	Y
Emergency Operations Plan	N/A	N/A	N/A
Getting To Resilience Report	Y	Y	Y
Intraborough Bicycle Plan	Y	N	N
Master Plan & Re-examination	N	N	N
Monmouth County Multi-Jurisdictional Natural Hazard Mitigation Plan	N/A	N/A	N/A
Recreation and Open Space Plan	N	N	N

### Assessment of Zoning Ordinance for Borough’s Recovery Strategies

A summary assessment of Highlands’ land use patterns and zoning regulations was provided in Chapter 1 of this Report. As the Getting to Resilience process revealed, a thorough review of the ordinance, and other land use regulations, should be performed after the Master Plan is reviewed and updated. More details on recommended revisions to the Borough’s Zoning Ordinance can be found in **Appendix 2 Getting To Resilience Report and Recommendations**.

### Coastal Area Facilities Review Act (CAFRA)

The Coastal Area Facility Review Act (CAFRA) was enacted by the state of New Jersey in 1973. The Act is intended to protect the vital shore areas of New Jersey from overdevelopment. Residential, commercial, industrial and public development in CAFRA areas are regulated through permitting from the New Jersey Department of Environmental Protection (NJDEP). Development activities under CAFRA jurisdiction include construction, relocation and enlargement of buildings or structures; and all related work, such as excavation, grading, shore protection structures and site preparation structures, and site preparation. This includes any excavation, clearing or grading of dunes, placement of sand, construction of revetment and retaining walls and bulkheads, and filling or grading of beaches.

CAFRA zones extend through eight counties of New Jersey, from the coastline of Middlesex County south to Cape May County, west following the Delaware River to Salem County. The Borough of Highlands is within a Coastal Metropolitan Planning Area. Despite its Coastal Metropolitan Planning Area



## Chapter 6 Recommendations for Action

Chapter 5 offered an overview of the plans and studies undertaken in preparing this Report. This review resulted in a list of approximately 300 separate recommended actions. These recommendations were then vetted to eliminate those actions that had been accomplished or were no longer valid or were redundant, resulting in approximately 130 recommendations. These 130 recommendations were then consolidated into 40 actions (*see Appendix 3, Potential Actions*). The items in this remaining list were considered as “potential priority actions” and were further analyzed using the vulnerability assessment to determine which would require an alternatives evaluation. Potential priority action that consisted of physical construction that would likely be affected by sea level rise or coastal flooding was included in the alternatives assessment (*see Appendix 2 Alternatives Assessment*). This Alternative Assessment was then used as part of the evaluation process to arrive at the highest priority actions, described below.

While all of these 40 actions are important projects for the Borough, there are limited resources, both within the Borough and from others. Moreover, this SRPR process explicitly anticipates articulating those “priority actions that are most urgently needed to improve public safety, increase resistance to damage from future storms, and stimulate economic recovery” (NJ DCA). Therefore, a working group of Borough officials reviewed these potential priority actions and determined that there were 13 actions that were of highest priority for the Borough to pursue. These highest priority actions are listed in Figure X, below, in alphabetical order. Each of these recommended actions are described in more detail below.

**Table 10: Highest Priority Actions**

Construct Direct Stormwater Piping from Route 36
Increase/enhance Property Maintenance and Code Compliance
Mitigate Steep Slope Stability issues (incl. design for mitigation, ordinance revisions)
Municipalities Facilities Plan (including Wilson Community Center), including potential for co-locating facilities with other towns
Obtain NFIP compliance and apply for CRS certification (including muni officials' training, CERT)
Sanitary System Improvements (to address inflow and infiltration issues)
Stormwater Drainage and Flood Mitigation (including pump station repairs, new catch basins and piping, outfall pipe improvements)
Undertake a study of the economic viability of continued clamming in the river and bay
Undertake redevelopment study(ies) and prepare plan(s) for areas determined to be in need of redevelopment, to include waterfront, downtown neighborhoods, potential for elevation of buildings in downtown, extension of Shrewsbury Ave., potential for converting single family detached to attached units
Update Borough Hazard Mitigation Plan after County Hazard Mitigation Plan is completed
Update municipal codes, plans, and strategies re: risks, hazards, and vulnerabilities explored in the Getting to Resilience process
Update ordinances to adopt the latest version of FEMA’s flood maps, rewrite elevation and freeboard requirements in a Flood Damage Prevention Ordinance as based upon the Best Available Flood Hazard Data or the most stringent version of FEMA’s flood maps

Update ordinances to streamline the development review process for improvements such as use changes, redevelopment, expansions, and developments.

Write new Master Plan

### **1. Construct a Direct Stormwater Piping system from Route 36**

Currently, storm water flows from Route 36 are connected to the downtown stormwater system which exacerbates flooding; resulting in standing water in the downtown area. This Project involves constructing new stormwater management pipes to direct stormwater from State Highway Route 36 into the Shrewsbury River/Sandy Hook Bay. Direct piping of stormwater from Route 36 to the river will bypass downtown and significantly reduce this condition. It will also eliminate sediments which accumulate in Highlands' stormwater system as a result of runoff; primarily from the Monmouth Hills section of Middletown Township. Those sediments reduce the capacity of the pipes to carry stormwater to the River/Bay and must be removed from the system on a regular basis at great expense.

### **2. Increase/enhance Property Maintenance and Code Compliance**

Sandy-related damage to properties has exacerbated property maintenance issues. Increasing and enhancing applicable codes and code compliance will help to reduce deteriorated properties and improve property values. This can be done by creating a working group to work with the Borough Council, the Borough Administrator and the Code Enforcer to find strategies to bring non-maintained homes into a maintenance compliance status. This strategy would have multiple aspects including: maintenance code review and modification, property inventory and review, creation of database, community outreach.

### **3. Mitigate Steep Slope Stability issues**

The coastal bluff that runs parallel to Route 36 through the borough is prone to slumping and erosion. Currently, the US Geological Survey is studying it, in order to update work done in the 1970's. While any significant mitigation work will likely need to wait until this study is completed, mitigation actions would likely be done through design, stormwater management, identification/implementation of appropriate slope vegetation and ordinance revisions.

### **4. Municipalities Facilities Plan**

With the significant Sandy-caused damage to borough hall and the Wilson Community Center and library, the Borough has been considering whether to rebuild borough hall in its current location or relocate it to a new site, and how to best rebuild the Community Center and library. The current borough hall site, on Bay Avenue, is within the 100 year floodplain. FEMA's policy for critical infrastructure such as municipal buildings is to discourage building them within the floodplain.

The Borough has hired an architect to examine rebuilding borough hall in its current location and rebuilding the Community Center. In addition, as part of this SRPR, conceptual design analysis has been done to create some alternatives for location and building programming. This analysis is presented in Appendix 4 Conceptual Site Planning for Possible Action: Relocate Borough Hall.

### **5. Obtain NFIP compliance and apply for CRS certification**

The Borough is currently working with FEMA and NJ Department of Environmental Protection to obtain NFIP compliance. Once NFIP compliance is granted, the Borough will be able to apply for Community Rating System (CRS) certification. CRS certification is done by FEMA and once the Borough achieves certification, property owners with flood insurance will benefit from lower flood insurance premiums. One of the benefits of the Getting To Resilience process was to document how the Borough can obtain

the highest level of compliance, resulting in the greatest reduction in insurance rates. Appendix 1, Getting to Resilience Report has detailed recommendations for this.

#### **6. Sanitary System Improvements (I&I)**

The existing system has significant inflow and infiltration (I&I) problems. This means that stormwater leaks into the sanitary sewer system, increasing the cost to treat the flow at the regional sewer treatment plant. This unnecessarily increases costs for all users of the system. The Borough has performed repairs on one of the 8 sub-basins that make up the sewer system, but the remaining 7 need to be examined and repairs done.

#### **7. Stormwater Drainage and Flood Mitigation**

Improving drainage and mitigating flooding are essential to reduce property damage. This recommended action involves upgrading several pump stations, installing new catchbasins and interconnecting pipes and repairing and replacing 48 check valves to prevent backflow of bay water into the streets at high tide. Sediment will be removed from storm drains and sources of runoff sediment to the system will be identified and abated.

#### **8. Undertake a study of the economic viability of continued clamming in the river and bay**

The clamming industry in Highlands, while not as dominant as it once was, is still an important part of the local economy and culture. A study to examine the various factors that influence the economics of the industry will help guide local and regional policy decisions.

#### **9. Undertake redevelopment study(ies) and prepare plan(s) for areas determined to be in need of redevelopment**

Previous plans have recommended redevelopment efforts in several areas of the borough, including the waterfront and downtown neighborhoods. Moreover, there have also been recommendations to extend Shrewsbury Avenue, converting housing stock from single family detached to single family attached, and elevating buildings in the downtown area. All of these recommendations could be reviewed and, if feasible and acceptable, accomplished through the redevelopment planning process.

#### **10. Update Borough Hazard Mitigation Plan**

Monmouth County's plan is nearing completion. While the Borough will be asked to approve the County's plan, it should also consider updating its own plan that takes into consideration the County's plan.

#### **11. Update municipal codes, plans, and strategies re: risks, hazards, and vulnerabilities explored in the Getting to Resilience process**

The Getting to Resilience (GTR) process revealed several areas in the Borough's existing codes that would benefit from an update, and the report made several recommendations to that. The GTR Report that was a result of that process recommends that the Borough's plans (including the Master Plan and any redevelopment plan) include explicit references and recommendations related to resiliency. The GTR Report also recommends that communication and outreach strategies include discussion of sea level rise and the associated hazards. The full GTR Report is included in this SRPR as Appendix 1.

#### **12. Update ordinances to adopt the latest version of FEMA's flood maps, rewrite elevation and freeboard requirements in the Flood Damage Prevention Ordinance**

Similar to the above recommendation, the GTR Report recommends that the Borough should revise its ordinances to increase resiliency to flooding hazards, including rewriting elevation and freeboard requirements, based upon the most stringent version of FEMA's flood maps.

### **13. Update ordinances to streamline the development review process**

The catastrophic nature of Hurricane Sandy created significant impact on the Borough's development review process and also revealed areas that might benefit from streamlining. The Borough should undertake a study to determine which parts of its review process might be streamlined and improved related to: use changes, redevelopment, expansions and developments.

### **14. Review and Write New Master Plan**

While a re-examination was performed in 2008, the analysis in this Report revealed the need for more substantial work, reflecting the impact of Sandy, the expected impacts of SLR and increased coastal flooding, and the need to enhance resiliency.

In the following chapter, these priority actions are shown in summary, with major tasks described, estimated costs, potential funding sources and lead entities. This Implementation Matrix is intended to be a summary of priority actions that the Borough desires, and is also intended to be a flexible blueprint that can be modified as conditions change, funding becomes available or technologies develop.

## Chapter 7 Implementation Matrix

Priority Project	Description of Project	Statement of Need (related to impact from Sandy)	Importance to Environmental/ Economic Health of Community	Major Tasks	Estimated Costs	Potential Funding Sources and Resources	Time frame
Construct a Direct Stormwater Piping from Rt 36	construct new stormwater management pipes to direct piping of stormwater from State Highway Route 36 into the Shrewsbury River/Sandy Hook Bay	Sandy exacerbated the need for improved stormwater management in borough.	Existing stormwater management system does not adequately manage stormwater, resulting in periodic flooding in the downtown, deterring private investment and causing potential public health issues.	Fund Construct Inspect	\$800,000	NJBIZ, Borough	1-2 years
Increase/enhance Property Maintenance and Code Compliance	Enhance property maintenance process and code, increase code compliance	Sandy-related damage to properties has exacerbated property maintenance issues. Increasing and enhancing applicable codes and code compliance will help to reduce deteriorated properties and improve property values.	Derelict or abandoned buildings create public health and safety issues and negatively impact the Borough's sense of place and community pride and morale.	Review Maintenance Code, and Modification, property Inventory and Review, creation of Database, Community Outreach	\$25,000	DCA PSAG Phase II	6 months
Mitigate Steep Slope Stability issues (incl. design for mitigation, ordinance revisions)	Mitigate slumping along coastal bluff	Storm events such as Sandy increase the probability of significant slope slumping, endangering properties above and below bluff. need for resilience.	Slope slumping can and has resulted in property damage and public safety issues.	After USGS Study is complete, undertake study to determine specific mitigation actions to take	TBD	USGS	3-5 years
Municipalities Facilities Plan (including Wilson Community Center), including potential for co-locating facilities with other towns	Design and construct a multi-purpose municipal building that may include Borough operations, OEM, First Aid, Police and DPW	Sandy caused substantial damage to the borough hall (containing the police department) and the rendered it uninhabitable	State of the art and adequate space for facilities will provide for more effective delivery of government services. A centralized municipal facility will allow for more efficient government coordination and	Design, Permitting, Construction Inspection	\$500,000 (design) \$4-5 million (construction)	Borough	2-3 years

Priority Project	Description of Project	Statement of Need (related to impact from Sandy)	Importance to Environmental/ Economic Health of Community	Major Tasks	Estimated Costs	Potential Funding Sources and Resources	Time frame
			centralized location from which to deploy response.				
Obtain NFIP compliance and apply for CRS certification	Complete all requirements for NFIP compliance and then submit an application for CRS certification	The impacts of Sandy highlighted need to obtain NFIP compliance, and CRS certification will result in benefits to all property owners who have flood insurance, and the Borough government itself.	NFIP compliance and CRS certification will contribute to public safety, public understanding of flooding hazards and enhance resiliency.	Fund/Write	\$5,000	DCA PSPAG (Phase II Project)	9-12 months
Sanitary System Improvements (I&I)	Examine and repair remaining 7 areas of sanitary sewer system to eliminate inflow and infiltration	Storm events like Sandy result in increased I&I in system, increasing costs to treat flow and potential public health issues.	Reducing costs for sanitary sewerage flow will be an economic benefit to businesses and homeowners and will increase sewer plant capacity to permit future growth of Highlands.	Assess system, construct repairs	\$4,200,000 (\$600,000 per area)	NJ DEP Borough	1-2 years
Stormwater Drainage and Flood Mitigation	Upgrade several pump stations, installing new catch basins and interconnecting pipes and repairing and replacing 48 check valves to prevent backflow of bay water into the streets at high tide. Sediment will be removed from storm drains and sources of runoff sediment to the system will be identified and abated.	The low-lying downtown of the Borough is prone to flooding associated with heavy rainfall and high tides. Hurricane Sandy resulted in tidal and storm surge flooding throughout the Borough that continued with successive high tide events following the initial storm surge.	The mitigation of flooding will enable the town to maintain public safety and allow normal community and business functions to proceed during periods of significant rain and high tides. In the event of future storms, the project improvements will enable the community to better manage stormwater and minimize damage to property and infrastructure associated with the flooding.	Complete design of all improvements, Fund Construct	\$7-8 million	NJ DEP	1-3 years

Priority Project	Description of Project	Statement of Need (related to impact from Sandy)	Importance to Environmental/ Economic Health of Community	Major Tasks	Estimated Costs	Potential Funding Sources and Resources	Time frame
Undertake a study of the economic viability of continued clamming in the river and bay	Examine the various factors that influence the economics of the clamming industry	The impact of Sandy on clamming may include impaired water from pollution released during Sandy.	An economic viability study will help guide local and regional policy decisions.	Fund/Write	\$30,000	DCA PSPAG (Phase II Project)	1 year
Undertake redevelopment study(ies) and prepare plan(s) for areas determined to be in need of redevelopment	Conduct Redevelopment Studies and, if such properties meet the statutory criteria to be designated as a redevelopment area, develop a redevelopment plan/plans for these properties	Sandy damage resulted in several vacant and demolished buildings, leaving abandoned buildings and vacant land.	Redevelopment can create incentives for private investment, while crafting area redevelopment plans provides the Borough with flexibility to implement its vision while focusing on getting to resilience	Fund/Write	\$50,000	DCA PSPAG (Phase II Project)	1-2 years
Update Borough Hazard Mitigation Plan after County Plan is completed	Update Borough's plan, using County's new plan as a basis	Sandy highlighted need to update HMP.	Enhancing existing hazard mitigation plan will increase resiliency and enhance public safety	Fund/Write	\$25,000	Borough NJ OEM	1 year
Update municipal codes, plans, and strategies	Based on Getting to Resilience Report recommendations, review and update codes and plans to reflect risks, hazards and vulnerabilities from sea level rise and coastal flooding	Sandy revealed some portions of the Borough's codes and plans that might need updating to reflect best practices on resiliency.	Updated codes will increase resiliency, improve property values and reduce vulnerability from hazards	Fund/Write	\$20,000	DCA PSPAG (Phase II Project)	6 – 12 months
Update ordinances to adopt the latest version of FEMA's flood maps, rewrite elevation and freeboard requirements in Flood Damage Prevention Ordinance	Based on Getting to Resilience Report, update floodplain ordinance and Flood Damage Ordinance as based upon the Best Available Flood Hazard Data or the most stringent version of FEMA's flood	Sandy revealed some portions of these ordinances that would benefit from updating	Updated codes will increase resiliency, improve property values and reduce vulnerability from hazards	Fund Write	\$20,000	DCA PSPAG (Phase II Project)	1 year

Priority Project	Description of Project	Statement of Need (related to impact from Sandy)	Importance to Environmental/ Economic Health of Community	Major Tasks	Estimated Costs	Potential Funding Sources and Resources	Time frame
	maps						
Update ordinances to streamline the development review process for improvements	Review and update ordinances and the development review process.	The catastrophic nature of Hurricane Sandy created significant impact on the Borough's development review process and also revealed areas that might benefit from streamlining.	A streamlined development review process will enhance economic recovery.	Fund/Write	\$25,000	DCA PSPAG (Phase II Project) -	1-2 years
Write new Master Plan	Review existing Plan and re-exam and determine extend of need for a new Plan	The impact of Sandy on land use, housing, transportation, community facilities, neighborhoods, businesses, government operations all reveal the need to significantly update the Plan	As the Borough's guiding planning policy document, an updated Plan will provide a framework for enhanced public safety, increased resilience, improved economic activities and environmental health protection	Fund/Write	\$50,000	DCA PSPAG Phase II	

### Appendix 1: FEMA Flood Zones Definitions

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. These zones are depicted on the published Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map (FHBM).

#### Special Flood Hazard Areas – High Risk

[Special Flood Hazard Areas](#) represent the area subject to inundation by 1-percent-annual chance flood. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply in these zones.

Zone	Description
A	Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown.
AE, A1-A30	Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. BFEs are shown within these zones. (Zone AE is used on new and revised maps in place of Zones A1–A30.)
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1–3 feet. BFEs derived from detailed hydraulic analyses are shown in this zone.
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1–3 feet. Average flood depths derived from detailed hydraulic analyses are shown within this zone.
AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may be used only when the flood protection system has reached specified statutory progress toward completion. No BFEs or flood depths are shown.

#### Coastal High Hazard Areas – High Risk

[Coastal High Hazard Areas](#) (CHHA) represent the area subject to inundation by 1-percent-annual chance flood, extending from offshore to the inland limit of a primary front al dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. Structures located within the CHHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Federal floodplain management regulations and mandatory purchase requirements apply in these zones.

Zone	Description
V	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Because detailed coastal analyses have not been performed, no BFEs or flood depths are shown.
VE, V1-V30	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. BFEs derived from detailed hydraulic coastal analyses are shown within these zones. (Zone VE is used on new and revised maps in place of Zones V1–V30.)

**Moderate and Minimal Risk Areas**

Areas of moderate or minimal hazard are studied based upon the principal source of flood in the area. However, buildings in these zones could be flooded by severe, concentrated rainfall coupled with inadequate local drainage systems. Local stormwater drainage systems are not normally considered in a community’s flood insurance study. The failure of a local drainage system can create areas of high flood risk within these zones. Flood insurance is available in [participating communities](#), but is not required by regulation in these zones. Nearly 25-percent of all flood claims filed are for structures located within these zones.

Zone	Description
B, X (shaded)	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
C, X (unshaded)	Minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. (Zone X (unshaded) is used on new and revised maps in place of Zone C.)

**Undetermined Risk Areas**

Zone	Description
D	Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in <a href="#">participating communities</a> .

Appendix 2: Getting To Resilience Report and Recommendations

# Borough of Highlands “Getting to Resilience” Recommendations Report

Prepared by the Jacques Cousteau National Estuarine Research Reserve



June 2014

*Recommendations based on the “Getting to Resilience” community evaluation process.*



## **Table of Contents**

Introduction .....	3
Methodology.....	5
Recommendations .....	5
Coastal Hazard Incorporation in Planning .....	18
Municipal Master Plan Example .....	19
Mapping .....	21
Sea Level Rise & Surge Vulnerability.....	23
CRS Sections That Likely Have Current Points Available .....	24
Appendix .....	31
Highlands Historical Erosion Information .....	38

## **Introduction**

The Getting to Resilience (GTR) questionnaire was originally developed and piloted by the New Jersey Department of Environmental Protection's Office of Coastal Management in an effort to foster municipal resiliency in the face of flooding, coastal storms, and sea level rise. The questionnaire was designed to be used by municipalities to assist in reducing vulnerability and increase preparedness by linking planning, mitigation, and adaptation. Originally developed by the State of New Jersey's Coastal Management Program, the Getting to Resilience process was later adapted by the Coastal Training Program of the Jacques Cousteau National Estuarine Research Reserve (JC NERR), converted into a digital format, and placed on an interactive website. Further improving the questionnaire, the JC NERR added linkages to evaluation questions including the National Flood Insurance Program's (NFIP) Community Rating System (CRS), Hazard Mitigation Planning, and Sustainable Jersey. While this website is publicly available, through the facilitated Getting to Resilience process, JC NERR Coastal Community Resilience Specialists can enhance the outcomes of the evaluation by providing community-specific recommendations, guided discussions with municipal representatives, a vulnerability analysis, and municipal plan reviews.

Located in northeastern Monmouth County, Highlands is bordered by the Shrewsbury River to the east, Sandy Hook Bay to the north, Atlantic Highlands to the west, and Middletown Township to the south. A small municipality, covering less than a square mile, Highlands can be separated into two distinct zones; lower Highlands and upper Highlands. A significant coastal bluff dictates these two areas, rising over 200 feet above sea level in some locations while the bayshore is fairly flat and no more than a few feet above sea level. This coastal bluff is prone to slumping and has experienced several well documented slump blocks, a unique hazard in New Jersey's coastal region. At times in the Borough's history, the nearby Sandy Hook spit has been attached to the shoreline of Highlands. This would have resulted in Highlands having oceanfront exposure. Through beach management practices and stabilization of the Shrewsbury River shoreline, such deviations are highly unlikely at this time but the dynamic nature of coastlines dictates that the possibility of such radical changes remains.

The Borough of Highlands was heavily impacted by Superstorm Sandy in 2012 and continues to recover and rebuild. A devastating storm surge flooded the lower half of the town. Waterfront properties also were impacted by waves generated by powerful winds. Homes and businesses were heavily impacted and a trailer park in town was destroyed. Many homes and businesses remain vacant while others are still rebuilding or elevating. The Community Center, Borough Hall, Police Station, and Fire Station were all impacted and decisions on response are still being weighed. Relocation would be the best option to reduce risk given the flooding vulnerability displayed by mapping in the current location of these facilities. However, if relocation is not an option, costly mitigation actions will need to be taken.

As part of a combined letter of agreement between the Borough of Highlands and New Jersey Future, New Jersey Future outlined a scope of services that would be provided to the towns through their Local Recovery Planning Manager Program. These services included providing guidance, technical assistance, project management, and staff support to develop and implement effective long term recovery and resilience strategies; assist the Borough of Highlands to rebuild in a manner that anticipates and responds to future severe storms and sea level rise; and to promote planning principles that were endorsed in a town resolution requesting that NJ Future provide a Local Recovery Planning Manager.

The JC NERR's participation is highlighted under *Task 6.1 Existing Conditions Analysis and Vulnerability Assessment* of the "Letter of Agreement between Borough of Highlands, and New Jersey Future". The recommendations given by JC NERR at the end of the Getting to Resilience process are part of this task that complement the deeper evaluation that NJ Future will be doing as the Vulnerability Assessment of

Highlands. The vulnerability assessment conducted by NJ Future will be based on detailed mapping of the characteristics described in part 1 of the “Elements of a Vulnerability Assessment” summary attached to the Letter of Agreement. The assessment shall evaluate potential impacts of a range of hazards (coastal storm events/flood patterns, category 1-4 hurricanes, erosion, flooding, sea level rise, storm surge) for past events, existing conditions, and year 2050 and 2100 planning horizons.

The Getting to Resilience process started as a facilitated discussion regarding the Borough’s strengths, weaknesses, and hurdles concerning resiliency. The Borough noted that many housing improvements are currently underway, including the raising many buildings and strengthening of others. This process has been aided by federal grants, non-profit assistance (from groups like NJ Future, the Robin Hood Foundation, Creative New Jersey, and Hope for Highlands), and has been guided by Borough officials. The Borough’s Office of Emergency Management is viewed by the Borough as one of the best in the area. The USACE is working on a feasibility study to examine how to best protect the waterfront from wave and surge damage in future storms. This includes a variety of berms, dunes, raised parking lots, and bulkheads. Such an expansive project would help to mitigate much of the major damages caused by Sandy. The Borough continues to search for grant funding for mitigation projects to alleviate flooding issues and rebuild and mitigate structures such as the Community Center which has yet to reopen after the storm. Highlands is currently working on a Strategic Recovery Planning Report (SRPR) through their partnership with NJ Future. This report will hopefully identify what municipal plans should be rewritten and how that process should take place. This presents an obvious opportunity for strengthening the municipal stance on resiliency.

The Borough did identify that resilience faces many obstacles in Highlands. The widespread damage of Sandy continues to linger in town. Many residents and businesses have still been unable to return. Funding for storm repairs and mitigation actions has been hard to come by and most do not have the money to pay out of pocket for such projects. Even with the widespread damage inflicted by Sandy and previous storm events, there are many residents that are not in favor of a USACE project along the waterfront. There is concern that the identity of the community will be changed and one of the largest selling points of Highlands, the fantastic waterfront view of Sandy Hook and New York City, will be lost. The largest issue facing Highlands is the topography of the town. A large portion of the town lies within the floodplain, including most of the municipal buildings, attractions, and businesses. Though some of the town does exist well beyond the reaches of floodwaters on the large coastal bluff, the town is largely built out. This makes relocation and retreat actions very difficult.

## **Methodology**

The GTR questionnaire is broken into five sections: Risk and Vulnerability Assessments, Public Engagement, Planning Integration, Disaster Preparedness and Recovery, and Hazard Mitigation Implementation. In order to efficiently answer all of the questions within the questionnaire, participation from a wide array of municipal officials and staff is encouraged. These can include administrators, floodplain managers, emergency managers, stormwater managers, public works officials, town engineers, and appointed and elected officials. For Highlands this team included Tim Hill (Borough Administrator), Dale Luebner (Floodplain Administrator, Zoning Officer, Representative of the Borough’s Engineer Office), Dave Parker (Office of Emergency Management), and Steven Nelson (NJ Future Local Recovery Manager). The questions in the GTR questionnaire were answered collectively by this group with JC NERR staff recording answers and taking notes on the discussions connected to each question.

The Getting to Resilience questionnaire was started with the town on May 16th. JC NERR staff met with two representatives of Sea Bright and one representative of NJ Future. A discussion of the towns' resilience strengths and weaknesses began the meeting and sections four and five of the questionnaire were completed. On May 27th, the questionnaire was completed with three representatives of Sea Bright and one representative of NJ Future meeting with JC NERR staff.

Upon completion of the GTR questionnaire, JC NERR staff analyzed the answers provided by the Borough of Highlands, linkages provided by the GTR website, notes taken during the discussion of questions, various municipal plans and ordinances, and mapping of risks, hazards, and vulnerabilities provided by Rutgers University and the NJ Floodmapper website. After reviewing all of this information, this recommendations report was drafted by JC NERR Community Resiliency Specialist Christopher Huch to help assist the Borough of Highlands' decision makers as the Borough works to recover from Superstorm Sandy and become more resilient.

## **Recommendations**

### ***1. Make sure all outreach programs are quantified and catalogued according to CRS standards.***

Highlands should examine the current number of outreach programs it runs and determine what it would take to gain additional points by adding more or expanding current efforts. Outreach should include information about the natural and beneficial functions of floodplains. Particularly after Sandy, residents throughout the impacted area have been looking for as much information as possible. A well organized and efficient outreach program can provide validated information from a trusted source and better prepare residents for natural risks. Outreach is one of the easiest sections to gain points in the CRS and one Highlands should focus on heavily.

It would be beneficial to develop a Program for Public Information (PPI) which would help to organize outreach, continue to include the current methods and avenues for outreach, and gain additional CRS credits. A PPI is a researched, organized, and implemented program for public outreach that is seen as having a seven step process. These steps are Establish a PPI Committee, Assess the Community's Public Information Needs, Formulate Messages, Identify Outreach Projects to Convey the Messages, Examine Other Public Information Initiatives, Prepare a PPI Document, and Implement, Monitor and Evaluate the Program. If done correctly, a PPI will make outreach initiatives more effective and can gain CRS credits in numerous categories besides outreach. For guidance on establishing a PPI, visit [http://crs2012.org/uploads/docs/300/developing\\_a\\_ppi\\_2-24-12.pdf](http://crs2012.org/uploads/docs/300/developing_a_ppi_2-24-12.pdf). For more information on Outreach Projects credit requirements, visit page 330-2 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

### ***2. Develop a pre-flood plan for public information projects that will be implemented during and after a flood.***

Highlands should consider developing a collection of outreach projects in anticipation of future flooding events. The outreach should cover all necessary information such as evacuation routes, safety procedures, and recovery operations. This action could be undertaken through a PPI and would help Highlands save time and energy leading up to, during, and after a flooding event as outreach will already have been prepackaged and prepared for dispersal. Pre-flood planning should take place with careful coordination with the community's emergency manager. Examples of messages include evacuation routes, shelter locations, "Turn Around Don't Drown," when it is safe to go back, don't enter a flooded building until it has been cleared by an inspector, get a permit for repairs, substantial damage rules, mitigation opportunities during repairs, and information on mitigation grants. Pre-flood planning is eligible for CRS credits under Flood Response Preparations. For more information on Flood Response

Preparations credit requirements, visit page 330-9 of the CRS Coordinator's Manual .

[http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**3. Make the public talks that took place post-Sandy about flood zones, flooding risk, building recommendations, etc into annual meetings.**

After Sandy, Highlands staff have held talks on various flood related topics which can be worth significant CRS credits if they become annual outreach meetings and they meet CRS guidelines in the Outreach section. Section 320 of the CRS discusses a wide variety of outreach projects and initiatives that can be covered. By continuing to discuss the importance of planning for flooding, the Borough can set an example to its residents that readiness for disaster events should be maintained, even in relatively "quiet" times. A PPI can ensure these talks are well placed and effective. Well publicized and attended talks can reduce the workload on Borough staff that would otherwise need to give numerous one-on-one meetings. However, continuing to have staff available for one on one meetings is highly recommended as it is highly beneficial and earns CRS credits in the Regulations Administration section. For more information on Outreach Projects credit requirements, visit page 330-2 of the CRS Coordinator's Manual. For more information on the Regulations Administration credit requirements, visit page 430-40 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**4. Look into becoming designated as a StormReady Community by the National Weather Service.**

The National Weather Service has created a community preparedness program to assist towns as they develop plans for a wide variety of severe weather events. This program provides guidance on hazardous weather identification, warning systems, and creating public readiness. For more information, visit <http://www.stormready.noaa.gov/howto.htm>. Highlands likely already meets much of the required criteria. Becoming a StormReady Community results in CRS credits. For more information on the StormReady Community credit requirements, visit page 610-17 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**5. Make sure all flood maps are available on the town website, at Borough Hall, and at any future Highlands Library or the nearby library in Atlantic Highlands.**

Highlands has made Flood Insurance Rate Maps (FIRMs) available in the past but must ensure that these maps are accessible and easy to find. Having the most up to date FEMA issued floodplain maps available at numerous locations in different forms of dispersal is critical to ensuring your citizens are informed and has the added benefit of allowing for CRS credits in the Outreach section. Maintaining a link to FEMA's website on the Borough website is highly recommended and should highlight a section that deals specifically with flooding and other coastal hazards rather than Sandy recovery. For more information on Outreach Projects credit requirements, visit page 330-2 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**6. Communicate the different information available within different pages of the Borough website to be easily accessible to the public.**

The Highlands website currently has some Sandy related information posted. However, it would be beneficial to add information to highlight flooding and coastal hazard risks according to CRS outreach criteria. A new section entitled "Flood Information" could replace the "Post-Sandy Information and Resources" section that would contain this information while still displaying relevant Sandy information. Once again, by establishing a PPI, the process for establishing this section of the website and subsequently updating it will be defined, documented, and eligible for CRS credits in the Outreach section. For more information on Outreach Projects credit requirements, visit page 330-2 of the CRS

Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**7. Transfer personal knowledge, documents, and other records of coastal storm and flooding event damages to digital format and place on a shared Borough computer drive to allow for access by multiple municipal departments.**

Memories of historical storm events, specifically ones that were not documented by state and federal agencies, are useful tools that can be used to plan for impending storms. However, it is vital that the information from these memories be available for all municipal staff. This information can be gathered and documented from current municipal staff, past municipal staff, and public input and may be very useful to identify past surge extents, conditions that caused amplification of storm damages, and vulnerable areas not shown by mapping. Meetings to allow for public input on historic storm damage extents may also earn CRS credits in the Outreach section. Hard copies of documents and other records should also be digitized for preservation and access. Given the small size and sometimes limited hours of Borough staff, having all storm and flooding related information on a shared drive will help educate the staff and allow for access without having to coordinate an exchange of information. For more information on Outreach Projects credit requirements, visit page 330-2 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**8. Adopt the latest version of FEMA's flood maps and rewrite elevation and freeboard requirements in a Flood Damage Prevention Ordinance as based upon the Best Available Flood Hazard Data or the most stringent version of FEMA's flood maps.**

The Borough may desire to amend the current Flood Damage Prevention Ordinance by using language available in the current NJ DEP recommended Ordinance. Writing new requirements as related to the Best Available Flood Hazard Data, it should allow for change over time as FEMA's maps are redrawn regularly. While it had been decades since FEMA had remapped the FIRMs in our area, the remapping process was long overdue and can be anticipated to take place with a much higher frequency in the future. Best Available Flood Hazard Data is defined by NJ DEP as the most recent available flood risk guidance FEMA has provided. The Best Available Flood Hazard Data may be depicted on but not limited to Advisory Flood Hazard Area Maps, Work Maps or Preliminary FIS and FIRM. For more information on NJ DEP recommended Flood Damage Prevention Ordinances, visit <http://www.nj.gov/dep/floodcontrol/modelords/modelde-bestavail.doc>.

By adding "or the most stringent version of FEMA's flood maps" to this ordinance, higher standards may be instituted that may result in the town becoming more resilient. For example, the Advisory Base Flood Elevation maps may have a more expansive V-zone than the Flood Insurance Rate Maps. By requiring building to adhere to the stricter requirements of the Advisory Base Flood Elevation maps, more homes will be built to higher standards. Likewise, a higher freeboard requirement may result in a safer community and better CRS credits. An amended ordinance may also include some of the newer information coming out on FEMA's maps including the Limit of Moderate Wave Action (LiMWA). That information can also be used to enhance the building standards. Both actions can result in a large amount of CRS points in the Higher Regulatory Standards section. For more information on the Higher Regulatory credit requirements, visit 430-2 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**9. Ensure the public is aware of any changes to FEMA's flood maps as they are updated and if those updates result in changes to the Borough's building requirements.**

Ensuring that the information on the maps is understood by all municipal leaders and staff prior to discussions with the public is critical to ensure the correct information disseminated by the Borough. For

every release of a map update, the Borough could make a public announcement to its citizens and detail if any changes were made to the prior map, including if additional information such as the Limit of Moderate Wave Action has been added. Notifying the public of a new map product is an example of outreach that can be done by the township's PPI, raising the potential for CRS points. Including information on what changes occur when new maps are released on the Borough's Flood Information webpage may help to alleviate questions the public may have as each map is updated, thereby reducing the workload on Borough staff.

The new RISK map products from FEMA include a GIS layer depicting the "changes since last FIRM" which will help the Borough in describing the changes in flood zones on individual properties and for the Borough as a whole. A description of this data set can be found at: <http://www.region2coastal.com/flood-risk-tools/tool-descriptions> and the new data layer is being developed as part of the preliminary FIRM process. This data is in draft form now but will be released at the [www.region2coastal.com](http://www.region2coastal.com) website soon. The more familiar the citizens are with the maps, the more likely they will take appropriate actions.

**10. Highlands should identify, map, and keep data on areas of coastal erosion and consider creating erosion protection programs or instituting higher regulations for building in areas subject to coastal erosion.**

Erosion can quickly become a problem in coastal areas. These areas could include any waterfront that is not bulkheaded and has experienced erosion. Factors that could amplify erosion (sea level rise, surge) should be defined. Over the last 150 years, the bayfront and riverfront shoreline positions have changed dramatically. The Borough should make an effort to identify and document the areas of erosion. Acquiring erosional rates and shoreline positions can be partially done through the USGS Coastal Shoreline Change data set (<http://marine.usgs.gov/dsasweb/#>). A short analysis of that dataset is included in the appendix under Highlands Historical Erosion Information. Identifying erosional hot spots and their potential impacts on homes and infrastructure can allow for mitigation actions that may prevent erosion from becoming a future problem. In the same mindset, unwanted deposition from shoaling and runoff can also be problematic for storm water management and navigation in waterways. Large-scale replenishment projects often change the erosional patterns of beaches as well so a change should be expected if a USACE project is completed. Having information on the patterns prior to these project can be used to gauge the project's success and help to improve the design for future replenishment projects. Keeping information on coastal erosion can result in CRS credit in the Erosion Data Maintenance (EDM) section. For more information on the Erosion Data Maintenance credit requirements, visit page 27 of Management of Coastal Erosion Hazards. [http://www.fema.gov/media-library-data/20130726-1755-25045-9869/crs\\_credit\\_coastal\\_erosion.pdf](http://www.fema.gov/media-library-data/20130726-1755-25045-9869/crs_credit_coastal_erosion.pdf)

**11. Highlands should identify sea level rise as a hazard in town plans and consider disclosing hazard risks to potential buyers and real estate agents.**

Even with the lowest level of predicted sea level rise Sea Bright will experience significant impacts in the near future. Historical rates of sea level rise should be defined as part of this action and future predicted sea levels should be taken into account when making land use decisions, construction standards, etc. The historical rate of sea level rise along the New Jersey coast over the past half century was 3-4 mm/yr (or 0.12 -0.16 in/yr), while projected future rates are expected to increase. In the recent paper entitled "A geological perspective on sea-level rise and its impacts along the U.S. mid-Atlantic coast" Miller and Kopp state that for 2050, the "best" estimate for sea level rise is 1.3 feet along the Jersey Shore. By 2100 sea level rise the "best" estimate is 3.1 feet along the Jersey coast. "Best" refers to a 50% likelihood of that level of sea level rise occurring, meaning that actual sea levels may be lower or higher than the "best" estimates.

While sea level rise is a monumental challenge to coastal areas, the challenge cannot be tackled until it is properly identified. Disclosing these risks to the public using various techniques also may result in CRS credits in the Outreach Projects and Hazard Disclosure sections. For more information on Outreach Projects credit requirements, visit page 330-2 of the CRS Coordinator's Manual. For more information on Hazard Disclosure credit requirements, visit page 340-2 of the CRS Coordinator's Manual.

[http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**12. Create a detailed mitigation plan for areas that experience repetitive loss.**

Repetitive loss properties can be a large burden on towns over time. By creating a mitigation plan for these areas, the Borough may identify new strategies to tackle this issue, pinpoint at what point in time in the future that buyouts of these properties may be prudent, and achieve CRS credits in the Repetitive Loss Area Analysis section. Furthermore, enacting mitigation for repetitive loss areas opens up a wide variety of CRS credits. For more information on Repetitive Loss Area Analysis credit requirements, visit page 510-29 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**13. Consider returning any properties acquired through Blue Acres or other buyout or acquisition programs to natural floodplain functions.**

Highlands has very limited areas of land left that still have natural floodplain functions. Floodplains can absorb runoff and mitigate flooding issues. This can be done utilizing a variety of techniques including wetlands restoration, planting natural vegetation, reducing sediment compaction, and creating a natural profile. Returning land to natural floodplain functions can achieve significant CRS credits in the Natural Functions Open Space (NFOS) section. Funding for mitigation projects like this could be available by applying for a portion of the \$112 million in funding available through the Federal Emergency Management Agency (FEMA) in two recently announced Hazard Mitigation Assistance (HMA) grant programs: Flood Mitigation Assistance (FMA) and Pre-Disaster Mitigation (PDM). For more information on Natural Functions Open Space credit requirements, visit page 420-13 of the CRS Coordinator's Manual. [http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**14. Focus on creating a dune system and re-establish dune grass and other natural vegetation.**

*"Coastal dunes form the first line of protection for the communities behind them (e.g. uplands and wetlands such as interdunal swales and bayside tidal marshes), by reducing the energy of storm waves. Dunes play a vital role in protecting coastal areas from erosion, coastal flooding and storm damage, as well as sheltering properties and ecosystems behind them from wind and sea spray and protecting the tidal wetlands on the bayside of barrier islands. During Hurricane Sandy, communities protected by larger, more well established (vegetated) dunes suffered much less damage than did those lacking this important defense."*

("Dune it Right!" [http://gcuonline.georgian.edu/wootton\\_l/why\\_are\\_dunes\\_important.htm](http://gcuonline.georgian.edu/wootton_l/why_are_dunes_important.htm))

The Christie administration has made dune systems a priority for storm protection after their effectiveness in mitigating wave damages was proven during Sandy. The USACE is currently completing a feasibility study for the establishment of protective dunes and berms along the shoreline in Highlands. While the Borough's bulkheads are the last line of defense during a storm, it has been shown that dunes are an effective way of combatting storm damage. A strong dune system in front of the Borough's bulkhead lines can add more protection and also prevent bulkheads from sustaining costly damages during storms. Dunes absorb wave energy and release sand supplies onto the beach during storm events, increasing the amount of time it takes for wave energy to reach the bulkhead line. A dune line

would also help to eliminate the overwash of the bulkhead that resulted in sand and debris deposited throughout the town, requiring a costly and time intensive cleanup.

A dune system should be continuous as cut throughs for beach access allow wave energy to erode the dunes rapidly. The presence of bulkheads on the backside of a dune will also increase the likelihood that cut throughs in the dune would cause rapid erosion due to the reflective nature of the bulkheads. Access should be over the top of the dune in specific and limited locations to protect dune vegetation. The Borough should support efforts by the USACE to establish a thriving dune system along the waterfront in appropriate areas. If such a project is successful, it is recommended that the Borough reach out to the Stockton Coastal Research Center and inquire if a site in town could be added to the NJ Beach Profile Network. This would allow data to be taken twice a year on any changes to the beach profile after a project has taken place. Keeping data and maps on erosion within the town may be eligible for CRS points under the Erosion Data Maintenance section. For more information on the Erosion Data Maintenance credit requirements, visit page 27 of Management of Coastal Erosion Hazards. [http://www.fema.gov/media-library-data/20130726-1755-25045-9869/crs\\_credit\\_coastal\\_erosion.pdf](http://www.fema.gov/media-library-data/20130726-1755-25045-9869/crs_credit_coastal_erosion.pdf)

For more information on the Stockton Coastal Research Center, visit <http://intraweb.stockton.edu/eyos/page.cfm?siteID=149&pageID=1>.

**15. Utilize the Community Vulnerability Assessment Tool, Risk and Vulnerability Assessment Tool, Hazard Assessment Tool, and HAZUS-MH to identify potential hazards, risks, and vulnerabilities and keep mapping information on file.**

There are numerous hazard, risk, and vulnerability assessment tools available to municipalities. It is recommended that the members of the municipal staff are familiar with the use of these tools. The importance of identifying hazard, risk, and vulnerability cannot be overstressed. Use of these tools can be beneficial in the CRS, hazard mitigation planning, creating municipal plans, zoning, and writing construction codes.

- The Community Vulnerability Assessment Tool is used to conduct a community vulnerability assessment to a wide range of hazards. It is often used in conjunction with the Risk and Vulnerability Assessment. <http://csc.noaa.gov/digitalcoast/training/roadmap>
- The Risk and Vulnerability Assessment Tool is used to identify people, property, and resources that area at risk of injury, damage, or loss from hazardous incidents or natural hazards. <http://csc.noaa.gov/digitalcoast/training/roadmap>
- The Hazard Assessment Tool is a risk assessment process which will help identify hazards, profile hazard events, inventory assets, and estimate losses. <http://www.fema.gov/hazard-mitigation-planning-risk-assessment>
- HAZUS-MH is a software package that uses models and Geographic Information Systems (GIS) technology for estimating physical, economic, and social impacts from various hazards such as floods and hurricanes. <http://www.fema.gov/hazus>

**16. Have Borough municipal officials participate in FEMA training courses.**

While going through the GTR questionnaire, it was expressed that many Borough officials had not taken advantage of FEMA trainings for certification. FEMA offers in person training and independent study programs. To find more information about in person training topics and dates please visit <http://training.fema.gov/> and <http://www.fema.gov/training-1> and for independent study programs please visit <http://training.fema.gov/is/>. Through the Coastal Training Program, the JC NERR offers free courses for municipal staff and elected/appointed officials. JC NERR is willing to work with the township to understand training needs and provide relevant courses when possible. Having municipal officials trained on various topics and techniques can result in CRS credits in the Regulations Administration (RA)

section though it may require SID codes. For more information on Regulations Administration credit requirements, visit page 430-40 of the CRS Coordinator's Manual.

[http://crsresources.org/files/2013-manual/crs\\_manual\\_508\\_ok\\_5\\_10\\_13\\_bookmarked.pdf](http://crsresources.org/files/2013-manual/crs_manual_508_ok_5_10_13_bookmarked.pdf)

**17. Ensure that Highlands' Community Emergency Response Team (CERT) meets CRS standards.**

CERT programs can provide volunteer support to first responders, provide assistance to victims, help to organize volunteers at disaster sites, and collect disaster information to support first responder efforts. Highlands already has a CERT team established but should make sure it meets CRS criteria to achieve points.

**18. Adopt a Continuity of Operations Plan.**

A Continuity of Operations Plan (COP) is separate from an Emergency Operations Plan and ensures that primary essential functions continue to be performed before, during, and after a wide range of emergencies. It is developed and maintained to enable each department, agency, and other governmental entity to continue to function effectively in the event of a threat or occurrence of any disaster or emergency that could potentially disrupt governmental operations and services. A COP can protect essential facilities, equipment, vital records, and other assets. It can reduce or mitigate disruptions to operations. It can facilitate decision-making during an emergency. JC NERR is able to provide example COP plans from the Borough of Avalon and Brick Township. FEMA also provides a Continuity Plan Template (<http://www.fema.gov//media-library/assets/documents/90025>) that can be used as a starting point for local governments.

**19. Examine municipal plans, strategies, and ordinances and consider rewriting sections to include the previous recommendations or reflect the risks, hazards, and vulnerabilities explored in the Getting to Resilience process.**

In order to fully embrace resiliency, municipal plans, strategies, or ordinances should incorporate resiliency recommendations and findings. These should include the Municipal Master Plan, All Hazards Mitigation Plan, Floodplain Management Plan, Evacuation Plan, Emergency Response Plan, Continuity of Operations Plan, Disaster Recovery Plan, Post Disaster Redevelopment Plan, Capital Improvements Plan, Economic Development Plan/Strategy, Coastal Plan, Shoreline Restoration Plan, Open Space Plan, Stormwater Management Plan, Historic Preservation Plan, Zoning Ordinance, Flood Damage Prevention Ordinance, and Building Code. If these plans, strategies, or ordinances do not currently exist, it is highly recommended the Borough move to create them. Further content regarding this recommendation can be found below in the section titled, "Coastal Hazard Incorporation in Planning".

**20. Begin the long term planning process to prepare for sea level rise.**

Highlands, like most other coastal municipalities, will experience future impacts from sea level rise in the form of regular tidal flooding and heightened storm impacts. Highlands' low relief in the lower portion of town results in a large number of properties, facilities, and infrastructure that will eventually need to have a plan in place to mitigate or respond to these heightened flooding threats. With such a large portion of the tax base to cover, the need for careful planning and informed decisions cannot be understated. While other municipalities may have the capability to react to smaller issues as they arise, Highlands will need to preemptively decide on actions and begin to carry them out. The range of options are bountiful, ranging from buyouts to elevating properties to hardening techniques but the use of these options must be weighed, discussed, and decided upon. While this may seem like a monumental task, it is a critical one.

The Blue Acres program is currently being administered by the NJDEP throughout the state and other buyout programs are also available. It would be prudent to look into repetitive loss properties that will

also be threatened by sea level rise in the future to determine if buyouts of these properties would be an effective way to plan for sea level rise. It is important to note that as sea level rises, the competition for buyout programs will be higher and funding may become more limited. If the Borough still feels that buyouts are not a good option, mitigation strategies will need to be looked into. However, not only will the individual mitigation options need to be examined, but the time frame of their effectiveness will need to be determined as well. Cost-benefit analysis should accompany all mitigation projects to ensure that the lifespan of the mitigation and effectiveness when compared to rate of sea level rise is weighed against anticipated protection. In some instances, it may be determined that the cost of protecting already flood prone areas against sea level rise will be less effective than property acquisition. This may lead the Borough to reconsider more drastic measures such as buyout programs. Again, these decisions will not be easy ones to make but it is critical that the decisions do take place.

JC NERR recommends Highlands consider learning from the resiliency planning process undertaken by Guilford, CT and described in “Town of Guilford Community Coastal Resilience Plan Report of Options to Increase Coastal Resilience”:

<http://www.ci.guilford.ct.us/pdf/Coastal%20Resilience%20Plan,%20Report%20&%20Options.pdf>.

The goal of their Coastal Resilience Plan was to address the current and future social, economic and ecological resilience of the Town of Guilford to the impacts to sea level rise and anticipated increases in the frequency and severity of storm surge, coastal flooding, and erosion. The Town has drafted the report of options for increased coastal resilience as a step toward developing a Community Coastal Resilience Plan.

The four basic steps of the Coastal Resilience Plan are:

1. Generate awareness of coastal risk;
2. Assess coastal risks and opportunities;
4. Identify options or choices for addressing priority risks and vulnerabilities (short term); and
5. Develop and implement an action plan to put selected options or choices into place (long term).

Similar to Highlands, Guilford’s coastal neighborhoods are diverse and it is likely that each will be faced with a combination of vulnerabilities to sea level rise and the increased incidence and severity of coastal storms. A combination of adaptation measures will therefore be necessary in each neighborhood in order to reduce risks and increase resilience. Likewise, neighborhood-scale resilience planning will likely be important. Steps should be taken to evaluate individual adaptation measures and determine how comprehensive solutions can be developed and implemented for building coastal resilience.

A comprehensive risk and vulnerability assessment for Highlands should include the following municipal sectors:

- Social – Residents, business community, and visitors.
- Economic – Residential Properties, commercial/industrial businesses, municipal resources,
- Tourism and future development.
- Infrastructure – Roads, bridges, railroads, stormwater, seawalls, tide gates, the marina, and
- Municipal facilities.
- Utilities – Public and private water supplies, septic systems, telecommunications, and
- Electricity.
- Emergency Services – Fire, police, medical, sheltering, evacuation/egress.
- Natural Systems – Tidal wetlands and other coastal landforms.

When considering options for coastal resilience, the following three types of adaptation responses are typically considered:

- **Retreat** involves no effort to protect the land from the sea. The coastal zone is abandoned and ecosystems shift landward. This choice can be motivated by excessive economic or environmental impacts of protection. In the extreme case, an entire area may be abandoned.
- **Accommodation** implies that people continue to use the land at risk but do not attempt to prevent the land from being flooded. This option includes erecting emergency flood shelters, elevating buildings on piles and elevating roadways.
- **Protection** involves hard structures such as sea walls and dikes, as well as soft solutions such as dunes and vegetation, to protect the land from the sea so that existing land uses can continue.

Included in a 2010 NOAA's Office of Ocean and Coastal Resource Management manual titled, "Adapting to Climate Change: A Planning Guide for State Coastal Managers" is a thorough discussion of adaptation strategies and methods.

(<http://coastalmanagement.noaa.gov/climate/docs/adaptationguide.pdf>). Highlands could consider some of the options presented in this document for long and short-term resiliency planning. Many of these suggestions complement the suggestions provided earlier in this GTR Recommendations report:

#### **Impact Identification and Assessment**

- Research and Data Collection – Predict possible social and economic effects of climate change on communities. Calculate cost-to-benefit ratios of possible adaptation measures.
- Encourage adaptation plans that are tailored to specific industries.
- Monitoring – A comprehensive monitoring program that incorporates multiple tools and considers a variety of systems and processes can provide input to the vulnerability assessment and adaptation strategy.
- Modeling and Mapping – Map which areas are more or less susceptible to sea level rise in order to prioritize management efforts.

#### **Awareness and Assistance**

- Outreach and Education – Create scientific fact sheets about climate change addressing community members, visitors, elected officials, businesses and industries. Use multiple forms of communication such as news media, radio, brochures, community meetings, social networks, blogs and websites.
- Real Estate Disclosure – The disclosure of a property's vulnerability to coastal hazards enables potential buyers to make informed decisions reflecting the level of impacts they are willing and able to accept.
- Financial and Technical Assistance – Provide flood insurance discounts for properties that exceed floodproofing standards by one or two feet. Encourage hazard mitigation by providing grants to areas that implement adaptation measures.

#### **Growth and Development Management**

- Zoning – Zoning can be used to regulate parcel use, density of development, building dimensions, setbacks, type of construction, shore protection structures, landscaping, etc. It can also be used to regulate where development can and cannot take place, making it an invaluable tool in efforts to protect natural resources and environmentally sensitive areas and guide development away from hazard-prone areas.
- Redevelopment Restrictions – Combining restrictions with acquisition/demolition/relocation programs provides safer options to property owners in the wake of the loss of or damage to their homes or businesses.

- Conservation Easements – A conservation easement is a legal agreement between a landowner and a land trust or government agency that can be used to restrict development in sensitive and hazard-prone areas.
- Compact Community Design – The high density development suggested by compact community design can allow for more opportunities to guide development away from sensitive and hazard-prone areas.

### **Loss Reduction**

- Acquisition, Demolition, and Relocation – The most effective way to reduce losses is to acquire hazard-prone properties, both land and structures, demolish or relocate structures, and restrict all future development on the land.
- Setbacks – Setbacks can protect structures from hazards by keeping the structures away from a property's most vulnerable areas. Building Codes – Building codes that regulate design, construction, and landscaping of new structures can improve the ability of structures in hazard-prone areas to withstand hazard events.
- Retrofitting – Existing structures can be protected from hazards through retrofitting.
- Infrastructure Protection – Infrastructure protection entails fortification against the impacts of climate change.
- Shore Protection Structures – Shore protection structures protect existing development allowing it to stay in place. They often damage or destroy other valuable coastal resources and create a false sense of security; nevertheless in some cases, for the purposes of protecting existing development, there may be no other acceptable or practical options.

### **Shoreline Management**

- Regulation and Removal of Shore Protection Structures – To protect the natural shoreline and the benefits it provides, regulations can be used to limit shoreline hardening as well as promote alternative forms of protection.
- Rolling Easements – Rolling easements are shoreline easements designed to promote the natural migration of shorelines. Typically, rolling easements prohibit shore protection structures which interfere with natural shoreline processes and movement, but allow other types of development and activities. As the sea rises, the easement moves or “rolls” landward, wetland migration occurs, and public access to the shore is preserved.
- Living Shorelines – Living shorelines can be effective alternatives to shore protection structures in efforts to restore, protect, and enhance the natural shoreline and its environment. Living shorelines use stabilization techniques that rely on vegetative plantings, organic materials, and sand fill or a hybrid approach combining vegetative plantings with low rock sills or living breakwaters to keep sediment in place or reduce wave energy.
- Beach Nourishment – Beach nourishment is the process of placing sand on an eroding beach, typically making it higher and wider, to provide a buffer against wave action and flooding.
- Dune Management – Dunes may be restored or created in conjunction with a beach nourishment project or may be managed as part of a separate effort.
- Sediment Management – Dredging and placing sediment, building shore protection structures and other structures that trap or divert sediment.

### **Coastal Ecosystem Management**

- Ecological Buffer Zones – Ecological buffers are similar to setbacks (and may be included within setbacks) but are typically designed to protect the natural environment by providing a transition zone between a resource and human activities.

- Open Space Preservation and Conservation – Open space preservation and conservation can be accomplished through the management of lands dedicated as open space through a number of the measures previously discussed, such as zoning, redevelopment restrictions, acquisition, easements, setbacks, and buffers.
- Ecosystem Protection and Maintenance – In the context of coastal adaptation, ecosystem protection largely involves the protection of tidal wetlands and other ecosystems. The facilitation of wetland migration is an important aspect of this.
- Ecosystem Restoration, Creation, and Enhancement – Similar to the above, ecosystem restoration and creation can replace tidal wetlands that are lost to sea level rise.

#### **Water Resource Management and Protection**

- Stormwater Management – Drainage systems may be ill-equipped to handle the amount of stormwater runoff that will accompany the more intense rainfall events expected in the future, and those in low-lying areas will be further challenged by losses in elevation attributed to rising sea levels.
- Water Supply Management – Climate change will negatively affect both water quantity and quality, and coastal populations will continue to grow, so water supply managers must be prepared to respond to associated challenges to water supply.

Examples of adaptation measures considered in Gilford’s plan include management of coastal real estate and structures, shoreline protection and management of coastal and nearshore lands, roadway alterations, and protection or replacement of water supply wells and septic systems. All these adaptation measures are presented with a variety of options for consideration.

Highlands may also gain some planning insight from the public participation process associated with Gilford’s resiliency planning. Gilford found their public believes that physical changes are needed to address sea level rise and increase coastal resilience, but that there are societal and institutional obstacles. Common themes noted from the public comments included:

- Coastal resilience planning – and many of the solutions that are implemented – may be best accomplished at the neighborhood scale; and neighborhood planning groups may need to be organized to begin looking at appropriate solutions;
- The tax base associated with coastal properties would need to be preserved in the short term and then some of the tax base may need to be shifted in the long term;
- Education and technical assistance are needed and desired by homeowners, and education could also be accomplished in the schools;
- Comprehensive solutions will be needed such as: addressing water and wastewater at the same time in neighborhoods where these systems will struggle or fail; ensuring that roadway improvements in one location are effective because improvements are also made elsewhere in the transportation network; and working on coordinated roadway and railroad improvements.

In thinking of their own public participation in resilience planning, Highlands could likely expect similar themes to emerge and could be prepared to offer the long-term planning options that may be under consideration by the municipality.

#### **Coastal Hazard Incorporation in Planning**

Incorporation of coastal hazards into municipal planning is highly recommended to accurately reflect the risks of coastal living. Life in coastal towns largely revolves around weather and water conditions and

planning should include consideration for current and future coastal hazards. While including information on coastal hazards in Emergency Response Plans and Evacuation plans is an easy connection to make, the path to incorporation of coastal hazards into documents such as a Master Plan may be more challenging to realize. However, to foster a community of resiliency, it is important to keep hazards in mind throughout all planning documents. The Master Plan should be used to catalogue and document the goals of all other planning documents. The following is an example of how identification of coastal hazards can be introduced to a Municipal Master Plan through the Floodplain Management section. This sort of language and related content can be utilized in various other planning documents and then rediscussed in the Master Plan under the corresponding sections.

### **Municipal Master Plan Example**

The following excerpts are adapted from a comprehensive plan for Worcester County in Maryland, the equivalent to a municipal master plan. This comprehensive plan incorporates coastal hazards throughout the entire document to form an integrated approach to resiliency. Coastal hazards are often identified in the document as “current and anticipated challenges”. Individual sections (such as the Floodplain Management section given in this example) identify objectives and recommendations that should be mirrored in individual plans (a Floodplain Management Plan in this example). In doing so, all municipal plans are organized under the master plan and share the same language and goals. Many of the recommendations in this municipal master plan example are closely tied to goals already addressed in the current Borough Master Plan. If choosing to update the Floodplain Management Plan, it is highly recommended to do so by following the guidelines set in Section 510 of the CRS which can result in large CRS credits. Refer to the following link for the Worcester County Comprehensive Plan for more ideas and examples of a planning document drafted with resiliency in mind.

<http://www.co.worcester.md.us/cp/finalcomp31406.pdf>

### **Sample Introduction**

*Realizing that air, water, and land could be overused and despoiled, the plans organized within this document increasingly moved toward resource protection. If such damage occurred, local residents' quality of life and tourism, the economic linchpin, would suffer. Preserving the Borough's natural resources and character will therefore, continue to be this plan's main purpose.*

*The plan's purpose is to provide the following:*

- 1. An official statement of goals, objectives, policies and aspirations for future growth, development and the quality of life;*
- 2. A set of guidelines for the government and private sectors to maximize the county's quality of life;*
- 3. A strategy addressing current and anticipated challenges ; and*
- 4. Sufficient policy guidance to effectively manage natural, human and financial resources.*

### **Sample Floodplain Management Section**

*Floodplains, lands along waterways subject to flooding, locally have low relief and sedimentary soils. Floodplains are defined by how often they flood. A 100-year floodplain has a 1% probability of flooding in a given year and is not tidally influenced. Local flooding can occur in major storm events. Most areas of the Borough of Highland's 100-year floodplain are highly developed. Both residential and commercial uses exist within this floodplain. Most of the time a floodplain is available for use. However, during floods they can be dangerous. Superstorm Sandy reinforced this fact. Floods injure people physically and emotionally and cause economic damage. Beyond this, emergency personnel are put at risk when called upon to rescue flood victims. In Highlands, flooding must be taken very seriously. To protect public safety and property, limiting future building in floodplains and stringent construction standards will help reduce*

*injuries and property damage. Federal, state and local policies should be consistent to implement this approach.*

### **Objectives**

*The Borough's objectives for floodplain protection are:*

- *Limit development in floodplains*
- *Reduce imperviousness of existing and future floodplain development where possible*
- *Preserve and protect the biological values and environmental quality of tidal and non-tidal floodplains, where reasonable and possible to do so.*

*Developed floodplains have a reduced capacity to absorb stormwater, resulting in increased flooding. For example, development results in new impervious surfaces (roads, sidewalks, roofs, etc.), which limit the effectiveness of the floodplain by reducing the land's absorption capacity. This increases the potential for flooding. It is therefore important that the natural floodplain character be maintained, wherever reasonable, to promote public safety, to reduce economic losses, and to protect water quality and wildlife habitat.*

*Highlands, with its extensive areas of low relief, faces additional flooding issues. Several areas of the Borough commonly flood during storms. Sea level rise will increase flooding hazards. New Jersey is particularly vulnerable to sea level rise. During this century, as sea level rises, shorelines could retreat significantly in parts of the Borough. Narrow bay beaches and wetlands at low elevations, both important habitats, would be lost to even a modest rise in sea level and erosion of the oceanfront would increase. Currently, the state recognizes a right to protect shores with hard structures (e.g. riprap). As sea level rises, these hard structures will prevent "migration" of beaches and wetlands, and these natural features will be lost.*

### **Programs and Policies**

*Flooding from coastal storms is a serious threat to life and property with the potential for extensive damage and disruptions. To reduce potential damage, the county is developing a hazard mitigation plan. This first step will provide guidance for pre-disaster activities. The second phase of addressing disasters is to develop a post disaster plan. Confusion and rapid decision-making follow a disaster. Advance planning can position the Borough to reduce its exposure to future disasters and reduce the need for ad hoc decision-making. Superstorm Sandy has taught us that effective post-disaster planning is necessary for an effective recovery process.*

### **Recommendations**

1. *Work with federal and state federal agencies to regularly update the Borough floodplain maps, with first priority being areas that are mapped as 100-year floodplain without base flood elevation established.*
2. *Limit new development and subdivisions in the floodplain.*
3. *Promote uses, such as open space easements, natural areas, and recreational open space to reduce impervious surfaces in floodplains.*
4. *Work to acquire properties in the lowest lying portions of the 100-year floodplain, and return them to a natural state.*
6. *Reevaluate the effectiveness of the current floodplain protection regulations.*
7. *Discourage the location of new homes and roadways in the "V" or wave velocity zone and the 100-year floodplain.*
8. *Work with the county to complete a hazard mitigation plan for flooding, wildfire, and other natural hazards.*

9. *Develop and implement a post-disaster recovery and reconstruction plan to facilitate recovery and to reduce exposure to future disasters.*
10. *Participate in the Community Rating System to receive flood insurance premium credits.*
11. *Consider code changes that will limit impervious surfaces.*
12. *Develop a sea level rise response strategy (including a two foot freeboard requirement for properties exposed to flooding and discourage further shoreline hardening).*

## **Mapping**

The following maps can be found in the appendices of this document and were either requested by Borough staff or recommended by JC NERR staff during GTR meetings. As part of launch of the New Jersey Roadmapper website, the site will host community profiles that include municipal mapping profile packets that will be available for future download. These maps can and should be used to help write and update the Municipal Master Plan, All Hazards Mitigation Plan, Floodplain Management Plan, Evacuation Plan, Emergency Response Plan, Continuity of Operations Plan, Disaster Recovery Plan, Post Disaster Redevelopment Plan, Capital Improvements Plan, Economic Development Plan/Strategy, Coastal Plan, Shoreline Restoration Plan, Open Space Plan, Stormwater Management Plan, Historic Preservation Plan, Zoning Ordinance, Flood Damage Prevention Ordinance, and Building Code.

### ***Repetitive Loss & Severe Repetitive Loss (working to secure datasets)***

Repetitive Loss and Substantial Damage maps can be used to identify “problem” areas. Depending on the location and size of these areas, the Borough can make decisions about how to prevent repetitive loss from occurring. These options can range from utilizing Blue Acres funding and returning the properties to a natural state to creating protective infrastructure projects in order to help protect from risk.

### ***Storm Surge (SLOSH Category 1, SLOSH Category 2, & SLOSH Category 3) (provided in the appendix)***

SLOSH or Sea, Lake, and Overland Surge from Hurricanes is a computerized model from the National Hurricane Program. SLOSH takes into account various factors to compute surge inundation above ground level or simple inundation. These factors include storm size, storm pressure, storm speed, storm path, wind speed, bathymetry, and topography. With this set of factors, SLOSH determines the worst surge impacts that can be expected from hurricanes according to category. SLOSH maps are vital tools for Emergency Operations Center managers for making decisions about evacuation orders, timing of evacuation, and staging of emergency equipment prior to tropical weather systems.

### ***Sea Level Rise 1-3 feet with Critical Facilities (Supplied in Appendix)***

Over the past hundred years, sea level has risen slightly higher than one foot in New Jersey. Due to a variety of factors including melting land ice and thermal expansion, it is anticipated that the rate of sea level rise will increase substantially in the future. While sea level rise poses its own threat to coastal communities, it also will increase the severity of storm surge and erosion. By examining sea level rise maps, the Borough can better understand future flooding risk and plan accordingly. As much of the Borough is near current sea level, Sea Level Rise maps should be utilized heavily for municipal planning documents.

### ***Shoreline Change (Erosion analysis supplied in Appendix)***

Shorelines are constantly in a state of change, be it from tidal fluctuations or erosional and depositional forces. Shoreline change can create large scale shifts in risk. Erosion may move shoreline closer to buildings and infrastructure, reducing natural buffers and heightening impacts. Deposition that moves shorelines or near shore features such as sandbars may in turn reduce rates of flow of streams and stormwater management systems and cause greater risk of precipitation driven flooding. Deposition can

also cause navigation hazards to waterways and navigation channels. Shoreline Change maps can identify trends and should be incorporated into appropriate municipal plans. Some shoreline change maps are available from USGS at <http://marine.usgs.gov/dsasweb/#>.

***Overlays of Hazards and Populations, Infrastructure, and Building Footprints (coming at future time in municipal profile)***

Though it is the goal of this report to guide the Borough of Highlands towards resiliency, risk will always exist. By overlaying hazards such as sea level rise and surge with population information, infrastructure, and building footprints, the Borough will be able to identify areas of highest risk and plan accordingly.

***Natural Resources, Historical Resources, Cultural Resources, & Economic Resources (coming at future time in municipal profile)***

Mapping of a community’s resources is an extremely useful tool, not only for creating a catalogue of a community’s strengths, but also for identifying areas that should be protected. Overlaying hazards such as sea level rise and surge may lead Highlands to make decisions on protecting certain resources through retrofitting historical buildings or protecting natural resources by allowing for natural floodplain functions.

**Sea Level Rise and Surge Vulnerability**

As much of the Borough of Highlands is at or near current sea level, fluctuations in sea level through surge events and trends towards higher sea level are of great significance. Analysis of SLOSH maps show that as hurricane strength increases, potential surge impacts will increase in scope and severity as one would expect. SLOSH models indicate we should expect flooding on a similar scale of Sandy for powerful Category 1 hurricanes. SLOSH models for Category 2 and 3 storms show a much more dire situation with flooding covering covering the entire lower section of town below the bluff in both scenarios with enough inundation to cause extensive and widespread devastation (between 3-9+ feet of flooding above ground level in Category 2 SLOSH, greater than 9 feet in almost all areas in Category 3 SLOSH). However, all SLOSH scenarios do not flood the critical evacuation route of Route 36. Although storms of this magnitude are very rare for our area, they remain a possibility that requires attention and planning.

Even the relatively low end scenario of one foot of sea level rise may require adaptation as numerous streets will be very close to seeing fairly regular tidal inundation. Scientists anticipate the arrival of one foot of sea level rise before 2050. As sea level rise is expected to accelerate this century, three feet of sea level rise is very likely before 2100. In the table below, the “low”, “high”, and “best” estimates for sea level rise projections for New Jersey for the years 2050 and 2100 are displayed. “Best” refers to a 50% likelihood of that level of sea level rise occurring.

<b>Total sea level rise projections for New Jersey.</b>			
	Total cm	Total inches	Total feet
<b>2050 best</b>	<b>40</b>	<b>16</b>	<b>1.3</b>
2050 low	23	9	0.7
2050 high	60	24	2.0
<b>2100 best</b>	<b>96</b>	<b>38</b>	<b>3.1</b>
2100 low	50	20	1.6
2100 high	147	58	4.8

All values with respect to a year 2000 baseline.

NJ sea level rise projection ranges and best estimates. Miller AK, Kopp RE, Horton BP, Browning JV and Kemp AC. 2013. A geological perspective on sea-level rise and its impacts along the U.S. mid-Atlantic coast. Earth's Future 1(1):3-18.

Two feet of sea level rise sees regular tidal flooding of numerous streets. These include Miller Street, North Street, Cornwall Street, Center Street, Shrewsbury Avenue, Bay Avenue, Snug Harbor Avenue, Recreation Place, Cheerful Place, Washington Avenue, and Barbarie Avenue. Three feet of sea level rise will result in regular tidal inundation in many areas including the area between Central Avenue and Seadrift Avenue as well as the triangle formed by 2nd Street and the two ends of Shrewsbury Avenue. Unfortunately, the downtown section of the Borough appears to be very vulnerable to sea level rise, creating an economic vulnerability. Any level of inundation due to regular tidal flooding will have large scale impacts on emergency response. Sea level rise will also result in greater impact of storm events as a surge atop a higher sea level will be more dramatic than the same surge atop a lower sea level. Necessary adaptation to sea level rise and the heightening of other hazards such as surge must be taken into account when planning for the future.

### **CRS Sections That Likely Have Available Current Points**

The following sections of the Community Rating System will likely contain credit points that are available for Highlands based off of the answers given in our Getting to Resilience questionnaire, discussions with JCNERR staff, and reviews of the Borough Master Plan and other documents. These sections represent the current state of the Borough but also include planned projects, uncompleted projects, and recommended actions deemed to be within the Borough's reach. However, these projects may need to be complete in order to be granted credit. It is likely that the Outreach Projects in Section 330 will be highly achievable and less costly than other sections within the CRS. The following sections do not represent guaranteed points for the CRS but are likely achievable to a certain degree and should be investigated to determine the costs and benefits of the required actions when submitting to the CRS. When working with your CRS coordinator, we recommend inquiring about the following sections.

**Section 310: Elevation Certificates:** To maintain correct federal emergency management agency (FEMA) Elevation Certificates and other needed certifications for new and substantially improved buildings in the Special Flood Hazard Area (SFHA).

- **Maintaining Elevation Certificates (EC):** Up to 38 points for maintaining FEMA elevation certificates on all buildings built in the special SFHA after the date of application to the CRS. All communities applying to the CRS must apply for this element. (GTR 1.14)
- **Maintaining Elevation Certificates for Post-FIRM Buildings (ECPO):** Up to 48 points for maintaining EC on buildings built before the date of application to the CRS but after the initial date of the FIRM. (GTR 1.14)
- **Maintaining Elevation Certificates for Pre-FIRM Buildings (ECPR):** Up to 30 points for maintaining elevation certificates on buildings built before the initial date of the FIRM. (GTR 1.14)

**Section 320: Map Information Service:** To provide inquirers with information about the local flood hazard and about flood-prone areas that need special protection because of their natural functions.

**Basic Firm Information (MI1):** 30 points for providing basic information found on a FIRM that is needed to accurately rate a flood insurance policy. (GTR 1.7, 2.5)

- **Additional Firm Information (MI2):** 20 points for providing information that is shown on most FIRMS, such as protected coastal barriers, floodways, or lines demarcating wave action. (GTR 1.7, 2.5)
- **Problems Not Shown on the FIRM (MI3):** Up to 20 points for providing information about flood problems other than those shown on the FIRM. (GTR 1.7, 2.5)

**Section 330: Outreach Projects:** To provide the public with information needed to increase flood hazard awareness and to motivate actions to reduce flood damage, encourage flood insurance coverage, and protect the natural functions of floodplains. (GTR 4.4)

- **Outreach projects (OP):** Up to 200 points for designing and carrying out public outreach projects. Credits for individual projects may be increased if the community has a Program for Public Information (PPI). (GTR 2.5.1, 2.5.2, 2.7, 2.8, 2.9, 2.11, 2.14)
- **Flood response preparations (FRP):** Up to 50 points for having a pre-flood plan for public information activities ready for the next flood. Credits for individual projects may be increased by the PPI multiplier. (GTR 2.7, 2.8, 2.9, 2.11)
- **Program for Public Information (PPI):** Up to 50 points added to OP credits and up to 20 points added to FRP credits, for projects that are designed and implemented as part of an overall public information program (GTR 2.7, 2.8 [Could be done])
- **Stakeholder delivery (STK):** Up to 80 points added to OP credits for having information disseminated by people or groups from outside the local government (GTR 2.7, 2.8)

**Section 340: Hazard Disclosure:** To disclose a property's potential flood hazard to potential buyers before the lender notifies them of the need for flood insurance.

- **Disclosure of the flood hazard (DFH):** Up to 25 points if real estate agents notify those interested in purchasing properties located in the Special Flood Hazard Area (SFHA) about the flood hazard and the flood insurance purchase requirement. An additional 10 points are provided if the disclosure program is part of a Program for Public Information credited under Activity 330 (Outreach Projects). (GTR 2.5.2)
- **Other disclosure requirements (ODR):** Up to 5 points for each other method of flood hazard disclosure required by law, up to a maximum of 25 points. (GTR 2.5.2)
- **Real estate agents' brochure (REB):** Up to 8 points if real estate agents are providing brochures or handouts that advise potential buyers to investigate the flood hazard for a property. An additional 4 points are provided if the disclosure program is part of a Program for Public Information credited in Activity 330 (Outreach Projects). (GTR 2.5.2)
- **Disclosure of other hazards (DOH):** Up to 8 points if the notification to prospective buyers includes disclosure of other flood-related hazards, such as erosion, subsidence, or wetlands. (GTR 1.4, 1.14, 2.5.2)

**Section 350: Flood Protection Information:** To provide more detailed flood information than that provided by outreach products.

- **Flood protection library (LIB):** 10 points for having 10 Federal Emergency Management Agency publications on flood protection topics housed in the public library. (GTR 2.5.1, 2.5.2, 2.15)
- **Locally pertinent documents (LPD):** Up to 10 points for having additional references on the community's flood problem or local or state floodplain management programs housed in the public library. (GTR 2.5.1, 2.5.2)
- **Flood protection website (WEB):** Up to 76 points for providing flood protection information via the community's website. An additional 29 points are provided if the website is part of a Program for Public Information (credited under Activity 330 (Outreach Projects)). (GTR 2.5.1, 2.5.2, 2.7, 2.8, 2.9, 2.11, 4.7)

**Section 360: Flood Protection Assistance:** To provide one-on-one help to people who are interested in protecting their property from flooding.

- **Property protection advice (PPA):** Up to 25 points for providing one-on-one advice about property protection (such as retrofitting techniques and drainage improvements). An additional 15 points are

provided if the assistance program is part of a Program for Public Information (credited under Activity 330 (Outreach Projects)). (GTR 5.7)

- **Advisor training (TNG):** 10 points if the person providing the advice has graduated from the EMI courses on retrofitting or grants programs. (could get training)

**Section 410: Floodplain Mapping:** To improve the quality of the mapping that is used to identify and regulate floodplain management.

- **Floodplain mapping of special flood-related hazards (MAPSH):** Up to 50 points if the community maps and regulates areas of special flood related hazards. (GTR 1.1, 1.3, 1.7, 2.5)
- **New Study (NS):** Up to 290 points for new flood studies that produce base flood elevations or floodways. (1.1, 1.7, 1.14 Could be eligible if other elevation studies have been or are going to be done)
- **Higher Study Standards (HSS):** Up to 160 points if the new study was done to one or more standards higher than the FEMA mapping criteria. (GTR 1.4, 1.7)

**Section 420: Open Space Preservation:** To prevent flood damage by keeping flood-prone lands free of development, and protect and enhance the natural functions of floodplains.

- **Open space preservation (OSP):** Up to 1,450 points for keeping land vacant through ownership or regulations. (GTR 5.9)
- **Natural functions open space (NFOS):** Up to 350 points extra credit for OPS-credited parcels that are preserved in or restored to their natural state. (GTR 3.5, 5.9)
- **Special flood-related hazards open space (SHOS):** Up to 50 points if the OSP credited parcels are subject to one of the special flood-related hazards or if areas of special flood related hazard are covered by low density zoning regulations. (GTR 1.3, 5.9)
- **Natural Shoreline Protection (NSP):** Up to 120 points for programs that protect natural channels and shorelines. (GTR 5.9)

**Section 430- Higher Regulatory Standards:** To credit regulations to protect existing and future development and natural floodplain functions that exceed the minimum criteria of the National Flood Insurance Program (NFIP).

- **Other higher standard (OHS):** Up to 100 points for other regulations. (GTR 2.9, 2.11)
- **Special Flood-related Hazard Regulations (SHR):** Up to 370 points for higher regulatory standards in areas subject to coastal erosion. (GTR 1.3)
- **Emergency warning dissemination (EWD):** Up to 75 points for disseminating flood warnings to the public. (GTR)
- **Flood response operations (FRO):** Up to 115 points with 10 points awarded for maintaining a database of people with special needs who require evacuation assistance when a flood warning is issued and for having a plan to provide transportation to secure locations. (GTR)
- **Critical facilities planning (CFP):** Up to 75 points for coordinating flood warning and response activities with operators of critical facilities. (GTR)
- **Protection of critical facilities (PCF):** Up to 80 points for protecting facilities that are critical to the community. (GTR 4.7)
- **Regulations administration (RA):** Up to 67 points for having trained staff and administrative procedures that meet specified standards. (GTR 5.6 [if further training of staff takes place])
- **Freeboard (FRB):** Up to 500 points for a freeboard requirement. (GTR 1.14, 5.4)
- **Foundation Protection (FDN):** Up to 80 points for engineered foundations. (GTR 1.14)
- **Coastal A Zone Requirements (CAZ):** Up to 500 points if all new buildings in the coastal A Zone must meet the requirements for buildings in V Zones and for openings in A Zones (GTR 1.14, Could be done)

- **State Mandated Standards (SMS):** Up to 20 points for a state-required measure that is implemented in both CRS and non-CRS communities in that state. (freeboard)

**Section 440: Flood Data Maintenance:** The community must maintain all copies of Flood Insurance Rate Maps issued for that community.

- **Additional Map Data (AMD):** Up to 160 points for implementing digital or paper systems that improve access, quality, and/or ease of updating flood data within the community. (GTR 1.7, 2.5)
- **FIRM Maintenance (FM):** Up to 15 points for maintaining copies of all FIRMs that have been issued for the community. (GTR 1.7, 2.5)
- **Erosion Data Maintenance (EDM):** up to 20 points for maintaining coastal erosion data. (Could easily be done by maintaining possible future Stockton CRC data and USGS shoreline datasets, GTR 1.3)

**Section 450: Stormwater Management:** To prevent future development from increasing flood hazards to existing development and to maintain and improve water quality

- **Watershed Master Plan (WMP):** Up to 315 points for regulating development according to a watershed master plan (GTR 1.13)

**Section 510: Floodplain Management Planning:** To credit the production of an overall strategy of programs, projects, and measures that will reduce the adverse impact of the hazard on the community and help meet other community needs.

- **Repetitive Loss Area Analysis (RLAA):** Up to 140 points for a detailed mitigation plan for a repetitive loss area. (GTR 1.11, 1.13, 2.1)
- **Floodplain management planning (FMP):** 382 points for a community-wide floodplain management plan that follows a 10-step planning process. (GTR 1.13, 2.3, 3.4, 3.4.1, 3.5 [if new plan written])
- **Natural Floodplains Function Plan (NFP):** 100 points for adopting plans that protect one or more natural functions within the community's floodplain (GTR 1.13)

**Section 520: Acquisition and Relocation:** To encourage communities to acquire, relocate, or otherwise clear existing buildings out of the flood hazard area. (GTR 1.11)

**Critical facilities (bCF):** Points awarded for facilities that have been acquired or relocated. (GTR 5.2 if any emergency facilities end up being relocated)

**Section 530: Flood Protection:** To protect buildings from flood damage by retrofitting the buildings so that they suffer no or minimal damage when flooded, and/or constructing small flood control projects that reduce the risk of flood waters' reaching the buildings.

- **Flood protection project technique used (TU\_):** Credit is provided for retrofitting techniques or flood control techniques. Retrofitting technique used: Points are provided for the use of elevation (TUE), dry floodproofing (TUD), wet floodproofing (TUW), protection from sewer backup (TUS), and barriers (TUB) Structural flood control technique used: Points are provided for the use of channel modifications (TUC), and storage facilities (TUF). (GTR 5.3, 5.7)

**Section 540: Drainage System Maintenance:** To ensure that the community keeps its channels and storage basins clear of debris so that their flood carrying and storage capacity and maintained.

- **Capital improvement program (CIP):** up to 70 points for having a capital improvement program that corrects drainage problems. (Stormwater updates, outfall pipe valves)
- **Coastal Erosion Protection Maintenance (EPM):** Up to 100 points for maintaining erosion protection programs in communities with coastal erosion prone areas. (GTR 1.3, USACE project)

**Section 600: Warning and Response:** The activities in this series focus on emergency warnings and response, because adequate notification combined with a plan for how to respond can save lives and prevent and/or minimize property damage. The activities emphasize coordinating emergency management functions with a community's other floodplain management efforts, such as providing public information and implementing a regulatory program. Separate, parallel activities are included for levees (Activity 620) and dams (Activity 630). Credit points are based on threat recognition, planning for a subsequent emergency response, and ongoing testing and maintenance. Up to 790 points. (GTR 4.2, 4.4)

**Section 610: Flood Warning and Response:** To encourage communities to ensure timely identification of impending flood threats, disseminate warnings to appropriate floodplain occupants, and coordinate flood response activities to reduce the threat to life and property. (GTR 4.5, 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.5.5)

- **Flood response operations (FRO):** Up to 115 points with 10 points awarded for maintaining a data base of people with special needs who require evacuation assistance when a flood warning is issued and for having a plan to provide transportation to secure locations. (GTR 2.9, 2.11, 2.12)
- **Flood threat recognition system (FTR):** Up to 75 points for a system that predicts flood elevations and arrival times at specific locations within the community (GTR 1.7, 4.3)
- **Emergency warning dissemination (EWD):** Up to 75 points for disseminating flood warnings to the public. (GTR 2.9, 2.11, 4.3, 4.7)
- **Critical facilities planning (CFP):** Up to 75 points for coordinating flood warning and response activities with operators of critical facilities. (GTR 2.11, 4.7)
- **StormReady Community (SRC):** 25 points for designation by the National Weather Service as a StormReady Community. (GTR 4.6)

**Appendix**

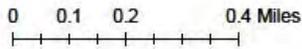
**Highlands Borough  
1 Foot of Sea Level Rise**

**Legend**

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- H Hospitals
- Evacuation Routes
- 1ft SLR

Year 2010 Population: 5005

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities.



Map Author: Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P, © 2012, GEBCO, USGS, FAO, NPS, NRCAN, Geobase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

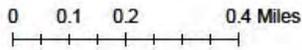
**2 Feet of Sea Level Rise  
Highlands Borough**

**Legend**

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes
- 2ft SLR

Year 2010 Population: 5005

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities.



Map Author: Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P. Corp., GEBCO, USGS, FAO, NPS, NRCAN, GEBCO, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

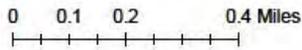
**3 Feet of Sea Level Rise  
Highlands Borough**

**Legend**

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes
- 3ft SLR

Year 2010 Population: 5005

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities.



Map Author: Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P. Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeBCoase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

**Highlands Borough  
Category 1 SLOSH Model**

**Legend**

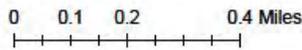
- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes

**Category 1 SLOSH**

- 0 - 3 Feet Above Ground Level
- 3 - 6
- 6 - 9
- > 9

Year 2010 Population: 5005

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or greater feet of inundation above ground level and are categorized in the legend above.



Map Author: Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



**Highlands Borough  
Category 2 SLOSH Model**

**Legend**

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals

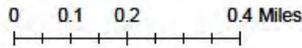
Evacuation Routes

**Category 2 SLOSH**

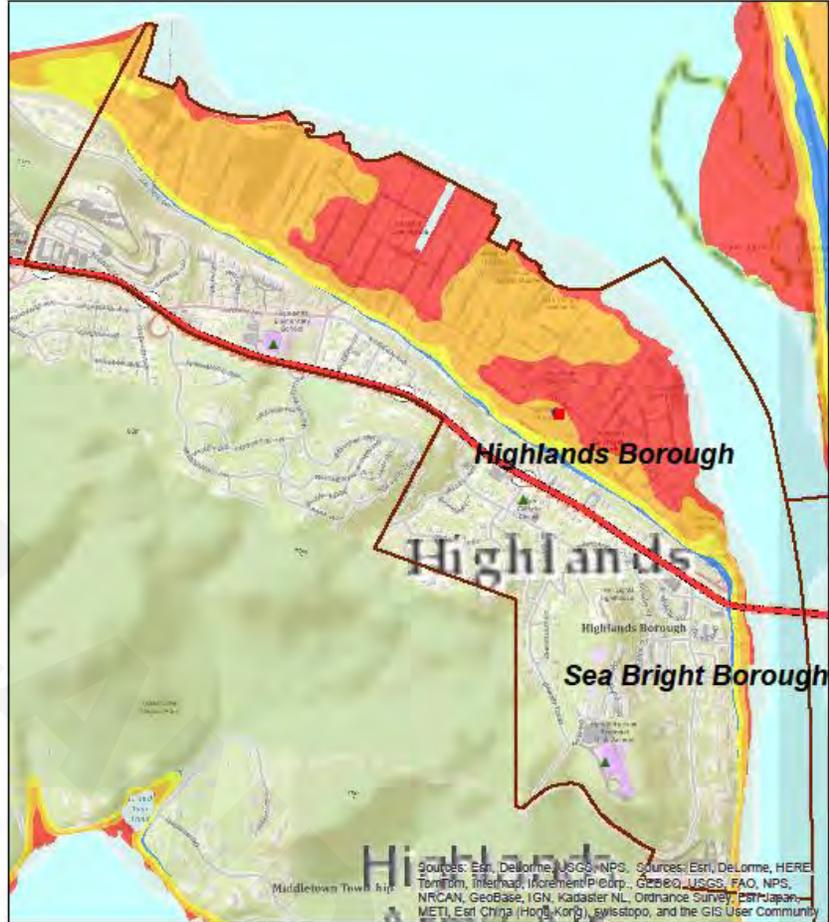
- 0 - 3 Feet Above Ground Level
- 3 - 6
- 6 - 9
- > 9

Year 2010 Population: 5005

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or greater feet of inundation above ground level and are categorized in the legend above.



Map Author: Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis



**Highlands Borough  
Category 3 SLOSH Model**

**Legend**

- Municipality
- ▲ Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals

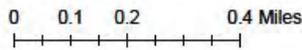
Evacuation Routes

**Category 3 SLOSH**

- 0 - 3 Feet Above Ground Level
- 3 - 6
- 6 - 9
- > 9

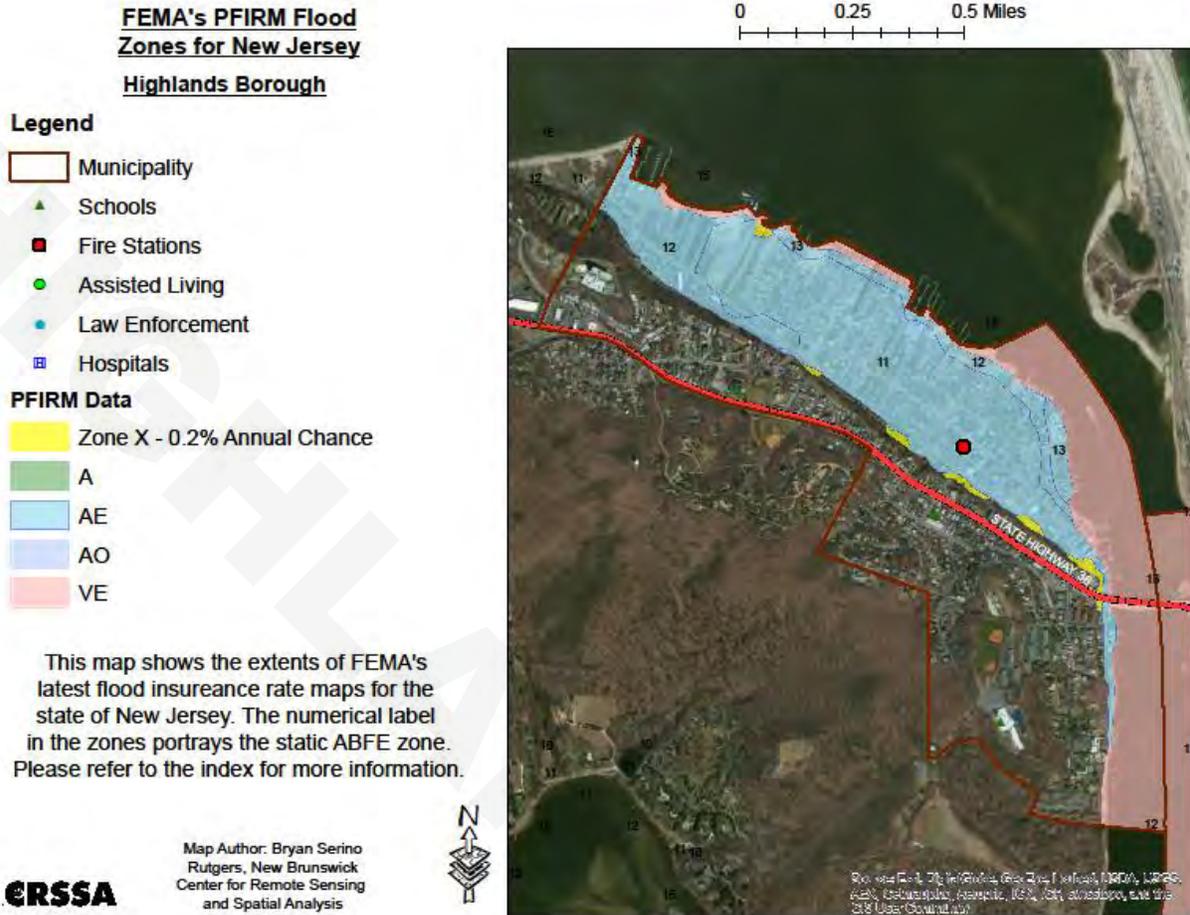
Year 2010 Population: 5005

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or greater feet of inundation above ground level and are categorized in the legend above.



Map Author: Bryan Serino  
Rutgers, New Brunswick  
Center for Remote Sensing  
and Spatial Analysis





### Highlands Historical Erosion Information

Sitting along the Sandy Hook Bayshore and the Shrewsbury River, Highlands is susceptible to erosion and deposition events. Unfortunately, the nearest beach profile location for the Stockton Coastal Research Center on the bayshore is at Port Monmouth, five miles away from Highlands. This is likely too far to draw substantial conclusions or similarities but it should be noted that the three sites Stockton Coastal Research Center monitors in the Raritan Bay area, two have had retreating shorelines while the third has remained neutral. It is recommended that the Borough of Highlands attempt to be included as a site in the Beach Profile Network in the future, especially if replenishment of the waterfront takes place.

### Historical Shoreline Positions

An examination of USGS shoreline information for the oceanfront shows that in 1836, Sandy Hook was isolated from Sea Bright and the rest of the barrier island spit and was attached to Highlands. This exposed Highlands to oceanfront wave energy. By the 1850's, Sandy Hook had attached to Sea Bright, closer to its current position. The oceanfront shoreline meandered often over the next 100 years until the beach replenishment project was completed in the area in the 1990's, further stabilizing the area. Though a storm event with the strength to roll Sandy Hook back towards Highlands and reattach it to the mainland is unlikely, the possibility always exists given the dynamics of the coastal area. To examine shoreline positions further using this dataset, visit <http://marine.usgs.gov/dsasweb/#>.

### Appendix 3: Alternatives Assessment

The Borough's existing planning documents recommend that the Borough explore and/or implement a variety of actions related to land use, parking and circulation, land development, government services, housing, utilities, and resiliency and sustainability. The following subsections evaluate potential alternatives for each of the recommended actions identified by the Borough's policy documents and consider the potential locations (where applicable), anticipated costs and anticipated timeframes associated with each alternative.

#### Action 1: U.S. Army Corps of Engineers Seawall

As the majority of Highlands Borough is vulnerable to flooding and tidal action from Sandy-type storm events, discussion of the construction of a seawall has become more relevant in terms of the Borough's resiliency to future storms. This action assesses the possibility of a protective seawall to be constructed by the U.S. Army Corps of Engineers (USACE).

#### Alternative 1: Implement Seawall along Entire Sandy Hook Bay Coast

This alternative consists of an 8,000 foot line of protection along the Sandy Hook Bay Coast of Highlands Borough. The seawall in this alternative is a comprehensive flood proofing barrier that consists of raised bulkheads, a fabricated floodwall, sand dune barriers with an interior flood wall, raised parking lots and roadways, and raised ground surfaces (comprised of grass berms with interior floodwalls). The seawall will also be equipped with closure gates and tide gates.

This project is already in the feasibility study stage. This alternative assumes the feasibility study will support actual project construction. The feasibility study will determine costs for the subsequent project implementation steps. The seawall project would be funded by the Army Corps.

#### Approximate Cost of Alternative Elements:

Feasibility Study .....	\$1,500,000.00
Construction.....	\$7,760,000.00* <sup>60</sup>

Land acquisition and easement costs, which cannot be estimated at this time, would be in addition to the construction costs.

The most immediate benefit of the implementation of a Seawall is the protection of residents, businesses, and community facilities. Where residents and businesses are unable to elevate their properties out of the flood hazard areas, this alternative provides protection for them. On the other hand, the seawall alternative serves as a large financial investment and could take years to construct. The implementation of this alternative will also have an impact on the character of Highlands Borough. A seawall will limit the waterfront views and access, which are historically part of Highland's appeal.

#### Alternative 2: Status Quo (No Sea Wall)

This alternative envisions Highland's waterfront remaining as it currently stands, with no seawall. This alternative leaves private residences, businesses, as well as public facilities in areas prone to flooding and storm surge. As existing and new development in the downtown and waterfront areas of the Borough will remain in flood hazard areas, the Borough will encourage and assist residents to elevate their structures as per new resiliency efforts, ABFEs, etc.

A benefit of this alternative is that the Borough will be able to retain its waterfront character, access, and views.

<sup>60</sup> This price is based on an average cost of \$970 per every linear foot of sea wall construction

### ***Alternative 3: Land Development Actions***

This alternative also proposes a no-build scenario for Highlands Borough. This alternative serves as a less-direct approach to dealing with the threats of flooding and storm erosion. It entails a mix of public policy strategies, including more strictly limiting the development in the flood-prone areas of the Borough (through changes in development standards and ordinances), and promoting public awareness of the threats of developing in flood hazard areas. An obvious drawback is that as in Alternative 2, land remains in flood hazard areas. Success of this alternative will rely on receptiveness of the public to change in land use policies.

### **Action 2: Elevate Residential and Commercial Buildings**

Some Borough residents are already currently undergoing the process of elevating their homes in attempts to lower their flood insurance premiums and to become more resistant to future flooding and Sandy-type storm events. This action contemplates the elevation of residential and commercial buildings in Highlands Borough, in the downtown area.

### ***Alternative 1: Elevate Single-Family Homes***

This alternative focuses on raising only the privately-owned single-family homes in the downtown area delineated above. These homes will be elevated to reflect FEMA's Advisory Base Flood Elevations (ABFEs). This alternative is particularly important for protecting the health and safety of the public and for the downtown/bayfront area of the Borough to become more resilient to future Sandy-type storms. It will also minimize future damages from flooding.

The success of this alternative's implementation will ultimately rely on the receptiveness of the individual homeowners in the neighborhood, as certain homeowners may not wish to or may be unable to elevate their structures. Grants and loans can serve as an incentive and as assistance to homeowners in this case. Here, the Borough's actions are limited to assisting individuals in their applications to elevate, and in helping to expedite the process.

The costs associated with Alternative 1 are the elevation of approximately 1,080 single family homes in the downtown area, at a cost of approximately \$100,000 per home for a total cost of \$108,000,000. For the purposes of this alternative, the calculation has included an estimate of the number of single family homes in the R-2.01, R-2.02, and R-2.03 zones north of State Route 36. This estimate was based on the land area of each zone, divided by the permitted lot size in the Borough's bulk schedule for each zone. As the permitted lot size used in this calculation is a minimum size, and that not every lot is exactly the minimum permitted size, it is noted that this cost estimate may be liberal.

### ***Alternative 2: Elevate Commercial Buildings in Downtown Area***

This alternative also focuses on the non-residential (i.e. commercial buildings) in the downtown area. The feasibility of elevating commercial buildings will vary. First, not all commercial buildings can easily be elevated due to their size and type of construction. For others that are built with masonry, it may be more feasible to keep buildings at the elevation they currently sit, and flood proof and retrofit the buildings instead. Second, some retail commercial property owners are hesitant to elevate their buildings since it reduces visibility of their establishment to customers and is slightly harder for customers to enter the store. The calculation of the costs of elevating commercial buildings in the downtown area subject to flood hazard is beyond the scope of this project.

**Alternative 3: No Change in Development Practices (Status Quo)**

This alternative proposes no widespread elevation of buildings. Though, the Borough will continue to assist individual homeowners in their efforts to elevate their own homes to reflect changes in FEMA's Advisory Base Flood Elevations (ABFEs). All new development will have to comply with FEMA regulations.

**Action 3: Create a Public Boat Ramp**

During the creation of the 2004 Master Plan, and also during stakeholder involvement in creation of this Plan, the greatest desire identified by Borough residents was a boat ramp. At the time of adoption of the 2008 Recreation and Open Space Plan Element, there were limited opportunities to create a boat launch ramp accessible by trailers due to limited available waterfront property, cost, and the availability of deep water along the bayfront. This Action continues the discussion and consideration of new public boat ramps along Highland's waterfront.

**Alternative 1: Create a Boat Ramp for Car Launch**

This alternative should be implemented in an area of the Borough with sufficient access to the Bay. A potential site for the car-launch boat ramp is at the end of Miller Street. Additional sites may also become available in the future. Alternative 1 aligns itself with Highlands Borough's assets and allows the Borough to capitalize on its prominent waterfront access. This alternative will also allow Highlands Borough to attract more regional and seasonal tourism that coincides with use of a public boat ramp. A drawback of this alternative is that the potential boat ramp locations do not have adequate parking options. This would require additional property acquisition.

Implementation of this alternative will require engineering design, NJDEP permits and improvement costs. Since a project design has not yet been prepared, improvement cost will vary based on site-specific conditions, the size of the ramp, types of material (such as stone or concrete), and permitting requirements. The ancillary facilities of a boat ramp such as a floating or fixed pier and parking area will also impact the construction costs. Based on the above, an estimate of the cost of this alternative is beyond the scope of this report.

**Alternative 2: Create a Non-Motorized Boat Launch at Waterwitch Beach**

Alternative 2 envisions the construction of a public boat launch that would not require as large of a site, and would not create as large an impact. A potential site for this alternative Waterwitch Beach, located at the northern end of Central Avenue. This area is adjacent to the public beach located at the Community Center site. The Waterwitch Beach Association controls the beach property, but the Borough has secured public access to the Bay.

**Alternative 3: Create no New Boat Ramps (No Action)**

There currently exist private ramps and marinas. The "No Action" alternative would create no new public ramps, and users would need to rely on existing private boat ramps. Private ramps are less accessible to the public and have higher costs. If other neighboring municipalities have more accessible public ramps, this could have a negative impact on the tourism and number of visitors to Highlands' waterfront and downtown area.

**Action 4: Remake Some Streets as "Green" and "Shared" Streets**

This action contemplates retrofitting selected existing suburban streets into "green" or "shared" streets, or relying on conventional development patterns, with no major changes to roads.

**Alternative 1: Retrofit Existing Roads**

Retrofitting existing roads as “green” or “shared” streets can serve as an attempt to recreate the Borough’s maritime character that residents value, improve the quality and sense of place, improve circulation, clarify parking options, and mitigate flooding from stormwater. This should include stormwater, bicycle, and pedestrian facilities incorporated into designs.

This alternative envisions North Street as a “green” street. This involves retrofitting the existing North Street with a 20 foot elevated right of way comprised of boardwalk material that will be dedicated to pedestrian and bicycle use, with additional shade trees, signage, and streetscape improvements to create a sense of place. As a “green” street, this alternative would reduce North Street’s impervious coverage. The existing East North Street is a one-way street and is approximately 900 feet long, extending from Bay Avenue north, ending at the Bay. While there are numerous variables that go into estimating the cost of such a project, it has been roughly estimated that implementing a green street would cost approximately \$125 per linear foot.

There exist some limitations to the retrofitting of North Street. Approximately 15 buildings currently have frontage on North Street. Studies would be required to ensure that retrofitting the street would not interfere with homeowners’ vehicular access, as they currently front on North Street, and alternate access points would have to be created. Additionally, retrofitting the road would require the relocation of essential utilities. For example, there exists a very large stormwater pipe under North Street. A retrofitted “green” street with boardwalk material will limit the ability of routine maintenance for the stormwater pipe to occur.

In addition to the green street, this alternative also envisions “shared” streets in the downtown/bayfront area, to be implemented on 4<sup>th</sup> and 5<sup>th</sup> Streets from Miller Street to Valley Street, on Center Street, John Street, Jackson Street, and Kay Street. This includes approximately 3,275 linear feet of roadways. Unlike the aforementioned green streets, these “shared” streets will allow automobile usage, and will also include sidewalks and shade tree elements.

**Approximate Cost of Shared Streets Elements<sup>61</sup>**

Sidewalk Construction* <sup>62</sup> .....	\$81,220
Shade trees every 50’ .....	\$3,250

**Alternative 2: Develop to Status Quo (No Change)**

This alternative only envisions road maintenance and improvements occurring as needed, with no planned changes to right-of-ways. The drawback to this alternative is that these streets and areas of the Borough remain in flood hazard areas. A no change scenario means that existing roads remain in danger of flooding, its impacts, and a hindrance to provision of emergency and recovery services.

**Action 5: Build Several Parking Garages**

Constructing parking garages in the downtown area will alleviate the existing shortfall in parking experienced by residents and visitors during the summer months. A downtown parking deck may also reduce parking-related traffic and congestion as residents and visitors move throughout the Borough in search of parking, and will provide adequate parking to serve municipal services and established commercial areas located in the Borough’s downtown.

<sup>61</sup> Cost estimates do not factor in permitting, administration, and engineering/inspection

<sup>62</sup> At an approximate cost of \$3.10 per square foot

**Alternative 1- On Borough Property: Construct a New Parking Deck on Borough-owned Property**

Constructing a parking deck on Borough-owned property will eliminate property acquisition costs and will provide a centralized location for a parking deck to address the parking demands generated by downtown business and beach/marina activities.

This alternative contemplates the design and construction of three (3) parking decks, generally along the publicly-owned parcels on Bay Avenue. This can provide approximately 1,172 parking spaces in approximately 404,000 square footage of space.

**Approximate Construction Cost: \$28,505,020<sup>63</sup>**

Conduct Parking Study .....	\$20,000
Design & Permitting .....	\$225,000
Construction & Inspection <sup>64</sup> .....	\$28,280,000

**Alternative 2 – On Private Property: Acquire Private Property(ies) and Construct New Parking Decks**

Acquiring privately-owned tracts of land within the Borough and subsequently constructing parking decks will preserve the existing uses taking place on Borough-owned property. However, this alternative will require the Borough to acquire a property or a number of properties to accommodate the construction of parking decks, which will result in substantial property acquisition costs.

This alternative contemplates the design and construction of five (5) parking decks throughout the Borough’s downtown area, to provide approximately 1,675 parking spaces in approximately 577,000 square footage of space. The actual land area that the parking garages in this alternative will encompass is about 2.5 acres.

**Approximate Cost of Alternative: \$41,760,000**

Conduct Parking Study .....	\$20,000
Land Acquisition <sup>65</sup> .....	\$1,125,000
Design & Permitting .....	\$225,000
Construction & Inspection <sup>166</sup> .....	\$40,390,000

Estimates for this alternative include five parking decks. However, this project could actually be implemented piece meal, with not all garages being constructed at the same time.

**Alternative 3 – No Build: Do Not Construct a New Parking Deck and Rely on Reconstruction of Municipal Parking Lot for Future Parking (No Action)**

The “no build/no action” alternative will not result in an increase in the amount of parking to serve downtown Highlands. This will benefit the Borough’s goal towards increasing resiliency by not contributing to or increasing the impervious cover in the downtown and bayfront areas. There will be no property acquisition required.

There currently exists some (limited) public parking space and unimproved land along the Shore Drive area. The Borough may identify the need to repair existing parking or build new parking, as well as

<sup>63</sup> Implementation time frame – 2 to 4 years

<sup>64</sup> Estimated at a cost of \$70/sq. ft. based on RSMeans Cost Data

<sup>65</sup> Based on estimate of 2.5 acres of land required for parking garage and average per acre land value for 2013 per Borough Tax Records

<sup>66</sup> Implementation time frame – 3 to 5 years

reassess the parking demand in the area as further recovery and development activity continues in the future. Cost estimates will vary, depending on the nature and extent of future projects.

**Action 6: Extend Shrewsbury Avenue Past Valley Street**

One way that Highlands Borough will be able to capitalize on its waterfront accessibility is by considering the extension of Shrewsbury Avenue along the Sandy Hook Bay waterfront. This area serves as prime Bay access for the Borough.

**Alternative 1: Extend Shrewsbury Avenue**

This alternative involves extending Shrewsbury Avenue from where it currently ends/intersects with Miller Street, through to Cedar Street. This will extend the road approximately 1,000 feet to the northwest, parallel to the Sandy Hook Bay. In this alternative, Shrewsbury Avenue’s extension would set the stage for new development and redevelopment on the bayfront.

An extension of Shrewsbury Avenue would occur on land which is currently developed and is mostly under private ownership. As such, this alternative would require property acquisition. However, some of the waterfront properties in this area have recently been approved for new developments, approved for up to the bulkhead line. This would interfere with the feasibility of a Shrewsbury Avenue Extension.

**Approximate Cost of Alternative: \$1,946,476<sup>67</sup>**

Clear Site .....	\$10,000.00
Land Acquisition <sup>68</sup> .....	\$1,461,776
Construction & Inspection .....	\$474,700.00

**Alternative 2: Do Not Extend Shrewsbury Avenue (No Action)**

Alternative 2 envisions Shrewsbury Avenue remaining as it is presently, with its westernmost end meeting at Miller Street. Routine maintenance and repairs to the road will reflect status quo. This alternative will not increase the impervious coverage of these bayfront properties. This is significantly important, as this is a flood hazard area. No land acquisition will be required.

**Action 7: Develop More Marinas and a Hotel along Extended Shrewsbury Avenue**

The extension of Shrewsbury Avenue through Valley Street would allow the road to take on a new role as the focus for higher value waterfront uses, such as a new marina, hotel, and accompanying services and uses. This action contemplates the development of the land along the extended Shrewsbury Avenue, reaching from Miller Street to Cedar Street (one block north of 5<sup>th</sup> Street).

**Alternative 1: Develop Marinas and a Hotel along the Sandy Hook Bay Waterfront**

The beachfront properties along the Shrewsbury Avenue extension are generally underutilized. This alternative would improve the area by developing marinas and a hotel. This alternative would also improve the local economy, as it would provide jobs and income to the nearby waterfront community, increase tourism in the Borough, increase the value in the adjacent residential neighborhood, and bring in ratables. Also from a resiliency perspective, new marinas and hotels would also increase the storm

<sup>67</sup> Implementation Timeframe: 3 to 5 years. Cost estimates do not take into consideration the design and permitting process

<sup>68</sup> Based on estimate of 1.15 acres of land required for road extension and average per acre land value for 2013 per Borough Tax Records

resiliency of the residential neighborhood, as market forces would gradually convert units to attached housing types

The area of the Shrewsbury Avenue extension is located in the Waterfront Transitional-Commercial (WT-C) and Waterfront Transitional-Commercial Townhouse (WT-C/T) zones. In these zones, marinas are permitted principal uses, as are hotels, motels, inns, and bed and breakfasts. For this reason, Alternative 1 would not require any changes to the zoning of the area in question

While no changes in zoning would be required, redeveloping this area would require sale or acquisition of the land that currently is privately owned.

***Alternative 2: No New Marinas or Hotel (No Action)***

Alternative 2 envisions Shrewsbury Avenue remaining as it is presently, with its westernmost end meeting at Miller Street. There will be no sales or acquisition of privately owned land, and owners will retain their current beachfront access.

**Action 8: Convert Residences to Attached Units**

This action focuses on the Highlands downtown/waterfront area., The action will require demolition of single family homes and construction of attached dwellings.

***Alternative 1: Convert Downtown Residences to Attached Units***

This alternative will have to be implemented by private property owners based on revisions to the Borough Zoning Ordinance or through a redevelopment plan. The benefit of the new attached dwellings, built above the flood hazard area, is increased resiliency of the housing stock. The limitation is the alternative is dependent, even with zoning revisions, on private property initiative.

As this alternative would require zoning changes, it serves as more of a legislative discussion for the Borough of Highlands. Does the Borough want to shift its development to more of an urban setting? Converting a large quantity of residential units to attached units in this part of town will also increase the density of the area. Increased density would further create more population for commercial growth in the downtown. Furthermore, elevated attached units would complement the potential for a marina along an extended Shrewsbury Avenue, discussed in Actions 6 and 7. This alternative would redevelop properties to make them more resilient to future Sandy-type events, as they would be elevated. Elevated units will provide parking options on the ground level under the residences, which will help provide more parking options and decrease reliance on on-street parking.

This alternative will require further planning analysis to evaluate the impact and suitability of the Borough infrastructure for the increased number of attached homes.

***Alternative 2: Do Not Convert (No Action)***

This alternative would not require any changes in zoning of the downtown and waterfront areas. Residential properties would remain as is and would have no changes on the impervious coverage and no impact on the traffic patterns of the area. Unless the existing properties are elevated above the flood hazard levels, the home will continue to be subject to flooding risk.

**Action 9: Determine Whether to Construct New or Rehabilitated Municipal Facilities**

After Hurricane Sandy, some of the Borough Hall's offices and the Police Station were temporarily relocated to the Department of Public Works Yard, located at 42 Shore Drive. Other Borough Hall functions have also been temporarily relocated to 19 Bay Avenue. The fact that vital Borough services remain in separated physical spaces serves as a reminder that the Borough still has steps to take to recover from Hurricane Sandy and to become more prepared for future emergencies.

**Alternative 1: Rehabilitation and Renovation of the Site at 171 Bay Avenue**

Alternative 1 envisions rehabilitating and renovating the existing building and facilities located at 171 Bay Avenue. As Borough activities have been temporarily relocated, this alternative would be technically feasible. In this alternative, the renovated building would have to be elevated to reflect FEMA's requirements. This would allow for parking and other storage uses on the ground floor. Parking would also be addressed for behind the building.

One main benefit of the Borough main facilities at 171 Bay Avenue is that it is a central location for Borough activity and for provision of services to residents and businesses located in the downtown and bayfront area.

This alternative has some technical drawbacks, however. For one, the existing site is undersized for all of the activities that this alternative envisions. The existing building at 171 Bay Avenue is about 8,000 square feet in area, on a lot that is approximately 24,000 square feet. Another drawback is that rehabilitating and renovating the existing site on Bay Avenue does not address the fact that the site is in an AE flood zone. Even if the site is to be elevated, certain essential activities, equipment, and materials such as emergency vehicles will have to remain on the ground level. In this case, they will continue to be vulnerable to storm surge in future Sandy-type storms.

The Borough has retained an architect to review feasibility and costs of this alternative.

**Alternative 2: Construct a New Permanent Facility at a New Site**

This Alternative assumes that all Borough activity that was previously located at 171 Bay Avenue (including Municipal Offices, Code Enforcement Offices, Police Offices and holding cells, Court Facilities, and the clerk's office) will be permanently relocated to a new facility.

One feasible option is to relocate Borough activity to the Department of Public Works Yard at 42 Shore Drive. This site has been considered because it has suitable space for the essential activities and services mentioned above.

It appears feasible to locate a proposed municipal facility of approximately 10,500 square feet with a parking area of 32 spaces at this location.

The cost of such a facility is estimated to be approximately \$2.9 million and plus parking improvements, design fees and contingencies for a total of \$3.7 million. (This dollar amount does not include: site preparation costs such as the filling required to elevate the overall site to above the 500 year flood elevation for FEMA compliance, drainage, utilities and does not include any provisions for site remediation if so required.) (The cost calculations are preliminary estimates for general budget purposes. The specific costs will be determined at the design phase.)

The benefits of this alternative are proximity to the downtown, no acquisition cost, location on a collector street and some flexibility to provide off-street parking. One of the drawbacks of this location is that it is not located on Bay Avenue in the business district.

HIGHLANDS.NJ.US

**Appendix 4: Potential Priority Actions**

Potential Priority Project Title	Description of Potential Priority
Communication Strategy	Create a Communications Plan (incl Getting to Resilience recommendations on outreach & sea level rise hazard, FEMA plan recommendations, establish boro identity)
Shrewsbury Extension	Extend Shrewsbury Ave several blocks
Bay Dredge	Examine Feasibility of Dredging the Bay
Commercial Revitalization Program	Expand the Commercial Revitalization program
Update Central District Design Manual	Update the Borough's Central District Design Manual. Include guidelines for parking lot development
Redevelopment Planning	Authorize the Planning Board to undertake redevelopment study(ies) and prepare plan(s) for areas determined to be in need of redevelop
Development Fee	To provide funding for critical infrastructure projects, flood mitigation, and municipal parking establish a Development Fee of 3% of the total project cost for both and commercial developments above \$1 million.
Boro Organization/Staffing Plan	Continue to investigate the consolidation and privatization of municipal services, and shared services
Hazard Mitigation Plan	Update Boro Hazard Mitigation Plan after County Plan is completed
Neighborhood Plans	create neighborhood plans including ped and bicycle connections, identifying local service and retail opportunities for mixed-use development
Waterfront Development	develop more marinas and a hotel along extended Shrewsbury Ave
Car top boat launch	Create a boat ramp (Car Launch Only)
Business Retention/Expansion Program	Develop a business retention and expansion program (incl market study, use of incentives, appropriate locations)
Tourism Marketing Strategy	Create Tourism Marketing Strategy including an inventory of key recreational, waterfront, historic, and other assets • branding • Events sponsorship and coordination • Local industry support (e.g., cross-selling Belford Seafood Co-Op locally) • Retention of fishing and maritime industries • Cultural resources and educational outreach • Transportation support (including gateway treatments, improvements to Rte 36)
Steep Slope Mitigation	Mitigate Steep Slope Stability issues (incl. design for mitigation, ordinance revisions)
Ordinance Update for Flooding	Adopt the latest version of FEMA's flood maps and rewrite elevation and freeboard requirements in a Flood Damage Prevention Ordinance as based upon the Best Available Flood Hazard Data or the most stringent version of FEMA's flood maps

Mitigation Plan	Create a detailed mitigation plan for areas that experience repetitive loss that might include policies of gradual retreat, acquiring Repetitive Loss properties
Long Term SLR Planning	Begin the long term planning process to prepare for sea level rise (incl. impact identification/assessment, awareness & assistance, growth mgmt, loss reduction, shoreline mgmt, coastal eco system mgmt., and water resource mgmt & protection
Housing Advocate/Grant Mgr	Hire a Housing Advocate and hire a Grant Manager
Shoreline Protection Project	USACE Shoreline Protection Project
Lift downtown	raise all buildings in lower part of town
Convert downtown residences to attached units	convert residences to attached units in lower part of town
Promote infill development	Promote infill development consistent with FEMA regulations and the user-friendly floodplain manual
Green & Shared Streets	remake some streets as “green streets” (i.e. no motor vehicles)and “shared streets”
Construct direct piping from Rt 36	Direct Stormwater Piping from Rt 36
Sanitary Sewer Improvements (I & I) Project	Sanitary System Improvements (I&I)
Stormwater Drainage and Flood Mitigation	Stormwater Drainage and Flood Mitigation (incl pump station repairs, new catch basins and piping, outfall pipe improvements)
Municipal Facilities Plan	determine whether to construct new or rehab muni facilities, determine potential for co-locating facilities with other towns
Wilson Community Center Rehab	Rehab Robert D. Wilson Community Center
NFIP/CRS	Continue efforts on NFIP compliance and apply for CRS certification (including muni officials' training, CERT)
Streamline Development Review	Update ordinances to streamline the development review process for improvements such as use changes, redevelopment, expansions, and developments.
Property Maintenance & Code Compliance	Increase/enhance Property Maintenance and Code Compliance
Police enforcement at parks	Examine increased police surveillance and enforcement at parks
Code Review for Resiliency	Review municipal codes, plans, and strategies re: risks, hazards, and vulnerabilities explored in the Getting to Resilience process
Transit Improvements	improve transit and intermodal transportation opportunities (including all buses, ferry, shuttle to Sandy Hook, water taxi)

Bicycling Plan	Implement Bicycling Improvement Plan (including routes, racks, signage, kiosks, traffic signal improvements)
Coordinate Transportation	Coordinate transportation maintenance and improvement actions with neighboring communities and Monmouth County.
Linden Traffic Circle	Explore use of traffic circle at Linden Ave
Transit Village	Apply for Transit Village Designation with the NJ DOT
Parking Study	Conduct parking study to evaluate and implement methods of providing adequate parking to serve existing development and proposed redevelopment
Waterfront Master Plan	Create a Waterfront Master Plan to guide its future development; including connections to downtown and use of redevelop planning
Write new Master Plan	Review existing Plan and determine extend of need to update.

## Appendix 5 : Conceptual Site Planning for Possible Action - Relocate Borough Hall

Hurricane Sandy severely damaged the Borough Hall located at 171 Bay Avenue and all municipal personnel and records have been temporarily relocated to other locations.

To address the damage to the municipal building, the Borough administration has retained an architect to advise the municipality as to the construction required to renovate the building and the costs to elevate the building above the 500 year flood hazard level ( to comply with FEMA guidelines ). The architect will be submitting a detailed report to the Borough Council in the near future. The purpose of this section is to provide a brief analysis of an alternative location for the Borough Hall facility. This analysis will supplement the architect's report and provide the Borough Council with an alternate action as it discusses the future municipal facilities.

### Site Layouts

Attached is one sketch titled "Municipal Facility Alternative 1". The sketch shows a 10,500 square foot municipal building to be located on municipally- owned property located on Shore Drive, just east of the Borough Fire Hall. The site is adjacent to the existing pump station and at the location of the existing municipal trailers. The building is proposed to be two stories over a garage area for first aid vehicles and will be occupied by all municipal departments including the police department. In addition it is contemplated that the first aid offices will also be located in the same building. The 10,500 square foot building area is a preliminary building area based on an increase of the size of the existing Borough Hall; the Borough has to complete a needs analysis to make a definitive determination as to the square footage needs for each of the municipal departments for a realistic projection of total facility needs. Until this building program is prepared, the figure used in this analysis is an approximate estimate.

The site improvements shown on the attached sketch include a parking area for 32 vehicles and sidewalk along both streets. The balance of the area can be used by the Department of Public Works.

As noted, the proposed municipal facility could also include two vehicle bays to house the First Aid vehicles. The bay doors can be located either on the Shore Drive or Second Avenue sides of the building. The location would be determined during the building design phase. Should the Borough decide to locate the First Aid facility elsewhere, the municipal building could be reduced in size and therefore the building cost can be slightly less.

Parking. The size of the parking area is not intended to provide parking for all municipal needs and may need to be increased in number. The number of spaces in the parking area will have to be determined at a later date based on the municipal building needs analysis. The number of spaces will be determined by the number of municipal employees (office staff and police officers), the size of the Council meeting room and the number of police vehicles.

The cost of such a facility is estimated to be approximately \$2.9 million and plus parking improvements, design fees and contingencies for a total of \$3.7 million. (This dollar amount does not include: site preparation costs such as the filling required to elevate the overall site to above the 500 year flood elevation for FEMA compliance, drainage, utilities and does not include any provisions for site remediation if so required.) (The cost calculations are preliminary estimates for general budget purposes. The specific costs will be determined at the design phase.)

The benefits of this alternative are proximity to the downtown, no acquisition cost, location on a collector street and some flexibility to provide off-street parking. One of the drawbacks of this location is that it is not located on Bay Avenue in the business district.

**Alternative: Optional Police Department Building**

The second project sketch includes a possible building location for the Police Department at the end of Shore Drive, generally in the area where the temporary police headquarters are now located. The proposed building is 3,000 square feet and would provide a new separate facility for the police department and parking area for department vehicles. (The building dimensions are only for illustrative purposes and would be determined at the time of design.) Since the facility is separate from the general municipal offices, it can be secured to meet police specifications. A possible variation of this alternative is to locate the First Aid Squad vehicle bays and office with the police department to provide a Public Safety Facility. With a separate police facility, the town hall could be reduced in size and is shown as such in the second sketch.

The cost of this alternative, has the same exclusions and would slightly more in cost (approximately \$100,000 based on the general calculations) since the building areas are slightly more than the one building alternative and there will be additional site preparation and improvement costs for two separate building locations.

**Additional Site: Site Description:**

The Borough has identified another potential site for the location of a new municipal facility. The parcel is located at an elevation well above the 100 and 500 year flood elevation. It has access to a major roadway as well as a local street. This site is in private ownership and currently for sale. The potential property will be just 0.9 acres in area and will have sufficient area to construct municipal parking. It is currently developed and will require demolition and gut renovation costs. A minor subdivision will be required to create a parcel which the Borough would then redevelop for its purposes.

**Additional information:**

a. Current land area: 1.1 acres; The potential land area, after subdivision, is 41,000 sq. ft.

b. The existing building has a ground floor of 12,360 sq. ft. and a total square footage of 20, 820 sq. feet. Project Costs will consist of the following:

1. Acquisition. The entire property is assessed at slightly more than \$ 3.5 million. The Borough will be purchasing approximately 75% of the parcel . The acquisition cost of the property cannot be determined until the Borough enters into negotiations.

2. Renovation cost.

Building Renovation Costs: (\$206 per sq. ft. x 10,000 sq. ft.)	\$ 2,060,000
Design (10%)	\$206,000
Building Subtotal	\$ 2,266,000
Parking Improvements, (30-40 spaces)	150,000
Bldg. and Parking Subtotal	\$2,416,000
Contingencies (10%)	241,600
Total:	\$2,657,600

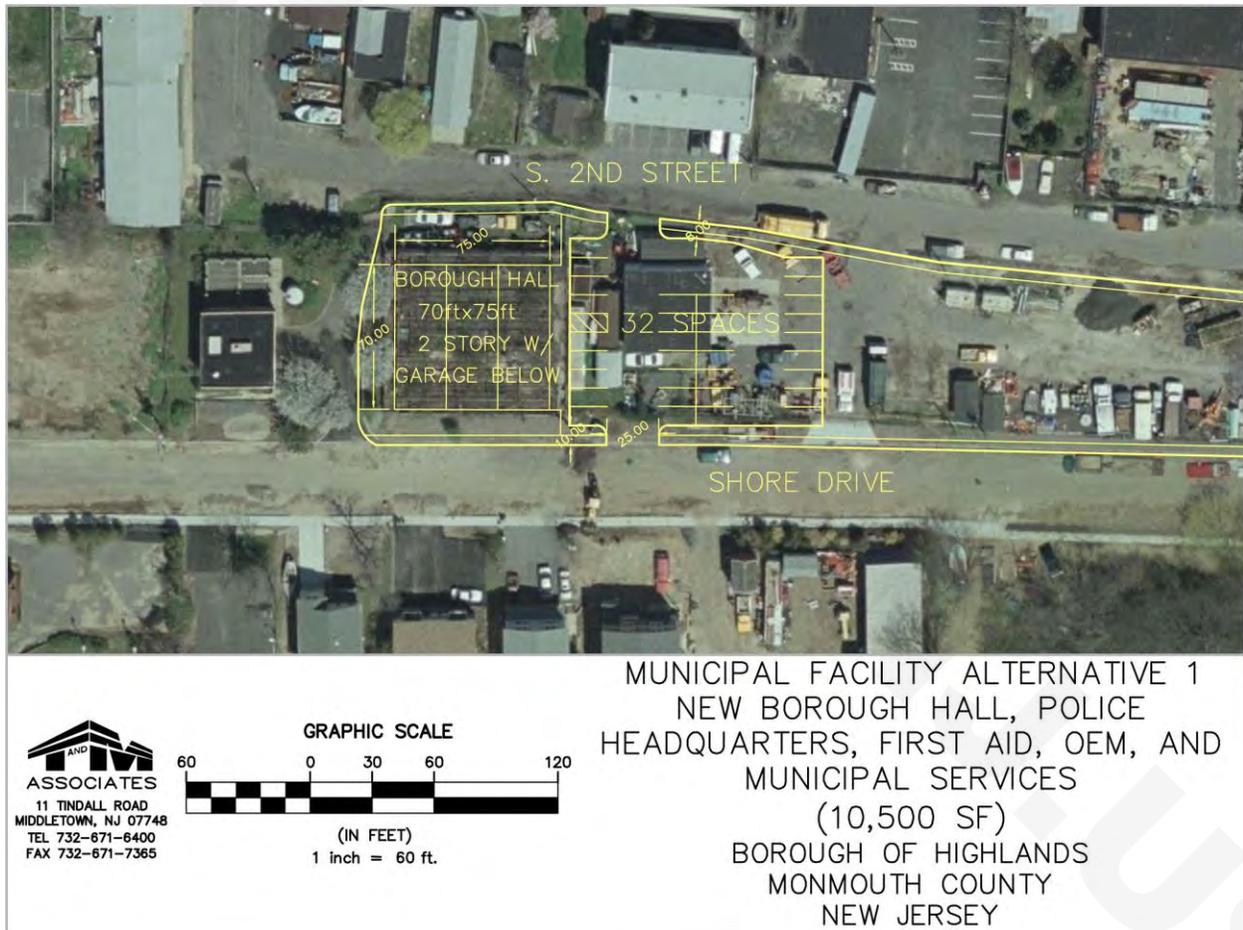
Demolition costs cannot be determined at this time since the building program will likely consist of demolition of a portion of a building which is too large at this time for municipal purposes, preservation

of a portion of the building for a meeting room and renovation of needed space. There are also two buildings on the site – a residence and a detached garage which will also need to be demolished. Demolition costs will not be a significant cost factor in the overall alternative site considerations to create a building of the size required for Borough purposes .

Considerations:

- a. Renovation costs will reflect the cost to transform a single purpose building to municipal offices and police station.
- b. The site has area for off-street parking greater than the cost information above. The municipal parking could be shared with the adjoining owner.
- c. These costs do not include drainage improvements and any specific utility extensions (if necessary).

Concept Sketches

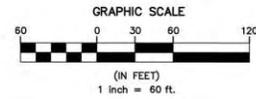




MUNICIPAL FACILITY ALTERNATIVE 1A  
NEW BOROUGH HALL, FIRST AID, OEM, AND MUNICIPAL SERVICES  
10,500 SF  
SEPARATE POLICE HEADQUARTERS  
3,000SF



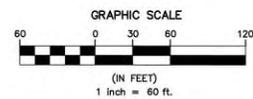
BOROUGH OF HIGHLANDS  
MONMOUTH COUNTY NEW JERSEY



MUNICIPAL FACILITY ALTERNATIVE 2  
NEW BOROUGH HALL, FIRST AID, OEM, AND MUNICIPAL SERVICES  
(8,060 SF)  
SEPARATE POLICE HEADQUARTERS  
(3,000 SF)



BOROUGH OF HIGHLANDS  
MONMOUTH COUNTY NEW JERSEY



**Appendix 6: Highlands Borough Hurricane Sandy Payout per Census Block**

*1. NFIP Payouts – Hurricane Sandy*

Number of Payouts per Census Block	Total Amount per Census Block	Average Payout per Census Block
1	\$14,552.95	\$14,552.95
1	\$26,467.79	\$26,467.79
1	\$37,325.43	\$37,325.43
1	\$38,743.66	\$38,743.66
1	\$43,193.49	\$43,193.49
1	\$51,759.80	\$51,759.80
1	\$74,801.82	\$74,801.82
1	\$94,736.02	\$94,736.02
1	\$94,913.71	\$94,913.71
1	\$100,426.73	\$100,426.73
2	\$103,104.70	\$51,552.35
2	\$104,686.72	\$52,343.36
1	\$109,489.03	\$109,489.03
1	\$124,128.24	\$124,128.24
2	\$131,327.91	\$65,663.96
2	\$138,421.12	\$69,210.56
1	\$175,149.12	\$175,149.12
1	\$192,264.47	\$192,264.47
2	\$249,138.41	\$124,569.21
5	\$272,493.81	\$54,498.76
3	\$284,087.95	\$94,695.98
4	\$293,364.44	\$73,341.11
3	\$308,180.77	\$102,726.92
2	\$317,107.34	\$158,553.67
5	\$319,188.42	\$63,837.68
3	\$326,827.75	\$108,942.58
5	\$351,727.60	\$70,345.52
4	\$378,581.15	\$94,645.29
4	\$498,877.09	\$124,719.27
4	\$544,528.77	\$136,132.19
6	\$545,580.56	\$90,930.09
5	\$556,486.91	\$111,297.38
7	\$566,917.62	\$80,988.23
7	\$668,454.85	\$95,493.55
9	\$795,794.35	\$88,421.59
7	\$832,078.15	\$118,868.31
7	\$947,689.48	\$135,384.21
5	\$1,223,186.84	\$244,637.37
10	\$1,235,711.24	\$123,571.12
8	\$1,238,122.07	\$154,765.26
16	\$1,591,844.97	\$99,490.31
30	\$3,083,073.33	\$102,769.11
<b>183</b>	<b>\$19,084,536.58</b>	<b>\$104,287.09</b>

2. Individual Assistance Payouts – Hurricane Sandy

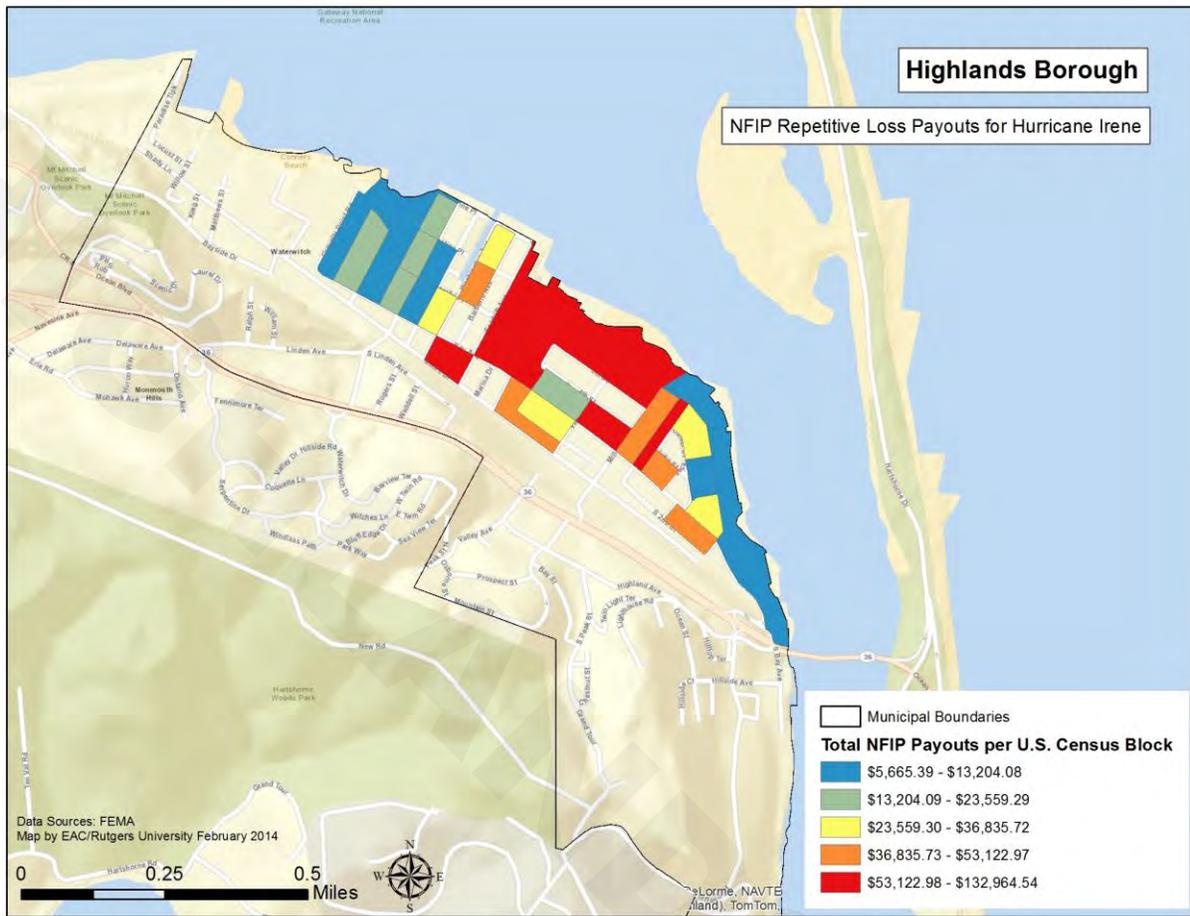
Number of Payouts per Census Block	Sum of Amount per Census Block	Average Payment per Census Block
1	\$369.94	\$369.94
1	\$499.99	\$499.99
1	\$500.00	\$500.00
1	\$987.42	\$987.42
1	\$2,820.00	\$2,820.00
1	\$3,910.00	\$3,910.00
3	\$5,299.99	\$1,766.66
3	\$8,278.32	\$2,759.44
3	\$8,412.82	\$2,804.27
3	\$8,626.01	\$2,875.34
5	\$9,289.99	\$1,858.00
3	\$9,974.73	\$3,324.91
4	\$11,655.27	\$2,913.82
10	\$22,210.66	\$2,221.07
10	\$29,450.24	\$2,945.02
12	\$37,947.80	\$3,162.32
15	\$39,751.71	\$2,650.11
13	\$41,118.00	\$3,162.92
16	\$41,332.38	\$2,583.27
15	\$42,178.37	\$2,811.89
12	\$45,255.00	\$3,771.25
14	\$45,567.64	\$3,254.83
18	\$52,065.52	\$2,892.53
25	\$53,078.80	\$2,123.15
19	\$55,440.94	\$2,917.94
17	\$55,811.78	\$3,283.05
18	\$57,545.68	\$3,196.98
9	\$57,712.22	\$6,412.47
19	\$59,958.62	\$3,155.72
14	\$61,421.24	\$4,387.23
18	\$62,612.22	\$3,478.46
14	\$65,426.10	\$4,673.29
24	\$70,279.89	\$2,928.33
15	\$76,719.90	\$5,114.66
18	\$78,191.95	\$4,344.00
26	\$84,112.16	\$3,235.08
19	\$85,335.05	\$4,491.32
22	\$93,053.67	\$4,229.71
25	\$94,731.62	\$3,789.26
23	\$94,881.40	\$4,125.28
37	\$95,210.10	\$2,573.25
28	\$100,064.06	\$3,573.72

29	\$107,496.93	\$3,706.79
33	\$110,440.44	\$3,346.68
31	\$115,204.87	\$3,716.29
29	\$116,210.01	\$4,007.24
31	\$121,259.36	\$3,911.59
22	\$133,416.94	\$6,064.41
22	\$138,082.55	\$6,276.48
37	\$143,836.78	\$3,887.48
47	\$151,165.46	\$3,216.29
36	\$169,348.68	\$4,704.13
36	\$184,297.55	\$5,119.38
52	\$185,597.52	\$3,569.18
63	\$207,122.18	\$3,287.65
45	\$215,008.35	\$4,777.96
75	\$217,078.85	\$2,894.38
75	\$252,860.43	\$3,371.47
65	\$323,950.92	\$4,983.86
183	\$687,808.06	\$3,758.51
398	\$1,553,899.07	\$3,904.27
<b>1,864</b>	<b>\$7,003,174.15</b>	<b>\$3,757.07</b>

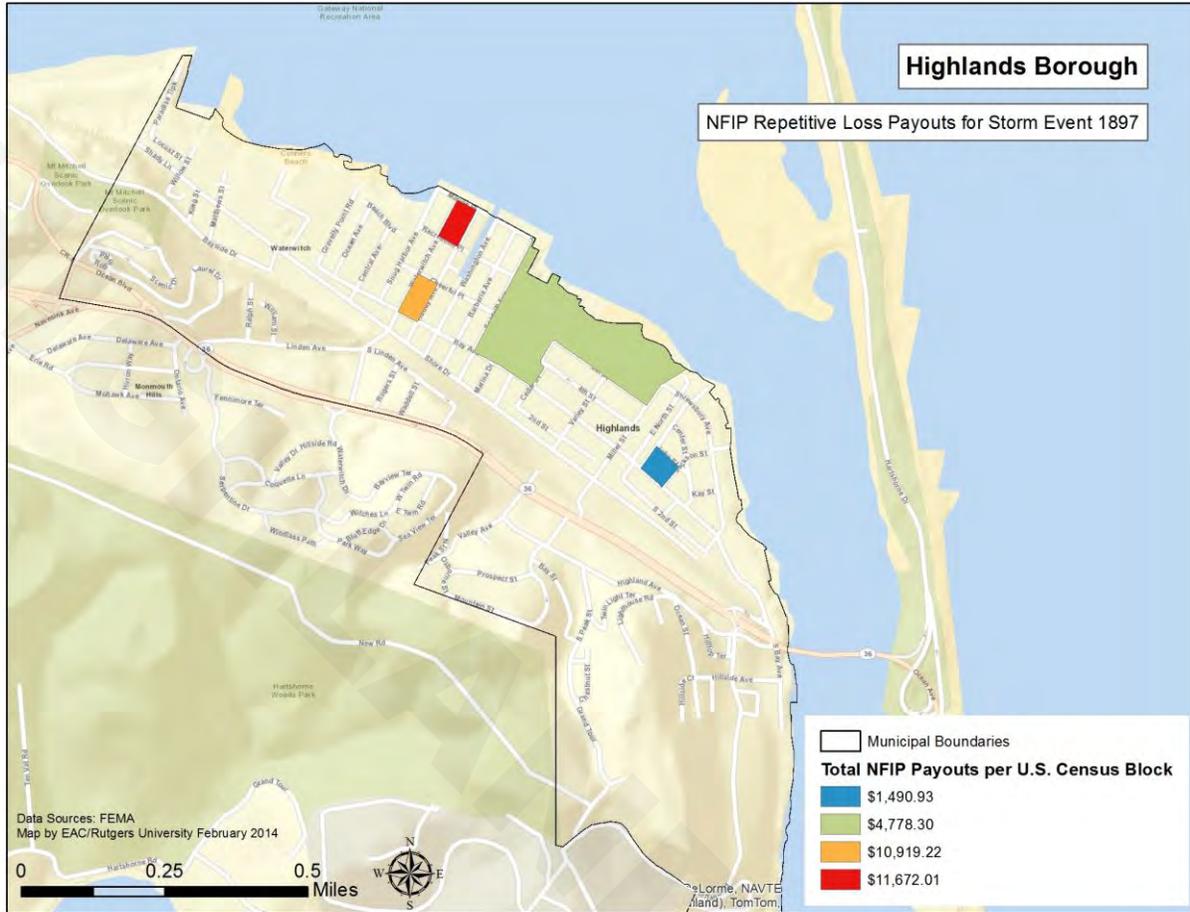
3. Public Assistance Payouts – Hurricane Sandy

Number of Payouts per Census Block	Sum of Amount per Census Block	Average Payment per Census Block
2	\$10,094.64	\$5,047.32
1	\$32,044.04	\$32,044.04
1	\$57,051.34	\$57,051.34
2	\$176,593.00	\$88,296.50
<b>6</b>	<b>\$275,783.02</b>	<b>\$45,963.84</b>

Appendix 7: Pre-Sandy Payout Maps



This map shows total NFIP payouts in the Repetitive Loss database held by the New Jersey Department of Environmental Protection for Hurricane Irene. There were a total of 35 payouts for damages related to the storm for a total of \$873,941. Total NFIP payouts per census block ranged from \$5,665.39 to \$132,964.54.



This map shows total NFIP payouts in the Repetitive Loss database held by the New Jersey Department of Environmental Protection for Storm Event 1897, which refers to the incident period of March 12, 2010 to April 15, 2010. There were 6 payouts associated with the storm for a total of \$28,860 Total NFIP payouts per census block ranged from \$1,490.93 to \$11,672.01.

**Appendix 8 : Roadways In AE and VE FEMA Flood Zones**

2nd Street  
4th Street  
5th Street  
Atlantic Street  
Barberie Avenue  
Bay Avenue  
Bayside Drive  
Beach Boulevard  
Bedle Place  
Cedar Avenue  
Cedar Street  
Center Street  
Central Avenue  
Cheerful Place  
Cornwall Street  
Cornwell Street  
County Route 8  
E North Avenue  
E North Street  
Elmore Street  
Fay Street  
Gravelly Point Rd  
Highland Avenue  
Hillside Avenue  
Huddy Avenue  
Jackson Street  
John Street  
Kay Street  
Kielgart Avenue  
King Street  
Locust Street  
Marie Avenue  
Marine Place  
Mathews Street  
Miller Street  
Ocean Avenue  
Recreation Place  
S 2nd Street  
S Bay Avenue  
Sea Drift Avenue  
Second Street  
Shore Drive  
Shrewsbury Avenue  
Snug Harbor Avenue  
South Street  
Spring Street  
State Hwy 36  
Valley Street  
W North Street  
Washington Avenue  
Waterwitch Avenue  
Willow Street