2016 Floodplain Management Plan DRAFT

Borough of Monmouth Beach
Monmouth County, New Jersey

2016 Floodplain Management Plan

DRAFT September 2016

Prepared for:
Monmouth Beach
Monmouth County, New Jersey

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The original of this document was signed
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Executive Summary

This plan is intended to identify and assess flood hazards within the Borough of Monmouth Beach, establish goals and objectives for floodplain management and resiliency, and to present a series of actions designed to minimize flooding and mitigate the impacts from flooding in the future. This Floodplain Management Plan was funded using Phase II- Post Sandy Planning Assistance Grant Funding from the New Jersey Department of Community Affairs and will be incorporated as an element of the Borough's Master Plan.

This plan has been organized according to the guidelines of the 2013 National Flood Insurance Program Community Rating System Coordinator's Manual to receive credit points in the FEMA Community Rating System Program and follows the 10-step planning process outlined in the manual. The planning process was conducted through a committee consisting of public members as well as Borough employees and officials. The committee met weekly throughout the planning process to discuss each step of the plan and provide input on suggested activities and actions.

To assess the problems and flood hazards impacting the Borough of Monmouth Beach, a review was done of all relevant planning studies, documents, and relevant zoning ordinances. Outside stakeholder agencies were contacted for input on the planning process. Historical flooding events, repetitive loss properties and known flood hazards were reviewed to determine problem areas within the Borough. Much of this work was completed utilizing the Borough's newly created Geographic Information Systems (GIS) program.

Possible activities to mitigate the impacts of flooding in the community were discussed. The committee determined a list of goals for the Monmouth Beach Floodplain Management Plan and determined a prioritized list of action items from the list of possible activities, using the goals as guidance. The Borough's recently updated Hazard Mitigation Plan was also used as a reference when determining proposed activities.

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I. INTRODUCTION

PURPOSE AND SCOPE

This plan has been prepared as the Borough of Monmouth Beach's Floodplain Management Plan (FMP) and will be incorporated as an element of the Borough's Master Plan and reviewed and adopted by the Borough's governing body. The Floodplain Management Plan identifies and assesses flood hazards within the Borough, establishes the goals and objectives for floodplain management in Monmouth Beach, and presents a series of actions designed to minimize flooding and mitigate the impacts from flooding in the future. The FMP evaluates the need and potential options for wetland restoration and maintenance and/or other engineering control measures to mitigate potential storm surge in those areas of the Borough that may be vulnerable. The FMP also includes recommendations for the Borough's current Flood Damage Prevention Ordinance. This Floodplain Management Plan is designed to receive points under FEMA's Community Rating System Program.

FLOODPLAIN MANAGEMENT PLANNING

Floodplain management is defined by FEMA as the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. While FEMA has minimum floodplain management standards for communities participating in the National Flood Insurance Program (NFIP), adopting higher standards will lead to safer, stronger, more resilient communities.

COMMUNITY RATING SYSTEM

The Community Rating System (CRS) is a voluntary incentive program of the National Flood Insurance Program (NFIP) that provides participating communities with discounted flood insurance premium rates for undertaking community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted in increments of 5%, reflecting the reduced flood risk resulting from community actions in four categories: public information, mapping and regulations, flood damage reduction, and flood preparedness. The three goals of the Community Rating System Program are:

1. Reduce flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP; and
3. Encourage a comprehensive approach to floodplain management.

ORGANIZATION OF THE PLAN

This plan has been organized according to the guidelines of the 2013 National Flood Insurance Program Community Rating System Coordinator's Manual to receive credit points under FEMA's Community Rating System Program. This Floodplain Management Plan follows the 10- step planning process outlined in the manual:

- Step 1: Organize
- Step 2: Involve the public
- Step 3: Coordinate
- Step 4: Assess the hazard
- Step 5: Assess the problem
- Step 6: Set goals
- Step 7: Review possible activities
- Step 8: Draft an action plan
- Step 9: Adopt the plan
- Step 10: Implement, evaluate, revise

II. BOROUGH OF MONMOUTH BEACH PROFILE

The Borough of Monmouth Beach is located on a barrier spit in northeastern Monmouth County, with approximately 1.6 miles of frontage along the Atlantic Ocean. It is bordered to the north by Sea Bright Borough, to south by the City of Long Branch, to the east by the Atlantic Ocean, and to the west by the Shrewsbury River. The Boroughs of Rumson and Oceanport are located on the other side of the Shrewsbury River. Monmouth Beach is approximately 1.1 square miles of land area and an established, full-built, year-round community with little land available for future development. Existing development within the Borough consists mostly of single family homes. The Borough has three (3) high rise condominium buildings, a small downtown commercial corridor, and the Two Rivers Reclamation Authority. The entire Borough is located within the Coastal Area Facility Review Act (CAFRA) zone.

Monmouth Beach is a low-lying coastal community subject to flooding from heavy rain, surface runoff, tidal events, hurricanes, and tropical storms. Within the Borough are the tidal waters of Jim's Creek and several man-made lagoons which connect with the Shrewsbury River to the northwest.

POPULATION TRENDS

The 2010 Census found that 3,279 people lived in 1,494 households within the Borough of Monmouth Beach, with an average age of 48.7 years. This is slight decrease in the overall number of residents from the 2000 Census number of 3,595 and households at 1,633; but an increase in the average age, up from 44.6 in 2000. The American Community Survey estimated that 3,239 people were living in Monmouth Beach in 2015, a slight decrease from the 2010 number. Given the impacts of Hurricane Sandy, the Borough of Monmouth Beach does not feel that the subsequent American Community Survey estimates represent an accurate number of residents. It is a recommendation of this plan that the Borough undertake a study to accurately determine the number of year-round and seasonal residents living in the Borough of Monmouth Beach.

III. PROJECT ORGANIZATION & PUBLIC MEETINGS

T & M Associates assisted the Borough of Monmouth Beach in preparing this Floodplain Management Plan, as the appointed Borough Engineer and Borough Planner. The planning process was conducted under the supervision of a New Jersey licensed professional planner.

The planning process was conducted through a Flood Advisory Committee consisting of both Borough staff and representatives of the public. The Committee was formed by Borough of Commissioners Resolution R-30-16 and met on a weekly basis in July and August 2016 to discuss the existing hazards and problems related to flooding in the Borough, review potential goals and hazard mitigation activities, prepare an action plan, and make recommendations to revise existing Borough Ordinances. The resolution forming the Flood Advisory Committee can be found in Appendix A and outlines of all steering committee meetings are located in Appendix B. The following are the members of the Flood Advisory Committee:

- Public Officials:
  - Sue Howard, Mayor
  - Joe Chirichello, Superintendent of Public Works
  - Don Clare, Floodplain Manager and Construction Official
  - Bonnie Heard, Borough Engineer
  - Aaron Rock, OEM
  - Tom Walsh, Chief of Police
  - Judy Wilson, Borough Administrator
  - Edward Junquet, OEM Alternate
  - Cranston Van Bloem, OEM Alternate
- Members of the Public:
  - Lawrence Boice, Resident
  - Ellen Conrad, Resident
  - Peter English, Resident
  - Eileen Fontana, Resident
  - Judy Kahn, Resident
  - Robert Karl, Resident
  - Bill Kline, Resident
  - Tom London, Resident
  - Robert McDonough, Resident
  - Scott Sergeant, Resident
  - Ray Smith, Resident
  - Darren Weinstein, Resident

In addition to the Advisory Committee meetings, a separate public information meeting was held during the initial stages of planning on August 23, 2016. This meeting was

publicly advertised on the Borough website and in the Asbury Park Press and open to all members of the public. The public was informed of the proposed Floodplain Management Plan and was given the opportunity to provide input and recommendations.

A second open public meeting was held on September 13, 2016. The draft Floodplain Management Plan was made available on the Borough website and the public was encouraged to provide input on the recommended plan.

Advertisements for all committee and public meetings can be found in Appendix C.

IV. COORDINATION

EXISTING DOCUMENTS

It is important to coordinate floodplain management goals with other planning and community development goals in Monmouth Beach. As part of the planning process, the following documents were reviewed:

- 1978 Master Plan
- 2001 Master Plan Reexamination Report
- 2007 Municipal Stormwater Management Plan
- 2010 Coastal Monmouth Plan
- 2012 Master Plan Reexamination Report
- 2014 Strategic Recovery Planning Report
- 2014 Monmouth County Multi-Jurisdictional All Hazards Mitigation Plan

Information from the following documents was identified as important to the floodplain management planning process:

1978 Master Plan

The Borough of Monmouth Beach Master Plan was adopted November 27, 1978. The following objectives and principles of the 1978 Master Plan are relevant to floodplain management planning:

Objectives:

- To encourage municipal action to guide the appropriate use or development of lands within the Borough in a manner which will promote the public health, safety, morals and general welfare.
- To secure safety from fire, flood, panic and other natural and man-made disasters.
- To promote the establishment of appropriate population densities and concentrations that will contribute to the well-being of persons, neighborhoods and preservation of the environment.
- To encourage the appropriate and efficient expenditure of public funds by the coordination of public development with land use policies.
- To promote the conservation of open space and valuable natural resources and prevent degradation of the environmental through improper use of land.
- To encourage coordination of the various public and private procedures and activities shaping land development with the view of lessening the cost of such development and to the more efficient use land.

Principles:

- Locating residential, commercial and marina uses at sites in locations which are suitable for their use environmentally, economically and geographically in conjunction with proximity to existing facilities, land uses, major roadways and natural features.
- Protection of natural and environmental resources including floodways, wetlands, marsh areas and areas suitable for public and quasi-public recreational activities.
- To encourage a development pattern which will protect and enhance the long term economic and community interests of the Borough as a residential community.

2001 Master Plan Reexamination Report

The 2001 Master Plan Reexamination Report did not identify any major problems relating to land development in the Borough.

2007 Stormwater Management Plan

The Borough's Stormwater Management Plan was adopted in 2005 and amended in September 2007. The following goals of the Stormwater Management Plan are also relevant to this Floodplain Management Plan:

- Reduce flood damage, including damage to life and property;
- Minimize, to the extent practical, any increase in stormwater runoff from any new development or redevelopment;
- Reduce soil erosion from any development, redevelopment or construction project;
- Seek to assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- Maintain groundwater recharge;
- Prevent, to the greatest extent feasible, an increase in non-point source pollution;
- Maintain the integrity of stream channels for their biological function, as well as for drainage;
- Minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water;
- Protect public safety through the proper design and operation of stormwater basins and best management practices.

- Increase public awareness of stormwater management through public education.
- Seek to provide healthy and naturally diverse habitats to support plants and wildlife that will enrich the lives of residents.
- Seek to maintain a safe and plentiful drinking water supply.
- Seek to preserve the integrity of the freshwater and tidal benthic communities to support commercial and recreational water-related uses including boating, bathing, fishing and sightseeing.

2012 Master Plan Reexamination Report

The 2012 Master Plan Reexamination Report was adopted on April 24, 2012. It does not make any specific recommendations to the current Master Plan and finds it to be appropriate for the existing development patterns within the Borough.

2014 Strategic Recovery Planning Report

The Strategic Recovery and Planning Report, adopted on August 26, 2014, discusses the vulnerabilities that have been exacerbated by Hurricane Sandy, and the opportunities the storm created. They are as follows:

Vulnerabilities exacerbated:

- The loss of fuel exposed residents to the dangers of cold fall nights;
- The loss of power and cell phone service impacted the communication between emergency personnel;
- Breaches and gaps in the Borough's dune system allowed stormwater to reach the community;
- Residences and businesses located in low-lying areas close to the Atlantic Ocean and the Shrewsbury River were especially vulnerable to flooding;
- Regular moon tide inundation has increased as a result of stream siltation from Superstorm Sandy; and
- Damages to roads and flooding throughout the Borough hindered the capacity of emergency response vehicles.

Opportunities Created:

Hurricane Sandy has provided Monmouth Beach Borough with an important learning opportunity, and its impacts demonstrate that the Borough may become more resilient to future hurricanes and storms by doing the following:

- Promoting public awareness of hazard mitigation and resiliency issues;
- Focusing public agencies on community vulnerabilities to hazards such as flooding;
- Encouraging regional solutions to flood- and storm-related impacts;

- Ensuring that future capital projects are designed and constructed to incorporate features that are resilient to storm- and flood-related impacts; and
- Encouraging/supporting the use of sustainable development techniques and green building design in future development and redevelopment.

The Strategic Recovery Planning Report recommended a number of actions to promote recovery from Hurricane Sandy and to reduce vulnerabilities from future storms. This Floodplain Management Plan, and a number of other recommended planning documents were funded under Phase 2 of the Post- Sandy Planning Assistance Grant Program, funded by the New Jersey Department of Community Affairs. All other recommended and funded actions are referenced in Section XIII Possible Floodplain Management Activities and Section IV Action Plan, of this document.

2015 Monmouth County Multi-Jurisdictional Natural Hazard Mitigation Plan

The Monmouth County Multi-Jurisdictional Natural Hazard Mitigation Plan (HMP) identifies natural hazards that could affect the County's jurisdictions, evaluates the risks associated with these hazards, identifies the mitigation actions to lessen the impacts of a disaster on Monmouth County communities, and prioritizes them based on the municipal master plans and other planning documents. Monmouth County employed a multi-jurisdictional approach to develop the plan, and every municipality in the County was invited to participate as an equal partner with the County.

As part of its participation in the HMP outreach process, the Borough of Monmouth Beach has identified that in the aftermath of Hurricane Sandy, the Borough is concerned with the following recovery actions:

1. Elevate Existing Sunken Retaining Wall: The Borough of Monmouth Beach requested funding in the amount of $150,000 (which is 75 percent of the total project cost of $200,000) to elevate an existing sunken retaining wall located at Shorelands Park. The existing retaining wall is currently at-grade due to repeated flooding and associated erosion, which have caused significant changes to the park's topography. The proposed elevation of the retaining wall will mitigate flooding at the park, reduce changes to the park's topography related to erosion, reduce litter and debris left by tidal flooding and storm surges, and protect the Borough's investment in this recreational amenity. The height of the existing retaining wall will be elevated to a height of fifteen (15) feet above sea level in an effort to protect the park and its existing amenities from flood related damage. The elevation of the retaining wall will also offer additional protection from floodwaters and wave action to other public infrastructure such as roads, drainage

pipes, and utilities located behind the park. The project will provide a significant public benefit, as it will protect existing public infrastructure and mitigate flooding in and around the park.

2. Floodproofing Pump Station: Monmouth Beach requested funding in the amount of 1.1 million to construct a new flood proofed stormwater pump station and associated backup generator at the northern terminus of Monmouth Parkway. The proposed stormwater pump station will serve the residential neighborhood in which it is located. The proposed pump station will reduce the incidence of flooding in this residential neighborhood, thereby reducing the likelihood of potential damage to public and private property during flood-related incidents. The proposed stormwater pump station will fill a significant need in the Borough's flood mitigation efforts. Currently, the area that will be served by the pump station experiences tidal flooding and stormwater pipe surcharge from storm events, causing periodic, and sometimes significant flooding of area roadways. This flooding makes area roadways inaccessible to emergency personnel and causes flood damage to private property. Tidal flooding further exacerbates flooding resulting from storm events. The proposed storm water pump station will serve to mitigate storm-related and tidal flooding in the project area, which will limit damage to public infrastructure and private property while also allowing for adequate emergency access during storm events.
3. Home Elevation: The elevation of 460 homes, 274 of which were substantially damaged, to the new FEMA FIRM maps will result in reduced future storm damages to residential structures, personal property and protect public health and safety during future events.
4. Elevation of six municipal structures; the Police Building, Borough Hall, the Cultural Center, Library, First Aid, and Fire House to new FEMA FIRM maps. The proposed mitigation will result in reduced future storm damages to municipal structures. These municipal structures are crucial to the protection of the health and safety of the residents. The elevation of the library has recent been completed.
5. Raising and Re-grouting of the Seawall: The Borough is proposing raising the existing Sea Wall three (3) feet and carrying out re-grouting where necessary.
6. Drainage Improvement: Installation of stormwater systems including inlets, manholes and piping for low lying areas such as Johnson St. / Anderson St. / Drew Ct. / Valentine St. The proposed project will result in reduced future flood damages to these areas.
7. Seawall construction: Expand the existing seawall to fill in the approximate 675 linear gap between Valentine Street and the south end of the Bathing Pavilion

where the existing seawall is buried. Seawall construction is planned to begin in 2017.

COORDINATION WITH OUTSIDE AGENCIES

Notices were sent to the following groups, commissions, municipalities, and agencies soliciting data or information related to flooding, as well as any specific actions the agency or organization has undertaken that may affect flooding. Agencies and organizations contacted include:

- Borough of Sea Bright
- City of Long Branch
- Borough of Rumson
- Borough of Fair Haven
- Borough of Little Silver
- Borough of Oceanport
- Borough of Monmouth Beach Environmental Commission
- Borough of Monmouth Beach Police Department
- Monmouth Beach Fire Department
- Monmouth Beach EMS
- Monmouth County Planning Department
- Monmouth County Office of Emergency Management
- Freehold Soil Conservation District
- North Jersey Transportation Planning Authority
- Natural Resources Conservation Service
- New Jersey Coastal Management Program
- U.S. Army Corp of Engineers, New York District
- American Red Cross, Jersey Coast Chapter
- Clean Ocean Action
- American Littoral Society
- Jacques Cousteau National Estuarine Research Reserve
- Shore Builders Association of Central Jersey
- Comcast Cable
- New Jersey American Water
- New Jersey Department of Environmental Protection, State Floodplain Manager
- Two Rivers Reclamation Authority

A sample of the letter sent out to all the above mentioned stakeholders, agencies, and individuals can be found in Appendix D. Many agencies responded and discussed information that could be beneficial to the Borough's Plan. An example of this work is the various mapping provided by the Jacques Cousteau Reserve and the Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA). A log of all agencies contacted, along with their responses can be found in Appendix E.

V. FLOOD HAZARD ASSESSMENT

FLOODING HISTORY

Description of Known Flood Hazards

The Flood Insurance Rate Map (FIRM) for the Borough of Monmouth Beach is currently in the process of being updated. The Effective FIRM maps dated September 29, 2006 can be found in Appendix F. The Advisory Base Flood Elevation Maps (ABFEs), which were adopted shortly after Hurricane Sandy, can be found in Appendix G and in Figure 1 below. The new Preliminary FIRM maps were issued on January 30, 2015 and can be found in Appendix H. New York City filed a technical appeal of the Preliminary FIRM maps after finding technical and scientific errors in FEMA's modeling that overestimated the height of the BFE by between 1 and 2.5 feet across the city. If the City's appeal is successful, the BFEs as depicted in the current Preliminary FIRMs will decrease and the extent of the one-percent annual chance floodplain will decrease.

The Borough of Monmouth Beach has adopted the Advisory Base Flood Elevation maps and requires building be built to those standards plus an additional three (3) feet of freeboard. The majority of Monmouth Beach is located within the 100 year floodplain on the ABFE map, with the exception of a small area in the center of Monmouth Beach and some land located along Route 36 in the southern portion of the Borough. The Monmouth Beach Police Department, Municipal Building, Fire Station, First Aid Station, Cultural Center, Elementary School, and the Two Rivers Reclamation Authority are located within the 100 year floodplain on the ABFEs.

Monmouth Beach is a low lying coastal community and is subject to flooding from heavy rain, surface runoff, tidal events, hurricanes, and tropical storms. The Borough is relatively flat, close to sea level, and bordered by the Shrewsbury River to the west and the Atlantic Ocean to the east. The topography and elevation of the Borough along with its proximity to water on two sides, exacerbates flooding problems throughout. The Borough has been vulnerable to tidal flooding from both the Atlantic Ocean and the Shrewsbury River. A seawall along most of the oceanfront helps to protect the Borough from the ocean's impacts. Bulkheads interspersed with erodible areas protect the Borough from the river. Within the Borough of Monmouth Beach, 73.76% of all structures are located within the Special Flood Hazard Area as delineated on the Borough's adopted ABFE maps.

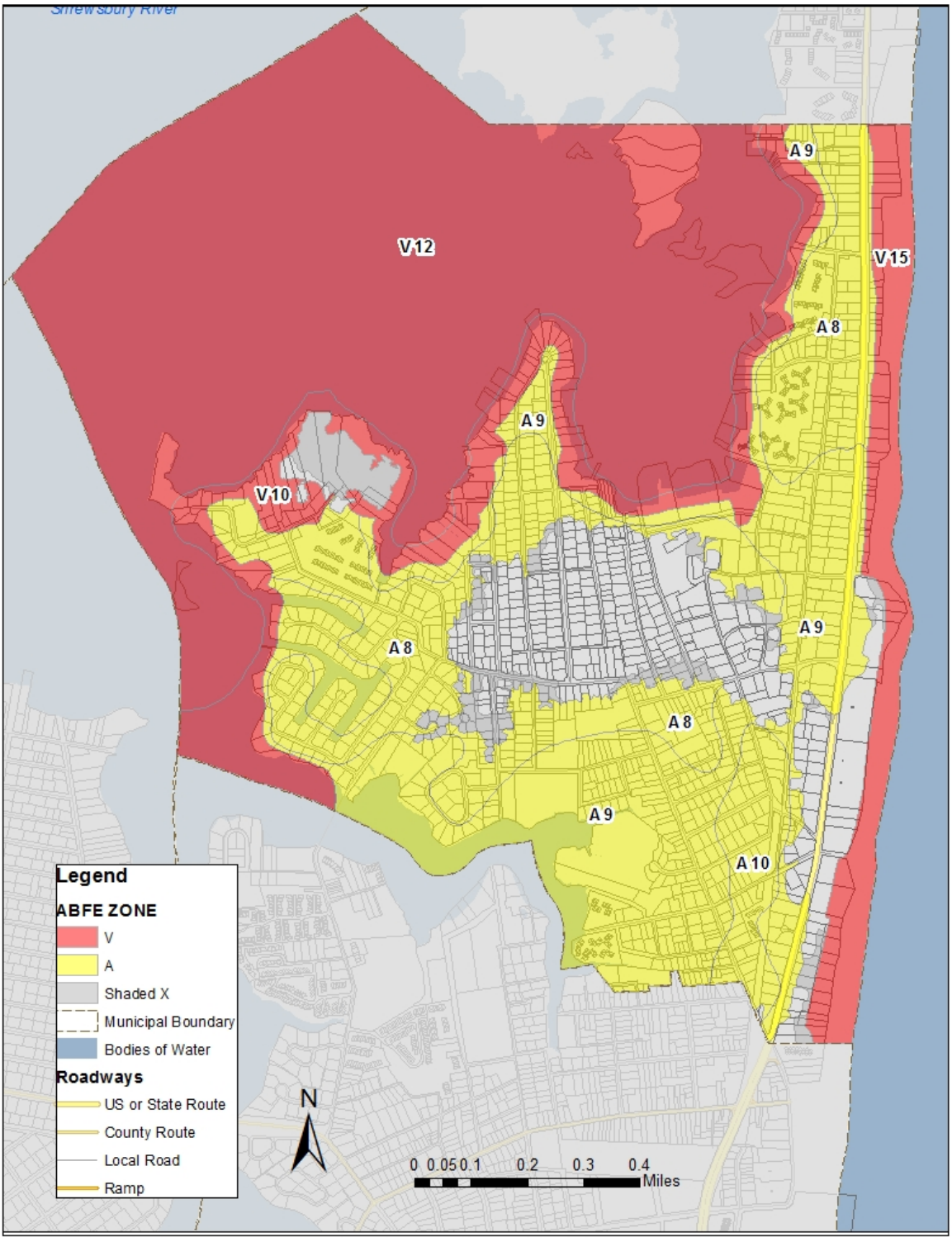

Figure 1. Advisory Base Flood Elevation Map

There are three designated flood zones in Monmouth Beach's preliminary FIRMS; the VE Zone, AE Zone and AO zone. VE Zones are areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Predicted wave heights are three feet or greater. Base Flood Elevations (BFEs) are derived from detailed hydraulic analyses and are indicated by the elevation provided. Among other criteria, the lowest horizontal structural member of a proposed structure must be located above the BFE in V Zones. AE Zones are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. AO Zones are areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone.

In addition to the above designations Monmouth Beach also contains some areas mapped as coastal A zones. These are areas where waves could be propagated of greater than 1.5 feet but less than 3 feet, and are usually located adjacent to VE zones. Laboratory tests and field data has shown that a wave as small as 1.5 feet may cause failure of light framed or masonry walls and in these designated areas VE Zone construction standards are recommended. A graphic depiction of the flood zones can be found below in Figure 2.

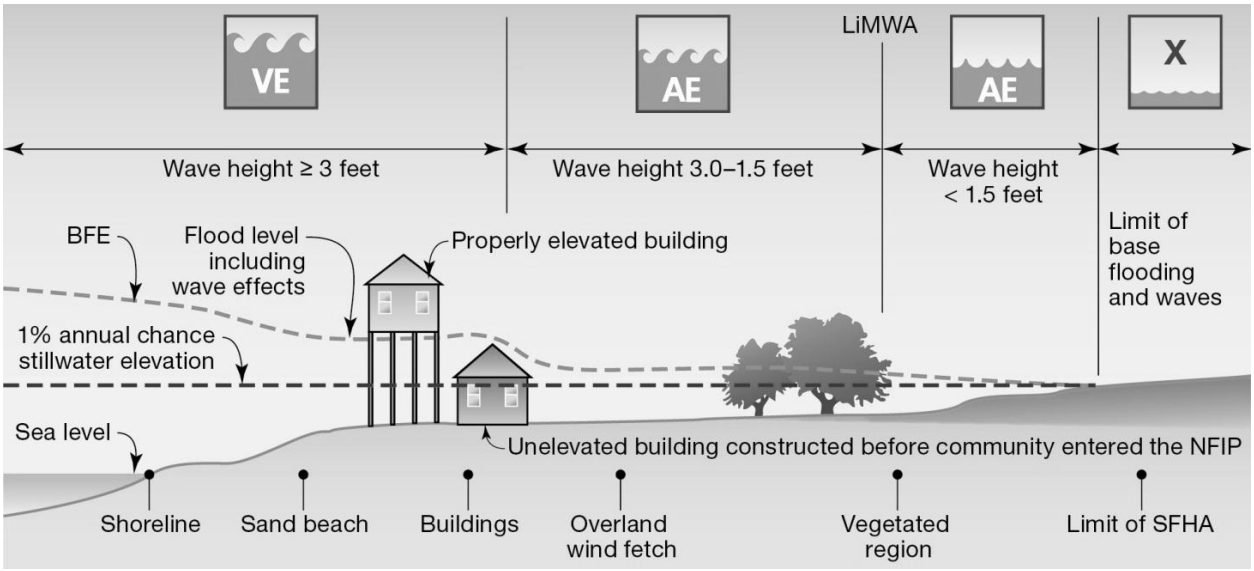

Figure 2. Flood Hazard Area Description

Source: FEMA

The Preliminary FIRMs (PFIRM), which depict the coastal A zone as the portion of the Special Flood Hazard Area (SFHA) area between the Zone VE boundary and the Limit of Moderate Wave Action (LiMWA). The LiMWA line is designated and provided to help communicate the higher risk that exists due to the increased potential for damage due to wave action in the Coastal A Zone. The PFIRM, including the coastal A zone, is depicted in Figure 3 below:

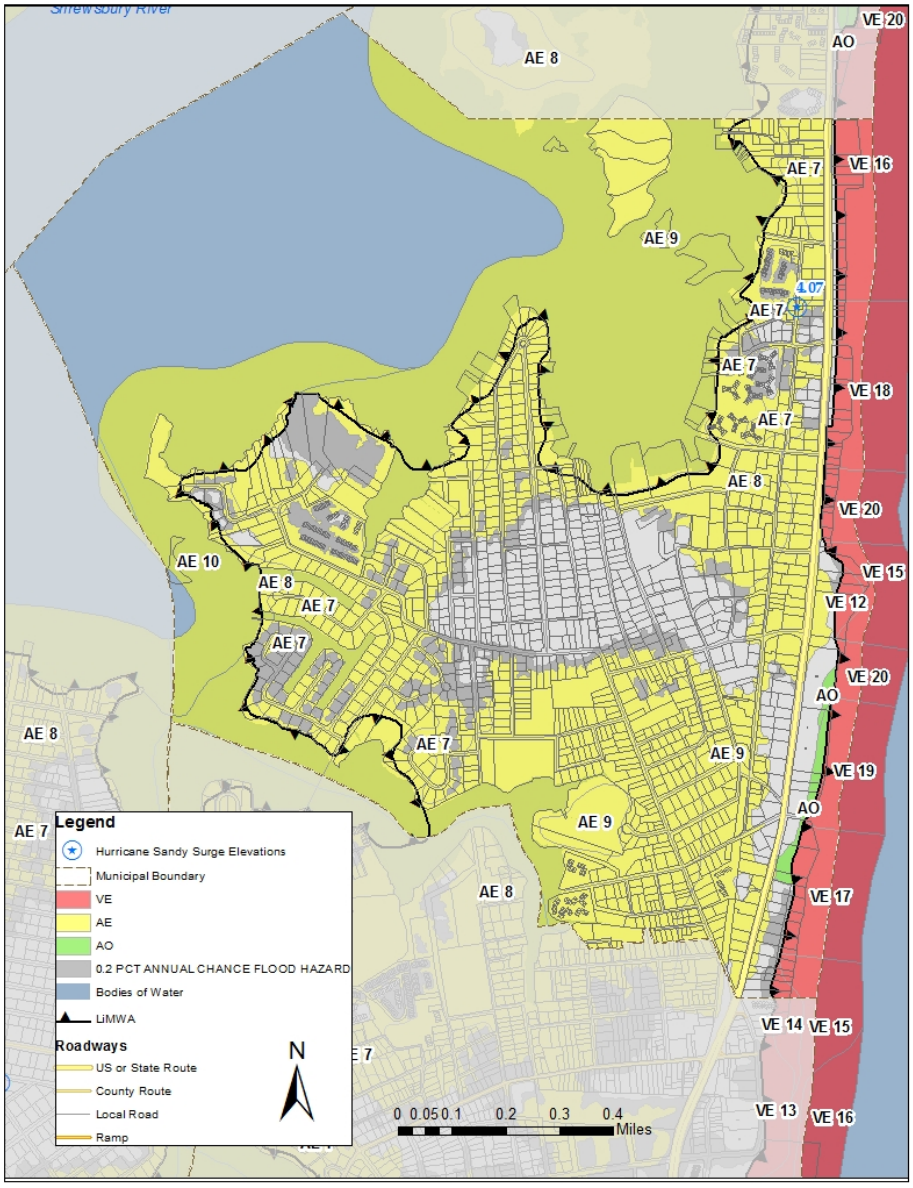

Figure 3. Preliminary FIRM

As depicted in the ABFE and PFIRM maps in Figures 1 and 3, much of Monmouth Beach is located within the 100-year floodplain and susceptible to flood from storm events with the exception of a few areas of higher elevation located near the absolute center of the Borough and along Ocean Avenue in the southern portion of the Borough.

Hurricane Sandy made landfall along the coast of New Jersey on October 29, 2012, causing major flooding and destruction. This event has become the flood of record (the highest flood recorded) for much of New Jersey and New York. Where available, Hurricane Sandy Surge Elevations were mapped throughout Monmouth Beach and surrounding communities and are noted on the Preliminary FIRM map located in Figure 3 above and in Appendix H. A map of the Sandy Surge Extent can be found in Appendix I. Storm Surge elevation data can be found in the report entitled 'Monitoring Storm Tide and Flooding from Hurricane Sandy Along the Atlantic Coast of the United States, October 2012,' and is located at the following web site http://pubs.usgs.gov/of/2013/1043/ Additional description of the effort to gather surge data can be found at http://www.state.nj.us/dep/wms/suro_hurricanesandy_njwatermonitoring_meeting.pdf

In addition to flooding from storm events, the Borough of Monmouth Beach is also susceptible to nuisance flooding in low-lying areas, particularly near the riverfront. Areas that have been identified as susceptible to nuisance flooding include:

- North Road
- Patten Avenue – Anchors Way to the Shrewsbury River
- Valentine Street – Sydney Place west to the River
- Riverdale Avenue – north of Valentine Street to Griffin Street
- Navesink Drive - north end and in front of house numbers 36, 37, 38, and 39
- Seaview Avenue – Between Sailors Way and Central Road
- Johnson Street – from approximately 5 Johnson Street west to Riverdale Avenue
- Robbin Street – from approximately 20 Robbin Street west to Riverdale Avenue
- Monmouth Parkway – from North Road to the intersection with Navesink Drive
- Griffin Street - from the east end of Monmouth Place to Hasting Place
- Margaret Place
- Monmouth Place
- River Avenue - between Sailors Way and Central Road
- Sailors Way - near intersection with River
- Spaulding Place - in front of house numbers 11, 12, and 13
- Meadow Avenue – west of Patten Avenue to 7 Meadow Avenue
- Tocci Avenue - from the river to Mann Court
- Willow Avenue – in front of the Library

- Columbus Drive – north of Elizabeth Place

A map of areas susceptible to nuisance flooding can be found in Figure 4 and in Appendix J.

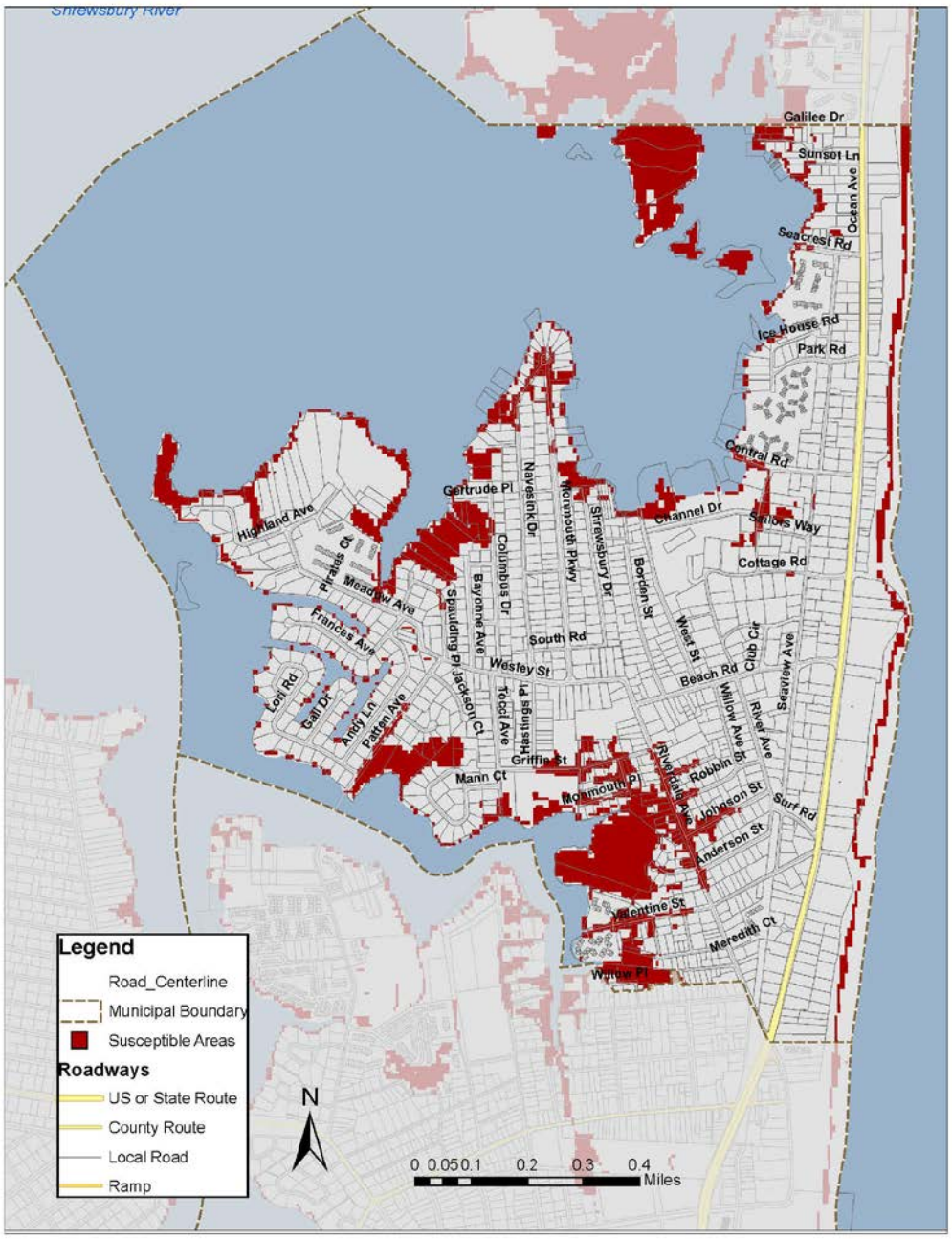

Figure 4. Areas Susceptible to Nuisance Flooding

Historical Flooding Events

Monmouth Beach is susceptible to flooding from the Atlantic Ocean and Shrewsbury River and has flooded repeatedly throughout time. Some of the major storm events that have affected the Borough and the greater Monmouth County area with flooding and damage are as follows:

- September 14 – 15, 1944: A Category 2 hurricane passed within 47 miles of the coast of New Jersey in September 1944, producing wind velocities over 100 mph and a maximum tidal elevation of 7.4 feet at the gage in Sandy Hook.
- Hurricane Donna: On September 12, 1960 Hurricane Donna was classified as a Category 2 hurricane when it reached Monmouth County. Wind speeds of up to 110 mph were recorded, as was a maximum tidal elevation of 8.6 feet at Sandy Hook.
- The Ash Wednesday Storm: A nor'easter struck the coast of New Jersey lasting 3 days and 5 tidal cycles from March 6- 8, 1962, causing massive amounts of destruction and 10 deaths in the State of New Jersey.
- Hurricane Belle: On August 9, 1976, Hurricane Belle impacted New Jersey as a Category 1 hurricane with wind speeds of up to 90 mph. In Asbury Park, 2.56 inches of rain was recorded as having fallen in a 24-hour period.
- March 1984: This nor'easter coincided with astronomically high tides and caused flooding, erosion, and damage to roads and boardwalks.
- Hurricane Gloria: On September 27, 1985, Hurricane Gloria came onshore in Long Island, NY as a Category 2 hurricane. The storm caused extensive power outages through New Jersey and forced people to be evacuated from their homes. However, coastal flooding was minimized as the peak storm surge arrived during low tide.
- The Perfect Storm: The Perfect Storm, also known as the Halloween Storm, was a nor'easter that caused coastal flooding on October 31, 1991.
- The Storm that Stole Christmas: A nor'easter struck the coast of New Jersey on December 11, 1992 and continued to impact the area through eleven (11) tidal cycles, causing extensive beach erosion and a 3 to 5 foot storm surge.
- Tropical Storm Floyd: Tropical Storm Floyd impacted New Jersey on July 16, 1999. Heavy rains coincided with high tide to exacerbate flooding. However, the greatest impacts were felt away from coastal areas in Bergen and Somerset Counties.
- Tropical Storm Irene: Tropical Storm Irene produced heavy rains from August 27-28, 2011, causing tidal flooding and beach erosion, making it the costliest storm in New Jersey after Hurricane Floyd prior to Hurricane Sandy.

Figure 5. Damage from Hurricane Sandy

- Hurricane Sandy: Hurricane Sandy made landfall in Brigantine on October 29, 2012, becoming the costliest natural disaster in the State of New Jersey and second only to Hurricane Katrina nationwide. The coastal areas of Monmouth and Ocean Counties were among the hardest hit with record breaking high tides and wave action. Many homes throughout the coastal communities were destroyed or impacted by severe flooding. All communities within Monmouth County faced power outages, some lasting for more than two (2) weeks. Monmouth Beach faced significant impacts from Hurricane Sandy with a loss of utility services, forced evacuation of residents, and the damage and/or destruction of buildings and infrastructure throughout the Borough. Additionally, the public water supply in Monmouth Beach was deemed unsafe for consumption in the days following the storm.

Storms with Repetitive Loss

Using repetitive loss data provided by FEMA, areas in Monmouth Beach were identified as generally being affected by flooding. A repetitive loss property is classified as one

which has experienced two or more claims of more than $1,000 that have been paid by the National Flood Insurance Program (NFIP) within any 10 year period since 1978. To protect the privacy of homeowners' individual repetitive loss properties were not mapped, but rather a 250 foot buffer was created around each repetitive loss property and any parcel falling in the buffer was categorized as in an area generally affected by flooding. Repetitive loss properties are scattered throughout the Borough. A map of the repetitive loss areas in Monmouth Beach can be found in Appendix K. Repetitive Loss Areas include:

- The northern portion of the Borough from its border with Sea Bright to Park Road.
- From just north of Beach Road to the southern border of the Borough along Ocean Avenue.
- From Navesink Drive east to Ocean Avenue.
- From Griffin Park east along the Shrewsbury River
- The areas surrounding Patten Avenue and Lori Road.

The average number of losses per repetitive loss property in the Borough of Monmouth Beach is four (4). The average pay-out per loss for a repetitive loss property in the Borough is $53,521, with an average total pay-out per property of $198,303 for all loses. Storm events that have resulted in repetitive losses since 1978 include:

- Blizzard of '78: The Blizzard of 1978 was a nor'easter that impacted the northeastern portion of the United States from February 5- 7, 1978. Heavy snow and winds contributed to the flooding in Monmouth Beach. Twelve (12) repetitive loss properties in Monmouth Beach filed claims for this event on February 6, 1978.
- February 15, 1978: One (1) flood insurance claim from a repetitive loss property was made for this event.
- November 15, 1981: One (1) flood insurance claim from a repetitive loss property was made for this event.
- February 11, 1983: One (1) flood insurance claim from a repetitive loss property was made for this event.
- April 10, 1983: One (1) flood insurance claim from a repetitive loss property was made for this event.
- March 13, 1984: One (1) flood insurance claim from a repetitive loss property was made for this event.
- Nor'easter: A nor'easter on March 29, 1984 caused over $3 million in damage throughout the state. In Monmouth Beach, seventy-seven (77) repetitive loss properties filed claims for this event.

- April 5, 1984: Three (3) flood insurance claims from repetitive loss properties were made for this event.
- Hurricane Gloria: Hurricane Gloria was a Category 2 storm when it made landfall in Long Island, NY. Hurricane Gloria caused extensive power outages throughout New Jersey due to a large amount of downed trees. Although the storm surge averaged about 6.5 feet above predicted tide levels, the peak surge arrived during low tide, minimizing coastal flooding. In the Borough of Monmouth Beach, seventeen (17) flood insurance claims on repetitive loss properties were made on September 27, 1985 for this event.
- January 1-2, 1987: Four (4) flood insurance claims from repetitive loss properties were made on January 1st, followed by an additional eight (8) on January 2nd.
- The Perfect Storm (The Halloween Storm): The Perfect Storm, also known as the Halloween Nor'easter, was a nor'easter that caused extensive damage along the east coast from North Carolina to Maine. It began on October 28th and lasted until November 1, 1991. On October 30th, 1991, thirteen (13) flood claims for repetitive loss properties were made in Monmouth Beach, followed by twenty-four (24) flood claims for repetitive loss properties on October 31, 1991; totaling thirty-seven (37) claims for this event.
- January 4, 1992: Two (2) flood insurance claims from repetitive loss properties were made for this event.
- "The Storm that Stole Christmas": The nor'easter of December 1992 caused massive coastal flooding and erosion. Hurricane force winds, a lunar eclipse, a full moon, and four inches of rain in 24 hours all contributed to the flooding. The strongest portion of the storm remained over New Jersey for several days, resulting in elevated surge levels through a number of tidal cycles. In Monmouth Beach, 107 flood insurance claims were made on repetitive loss properties on December 11, 1992.
- Blizzard: A federal emergency declaration was declared for a blizzard from March 13, 1993 to March 17, 1993 in the State of New Jersey. The Borough of Monmouth Beach had four (4) flood insurance claims for repetitive loss properties due to this event on March 13 and one (1) flood insurance claim for a repetitive loss property on March 14, 1993 for a total of five (5) claims on repetitive loss properties for this event.
- March 2-3, 1994: One (1) flood insurance claim from a repetitive loss property was made for on March 2nd and two (2) repetitive loss claims were made on March 3, 1994; totaling three (3) repetitive loss claims for this event.

- December 23, 1994: One (1) flood insurance claim from a repetitive loss property was made for this event.
- January 9, 1996: One (1) flood insurance claim from a repetitive loss property was made for this event.
- March 20, 1996: One (1) flood insurance claim from a repetitive loss property was made for this event.
- October 18- 19, 1996: Two (2) flood insurance claims from repetitive loss properties were made for this event on October 18th, followed by an additional nine (9 claims on October 19th.
- February 19, 1998: One (1) flood insurance claim from a repetitive loss property was made for this event.
- January 3, 1999: One (1) flood insurance claim from a repetitive loss property was made for this event.
- July 26, 2000: One (1) flood insurance claim from a repetitive loss property was made for this event.
- January 24, 2001: One (1) flood insurance claim from a repetitive loss property was made for this event.
- August 2, 2002: Two (2) flood insurance claims were made on repetitive loss properties.
- October 13- 15, 2005: A total of three (3) flood insurance claims from repetitive loss properties were made over the course of these three (3) days in the Borough of Monmouth Beach. One (1) claim was filed on October 13th, and two (2) claims on October 15th, 2005.
- October 25- 26, 2005: One (1) flood insurance claim from a repetitive loss property was made on October 25th, followed by another claim on October 26th, 2005.
- May 9, 2008: One (1) flood insurance claim from a repetitive loss property was made for this event.
- Nor'easter: A nor'easter in mid- March caused severe storms and flooding in New Jersey. On March 13, 2010, twelve (12) flood insurance claims for repetitive loss properties were filed in the Borough of Monmouth Beach.
- March 30, 2010: One (1) flood insurance claim from a repetitive loss property was made for this event.
- Tropical Storm Irene: Tropical Storm Irene caused flooding throughout the state of New Jersey. In the Borough of Monmouth Beach, a total of forty-nine (49) flood insurance claims were submitted for repetitive loss properties; three (3) on August 26th, nine (9) on August 27, 2011, thirty-four (34) on August 28th, and three (3) on August 29, 2011.

- Hurricane Sandy: Hurricane Sandy is the costliest storm to hit the state of New Jersey. It caused extensive damage and severe flooding throughout the state. Coastal Monmouth County was one of the areas hardest hit by the storm. One week after Hurricane Sandy a nor'easter hit the area, bringing significant amounts of snow and causing additional power outages. The Weather Channel named the storm Winter Storm Athena, although the National Weather Service does not recognize the naming of winter storms. A total of one hundred fifteen (115) flood insurance claims were filed on repetitive loss properties during Hurricane Sandy and the subsequent nor'easter. On October 29, 2012 one hundred three (103) claims were filed, followed by eight (8) on October 30th, two (2) on November 1st, one (1) on November 3rd, and one (1) on November 4, 2012.
- December 27, 2012: One (1) repetitive loss property in the Borough of Monmouth Beach filed a claim for this flood event.

DESCRIPTION OF FUTURE EVENTS FOR OTHER HAZARDS

In addition to flooding, the Borough of Monmouth Beach is susceptible to a number of other hazards. While the intent of this plan is to focus on flood hazards, it is important to identify and recognize other hazards that impact the Borough. Information on other hazards was taken from the 2015 Monmouth County Multi-Jurisdictional All-Hazards Mitigation Plan.

Coastal Erosion

Coastal erosion occurs when more sediment is being lost than is being gained at a particular location. Coastal erosion can result from natural or man-made causes, including sea level rise, flooding, strong wave action or large storms, some types of shore protection structures, some land uses, and other alterations to the natural environment. Coastal erosion can occur gradually, as shorelines recede over a period of time or can be caused by a rapid recession of shoreline due to another hazard event. Erosion increases the vulnerability of near-shore structures to damage from storms and flooding events. The impacts of coastal erosion can be lessened by implementing living shoreline techniques, undertaking a variety of shoreline protection measures, and frequent beach nourishment projects. Measures to prevent coastal erosion may also reduce flooding impacts.

Climate Change

The Borough of Monmouth Beach will be affected by increasing sea levels along the oceanfront and Shrewsbury River. The effects of sea level rise will be more pronounced

in low-lying areas of the Borough and will exacerbate problems with flooding. Additionally, severe storm events are predicted to become more frequent as the climate warms. The impact of climate change in the future will depend on the rate which sea level rises and human actions and response to the threats caused by climate change. Sea level rise will worsen the impacts of storm surges on the Borough of Monmouth Beach.

Drought

A drought is a period of low or no precipitation in a given area. The severity of the drought depends on the length of time, geographic reach, regional water supply demand, and the impact of other hazards, such as extreme heat. There is a low probability of severe drought conditions occurring in Monmouth Beach, due to Borough's relatively low elevation and abundant groundwater supply; although short term, less severe droughts may be more likely. If extended drought conditions do occur in Monmouth Beach, the Borough may be subject to restricted water usage and other regulations. Recent periods of drought in New Jersey include:

- October 1997
- 1998- 1999
- October 2001- 2002
- August- September 2008
- August to October 2010

Earthquake

The probability of a significant, damaging earthquake in Monmouth Beach is low. While low magnitude earthquakes do occur throughout New Jersey on a fairly regular basis, most earthquakes impacting Monmouth Beach will have only minor effects. The greatest probability of an earthquake occurrence in New Jersey exists in the northern portion of the State near the Ramapo Fault.

Extreme Temperature

Monmouth Beach is highly susceptible to both extreme heat and extreme cold events. Long periods of extreme temperatures can overstress power supply systems, resulting in brown-outs or black outs and leaving residents without heat or air conditioning. Generally, the impact on humans of extreme weather events is minimal, with the exception of the very young and elderly populations, who are more susceptible to the health impacts of extreme temperatures. If the population of Monmouth Beach continues to age, the vulnerability to extreme temperature events will increase.

Improved weather forecasting, community warnings, and community preparedness can help to reduce the risks of extreme weather events to vulnerable populations.

Extreme Cold

Extreme cold events often accompany a winter storm or occur soon after. Prolonged exposure to the cold can cause frostbite or hypothermia. Recent periods of extreme cold in Monmouth Beach include:

- Jan 14- 29, 2003
- Jan 9-11, 2004
- Jan 16- 18, 2009
- Jan 23, 2013
- Jan 4, 7, & 22, 2014

Extreme Heat

Monmouth Beach is more likely to experience extreme heat than extreme cold events. Extreme heat events occur during the summertime when the weather in Monmouth Beach is substantially hotter and/or more humid than the Borough average for that time of year. Recent periods of extreme heat include:

- July 4- 11, 1999
- August 1-3, 2006
- June 7-10, 2008
- July 5-7, 2010
- July 21- 24, 2011
- July 17- 18, 2012
- July 18-19, 2013

The extent of extremely hot temperatures are typically measured through the Heat Index, which calculates the temperature that is felt when the effects of relative humidity are added to the base air temperature, highlighting dangerous extreme heat conditions. The NOAA National Weather Service Heat Index is illustrated in Figure 5.

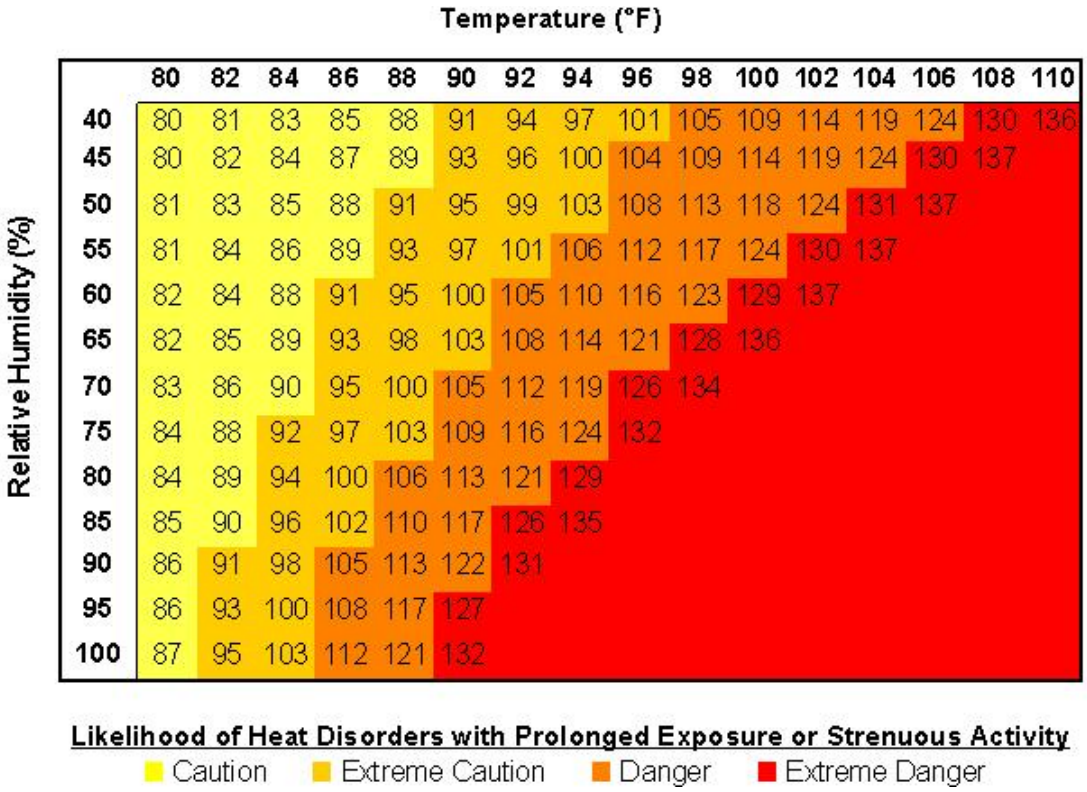

Figure 6. NOAA National Weather Service Heat Index

Extreme Wind

Extreme wind can occur alone or with other natural hazards, often occurring during thunderstorms. The impact of extreme winds can be critical and can include flying debris and downed trees and power lines. The probability of future extreme wind events is high, with an average of 5- 10 extreme wind events occurring each year in the Central New Jersey region. Recent extreme wind events in Monmouth County, New Jersey include:

- Thunderstorm on September 9, 1998
- Thunderstorm on August 7, 2000
- Thunderstorm on August 2, 2002
- Thunderstorm on July 22, 2003
- January 18, 2006
- Thunderstorm on August 17, 2007
- Wind event on February 13, 2008
- A line of thunderstorms on March 5, 2008
- Wind event on March 13, 2010
- Hurricane Irene, August 27- 28, 2011
- Hurricane Sandy, October 29, 2012

Hurricanes, Tropical Storms, & Nor'easters

Hurricanes, tropical storms, and nor'easters are events consisting of a number of damaging hazards including heavy precipitation, high winds, wave action, storm surge, coastal flooding, and coastal erosion. All of New Jersey, including the Borough of Monmouth Beach, falls within the Hurricane Susceptible Region, and there is an 18- 24% chance of experiencing a tropical storm or hurricane event between June and November of any given year in Monmouth County. Since 1850, thirty-six (36) Hurricane or Tropical Storm tracks have passed within 75 miles of Monmouth County. Nor'easters generally occur during the winter months and are named after the wind direction of the storm. They tend to last for more than one tidal cycle, often generating flooding events. Severe storms that have impacted the Borough of Monmouth Beach with flood damages were discussed in the Historical Flooding Events section of this document.

Figure 7. Hurricane Sandy Damaged Boardwalk

Landslide

The probability of a landslide event in the Borough of Monmouth Beach is low.

Lightning

Monmouth Beach is susceptible to lightning events, but not as much as other areas of the United States, particularly the Southeast. The probability of future lightning events in Monmouth Beach is certain, however, lightning often occurs with other natural hazards, such as thunderstorms.

Storm Surge

All coastal areas are at high risk for storm surge. The severity of storm surge is generally related to the severity of the storm making landfall, as well as the tidal and lunar cycles.

Tornado

The probability of a tornado in Monmouth Beach is low. If a tornado is to occur, it is mostly likely to do so between March and August, forming in the late afternoon or early evening at the trailing edge of a thunderstorm.

Wave Action

All immediate coastal and shoreline areas along the Atlantic Ocean are at risk from wave action. Waves are caused by wind during storm events, even those which remain offshore, and generally the more severe the storm, the more destructive waves become. The size of wind generated waves is related to the speed of the wind, the distance over which the wind travels (the fetch) and the depth of the water. Wave action will affect the areas of Monmouth Beach located along the Atlantic Ocean in the coastal flood hazard velocity zone. The velocity zone is an area where a 3 foot wave is capable of being propagated and the hazard from the force of those waves is high. Beyond the velocity zone is an area known as the Coastal A Zone where waves of from 1.5 to 3 feet are capable of being propagated. Post storm analysis has shown that a wave of this height is still capable of producing damage to building using typical construction techniques. Additionally, waves can be generated in the Shrewsbury River, creating another Coastal A zone in Monmouth Beach along the riverfront.

Wildfire

Wildfires typically occur in unoccupied, rural, or forested areas and happen during the fall and spring when it is hot and dry. In New Jersey, 99% of wildfires are caused by human activity. Due to the developed nature of the Borough of Monmouth Beach, the probability of wildfires occurring is low.

Winter Storms

Although the Borough of Monmouth Beach is located south of the typical boundary between freezing and non-freezing precipitation during the wintertime, there is a high probability of occurrence of winter storms in the Borough of Monmouth Beach, with Monmouth County averaging approximately 25 - 26 inches of snowfall annually. Winter storms generally occur from November through mid- April, with the peak

season being December through March. Winter storms can consist of blizzards, heavy snow, sleet, and/or ice storms.

Winter storms can result in downed trees, damaged vegetation, transportation accidents, road closings, stranded travelers, power outages, and a depletion of heating supplies. They can cause major disruptions to transportation, commerce, and electrical power. Recent winter storm events that have impacted the Borough of Monmouth Beach include:

- January 6-8, 1996
- February 16-17, 2003
- January 22, 2005
- February 17, 2007
- December 26, 2010
- November 7-8, 2012

SPECIAL FLOOD RELATED HAZARDS

There are many special localized situations in which flooding or flood-related problems do not fit the national norm for riverine and coastal floodplain management. These special flood-related hazards include:

Uncertain Flow Paths

Alluvial fans, moveable bed streams, channel migration, and other floodplains where the channel shifts during a flood are classified as uncertain flow paths. This hazard is not an issue in Monmouth Beach.

Closed Basin Lakes

Lakes that have a small or no outlet that may stay above flood stage for weeks, months, or years are called closed basin lakes. This hazard is not relevant to Monmouth Beach.

Ice Jams

Ice jams, also known as ice dams, typically occur in late winter or early spring when a frozen river begins to thaw. Blocks of ice break free and can accumulate at bends in the river, mouths of tributaries, or near structures such as bridge piers. The ice can restrict the flow of a river and cause flooding upstream. A flash flood type event can also occur downstream if the ice jam suddenly breaks free. The Shrewsbury River has been known to freeze in winter month and the threat of flooding from ice jams in the Borough of

Monmouth Beach is high due to the width and depth of the river. There is also a possibility of damage to structures such as bulkheads, docks and piles from floating ice.

Land Subsidence

Land Subsidence, as defined by the United States Geological Survey, is the process by which land sinks or lowers; this, combined with rising water levels can cause a relative sea-level rise. Roughly 80% of land subsidence in the United States is caused by groundwater withdrawals. Evidence suggests that the global sea-level rise rate during the last century is on average 1.0 to 2.0 mm/year. During this time, the sea level rose by 3 to 5 millimeters per year in the region between North Carolina and New Jersey. On the coast of New Jersey, tidal gauges predicted that the relative sea-level rise was about 3.53 mm/year during the last century, but only 2mm/year can be particularly attributed to land subsidence and sediment compaction. Land subsidence is an aggravating factor in relative sea level rise.

Mudflow hazards

Mudflow hazards are identified as a river, flow, or inundation of liquid mud down a hillside, usually as a result of a dual condition of loss of brush over and the subsequent accumulation of water on the ground, preceded by a period of unusually heavy or sustained rain. This is not considered to be a threat in Monmouth Beach.

Coastal Erosion

This hazard was discussed in the previous section. It has and will continue to have a large impact on Monmouth Beach.

Tsunamis

Tsunamis are large ocean waves typically caused by an earthquake, landslide, or underwater volcano. Although Tsunamis are far more likely on the west coast, there are three DART (Deep-ocean Assessment and Reporting of Tsunamis) monitoring stations off the coast of New Jersey, near the Hudson Canyon.

VI. PROBLEM ASSESSMENT

FEMA is currently in the process of updating the Flood Insurance Rate Map (FIRM) for the Borough of Monmouth Beach. The updated ABFE map indicates that much of the Borough is located within the 100-year floodplain, also known as the Special Flood Hazard Area (SFHA), with the exception of the area around the Two Rivers Reclamation Authority in the western portion of the Borough, located in the 500- year floodplain; and the very center of town and an area along Route 36 in the southern portion of the Borough, which are located out of the floodplain. A total of 1,268 residential properties and 30 commercial properties are located within the SFHA. Table 1 below indicates the structures, properties, and land area located within both the 100-year and 500-year floodplains. The table also shows the percentage of each category that is located within the 100-year floodplain to get a better understanding of how much of the Borough is vulnerable to flooding.

Table 1. Floodplain Property Data

Item	Borough Total	100-Year Floodplain	500-Year[1] Floodplain	100-Year + 500-Year Floodplain*	Percent Located within the 100-Year Floodplain
Structures	1,246	919	98	970	73.76%
Properties	2,239	1,488	182	1,541	66.46%
Land Area (acres)[2]	571.31	71.08	4.63	75.71	12.44%

*100 + 500 year total may not equal total due to some structures and/or properties being located in both areas.
1. This does not include the area within the 100-year floodplain.
2. Land area only includes land parcel areas. Waterways and roads are not included in this area.

The Monmouth Beach municipal building, library, police department, fire department, first aid department, school and cultural center are all located within the 100- year floodplain. The Two Rivers Reclamation Authority is located in the 500 year flood plain. The Borough is in the process of raising the library and municipal building to increase their resiliency. Additionally, Monmouth Beach is digitizing all files to ensure they will not be lost if a flood event occurs. The Borough maintains flood insurance on the bathing pavilion. It is critical that these facilities be protected from flooding so valuable equipment is not destroyed and emergency services can be provided during and after storm events. FEMA recommends that any critical facility be properly flood proofed or elevated to withstand the 500-year storm event. A map showing the Borough's critical facilities and the Special Flood Hazard Areas can be found in Appendix L.

HAZARD IMPACT

Borough residents and first responders are particularly vulnerable to the impacts of flooding in Monmouth Beach. Residents who live within the SFHA should be encouraged to take all necessary precautions to ensure their homes are safe from flood hazards. Additionally, those residents who do not live within the SFHA, but live in areas which are known to flood should take similar precautions as their neighbors living within the SFHA. In addition to the possible damage to buildings and other infrastructure, there is the possibility of injury or even death to residents or responders who could get trapped in a flooded building or swept away in fast moving floodwaters. The Borough and its residents must also be aware of the potential impacts to public health from flooding. Mold can quickly develop in many structures and cause respiratory issues for those attempting to rebuild. Debris from damaged and demolished structures could also contain hazardous materials such as mold, lead or asbestos. Early warning and evacuation, as well as making the necessary preparations to protect facilities from flooding, can protect the health and safety of residents and emergency workers and facilitate a rapid response and recovery from future flood events. Additionally, it will be importation to ensure that damaged areas can be secured after flooding recedes to prevent scavengers and gawkers. Monmouth Beach is in the process of updating its Emergency Operations Plan, Debris Management Plan, and Hazard Mitigation Plan. These documents address hazard preparedness issues and can minimize their impacts to the maximum extent practical.

Many of the hazards to which Monmouth Beach is vulnerable generally occur concurrently with flooding. Areas that are susceptible to flooding will only increase in their vulnerability as impacts due to sea level rise become greater in the future. Homes which are not raised above the base flood elevation are particularly vulnerable to flood related hazards, as are areas prone to flooding but not located within the SFHA. The Borough of Monmouth Beach should work with FEMA to ensure that all flood maps illustrate an accurate portrayal of flood risk within the community. Currently, Monmouth Beach has adopted both the Advisory Base Flood Elevations and requires that new or substantially damaged homes be elevated to three (3) feet above the ABFE in order to minimize the vulnerability of homes within Monmouth Beach to flood events.

Repetitive loss areas indicate portions of the Borough where the risk of flooding may be higher as indicated by multiple flood insurance claims filed on a single property. The average number of losses per repetitive loss property within Monmouth Beach is four (4), with properties found throughout the Borough. The Repetitive Loss Areas can be found mapped in Appendix K.

Category 1, 2, & 3 SLOSH models for the Borough of Monmouth Beach were run by the Jacques Cousteau National Estuarine Research Reserve (JCNERR) to estimate storm surge heights and wind resulting from historical, hypothetical, or predicted hurricanes. SLOSH is a computer model developed by the National Weather Service (NWS) and stands for Sea, Lake, and Overland Surge from Hurricanes. It is important to note that the SLOSH model does not include rainfall amounts, river flow, or wind-driven waves and accuracy is generally within 20% (NOAA).

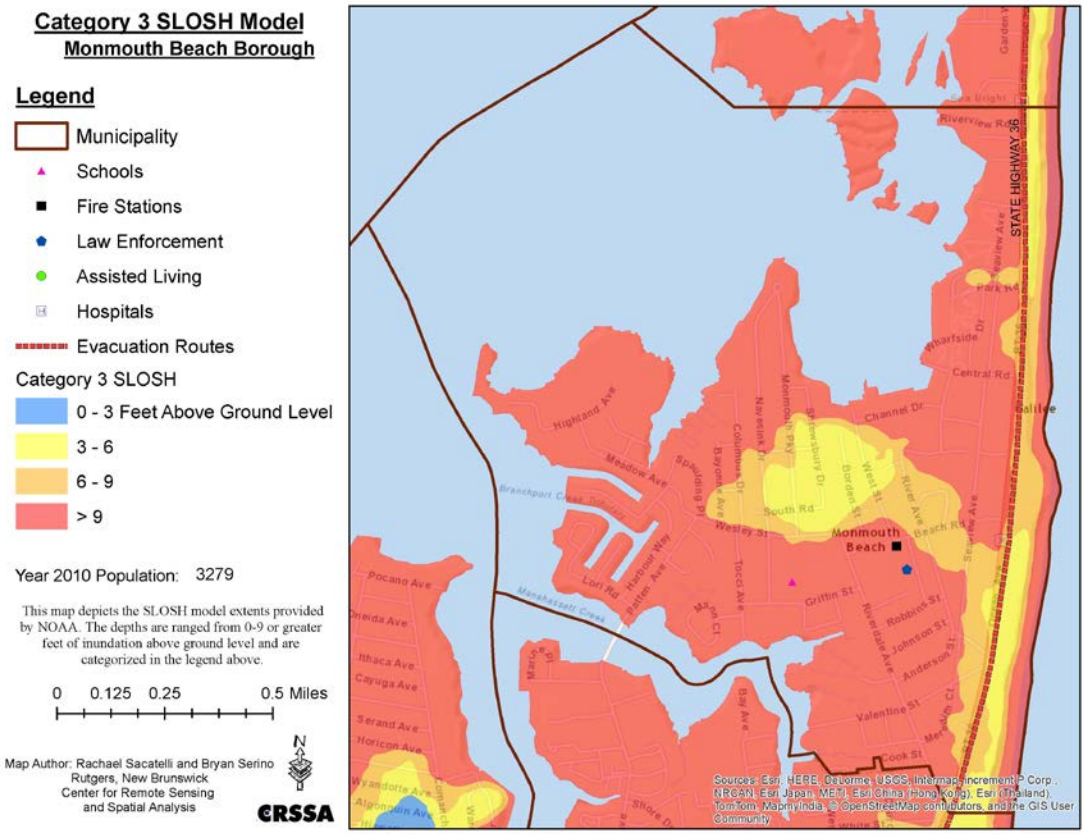

Figure 8. Category 3 SLOSH Model

As depicted in the maps found in Appendix M., during a Category 1 storm event storm surge would impact the Borough along its borders with the Shrewsbury River and Atlantic Ocean, with the interior of the Borough remaining dry. During a Category 2 storm event, storm surge would further inundate the Borough, with only small portions of the Borough, along Route 36 at the northern end of Monmouth Beach and the very center of the Borough, remaining dry. As shown above in Figure 8, the entire Borough would be inundated by storm surge during a Category 3 storm event, with depths reaching approximately 9 feet throughout most of the Borough.

The impacts of Sea Level Rise and marsh retreat on the Borough of Monmouth Beach were also analyzed by JCNERR. With a one foot increase in sea level rise, there would be some encroachment along both the river and ocean shoreline throughout the Borough. There will be some areas of marsh conversion to open water along the edges of the Shrewsbury River. With two feet of sea level rise, water will encroach slightly more in the same areas as discussed with a one foot increase in sea level rise. Further marsh conversion to open water will happen along the Shrewsbury River, as well as some areas of marsh retreat. Three feet of sea level rise will encroach further on all shorelines within the Borough. With three feet of sea level rise, there will be further marsh retreat and conversion to open water. Sea level rise maps and marsh retreat maps can be found in Appendices N and O, respectively.

Monmouth Beach is a predominately residential community, with a small downtown area on Beach Road. Much of the areas that will be affected by storm surge and/or sea level rise are residential. Residential homes are located throughout Monmouth Beach, including areas that are particularly susceptible to storm surge and sea level rise such as along the riverfront and near the beachfront.

Monmouth Beach has an established land use pattern and is essentially a fully developed community. As such, there are not many viable options for major changes to zoning and development regulations. However, the Borough should continue to consider adopting stricter regulations to limit the impacts of flooding and protect those residents building in flood zones.

HISTORICAL DAMAGE

Hurricane Sandy caused the most damage of any storm in recent history. During the storm, Monmouth Beach experienced major impacts from sustained winds in excess of 80 miles per hour, storm surge, and flooding of up to nine feet resulting in significant damage to structures and buildings, the disruption of electrical service, downed trees, and damage to roadways. The storm caused a loss of gas, electricity and telephone service for 10- 45 days and the public water supply was deemed unsafe for consumption in the days following the storm. Residents were asked to not flush their personal toilets for a period of time, as sewage authority lines were surcharged.

The United States Department of Housing and Urban Development considers a residential unit to have sustained "major" damage when there is between $8,000 and $28,799 of physical damage or more than one foot of flooding on the first floor and "severe" damage when there is more than $28,800 of physical damage or more than four feet of flooding on the first floor. During Hurricane Sandy, approximately 42% of homes

within one census tract in Monmouth Beach were affected with major or severe damage. The Borough as whole sustained a 4.2% loss in home values and tax revenue and a $51,934.50 reduction in assessment from 2012 to 2013 as a result of Hurricane Sandy. Within Monmouth Beach, 784 properties faced reduced property values.

All of the municipal buildings in Monmouth Beach incurred damage during Hurricane Sandy. The Monmouth Beach Borough Hall was damaged by power surges and water intrusion during Hurricane Sandy with water levels six inches above the finished floor. The Borough's library was inundated with approximately 16 – 18 inches of flood water. Storm surge caused additional damages to contents and mechanical equipment. The Monmouth Beach Cultural Center sustained damages totaling over $60,000, with flood waters reaching 30 inches above the finished floor. The police station and annex building had eight inches of water enter the building, while wind caused additional damage. The fire house and first aid building sustained extensive damages to equipment, furniture, and appliances due to flooding. The Borough's salt shed was damaged by heavy winds, exposing the stockpile of rock salt. The Monmouth Beach elementary school sustained three feet of water damages throughout the building and required a $2.5 million renovation. This damage was disruptive to local children, who had to attend neighboring schools while the school was closed due to flooding and subsequent renovations.

The recreational areas within Monmouth Beach also sustained damages from Hurricane Sandy. Approximately 1,500 linear feet of protective dunes were damaged along the beachfront areas and all five (5) of the Borough's public access points were destroyed by storm surge. The Monmouth Beach Bathing Pavilion sustained damages from storm surge, wave action, and high winds. The restrooms at Griffin Park sustained damages totaling $16,000. Additionally, baseball equipment was destroyed.

Figure 9. Newly Constructed Beach Access Point

ECONOMIC IMPACTS

The economic impacts of any major flooding event in the Borough of Monmouth Beach will be greatly felt. Due to Hurricane Sandy, the Borough lost 4.2% of its tax revenue and incurred large restoration and repair costs. Local businesses were impacted in a variety of ways from temporary business disruption to severe damage from winds, flooding, and storm surge.

Due to the large percentage of residential homes within the Borough, the majority of flood damage within Monmouth Beach has been, and will continue to be, to residential properties. The cost of flood damage to residential property is generally covered by insurance pay-outs and owner out of pocket expenses. The average flood insurance pay-out for a repetitive loss property within the Borough of Monmouth Beach is $53,521. If property owners can no longer pay their taxes or decide to abandon their property prior to making necessary repairs, there could be a potential impact on the tax base of the Borough due to flooding events.

Additionally, economic impacts of flooding to the Borough are felt in the cost of debris removal, municipal facility repair, and personnel costs during the event. The impact of costs to the community would depend on the severity and longevity of the event as well as reductions in the tax base due to property loss or migration.

NATURAL FEATURES

Monmouth Beach is a largely built out community, with the entire eastern boundary of the community bordered by beach and the Atlantic Ocean and the western boundary bordered by the Shrewsbury River. The beachfront acts as a natural buffer and absorbs the impacts of storm surge from smaller scale storms. Within the Borough there are a few areas designated for open space and recreation, consisting mostly of playing fields and the beachfront. These parks provide passive and active recreational opportunities and aid in the natural recharge of stormwater.

There are a few areas of wetlands within the Borough of Monmouth Beach, most of which are located along the Shrewsbury River. Additionally, there is a marsh island located in the northern portion of the Borough in the Shrewsbury River which is classified as wetlands and a Costal Barrier Resource System. A map of all the natural feature areas in Monmouth Beach can be found in Figure 10 and in Appendix P.

FUTURE FLOODING IMPACTS

As previously indicated, the Borough of Monmouth Beach is predominantly built-out. Due to existing development and current regulations, there is little vacant land available for new development. The Borough should continue to enforce the existing development standards and maintain its open spaces and natural features. This is critical to maintaining permeable surfaces and limiting stormwater runoff. As recommended by the Flood Advisory Committee, the Borough should also conduct an impervious coverage study and an infrastructure capacity analysis to determine the impacts of current development patterns on flooding and if any ordinance modifications are required.

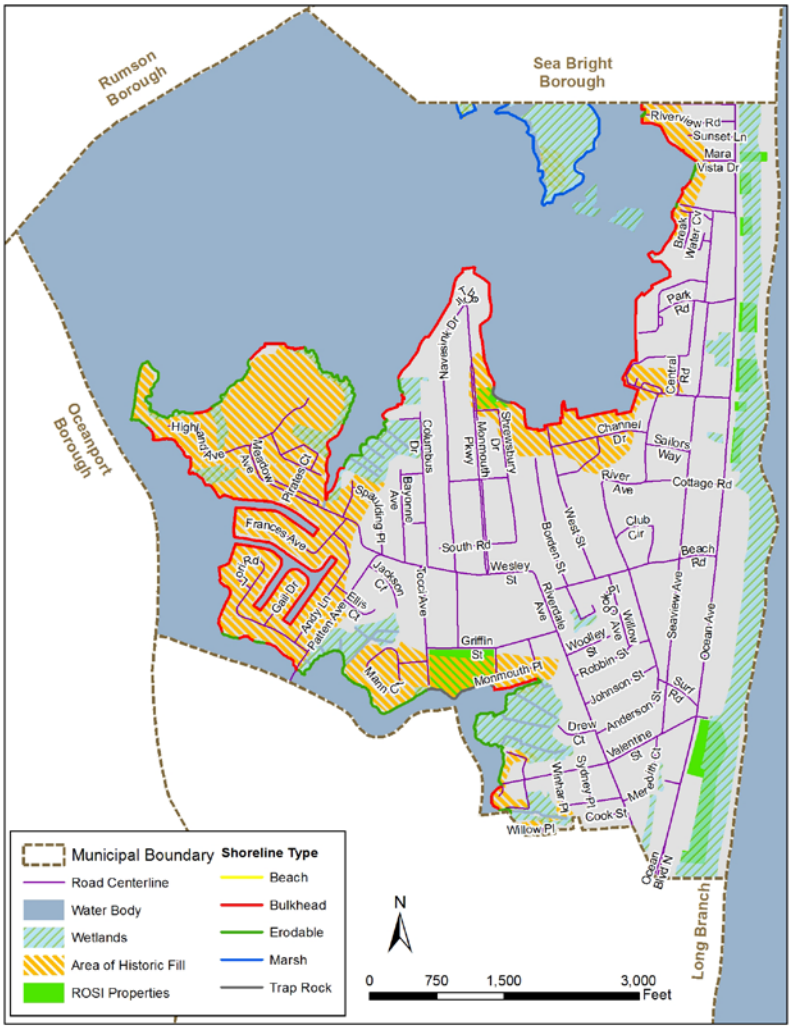

Figure 10. Nature Features

As sea levels rise and marshes retreat, Monmouth Beach could become more vulnerable to impacts from flooding. The overall impacts of flooding on the community will be contingent on how effectively the Borough mitigates current vulnerabilities and plans for

future conditions. It is imperative that the Borough utilize this Floodplain Management Plan as a valuable tool to plan for the future.

VII. GOALS

Over the course of the various Flood Advisory Committee meetings, the Committee reviewed the goals from existing planning documents and discussed potential new goals to increase resiliency and mitigate damage from future storm events through the Floodplain Management Plan. The following is a list of the goals agreed upon by the Committee:

1. Secure safety from flood, due to surge, stormwater, and sea level rise, fire (as a result of flood situations), panic and other natural and man-made disasters.
2. Reduce flood damage, including damage to life and property.
3. Manage and minimize increases in stormwater runoff from any new development or redevelopment.
4. Maintain and enhance groundwater recharge.
5. Increase public awareness of stormwater management through public education.
6. Protect natural and environmental resources including floodways, wetlands, marsh areas and areas suitable for public and quasi-public recreational activities; and support resiliency to storm and other natural hazard events.
7. Promote the conservation of open space and valuable natural resources, including trees and vegetation, and prevent degradation of the environmental through improper use of land.
8. Promote public awareness of hazard mitigation and resiliency issues and provide adequate resources to Borough residents and business owners so they are properly informed of the natural hazards they face and the precautions they can take to protect their properties.
9. Promote regional coordination between Local, County, State, and Federal Governments and OEMs, FEMA, and the National Flood Insurance Program; to identify community vulnerabilities, promote regional resiliency to hazard events, and coordinate post-disaster recovery efforts.

VIII. POSSIBLE FLOODPLAIN MANAGEMENT ACTIVITIES

As part of the planning process, all existing and potential floodplain management activities and measures to mitigate property damage and impacts to community infrastructure were reviewed. The benefits, costs and general feasibility of each action were considered prior to making a recommendation to proceed with the action. Many of the proposed activities coincide with actions recommended in the 2015 Monmouth County Multi-Jurisdictional All Hazards Mitigation Plan. All activities and measures have been grouped into the following six mitigation strategies: Preventative Measures, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects and Public Information. The findings are as follows.

PREVENTIVE

Preventive activities keep flood problems from getting worse by limiting the use and development of flood-prone areas through planning, land acquisition, or regulation. These activities are generally administered by the Borough building, zoning, planning, and code enforcement offices.

Floodplain mapping and data

The Borough of Monmouth Beach has been studied and its flood-prone areas mapped by FEMA in entirety. FEMA is currently in the process of updating the flood maps for the Borough. Additionally, the Borough is developing Geographic Information Systems (GIS) to increase the community's resiliency and enable them to better prepare for, respond to and recover from disasters. The components of GIS will support facilities and public works infrastructure, land information, and floodplain management- related data layers and applications. This will be done as part of the Round 2 Post-Sandy Planning Assistance Grant program. See Section IX, Action Plan for this action's implementation strategy.

Open Space Preservation

The opportunity for future open space preservation in Monmouth Beach is small, due to the fact that it is largely built-out and the value of land within the community is high. However, there are already parks and areas of preserved open space scattered through-out the community. While the opportunity for future open space preservation within the Borough is low, measures should be taken to ensure that existing areas of open space within the Borough remain as such. The Flood Advisory Committee recommends the

Borough revisit its' Vacant Land Assessment (VLA) to determine if there are any parcels which could be targeted for preservation. Additionally, the Borough can look for additional beach access opportunities as they arise. See Section IX, Action Plan for this action's implementation strategy.

Floodplain Regulations

Floodplain Regulation are in place throughout the Borough by zoning and development regulations at the local, county, state, and federal levels. The Borough's floodplain ordinance is one of the most restrictive in the State, requiring new or substantially improved structures to be built to three (3) feet above the Advisory Base Flood Elevations (ABFEs). See Section IX, Action Plan for this action's implementation strategy.

Erosion Setbacks

The Borough of Monmouth Beach should review the CAFRA requirements for waterfront development to determine if additional Borough regulations should be enacted. See Section IX, Action Plan for this action's implementation strategy.

Planning and Zoning

The Borough of Monmouth Beach is in the process of preparing a new Master Plan and sustainability element to address post-Sandy strategies and policies related to hazard mitigation, community resiliency, and forecasted sea level rise and its impacts. Additionally, the Borough has automated, updated, and expedited its system for processing zoning and construction permits. Monmouth Beach has recently created a tree- save ordinance based on those in neighboring communities. Current Borough regulations require property owners to build above the ABFE and an additional 3 feet of freeboard by allowing the maximum building height of 35 feet to be exceeded by the additional feet the home is raised. The Borough can promote resiliency by regulating impervious cover and by allowing for residences to be built above the base flood elevation. The Borough of Monmouth Beach is interested in joining the Community Rating System (CRS) program. See Section IX, Action Plan for this action's implementation strategy.

Stormwater Management

The Borough should conduct an infrastructure capacity analysis to determine if current infrastructure meets the community's needs, as well as the needs of future development. Similarly, the borough engineer should be engaged to determine the impact on drainage patterns as a result of fill on private properties. See Section IX, Action Plan for this action's implementation strategy.

Drainage System Maintenance

The Borough Department of Public Works regularly checks for blocked storm drains and removes sediment and debris as necessary. Regular checks should include outfalls, swales, and other major drainage features. See Section IX, Action Plan for this action's implementation strategy.

Building Codes

The Borough of Monmouth Beach has adopted the Advisory Base Flood Elevation maps and requires that all new and substantially damaged buildings be built to the higher ABFE plus an additional three (3) feet of freeboard. The Borough should investigate adopting an accumulative damage ordinance that will track all projects which occur on a structure at the individual property level. Homes would be required to be elevated if they reach the substantially improved or damaged threshold over a number of improvements or losses. This would also allow homes that have received damage numerous times to be eligible for ICC grants. The impacts on property owners must be further analyzed before this type of ordinance could be officially proposed. See Section IX, Action Plan for this action's implementation strategy.

PROPERTY PROTECTION

Property protection activities are usually undertaken by property owners on a building-by-building or parcel basis.

Acquisition

Wide-scale acquisition of structures within the floodplain is not feasible within Monmouth Beach, as a large portion of the Borough's ratables are located within the flood hazard area.

Relocation

The wholesale acquisition and relocation of properties located within flood prone areas is not practical in the Borough of Monmouth Beach. The Borough is fully developed with no potential for relocation elsewhere in the Borough. However, property owners who are wishing to sell their properties for natural lands preservation should be encouraged to do so and provided with as much information as possible on potential funding sources. See Section IX, Action Plan for this action's implementation strategy.

Building Elevation

Requiring that structures within the flood hazard area be elevated to at least the highest regulatory standard is the best method for reducing flood problems and losses in Monmouth Beach Borough. The elevation of approximately 330 homes within the Borough and six municipal structures including the police building, borough hall, cultural center, library, first aid, and fire house to higher standards and elevations are recommended actions in the 2015 Monmouth County Multi-Jurisdictional All Hazards Mitigation Plan. The Borough of Monmouth Beach has decided to adopt the requirements of the ABFE maps and an additional three (3) feet of freeboard. This is one of the most restrictive floodplain ordinance in the State. The State of New Jersey requires one foot of freeboard above the effective base flood elevation. Home elevation will mitigate the impact of flood related hazards while maintaining residents in the community. The Flood Advisory Committee recommended keeping records of the actual first floor height of all structures within the Borough to determine those structures which have been elevated out of the floodplain. The Borough is doing this over time, as elevation certificates are turned into the Borough construction official. See Section IX, Action Plan for this action's implementation strategy.

Retrofitting

The Borough provides information to property owners on various types of flood protection and floodproofing, including the installation of flood vents, through the construction office. As property owners utilize these techniques, they should be encouraged to get new elevation certificates. Commercial buildings within Monmouth Beach can be encouraged to utilize flood-proofing techniques.

Sewer Backup Protection

Property owners in Monmouth Beach should be encouraged to install back flow protectors to prevent against sewage back-ups into their homes. See Section IX, Action Plan for this action's implementation strategy.

Insurance

Monmouth Beach participates in the National Flood Insurance Program. Homeowners are encouraged to maintain flood insurance to protect against loss of structure and contents in case of flooding. Homeowners who are not necessarily located within a flood zone should also be encouraged to carry flood insurance. The Borough of Monmouth Beach is interested in becoming credited under the Community Rating System, a voluntary program of the NFIP that can reduce the flood insurance premiums

community wide in increments of 5% for participating communities. This plan assists in gaining points towards that program. See Section IX, Action Plan for this action's implementation strategy.

NATURAL RESOURCE PROTECTION

Natural resource protection activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a variety of agencies including parks, recreation, or conservation agencies and organizations.

Wetlands Protection

Due to the built out nature of Monmouth Beach, there are very few areas of wetlands left within the Borough. The State regulates wetlands protection through NJDEP freshwater and coastal wetland permit programs.

Erosion and Sediment Control

Soil erosion and sediment control is regulated through New Jersey's Soil Erosion and Sediment Control Act and is administered by the Freehold Soil Conservation District.

Natural Area Preservation

The Borough should work with the owners of natural areas within Monmouth Beach to ensure the natural areas of the Borough are preserved as such and to assure that natural areas are not degraded or cleared, which would lead to an increase in runoff. Additionally, the Borough should look for opportunities to increase the amount of preserved natural open space and public beach access points within Monmouth Beach. See Section IX, Action Plan for this action's implementation strategy.

Natural Area Restoration

The Borough has received a $1,175,000 grant from the National Fish and Wildlife Foundation (NFWF) to undertake restoration efforts of the marsh islands located in the Shrewsbury River. This grant will construct 2,000 feet and enhance 3,000 feet of coastal dune system, restore habitat for plovers, terns, and skimmers, and improve the resiliency of Monmouth Beach. See Section IX, Action Plan for this action's implementation strategy.

Water Quality Improvement

Monmouth Beach follows Phase 2 regulations set forth by the NJDEP.

Coastal Barrier Protection

Monmouth Beach should continue its beach and dune maintenance programs. The Coastal Area Facilities Review Act (CAFRA) regulates coastal development at the state level, including a restriction on building on beaches or dunes. There is a Coastal Barrier Resource System area located in the Shrewsbury River toward the northern portion of the Borough.

Environmental Corridors

This is not applicable to Monmouth Beach.

Natural Functions Protection

The Flood Advisory Committee recommends that the Borough Engineer conduct a lot coverage study and impervious coverage analysis to determine if allowable impervious coverage is negatively impacting drainage throughout the Borough. Based on the findings of the study, ordinances should be updated as determined to be necessary. See Section IX, Action Plan for this action's implementation strategy.

EMERGENCY SERVICES

Emergency services are measures taken during an emergency to minimize its impact. These measures are usually the responsibility of municipal or county emergency management staff and the owners or operators of major or critical facilities.

Hazard Threat Recognition

Prior to storm events, warnings are issued by the National Weather Service. Additionally, Monmouth Beach is in the process of creating a municipal Hazard Mitigation Plan, based on a recommendation from the SRPR, to incorporate key lessons learned from Sandy and related post- storm response efforts. See Section IX, Action Plan for this action's implementation strategy.

Hazards Warning

Monmouth Beach participates in the Shrewsbury River Warning System, which gives flooding alerts to the 7 participating communities. The Borough notifies residents of hazard events through email, AM radio, Code RED, local television, and door to door notifications. In the Borough's SRPR, the Borough of Monmouth Beach identified installing a Supervisory Control and Data Acquisition (SCADA) system in conjunction with the Borough's owned and operated facilities to communicate critical alarms to a

centralized location or operational personnel. See Section IX, Action Plan for this action's implementation strategy.

Hazards Response Operations

The Borough is in the process of updating the Emergency Operating Plan to incorporate updates and revisions based on key lessons learned from Sandy and related post- storm response efforts. These efforts will be funded through the NJDCA Post- Sandy Planning Assistance Grant Program. As recommended by the Flood Advisory Committee, the Borough will explore ways to provide transportation for residents who do not have vehicles in town and need to evacuate. The Flood Advisory Committee also recommended developing and conducting a survey to determine population characteristics. This can help the Borough's first responders to better understand their population for response operations. See Section IX, Action Plan for this action's implementation strategy.

Critical Facilities Protection

Monmouth Beach's Municipal Building, Police Department, First Aid Department, Library, cultural center, and the Fire Station are located within the 100 year floodplain. The 2015 Monmouth County Multi-Jurisdictional All Hazards Mitigation Plan recommends elevating these structures to the new FEMA FIRM map elevations and floodproofing the pump station near the northern terminus of Monmouth Parkway. The Borough would like to elevate the backup generator at the municipal building above the 100 year floodplain. As recommended in the 2014 SRPR, the Borough is in the process of preparing a Capital Improvement Plan identifying needed capital improvements to improve local resiliency. Monmouth Beach is also scanning all municipal documents and storing them electronically to ensure they will not be destroyed by future flood events. See Section IX, Action Plan for this action's implementation strategy.

Health and Safety Maintenance

The Borough should work with the Two Rivers Reclamation Authority to determine if they have a disaster plan in place.

Post-disaster Mitigation Actions

The Borough is currently preparing a Debris Management Plan, as recommended in the 2014 SRPR, to provide the Department of Public Works with an emergency staging facility and a designated debris management area. See Section IX, Action Plan for this action's implementation strategy.

STRUCTURAL PROJECTS

Structural projects keep flood waters away from an area with a levee, reservoir, or other flood control measure. They are usually designed by engineers and managed or maintained by the public works staff.

Reservoirs

This is not applicable to Monmouth Beach.

Levees/ floodwalls

Levees are not possible in Monmouth Beach due to the area constraints. There is a seawall along the eastern border of Monmouth Beach Borough. The 2015 Monmouth County Multi-Jurisdictional All Hazards Mitigation Plan recommends raising the existing seawall three (3) feet and carrying out re-grouting where necessary and expanding the existing seawall to fill in the approximately 675 feet gap between Valentine Street and the south end of the Bathing Pavilion where the existing seawall is buried. The NJDEP Bureau of Coastal Engineering is currently soliciting bids for the seawall gap project and is expected to begin construction in 2017. See Section IX, Action Plan for this action's implementation strategy.

Diversions

This is not applicable to Monmouth Beach.

Channel Modifications

The Borough would like the Shrewsbury River channels to be dredged, specifically near the Sea Bright Bight, as this is a choke point. See Section IX, Action Plan for this action's implementation strategy.

Storm Drain Improvements

The 2015 Monmouth County Multi-Jurisdictional All Hazards Mitigation Plan recommends the installation of stormwater systems including inlets, manholes and piping for low lying areas such as Johnson Street, Drew Court, and Valentine Street. The Plan also recommends installing drainage to relieve flooding from flood prone areas such as Johnson Street, Anderson Street, Drew Court, and Valentine Street. Flap values should be installed on existing outfalls to minimize impacts from tidal flooding. See Section IX, Action Plan for this action's implementation strategy.

PUBLIC INFORMATION

Public Information activities advise property owners, potential property owners and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains. In Monmouth Beach, these activities are implemented largely by the Borough's construction official and CRS coordinator.

Map Information

Copies of the FIRM maps are available for the public to review in the Borough Construction Office. Don Clare, the Borough's construction official and floodplain manager, is available to explain the maps as needed. A log should be kept of information provided to residents who come in to view maps or who call with questions for CRS credit documentation. See Section IX, Action Plan for this action's implementation strategy.

Outreach Projects

Monmouth Beach should send out letters to property owners annually discussing the NFIP program and their flood risk. The Borough is currently sending out letters to all residents on the negative rating and repetitive loss/ severe repetitive loss lists discussing flood risk. Due to the high cost associated within sending out annual mailings the Borough can think about moving toward more online outreach materials after this initial effort, as the majority of the population can now be readily reached through online sources and social media. See Section IX, Action Plan for this action's implementation strategy.

Real Estate Disclosure

Typically local real estate agents contact the Borough with any questions they may have.

Library

The Monmouth Beach Library has copies of educational materials on flood risks from FEMA on file. These are updated as new documents become available. See Section IX, Action Plan for this action's implementation strategy.

Technical Assistance

Don Clare, the Borough construction official and floodplain manager, provides technical information on a daily basis to anyone who calls or visits his office. See Section IX, Action Plan for this action's implementation strategy.

Environmental Education

As part of the NFWF grant, environmental education will be provided at the Monmouth Beach School. The Borough should look for additional education opportunities such as partnering with the New Jersey Sea Grant Consortium or Monmouth University's Urban Coast Institute. See Section IX, Action Plan for this action's implementation strategy.

IX. ACTION PLAN

The previous section presented a wide range of possible floodplain management activities to address the goals established by the Flood Advisory Committee. This section presents an Action Plan that describes which activities should be implemented, who is responsible for implementing the activity, the deadline for completing the activity, the proposed budget and the funding source. The Committee realizes that there are many proposed activities, and that not all activities can be completed immediately based on available funds. The Borough should initially focus on those projects that are economically feasible and will aid in the recovery and resiliency of the Borough. The following priority levels were therefore established:

- High Priority – Activities in this category are critical to protecting the Borough's critical facilities and creating a more resilient community. The benefits of these activities far outweigh the costs. Funding for these projects is currently in place or there is the high likelihood for grant funds to be secured in the near future. It is recommended that the majority of these projects be completed prior to the next hurricane season.
- Medium Priority – Activities in this category are necessary to increase the Borough's resiliency and provide flood protection. Benefits outweigh the costs; however, funding has not yet been secured for those activities with physical improvements. The Borough should continue to seek grants and other funding sources for these activities. It is recommended that these projects be completed in the next three years as funding becomes available.
- Low Priority – Activities in this category will mitigate hazard risks for the Borough and are cost-effective. However, it is understood that these projects are not as critical as those identified as high or medium priority and that funding may be difficult to obtain for some of the larger construction projects.

The following is the recommended Action Plan for the Borough of Monmouth Beach:

PREVENTATIVE MEASURES

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Adopt a Floodplain Management Plan	High	Borough Staff, Flood Advisory Committee, and T&M Associates	October 2016	$50,000	NJDCA Grant (secured)
Create an automated and expedited system for zoning and construction permit administration	High	Borough Staff	Ongoing	$25,000	NJDCA Grant (secured) and Borough
Develop a Geographic Information System (GIS) Program	High	Borough Staff and T&M Associates	October 2016	$50,000	NJDCA Grant (secured)
Prepare a Master Plan and Sustainability Element to address post- Sandy strategies and policies related to hazard mitigation, community resiliency, forecasted sea level rise and its impacts.	High	Borough Staff, Borough sub-committee, and T&M Associates	December 2016	$50,000	NJDCA Grant (Secured)
Participate in FEMA's Community Rating System (CRS) Program.	High	Borough Administrator and Floodplain Manager	October 2016 and Spring 2017	Borough Staff Time	Borough
Create a Tree- Save Ordinance.	High	Borough Staff	September 2016	Borough Staff Time	Borough
Conduct an infrastructure capacity analysis to determine the impacts of future development on the existing infrastructure as well as determine the impact to drainage patterns as a result of fill. Modify ordinances based on findings.	High	Borough Engineer	September 2017	TBD	Borough

Regularly check for blocked storm drains, outfalls, and other major drainage features; and remove sediment and debris.	High	Department of Public Works	Quarterly	Borough Staff Time	Borough
Encourage selective acquisition of natural lands. Use the Borough's vacant land assessment (VLA) to identify areas that may qualify for preservation. Look for additional beach access opportunities	Low	Borough Staff	Ongoing	NA	Green/ Blue Acres, Monmouth County Open Space, NRCS
Investigate adopting an accumulative damage ordinance.	Low	Borough Construction Official	September 2017	Borough Staff Time	Borough
Encourage and support participation in the Two River Resiliency Action Plan, the purpose of which is to develop a Coastal Resiliency Plan to address the impacts of coastal hazards and storm surge in the Navesink and Shrewsbury Rivers.	Low	Mayor, Borough Staff	2017	$900,000	NOAA Grant

PROPERTY PROTECTION

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Require all new buildings and substantially improved buildings to be built to the ABFE elevation plus an additional three (3) feet of freeboard	High	Construction official	Ongoing	Borough Staff Time	Borough
Continue to participate in the National Flood Insurance Program	High	Borough Staff	Ongoing	Borough Staff Time	Borough
Encourage the elevation of homes within the Borough to higher standards and elevations	Medium	Homeowners	Ongoing	Will vary by home	Potential HMGP, ICC, FEMA SRL, HUD RREM
Determine the actual elevation of the first floor of existing and new structures to ensure they are elevated out of the floodplain.	Medium	Construction Official	Ongoing – this is being done as residents bring in elevation certificates.	Borough Staff Time	Borough
Encourage property owners to install back flow protectors.	Medium	Construction Official	Ongoing	Borough Staff Time.	
Make the public aware of the various types/ methods of flood protection and floodproofing.	Low	Construction Official	Ongoing	Borough Staff Time	Borough

NATURAL RESOURCE PROTECTION

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Continue beach and dune maintenance programs.	High	United States Army Corp of Engineers	Ongoing	Ongoing	United States Army Corp of Engineers, State of New Jersey, Borough
Conduct a lot coverage study/ impervious coverage analysis	High	Borough Engineer	September 2017	TBD	Borough
Replenish and restore dunes and marsh islands.	Medium	NFWF, Borough	TBD	1.78 million	NFWF Grant
Continue to follow state regulations in regards to wetlands protections, soil erosion and sediment control, and Phase 2 stormwater.	Low	New Jersey DEP	Ongoing	Ongoing	The State of New Jersey

EMERGENCY SERVICES

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Prepare a Debris Management Plan	High	Borough Staff and T&M Associates	December 2016	$20,000	NJDCA Grant (secured)
Prepare a Borough Hazard Mitigation Plan	High	Borough Staff, Local Planning Team, and T&M Associates	October 2016	$24,000	NJDCA Grant (secured)
Adopt an Emergency Operations Plan Flood Annex.	High	Borough Staff, Local Planning Team, and T&M Associates	October 2016	$25,000	NJDCA Grant (secured)
Prepare a Capital Improvement Plan.	High	Borough Staff and T&M Associates	December 2016	$30,000	NJDCA Grant (secured)
Elevate the generator located at the municipal building.	High	Borough Staff	ASAP	TBD	Capital Program
Continue participation in the Shrewsbury River Flood Warning System	High	Monmouth County	Ongoing		Split between 7 participating communities
Maintain the Borough's various hazard warning systems and social media sites. Educate the public on these systems.	High	Borough Office of Emergency Mgmt.	Ongoing	Borough Staff Time	Borough
Scan all documents and store securely and electronically.	High	Borough Administrator	Ongoing	Borough Staff Time	Borough
Provide transportation to residents without vehicles who need to evacuate	Medium	Borough Office of Emergency Mgmt.	As needed	Borough staff time	Borough
Increase the flood resiliency of critical facilities within the Borough by elevating the police building, borough	Medium	Borough staff	Ongoing pending funding		Potential HMGP

hall, cultural center, library, first aid, and fire house					
Install a Borough-wide Supervisory Control and Data Acquisition (SCADA) system in conjunction with the Borough's owned and operated facilities.	Low	Borough Office of Emergency Mgmt.	As new technology becomes available	TBD	TBD
Identify alternate routes to reach isolated residents	Low	Borough Office of Emergency Mgmt.	Ongoing	Borough Staff Time	Borough
Floodproof pump station	Low	Borough staff			Borough
Develop and conduct a survey to determine population characteristics	Low	Borough staff	September 2017	Borough Staff Time	Borough

STRUCTURAL PROJECTS

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Raise, regrout, and expand the existing seawall to fill in the gap at the southern end of town.	High	FEMA, USACE		$34 million	FEMA, USACE, NJDEP, CDBG, Borough
Dredge Shrewsbury River Channels.	High	USACE, NJ DOT Maritime			USACE, NJ DOT Maritime
Install stormwater systems including inlets, manholes, and piping for low lying areas.	Medium	Borough staff	Ongoing		Potential FEMA HMGP

PUBLIC INFORMATION

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Conduct outreach projects by sending out annual mailings on flood risks, flood proofing, etc.	High	Borough Administrator and Floodplain Manager	Ongoing	Borough Staff Time	Borough
Conduct outreach programs in school to teach children the importance of natural systems.	Medium	NFWF, Urban Coast Institute, Borough Staff	Ongoing		NFWF Grant
Keep historical flood mapping on file for review by residents. Maintain a log of all inquiries.	Low	Floodplain Manager	Ongoing	Borough Staff Time	Borough
Provide the Monmouth Beach Library with educational materials on flooding from FEMA.	Low	Borough Administrator	Annually	Borough Staff Time	FEMA
Provide information regarding flood preparedness, NFIP, and floodproofing techniques as requested by residents. Maintain a log of all inquiries.	Low	Floodplain Manager	Ongoing	Borough Staff Time	Borough

X. PLAN IMPLEMENTATION & MAINTENANCE

It is anticipated that this Plan will be introduced to the Borough Planning Board and adopted on September 27, 2016. The Plan will also be adopted by the Borough Council by a formal Resolution on October 25, 2016.

This floodplain management plan is intended to be a dynamic document, adapting to changes in flood hazards and the needs of the Borough of Monmouth Beach. The recommendations and actions identified in this plan should be implemented by the designated lead for each action item as funding and resources become available. Changes in future conditions and funding availability may determine the timeline for when some actions get implemented. As the plan is evaluated each year and updated every five years, the goals and objectives of this plan should also be evaluated and revised as necessary.

The Borough's CRS Coordinator will be responsible for monitoring the plan and ensuring that the Flood Advisory Committee will meet at least once per year to aid with the yearly plan evaluation. The original members of the committee will remain, unless they wish to be replaced. Then a like representative will replace them. The committee will review the plan on an annual basis to evaluate changes to hazard conditions, goals and objectives, and progress made towards objectives. The committee will identify any necessary changes or revision to the plan. The annual review will include:

- A review of the original plan;
- Identification of any flood, hurricane, or other disaster that has impacted Monmouth Beach since the last review;
- Review of action items from the original plan, including what has been accomplished;
- Discussion on why actions have not been completed;
- Where vulnerabilities have increased, identify why and what additional measures can be taken to decrease the vulnerability of that area to flood hazards;
- Recommendations for new projects or revised action items; and
- Survey of available resources to address action items.

This Floodplain Management Plan will be updated every five years and reviewed for CRS credit according to the CRS Coordinator's Manual in effect at the time. The 5-year update must include the following steps to retain CRS credit:

- The update must be conducted by a committee;
- A public meeting must be conducted to review and receive comments on the draft update;

- Review of new studies, reports, and technical information of the community's needs, goals, and plans for the area;
- New floodplain or hazard mapping;
- Identification of additional repetitive loss properties or completed mitigation projects;
- Discussion of any major flood or other disasters that have occurred since the plan was adopted;
- Review of any other changes in flooding conditions or development exposed to flooding or other hazards;
- Goals must be evaluated to determine if they are still appropriate;
- The action plan will be revised to account for projects that have been completed, dropped, or changed, and for changes in the hazard and problem assessments; and
- The update shall be adopted by the community's governing body.

Appendix A: Ordinance Forming Steering Committee

R-30-16

RESOLUTION
ESTABLISHING A FLOOD ADVISORY COMMITTEE

BE IT RESOLVED, by the Board of Commissioners of the Borough of Monmouth Beach, County of Monmouth and State of New Jersey, that there be, and is hereby established a Flood Advisory Committee whose members shall be appointed by the Governing Body; and

BE IT FURTHER RESOLVED that the membership shall be comprised as follows:

A Member of the Governing Body
The Borough Administrator
A Representative of the Police Department
A Representative of the Office of Emergency Management
Construction Official/Floodplain Manager
Director of Public Works
Zoning Officer/Borough Engineer
Six (6) Borough Residents recommended by the Borough Administrator

BE IT FURTHER RESOLVED the Flood Control Advisory Committee shall have the power and duty to study issues involving flood control and flood protection and to advise the various Borough bodies, agencies and departments on matters involving flood control and flood protection.

I hereby CERTIFY this to be a true copy of a Resolution that was passed and approved at a meeting of the Board of Commissioners of the Borough of Monmouth Beach held on February 23, 2016.

ATTEST:

Joyce L. Escalante

Joyce L. Escalante, RMC
Municipal Clerk

Appendix B: Steering Committee Meeting Outlines

Borough of Monmouth Beach
Floodplain Management Plan
Revised Committee Meeting Minutes
Thursday, July 30, 2015

The Monmouth Beach Floodplain Management Committee held a committee meeting on July 27, 2016 at 5 pm. An ad notifying of same was posted on the Borough web site. In attendance were the following:

- Sue Howard, Mayor
- Thomas Walsh, Chief of Police
- Aaron Rock, Deputy OEM
- Judy Wilson, Borough Administrator
- Joe Chirichello, Superintendent of Public Works
- Don Clare, Floodplain Manager
- Christine Bell, Planner, T&M Associates
- Bonnie Heard, Engineer, T&M Associates
- Larry Boice, Resident
- Ellen Marie Conrad, Resident
- Judy Kahn, Resident
- Robert Karl, Resident
- Bill Kline, Resident
- Tom London, Resident
- Scott Sergeant, Resident
- Ray Smith, Resident
- Darren Weinstein, Resident

Christine Bell led the meeting and discussed the following:

This Floodplain Management Plan will be written following the process outlined by the *Community Rating System (CRS)*. This process consists of 10 steps. At this meeting **Step # 4, <u>Assess the Hazard</u>** was discussed. The main hazard in Monmouth Beach for the purpose of this Floodplain Management Plan is flooding.

Assess the Hazard (Flooding):

Definition of Flooding: overflow of inland or tidal waters; or the unusual and rapid accumulation of runoff or surface waters from any source (adopted from FEMA).

- Flooding from the Shrewsbury River is a larger issue than flooding from the ocean.
- Northeast winds causing flooding along the northwestern portion of the Borough.
- Every area in town acts differently, depending on the winds, tides, lunar cycle, length of the storm event, etc.

Some areas that generally flood include:

- The following streets are prone to localized, nuisance flooding:
    - Club Circle
    - Griffin Street

    - Johnson Street
    - Margaret Place
    - Meadow Avenue
    - Monmouth Parkway
    - Monmouth Place
    - Navesink Drive
    - North Road
    - Patten Avenue
    - River Avenue
    - Riverdale Avenue
    - Robbin Street
    - Sailors Way
    - Seaview Avenue
    - Spaulding Place
    - Tocci Avenue
    - Valentine Street
    - Willow Avenue
- Areas of nuisance flooding are accurately represented on the map titled "Shallow Coastal Flooding Susceptibility." This map can act as a general guideline to flood-prone areas within the Borough.
- During the committee meeting the following areas were also mentioned to have nuisance flooding issues:
    - Areas around the police station flood during heavy rain events.
    - During Irene, Griffin Street and Meredith flooded until the wind shifted west.
    - Sands Point North floods in common areas.
    - Riverdale frequently floods - flooding is tidal.
    - Willow has a drainage issue.
    - Shores Condos - drainage systems built by USACE are backing up and flooding on the north side of building.

What issues are believed to cause flooding?

- The Borough of Monmouth Beach is an oceanfront community located on a barrier spit that is bordered by the Atlantic Ocean to the east and the Shrewsbury River to the west.
- While a small portion of the center of the Borough is considered uplands the majority of the Borough is fairly low-lying with flat elevations ranging between 3 and 7 feet above sea level.
- Most of the oceanfront properties are protect by the existing seawall that is between 17 and 18 feet above sea level, the riverfront properties are impacted by erosion and tidal forces.
- Development along the riverfront shoreline and bulk heading have limited shoreline migration and inlet formation.
- As all of the Borough's drainage outfalls discharge into the river, tidal flooding occurs on many roadways and limits drainage in upstream sections of these drainage systems.
- In recent years the Borough has installed flap valves to minimize tidal flooding impacts, however, during rain events these flap valves cause localized flooding until the tide recedes.
- Changing weather patterns have been producing more frequent, short duration, high-intensity storms that cause localized flooding.
- River channels have not been dredged in decades.
- Tidal impacts and infrastructure capacity.
- Impervious Surface (it is important to note, Monmouth Beach has been recognized as a leader for their stringent impervious surface requirements).

Map Review:

- *Natural Functions:* The accuracy of shoreline type as mapped was questioned. On 7/28, Monmouth Beach DPW field checked the map to determine accuracy. It was found that the shoreline types were in fact accurate in most places, and updates were made to the data layer where they were not. The validity of the contour lines were questioned, as elevations within the Borough are seen as changing over the last few years. A request for a map of soil types was made to better understand percolation throughout the Borough. This has been completed.
- *Repetitive Loss Areas:* The underlying PFIRM map removes the V zone from the Shrewsbury River. The methodology behind these maps is being challenged by New York City.
- *ABFEs:* These are the maps currently adopted for use by the Borough.
- *Effective Flood Maps:* These are the maps currently used to determine flood insurance rates.
- *Coastal Flood Exposure:* It was noted that flood exposure corresponded to maps depicting repetitive loss areas, flood areas, and SLOSH modeling.
- *Shallow Coastal Flooding Susceptibility:* This map correctly indicates areas that are prone to flooding during a high tide or average rainfall event.
- *Sea Level Rise:* no comments.
- *SLOSH Modeling:* it was noted that all versions of the flood maps indicate more flooding that a Category 1 storm event.
- *Marsh Retreat:* no comment.
- *FEMA PFIRM Zone Zones:* as discussed on Repetitive Loss Area map above.
- *Sandy Storm Surge:* indicates more flood inundation than during a category 1 storm event as depicted by the SLOSH modeling.

Special Flood Related Hazards:

- Uncertain Flow Paths - not relevant to Monmouth Beach.
- Closed Basin Lakes - not relevant to Monmouth Beach.
- Ice Jams - This occurs in the Shrewsbury River. Blocks of ice break free and clog up in Sea Bright, which then backs up into Monmouth Beach. All of the Shrewsbury River Basin suffers.
- Land Subsidence - is an aggravating factor in sea level rise along the East Coast of the United States.
- Coastal erosion - has a large impact along the beachfront on the Borough of Monmouth Beach.
- Tsunamis - are possible, but not likely (low threat level).

The 2015 Monmouth County All Hazards Mitigation Plan, of which Monmouth Beach is a participating municipality, addresses all hazards within the Borough. The plan is due to be updated in 2019.

Future Actions Items and Goals identified at Assess the Hazard Meeting:

- Infrastructure Capacity Analysis.
- Lot Coverage Study.
- Committee members to review maps and provide feedback.
- Bonnie to preform analysis on 18 River Rd as requested.

The next meeting of the Floodplain Management Plan Committee will be **August 3, 2016 at 6pm**.

Borough of Monmouth Beach
Floodplain Management Plan
Committee Meeting
Minutes
Wednesday, August 3, 2016

The Monmouth Beach Floodplain Management Committee held a committee meeting on August 3, 2016 at 6 pm. An ad notifying of same was posted on the Borough web site. In attendance were the following:

- Sue Howard, Mayor
- Judy Wilson, Borough Administrator
- Joe Chirichello, Superintendent of Public Works
- Don Clare, Floodplain Manager
- Cranston Van Bloem, Borough OEM
- Christine Bell, Planner, T&M Associates
- Bonnie Heard, Engineer, T&M Associates
- Larry Boice, Resident
- Ellen Marie Conrad, Resident
- Eileen Fontana, Resident
- Judy Kahn, Resident
- Bill Kline, Resident
- Tom London, Resident
- Ray Smith, Resident
- Christina Soto as proxy for Scott Sergeant, Resident
- Darren Weinstein, Resident
- Valerie Bretl, Resident

Christine Bell led the meeting and discussed the following:

1. Assess the Problem:

Problems occur from development in the flood hazard area. Identify problems relevant to each flood related hazard discussed in Assess the Hazard:

a. Impact on life, safety, and the need for warning and evacuations:
    i. Evacuation procedures.
    ii. Emergency Operating procedures – EOP is being updated.
    iii. Code RED notifies residents.
        1. Email blasts.
        2. Special concern for elderly residents.
        3. Chief of Police has a list of all "special needs" residents.
    iv. Other existing forms of notification:
        1. Door to door.
        2. TV notifications.
        3. AM broadcast.
    v. Monmouth Beach does an excellent job at notifying residents of extreme weather events.

b. Public health and health hazards:
    i. Sewage Treatment Plant.
        1. After Sandy had to warn residents not to use water.
        2. Effluent washed up on properties.

3. Reach out to Two Rivers to see if they have a disaster plan in place.

ii. What if flooding occurs in the winter months and water freezes?
iii. Stress, fatigue, etc. within community are all concerns.
iv. Increase in mosquitos due to standing water.
v. Building materials and debris.

c. Critical facilities and infrastructure:
   i. School.
   ii. Municipal Building - has a generator.
   iii. Police Department.
   iv. Fire Department.
   v. Sewage Treatment Plant.
   vi. Electrical substation – has been floodproofed.
   vii. Parish center - this cannot be considered a safe shelter place as it is below the BFE and has flooded during major storm events.
   viii. Storm evacuations
      1. Residents should be leaving town, emergency personnel may not be able to reach those who stay behind.
      2. More coordination on County and regional levels should occur
      3. Monmouth Park- evacuation point.
      4. ***RECOMMENDATION***: Borough should provide transportation for people who have moved their vehicles and then decided they need to evacuate.

d. Economy and major employers
   i. Primarily residential.
   ii. Two River Reclamation Authority.
   iii. School.
   iv. Small Downtown Area.
   v. Summer seasonal: Beach clubs.
   vi. Where do most people work? How do they commute?
      1. Primary exit points are Route 36 or Patten Ave.

e. Number and types of affected buildings

	Borough Total	100- Year Floodplain	500- year Floodplain[1]	100- Year + 500- Year Floodplain*	Percent Located within the 100- Year Floodplain
Structures	1,246	919	98	970	73.76%
Properties	2,239	1,488	182	1,541	66.46%
Land Area (acres)[2]	571.31	71.08	4.63	75.71	12.44%

*100 +500 may not equal total due to some structures and/or properties being located in both
1. This does not include the area within the 100-year floodplain.
2. Land area only includes land parcel areas. Waterways and roads are not included in this area.

ACTION ITEM: Determine actual elevation of first floor of structures to see if they are elevated out of the floodplain. This is something the Borough is working on through the collection of elevation certificates and as part of the CRS application.

f. Historical damage:
   i. Repetitive Loss Properties.
      1. Average Number of Losses: 4.
      2. Average Total Paid: $198,024.
      3. Average Paid per loss: $53,300.
   ii. Hurricane Sandy.
      1. Estimated $3 million in damage to Borough's public buildings.

2. Loss of utility services.
3. Forced evacuation of residents.
4. 4.2% loss in home values and tax revenue from 2012 to 2013
    a. Tax revenue has still not fully recovered.
5. Not a lot of damage from wind.

g. Development, redevelopment, and population trends
    i. Census estimates questionable because of rebuilds and post- Sandy sales:
        1. Monmouth Beach 2010 Census: 3,279.
        2. Monmouth Beach Population Estimate 2012: 3,274.
        3. Monmouth Beach Population Estimate 2013: 3,287.
        4. Monmouth Beach Population Estimate 2015: 3,239.
        5. Fully developed town.
        6. Less children being born and enrolling in schools.
    ii. Increase in 2nd home owners - only closer to the ocean, most residents still year round.
    iii. As more new residents move into town, loss of local knowledge.

ACTION ITEM: Develop/ conduct survey to determined population characteristics (new resident since Sandy, 2nd home owner, etc.).

h. Other Problems raised by committee members:
    i. Concerns about amount of new construction in Borough.
    ii. Fill:
        1. Fill is believed to be causing drainage problems on neighboring properties and streets.
        2. ***ACTION ITEM:*** determine impact to drainage patterns as a result of fill. Modify ordinances based on findings.
    iii. Bonnie Heard gave a summary of impervious coverage calculations for River Road.

2. **Next Meeting:** August 10th**, Time:** 6 pm.

Borough of Monmouth Beach
Floodplain Management Plan
Committee Meeting
Wednesday, August 10, 2016

The Borough of Monmouth Beach Floodplain Management Committee held a meeting on Wednesday August 10th, 2016 at 6 pm. The meeting was posted on the Borough website. In attendance were the following:

- Sue Howard, Mayor
- Judy Wilson, Borough Administrator
- Joe Chirichello, Superintendent of Public Works
- Don Clare, Floodplain Manager
- Cranston Van Bloem, Borough OEM
- Aaron Rock, OEM
- Chief Tom Walsh, Chief of Police
- Christine Bell, Planner, T&M Associates
- Bonnie Heard, Engineer, T&M Associates
- Larry Boice, Resident
- Ellen Marie Conrad, Resident
- Eileen Fontana, Resident
- Judy Kahn, Resident
- Robert Karl, Resident
- Bill Kline, Resident
- Tom London, Resident
- Robert McDonough, Resident
- Scott Sergeant, Resident
- Ray Smith, Resident
- Darren Weinstein, Resident

Setting Goals:

The goals should set the context for the subsequent review of floodplain management activities and drafting of the action plan. They should incorporate or be consistent with other community goals for the affected areas. The goals must address all flood-related problems identified in the "Assess the Problem" step.

A list of proposed goals was provided to the Floodplain Management Plan Committee. Through discussion, feedback, and goal revision, the following list of goals for the Floodplain Management Plan was agreed upon:

<u>Floodplain Management Plan Goals:</u>

- Secure safety from flood, due to surge, stormwater, and sea level rise, fire (as a result of flood situations) panic and other natural and man-made disasters.
- Reduce flood damage, including damage to life and property.

- Manage and minimize increases in stormwater runoff from any new development or redevelopment.
- Maintain and enhance groundwater recharge.
- Increase public awareness of stormwater management through public education.
- Protect-natural and environmental resources including floodways, wetlands, marsh areas and areas suitable for public and quasi-public recreational activities; and support resiliency to storm and other natural hazard events.
- Promote the conservation of open space and valuable natural resources, including trees and vegetation, and prevent degradation of the environmental through improper use of land.
- Promote public awareness of hazard mitigation and resiliency issues and provide adequate resources to Borough residents and business owners so they are properly informed of the natural hazards they face and the precautions they can take to protect their properties.
- Promote regional coordination between Local, County, State, and Federal Governments and OEMs, FEMA, and the National Flood Insurance Program; to identify community vulnerabilities, promote regional resiliency to hazard events, and coordinate post-disaster recovery efforts.

Actions items for further review include:

- Updating ordinances including:
    - Accumulative damage ordinance
    - Tree- Saving Ordinance
    - Higher Standards Ordinances
- Public education on hazard mitigation, resiliency, and flood reduction measures.
- Annual environmental impact of construction
- Create venue for public to express ongoing concerns

Borough of Monmouth Beach
Floodplain Management Plan
Committee Meeting
Wednesday August 24, 2016

The Monmouth Beach Floodplain Advisory Committee held a committee meeting on August 24, 2016 at 6 pm. The meeting was posted on the Borough website. In attendance were the following:

- Sue Howard, Mayor
- Judy Wilson, Borough Administrator
- Joe Chirichello, Superintendent of Public Works
- Don Clare, Floodplain Manager
- Cranston Van Bloem, Borough OEM
- Aaron Rock, OEM
- Chief Tom Walsh, Chief of Police
- Christine Bell, Planner, T&M Associates
- Bonnie Heard, Engineer, T&M Associates
- Peter English, Resident
- Eileen Fontana, Resident
- Judy Kahn, Resident
- Robert Karl, Resident
- Bill Kline, Resident
- Robert McDonough, Resident
- Scott Sergeant, Resident
- Ray Smith, Resident

Christine Bell led the meeting and discussed the following:

Action Plan: A wide range of possible floodplain management activities were discussed at the previous meeting to address the goals established by the Floodplain Management Plan Steering Committee. Proposed actions were identified and discussed as per the review of possible activities. Comments and changes to the proposed action plan identified at the committee meeting are marked in bold italics. Each action item was tied to a goal of the Floodplain Management Plan. The Goals of the Floodplain Management Plan are:

- Secure safety from flood, due to surge, stormwater, and sea level rise, fire (as a result of flood situations) panic and other natural and man-made disasters.
- Reduce flood damage, including damage to life and property.
- Manage and minimize increases in stormwater runoff from any new development or redevelopment.
- Maintain and enhance groundwater recharge.
- Increase public awareness of stormwater management through public education.

- Protect-natural and environmental resources including floodways, wetlands, marsh areas and areas suitable for public and quasi-public recreational activities; and support resiliency to storm and other natural hazard events.
- Promote the conservation of open space and valuable natural resources, including trees and vegetation, and prevent degradation of the environmental through improper use of land.
- Promote public awareness of hazard mitigation and resiliency issues and provide adequate resources to Borough residents and business owners so they are properly informed of the natural hazards they face and the precautions they can take to protect their properties.
- Promote regional coordination between Local, County, State, and Federal Governments and OEMs, FEMA, and the National Flood Insurance Program; to identify community vulnerabilities, promote regional resiliency to hazard events, and coordinate post-disaster recovery efforts.

An Action Plan will be established that describes which activities should be implemented, who is responsible for implementing the activity, the deadline for completing the activity, the proposed budget and the funding source; with the following priority levels:

- High Priority – Activities in this category are critical to protecting the Borough's critical facilities and creating a more resilient community. The benefits of these activities far outweigh the costs. Funding for these projects is currently in place or there is the high likelihood for grant funds to be secured in the near future. It is recommended that the majority of these projects be completed prior to the next hurricane season.
- Medium Priority – Activities in this category are necessary to increase the Borough's resiliency and provide flood protection. Benefits outweigh the costs; however, funding has not yet been secured for those activities with physical improvements. The Borough should continue to seek grants and other funding sources for these activities. It is recommended that these projects be completed in the next three years as funding becomes available.
- Low Priority – Activities in this category will mitigate hazard risks for the Borough and are cost-effective. However, it is understood that these projects are not as critical as those identified as high or medium priority and that funding may be difficult to obtain for some of the larger construction projects.

PREVENTATIVE MEASURES

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Update the Floodplain Management Plan	High	Borough Staff, Floodplain Advisory Committee, and T&M Associates	October 2016	$50,000	NJDCA Grant (secured)
Create an automated and expedited system for zoning and construction permit administration	High	Borough Staff	Ongoing	$25,000	NJDCA Grant (secured) and Borough General Funds
Develop a Geographic Information System (GIS) Program	High	Borough Staff and T&M Associates	October 2016	$50,000	NJDCA Grant (secured)
Prepare a Master Plan and Sustainability Element to address post- Sandy strategies and policies related to hazard mitigation, community resiliency, forecasted sea level rise and its impacts.	High	Borough Staff, Borough sub-committee, and T&M Associates	December 2016	$50,000	NJDCA Grant (Secured)
Participate in FEMA's Community Rating System (CRS) Program.	High	Borough Administrator and Floodplain Manager	October 2016 and Spring 2017	Borough Staff Time	Borough General Funds
Create a Tree- Save Ordinance.	High	Borough Staff	September 2016	Borough Staff Time	Borough General Funds
Conduct an infrastructure capacity analysis and determine the impact to drainage patterns as a result of fill. Modify ordinances based on findings.	High	Borough Engineer	September 2017	TBD	Borough General Funds
Regularly check for blocked storm drains, outfalls, and other major drainage features; and remove sediment and debris.	High	Department of Public Works	Annual	Borough Staff Time	Borough General Funds

Encourage selective acquisition of natural lands. Use the Borough's VLA to identify areas that may qualify for preservation. Look for additional beach access opportunities	Low	Borough Staff	Ongoing	NA	Green/ Blue Acres, Monmouth County Open Space, NRCS
Investigate adopting an accumulative damage ordinance.	Low	Borough Construction Official	September 2017	Borough Staff Time	Borough General Funds

PROPERTY PROTECTION

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Require all new buildings and substantially improved buildings to be built to the ABFE elevation plus an additional three (3) feet of freeboard	High	Construction official	Ongoing	Borough Staff Time	Borough General Funds
Continue to participate in the National Flood Insurance Program	High	Borough Staff	Ongoing	Borough Staff Time	Borough General Funds
Encourage the elevation of homes within the Borough to higher standards and elevations	Medium	Homeowners	Ongoing	Will vary by home	Potential HMGP, ICC, FEMA SRL, HUD RREM
Determine the actual elevation of the first flood of existing and new structures to ensure they are elevated out of the floodplain.	Medium	Construction Official	Ongoing – this is being done as residents bring in elevation certificates.	Borough Staff Time	Borough General Funds
Encourage property owners to install back flow protectors.	Medium	Construction Official	Ongoing	Borough Staff Time.	
Make the public aware of the various types/ methods of flood protection and floodproofing.	Low	Construction Official	Ongoing	Borough Staff Time	Borough General Funds.

NATURAL RESOURCE PROTECTION

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Continue beach and dune maintenance programs.	High	United States Army Corp of Engineers	Ongoing	Ongoing	United States Army Corp of Engineers, the State of New Jersey, Borough funds
Conduct a lot coverage study/ impervious coverage analysis	High	Borough Engineer	September 2017	TBD	Borough General Funds
Replenish and restore dunes and marsh islands.	Medium	USACE, New Jersey, Borough	TBD	1.78 million	USACE, New Jersey, Borough
Continue to follow state regulations in regards to wetlands protections, soil erosion and sediment control, and Phase 2 stormwater.	Low	The State of New Jersey DEP	Ongoing	Ongoing	The State of New Jersey

EMERGENCY SERVICES

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Prepare a Debris Management Plan	High	Borough Staff and T&M Associates	August 2015	$20,000	NJDCA Grant (secured)
Prepare a Borough Hazard Mitigation Plan	High	Borough Staff, Local Planning Team, and T&M Associates	October 2016	$24,000	NJDCA Grant (secured)
Adopt an Emergency Operations Plan Flood Annex.	High	Borough Staff, Local Planning Team, and T&M Associates	October 2016	$25,000	NJDCA Grant (secured)

Prepare a Capital Improvement Plan.	High	Borough Staff and T&M Associates	December 2016	$30,000	NJDCA Grant (secured)
Elevate the generator located at the municipal building.	High	Borough Staff	ASAP	TBD	Capital Program
Continue participation in the Shrewsbury River Flood Warning System	High	Monmouth County	Ongoing		Split between 7 participating communities
Maintain the Borough's various hazard warning systems and educate the public on these systems	High	Borough Office of Emergency Mgmt.	Ongoing	Borough Staff Time	Borough General Funds
Scan all documents and store securely and electronically.	High	Borough Administrator	Ongoing	Borough Staff Time	Borough General Funds
Provide transportation to residents without vehicles who need to evacuate	Medium	Borough Office of Emergency Mgmt.	As needed	Borough staff time	Borough Funds
Increase the flood resiliency of critical facilities within the Borough by elevating the police building, borough hall, cultural center, library, first aid, and fire house	Medium	Borough staff	Ongoing pending funding		Potential HMGP
Install a Borough-wide Supervisory Control and Data Acquisition (SCADA) system in conjunction with the Borough's owned and operated facilities.	Low	Borough Office of Emergency Mgmt.	As new technology becomes available	TBD	TBD
Identify alternate routes to reach isolated residents	Low	Borough Office of Emergency Mgmt.	Ongoing	Borough Staff Time	Borough General Funds
Floodproof pump station	Low	Borough staff			Borough funds

Develop and conduct a survey to determine population characteristics	Low	Borough staff	September 2017	Borough Staff Time	Borough funds

STRUCTURAL PROJECTS

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Raise, regrout, and expand the existing seawall to fill in the gap at the southern end of town.	High	FEMA, USACE		$34 million	FEMA, USACE, DEP, CDBG, Borough
Dredge Shrewsbury River Chanels.	High	USACE, DOT Maritime			USACE, DOT Maritime
Install stormwater systems including inlets, manholes, and piping for low lying areas.	Medium	Borough staff	Ongoing		Potential FEMA HMGP

PUBLIC INFORMATION

Action Item	Priority	Responsible Party	Deadline	Budget	Funding Source
Conduct outreach projects by sending out annual mailings on flood risks, flood proofing, etc.	High	Borough Administrator and Floodplain Manager	Ongoing	Borough Staff Time	Borough General Funds
Conduct outreach programs in school to teach children the importance of natural systems.	Medium	NFWF, Urban Coast Institute, Borough Staff	Ongoing		NFWF Grant
Keep historical flood mapping on file for review by residents. Maintain a log of all inquiries.	Low	Floodplain Manager	Ongoing	Borough Staff Time	Borough General Funds

Provide the Monmouth Beach Library with educational materials on flooding from FEMA.	Low	Borough Administrator	Annually	Borough Staff Time	FEMA
Provide information regarding flood preparedness, NFIP, and floodproofing techniques as requested by residents. Maintain a log of all inquiries.	Low	Floodplain Manager	Ongoing	Borough Staff Time	Borough General Funds

Appendix C: Public Meetings Information

Menu

July - August, 2016

July 27, 2016

Flood Plain Management Committee Meeting

July 27, 2016 @ 5:00 pm - 6:00 pm

August 1, 2016

Beautification Committee

August 1, 2016 @ 7:00 pm - 8:00 pm
Cultural Center

Recreation Meeting

August 1, 2016 @ 7:30 pm - 8:30 pm
Monmouth Beach Borough Hall

I WANT TO...

Click here to register for

Menu

August 2016

August 3, 2016

Floodplain Management Committee Meeting

August 3, 2016 @ 6:00 pm - 7:00 pm
Monmouth Beach Borough Hall

August 10, 2016

Floodplain Management Committee Meeting

August 10, 2016 @ 6:00 pm - 7:00 pm
Monmouth Beach Borough Hall

August 17, 2016

I WANT TO...

Click here to register for

Public Works
Tax Assessor
Tax Collector
Vital Statistics
Public Safety
Animal Control
Emergency Management
EMS
Fire Department
Police
CodeRED Emergency Notification System
Flood Information
Boards & Commissions
Ordinances

Beautification Committee

August 1, 2016 @ 7:00 pm - 8:00 pm
Cultural Center

Recreation Meeting

August 1, 2016 @ 7:30 pm - 8:30 pm
Monmouth Beach Borough Hall

August 3, 2016

Floodplain Management Committee Meeting

August 3, 2016 @ 6:00 pm - 7:00 pm
Monmouth Beach Borough Hall

August 10, 2016

Floodplain Management Committee Meeting

August 10, 2016 @ 6:00 pm - 7:00 pm
Monmouth Beach Borough Hall

Beautification Committee Pot Luck

August 10, 2016 @ 6:00 pm - 8:00 pm
Monmouth Beach Bathing Pavillion

August 17, 2016

Floodplain Management Committee Meeting

August 17, 2016 @ 6:00 pm - 7:00 pm
Monmouth Beach Borough Hall

Environmental Committee

August 17, 2016 @ 7:00 pm - 8:00 pm
Monmouth Beach Borough Hall

PAY TAXES ONLINE

Menu

August - September, 2016

August 17, 2016

Floodplain Management Committee Meeting

August 17, 2016 @ 6:00 pm - 7:00 pm
Monmouth Beach Borough Hall

Environmental Committee

August 17, 2016 @ 7:00 pm - 8:00 pm
Monmouth Beach Borough Hall

August 23, 2016

Borough Meetings

August 23, 2016 @ 6:00 pm - 7:00 pm
Cultural Center

Planning Board Meetings:

August 23, 2016 @ 7:00 pm - 8:00 pm

August 24, 2016

Floodplain Management Committee Meeting

August 24, 2016 @ 6:00 pm - 7:00 pm

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A GANNETT COMPANY

ASBURY PARK PRESS

Classified Ad Receipt
(For Info Only - NOT A BILL)

Customer: MONMOUTH BEACH BOROUGH

Address: 22 BEACH RD
MONMOUTH BEACH NJ 07750
USA

Ad No.: 0001509172
Pymt Method Invoice
Net Amt: $60.50

Run Times: 1

No. of Affidavits: 1

Run Dates: 08/17/16

Text of Ad:

BOROUGH OF
MONMOUTH BEACH
NOTICE OF MEETING
OF FLOODPLAIN MANAGEMENT
COMMITTEE

The Floodplain Management Committee of the Borough of Monmouth Beach will conduct a public hearing meeting regarding the Floodplain Management Plan for Monmouth Beach, Monmouth County, New Jersey. The public and interested parties are invited to attend and provide input on the natural hazards, problems, and possible solutions relating to the same within the Community. The meeting will be held in Monmouth Beach Cultural Center, 128 Ocean Avenue, Monmouth Beach, NJ at 6pm, August 23, 2016. These interested in commenting who cannot attend may address comments to T&M Associates, 11 Tindall Road, Middletown, NJ, 07748, Attention: Christine L. Bell, PP, ACIP, CFM.

Joyce L. Escalante, RMC
Borough Clerk
($26.25)

0001509172-01

Menu

- Government
  - Administration
  - Departments
    - Borough Administration
    - Borough Clerk
    - Code Enforcement
    - Construction Department
    - Court
    - Finance Office
    - Health Department
    - Housing Department
    - Recreation Division

August - September, 2016

August 23, 2016

Borough Meetings

August 23, 2016 @ 6:00 pm - 7:00 pm
Cultural Center

Planning Board Meetings:

August 23, 2016 @ 7:00 pm - 8:00 pm

August 24, 2016

Floodplain Management Committee Meeting

August 24, 2016 @ 6:00 pm - 7:00 pm

September 6, 2016

Beautification Committee

September 6, 2016 @ 7:00 pm - 8:00 pm
Cultural Center

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Appendix D: Sample Letter to Outside Agencies

YOUR GOALS. OUR MISSION.

MBCH-01592

August 3, 2016

Antonetta Heinzinger, Secretary
Borough of Monmouth Beach
Environmental Commission
22 Beach Rd
Monmouth Beach, NJ 07750

Dear Ms. Heinzinger:

The Borough of Monmouth Beach is currently in the process of preparing a Floodplain Management Plan to be incorporated as an element of the Borough Master Plan. The Floodplain Management Plan will identify and assess flood hazards within the Borough, establish the goals and objectives for floodplain management planning in Monmouth Beach, and present a series of actions designed to minimize flooding and mitigate the impacts from flooding in the future. The Plan is being funded through a Post- Sandy Planning Assistance Grant issued by the New Jersey Department of Community Affairs (DCA). As we continue to recover from the effects of Superstorm Sandy, the Borough has prioritized flood prevention and mitigation as key elements of its post-Sandy planning strategy. The project implements recommendations of the Strategic Recovery Planning Report (SRPR) adopted by the Borough Council in August of 2014.

As part of the Floodplain Management planning process, we are seeking the input of valued stakeholders to develop a foundation for assessing known hazards and flood impacts in Monmouth Beach. We would appreciate any information from your organization regarding flood hazards in the Borough of Monmouth Beach and/ or anything your agency or organization is doing that may affect flooding or properties in flood-prone areas. Additionally, we would like to invite you, or another representative of your agency or organization to become more actively involved in our floodplain management planning process. Your input and involvement in this planning process is important to help identify key floodplain management issues affecting the Borough of Monmouth Beach and to establish goals and objectives to make Monmouth Beach more resilient to flooding events in the future.

Please contact Christine Bell, PP, AICP, CFM, Staff Planner, T&M Associates at 732-671-6400 or cbell@tandmassociates.com on or before August 19, 2016 if you have any comments, suggestions, input, or would like to set up a meeting to discuss the floodplain management plan in greater detail.

Very truly yours,

T & M Associates

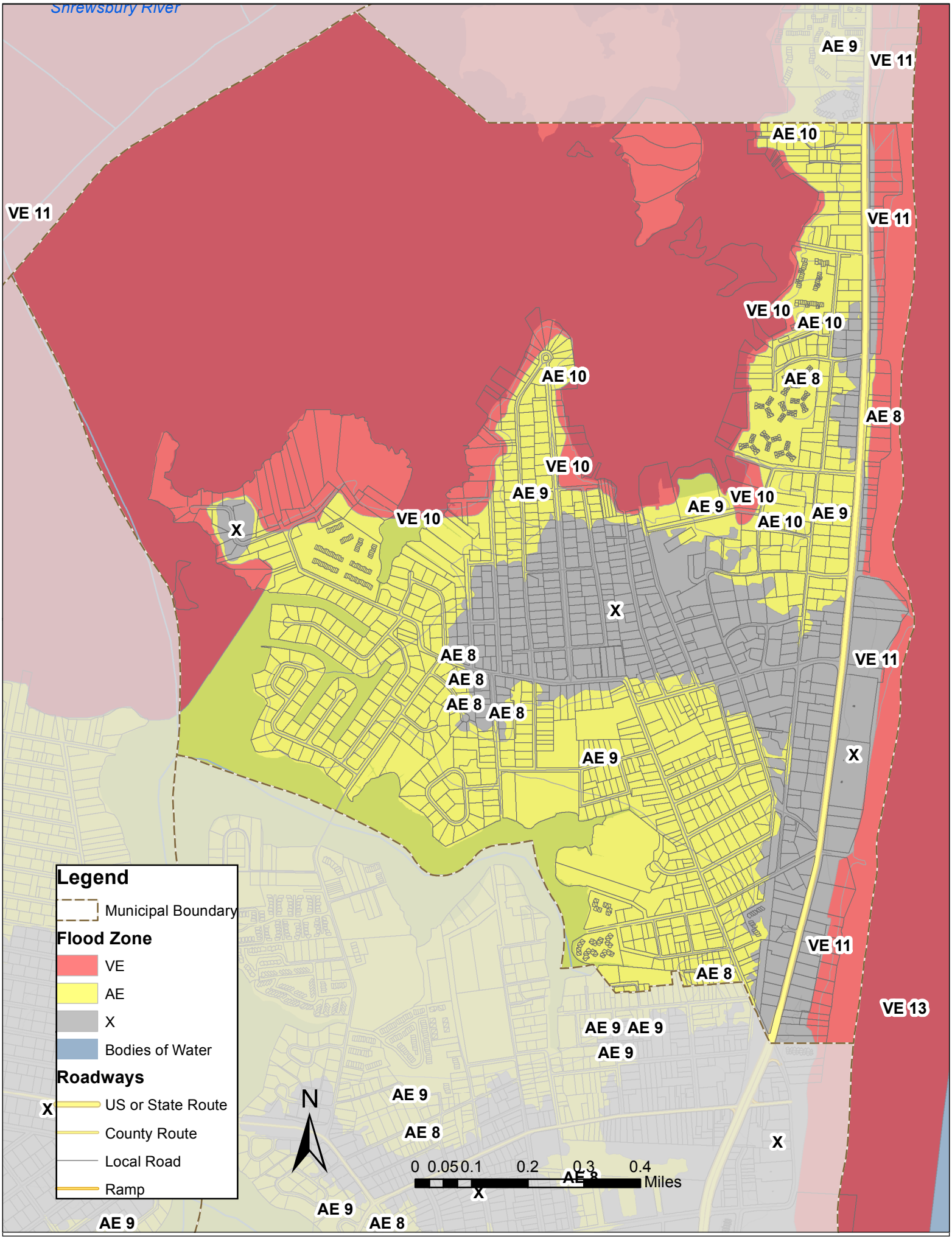
Christine L. Bell, P.P., AICP, CFM

Appendix E: Log of Stakeholder Interactions

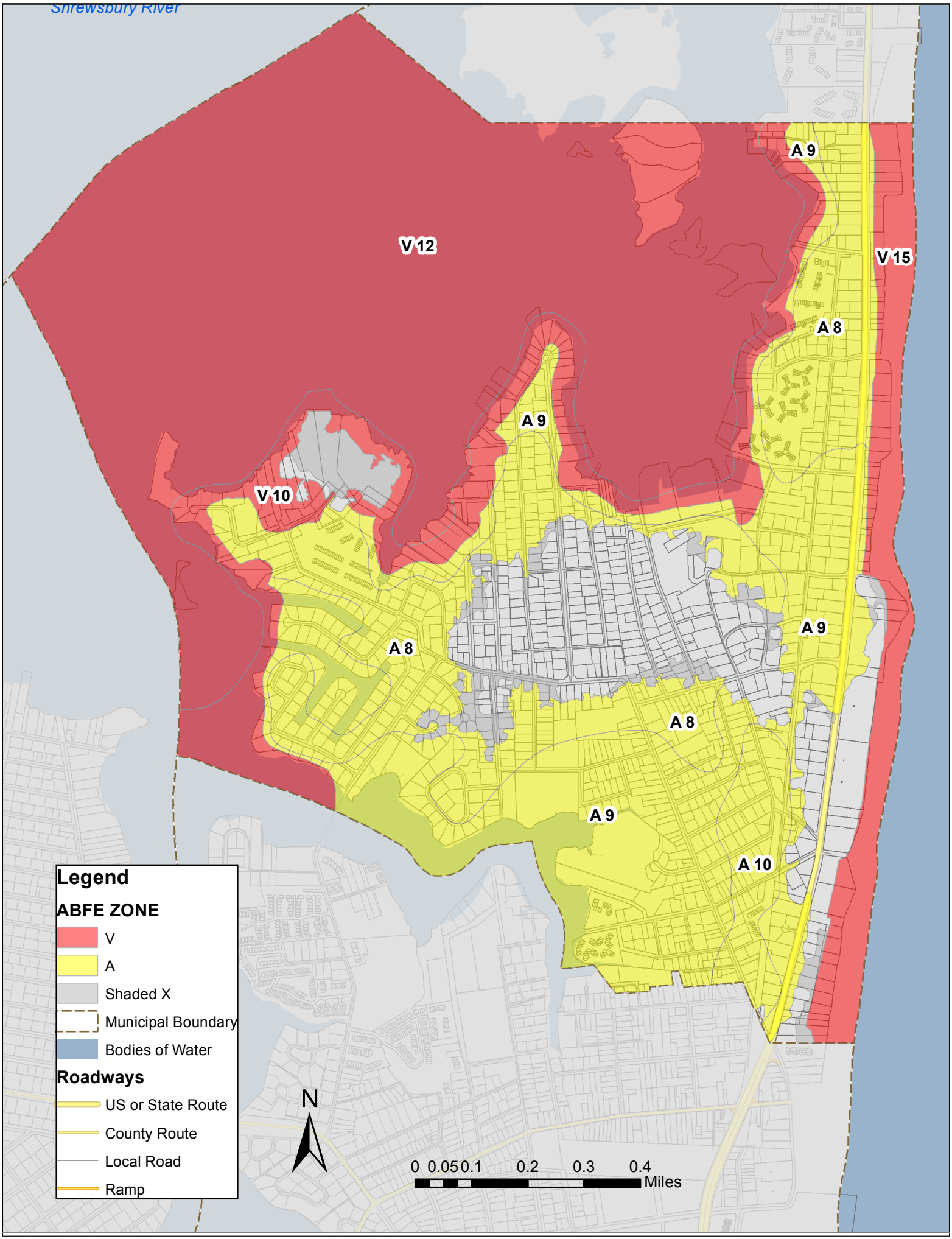
Outreach Letter Responses and Follow-Ups

Organization	Contact	Sent	Responded
Borough of Sea Bright	Dina Long	8/3/2016	
City of Long Branch	Adam Schneider	8/3/2016	
Borough of Rumson	John E. Ekdahl	8/3/2016	
Borough of Fair Haven	Benjamin Lucarelli	8/3/2016	
Borough of Little Silver	Robert C. Neff Jr.	8/3/2016	
Borough of Oceanport	Jay Coffey	8/3/2016	
Monmouth County Planning Department	Joe Barris	8/3/2016	
Monmouth County Office of Emergency Management	Margaret Murnane Brooks	8/3/2016	
Borough of Monmouth Beach Environmental Commission	Antonetta Heinzinger	8/3/2016	Responded by email on 8/18. Dave Stickle would like to be involved in planning process on behalf of the commission. Email: mheinc@comcast.net
Borough of Monmouth Beach Police Department	Thomas C. Walsh	8/3/2016	
Monmouth Beach Fire Department	Tim Griffin	8/3/2016	
Monmouth Beach EMS	Sue McDonald	8/3/2016	
Freehold Soil Conservation District	Ines Zimmerman	8/3/2016	
North Jersey Transportation Planning Authority	Zenobia Fields	8/3/2016	
Natural Resources Conservation Service	David Lamm	8/3/2016	
NJ Coastal Management Program		8/3/2016	
US Army Corps of Engineers		8/3/2016	
American Red Cross		8/3/2016	
Clean Ocean Action	Zachary Lees	8/3/2016	Had phone call on 8/19 to discuss Floodplain Management Planning Process and COA's interest in the project, asked to be sent draft plan.
American Littoral Society	Tim Dillingham	8/3/2016	
Jacques Cousteau National Estuarine Research Reserve	Christopher Huch	8/3/2016	Responded by email on 8/8. With permission of Mayor Howard, sent over draft getting to resilience recommendation report.
Shore Builders Association of Central Jersey	Gina Woolley	8/3/2016	
Comcast Cable	Lawrence Fary	8/3/2016	
New Jersey American Water	Paul Richards	8/3/2016	
JCP&L	William Uellner	8/3/2016	
New Jersey Department of Environmental Protection	John H. Moyle	8/3/2016	Kelly Pflicke reached out by email on 8/17 to discuss planning process and Two Rivers Regional Resilience Action Plan. Phone call with Kelly, Mayor Howard, Jeff Cuicinotta, and Christine Bell on 8/25 to discuss plans, additional data, etc.
New Jersey Department of Environmental Protection	Joseph Ruggeri	8/3/2016	
Two Rivers Reclamation Authority	Michael Gianforte	8/8/2016	

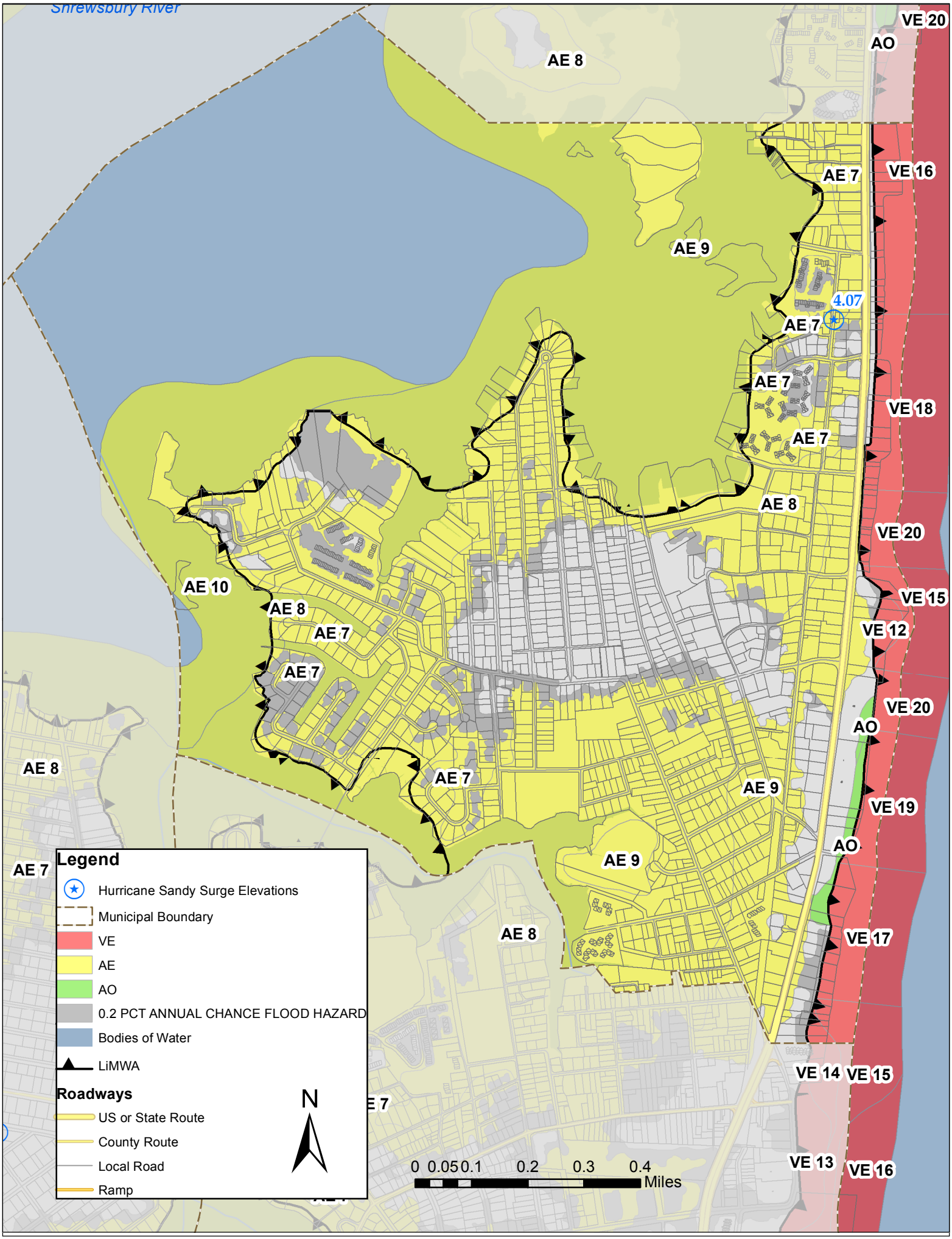
Appendix F: Effective FIRM Map


Shrewsbury River
AE 9
VE 11
AE 10
VE 11
VE 11
VE 10
AE 10
AE 10
AE 8
AE 8
VE 10
AE 9
VE 10
AE 9
VE 10
AE 10
AE 9
X
X
AE 8
AE 8
AE 8
AE 8
AE 9
VE 11
X
VE 11
AE 8
VE 13
AE 9 AE 9
AE 9
X
AE 9
AE 8
X
AE 9
AE 8
AE 9
AE 8
X
Legend
Municipal Boundary
Flood Zone
VE
AE
X
Bodies of Water
Roadways
US or State Route
County Route
Local Road
Ramp
N
0 0.05 0.1 0.2 0.3 0.4
Miles

Appendix G: Advisory Base Flood Map


Shrewsbury River
V 12
V 15
V 10
A 9
A 8
A 10
Legend
ABFE ZONE
V
A
Shaded X
Municipal Boundary
Bodies of Water
Roadways
US or State Route
County Route
Local Road
Ramp
N
0 0.05 0.1 0.2 0.3 0.4
Miles

Appendix H: Preliminary FIRM Map


Shrewsbury River
AE 8
VE 20
AO
VE 16
AE 7
AE 9
4.07
AE 7
AE 7
VE 18
AE 7
AE 8
VE 20
AE 10
VE 15
AE 8
AE 7
VE 12
AE 7
VE 20
AO
AE 8
AE 7
AE 9
VE 19
AO
AE 7
AE 9
AE 8
VE 17
VE 14
VE 15
VE 13
VE 16
Legend
Hurricane Sandy Surge Elevations
Municipal Boundary
VE
AE
AO
0.2 PCT ANNUAL CHANCE FLOOD HAZARD
Bodies of Water
LiMWA
Roadways
US or State Route
County Route
Local Road
Ramp
N
0 0.05 0.1 0.2 0.3 0.4
Miles

Appendix I: Sandy Surge Extents

Sandy Storm Surge

Monmouth Beach Borough

Legend

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

Sandy Storm Surge

High: More Water

Low: Less Water

0 0.15 0.3 0.6 Miles

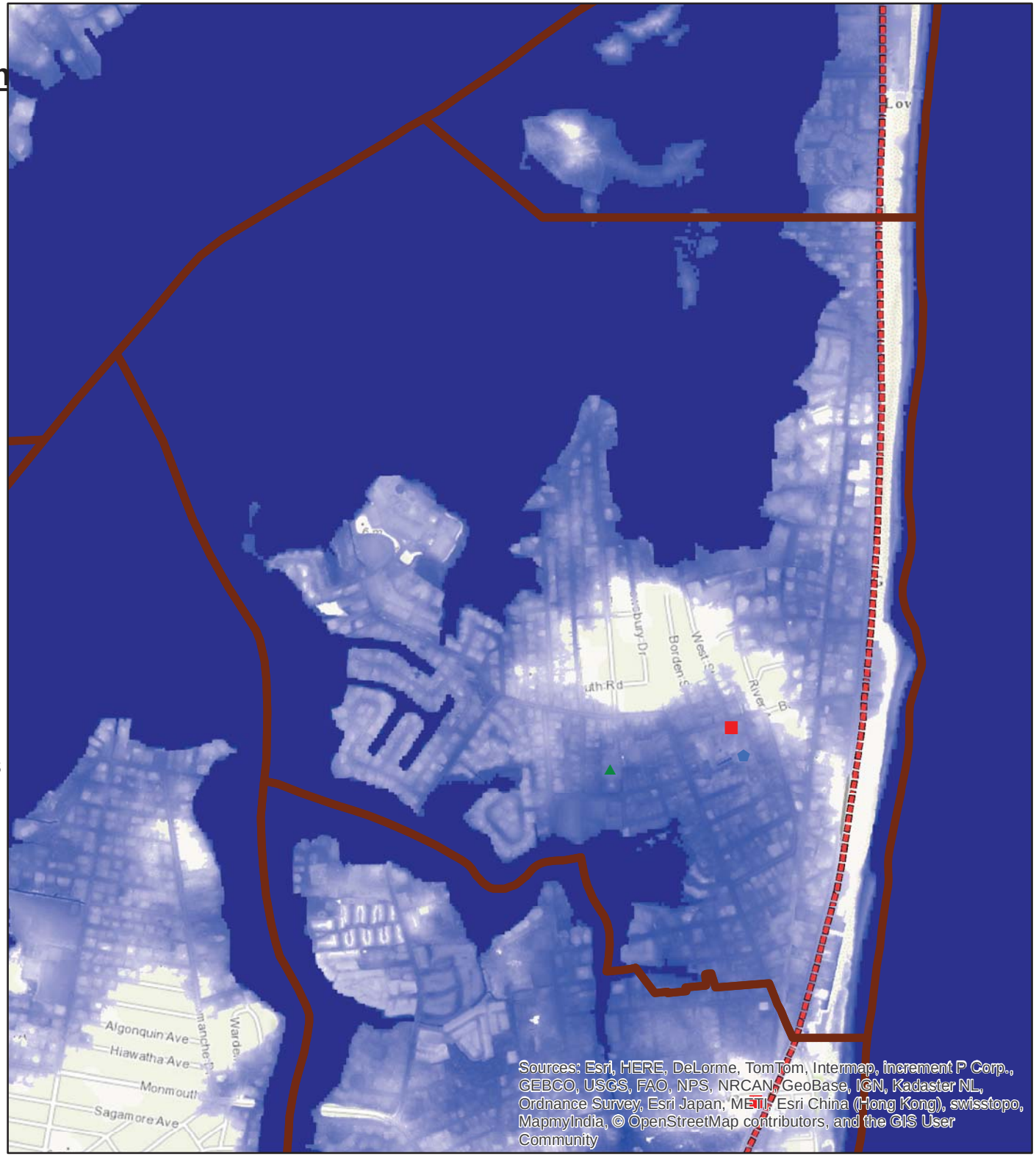
Year 2010 Population: 3279

This map depicts the Sandy Storm Surge extents provided by FEMA. The depths are ranged in meters of inundation above ground level and are categorized in the legend above.

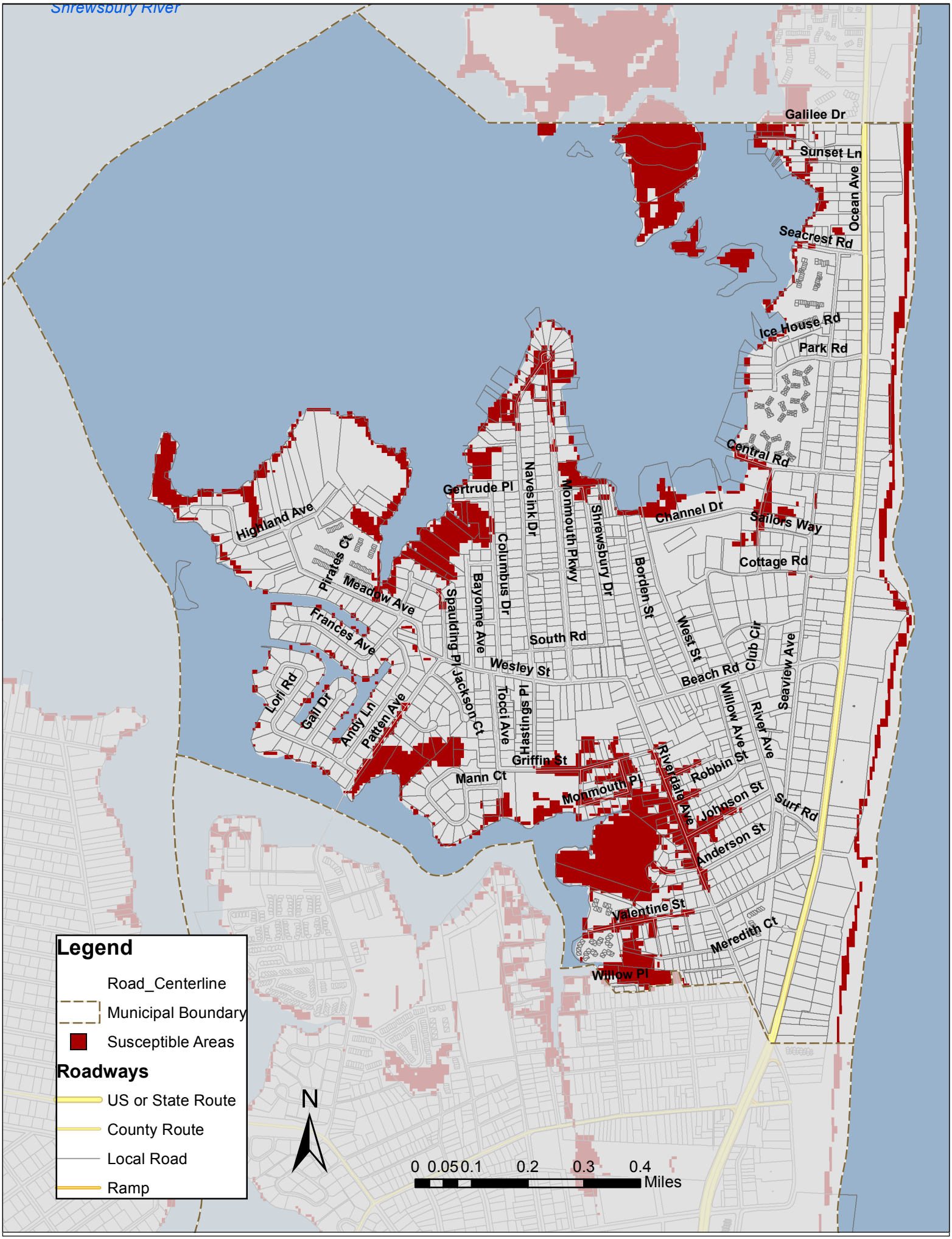
Map Authors: Rachael Sacatelli and Bryan Serino
Rutgers, New Brunswick
Center for Remote Sensing
and Spatial Analysis

N

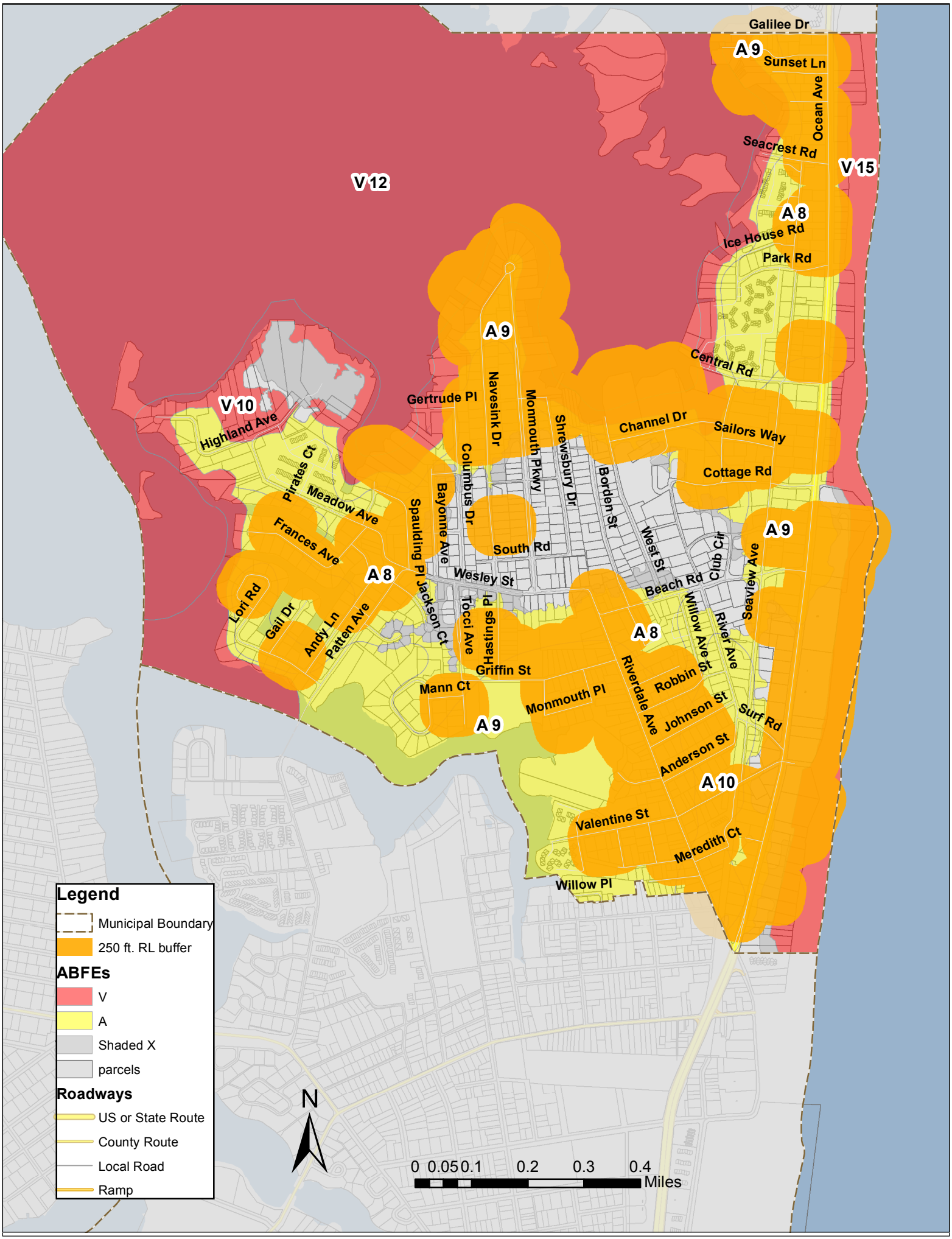
CRSSA



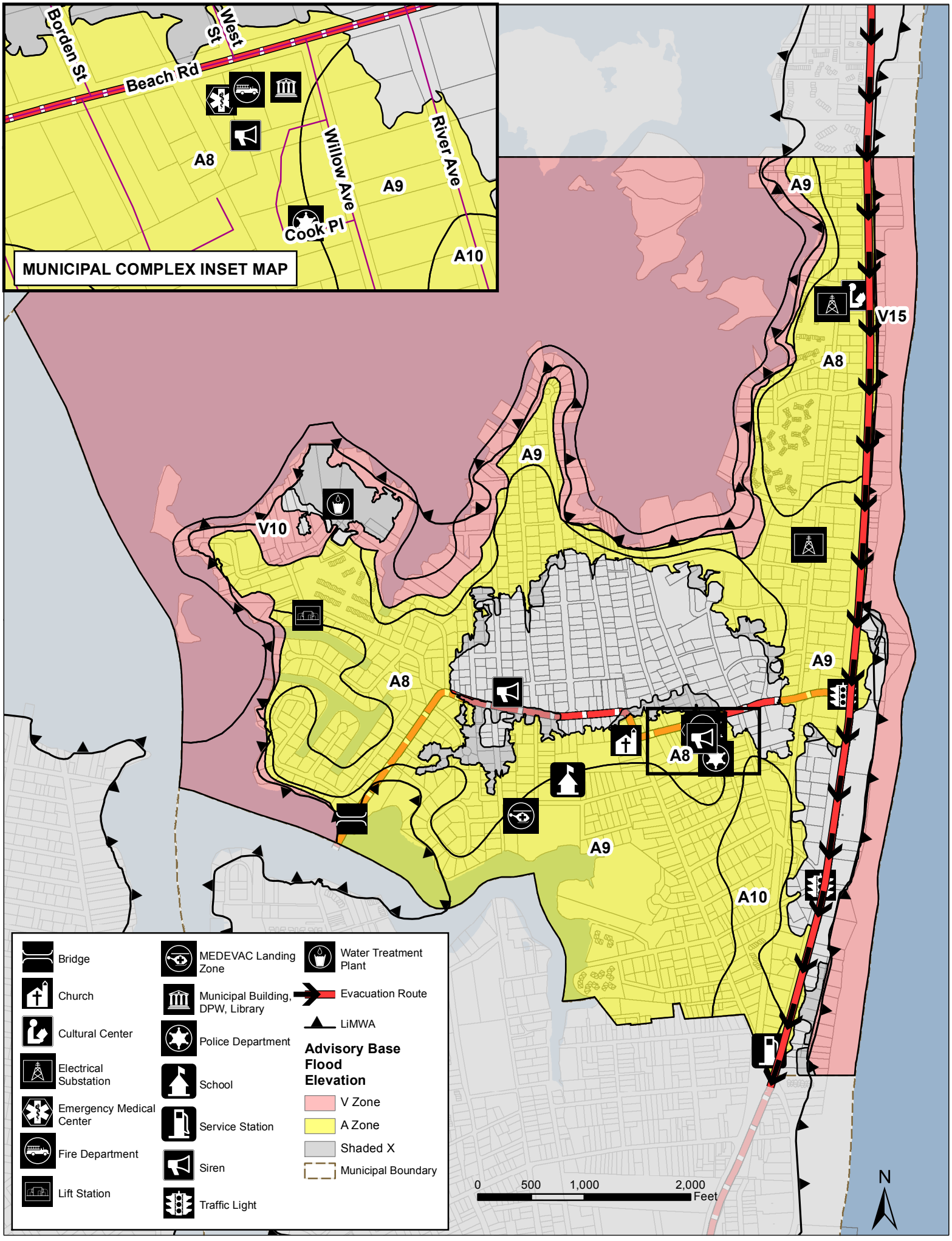
Appendix J: Nuisance Flooding Areas


Shrewsbury River
Galilee Dr
Sunset Ln
Ocean Ave
Seacrest Rd
Ice House Rd
Park Rd
Central Rd
Channel Dr
Sailors Way
Cottage Rd
Gertrude Pl
Navesink Dr
Monmouth Pkwy
Shrewsbury Dr
Borden St
West St
Club Cir
Seaview Ave
River Ave
Willow Ave
Robbin St
Johnson St
Surf Rd
Anderson St
Meredith Ct
Valentine St
Willow Pl
Riverdale Ave
Monmouth Pl
Griffin St
Mann Ct
Hastings Pl
Tocci Ave
Columbus Dr
Bayonne Ave
Spaulding Pl
Jackson Ct
South Rd
Wesley St
Beach Rd
Highland Ave
Pirates Ct
Meadow Ave
Frances Ave
Lori Rd
Gail Dr
Andy Ln
Patten Ave
Legend
Road_Centerline
Municipal Boundary
Susceptible Areas
Roadways
US or State Route
County Route
Local Road
Ramp
N
0 0.05 0.1 0.2 0.3 0.4
Miles

Appendix K: Repetitive Loss Areas Map


Galilee Dr
A 9
Sunset Ln
Ocean Ave
Seacrest Rd
V 15
V 12
A 8
Ice House Rd
Park Rd
A 9
Central Rd
Gertrude Pl
Navesink Dr
Monmouth Pkwy
Shrewsbury Dr
Channel Dr
Sailors Way
V 10
Highland Ave
Pirates Ct
Columbus Dr
Borden St
Cottage Rd
Meadow Ave
Bayonne Ave
Spaulding Pl
Frances Ave
South Rd
West St
Club Jr
A 9
Seaview Ave
A 8
Wesley St
Beach Rd
Lori Rd
Gail Dr
Andy Ln
Patten Ave
Jackson Ct
Tocci Ave
Hastings Pl
Willow Ave
River Ave
A 8
Griffin St
Riverdale Ave
Robbin St
Mann Ct
Monmouth Pl
Johnson St
Surf Rd
A 9
Anderson St
A 10
Valentine St
Meredith Ct
Willow Pl
Legend
Municipal Boundary
250 ft. RL buffer
ABFEs
V
A
Shaded X
parcels
Roadways
US or State Route
County Route
Local Road
Ramp
N
0 0.05 0.1 0.2 0.3 0.4
Miles

Appendix L: Critical Facilities Map


MUNICIPAL COMPLEX INSET MAP
Borden St
West St
Beach Rd
Willow Ave
River Ave
Cook Pl
A8
A9
A10
V10
V15
Bridge
Church
Cultural Center
Electrical Substation
Emergency Medical Center
Fire Department
Lift Station
MEDEVAC Landing Zone
Municipal Building, DPW, Library
Police Department
School
Service Station
Siren
Traffic Light
Water Treatment Plant
Evacuation Route
LiMWA
Advisory Base Flood Elevation
V Zone
A Zone
Shaded X
Municipal Boundary
0
500
1,000
2,000
Feet
N

Appendix M: SLOSH Maps

Category 1 SLOSH Model
Monmouth Beach Borough

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

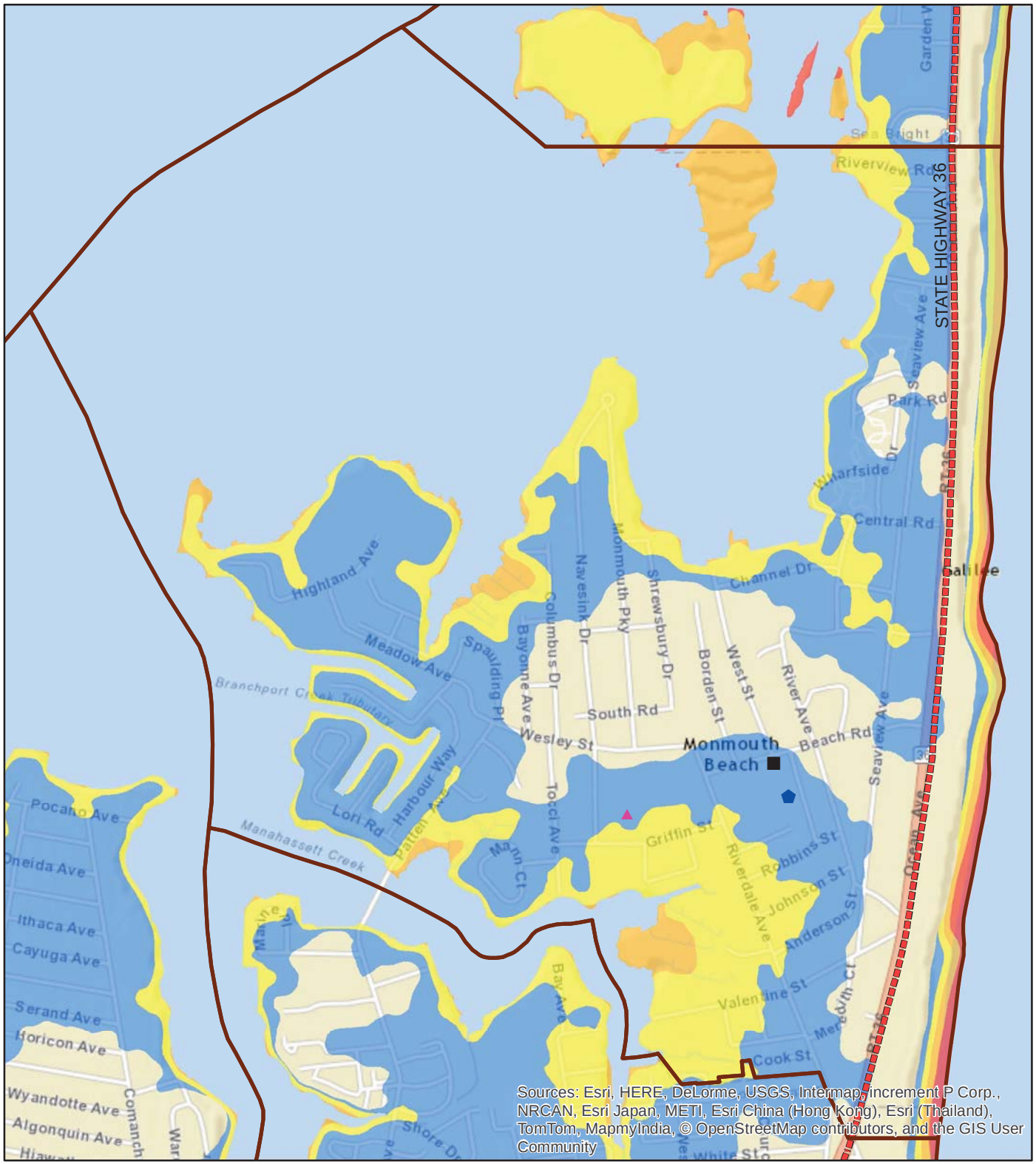
Year 2010 Population: 3279

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.

0 0.125 0.25 0.5 Miles

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

CRSSA



Category 2 SLOSH Model
Monmouth Beach Borough

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

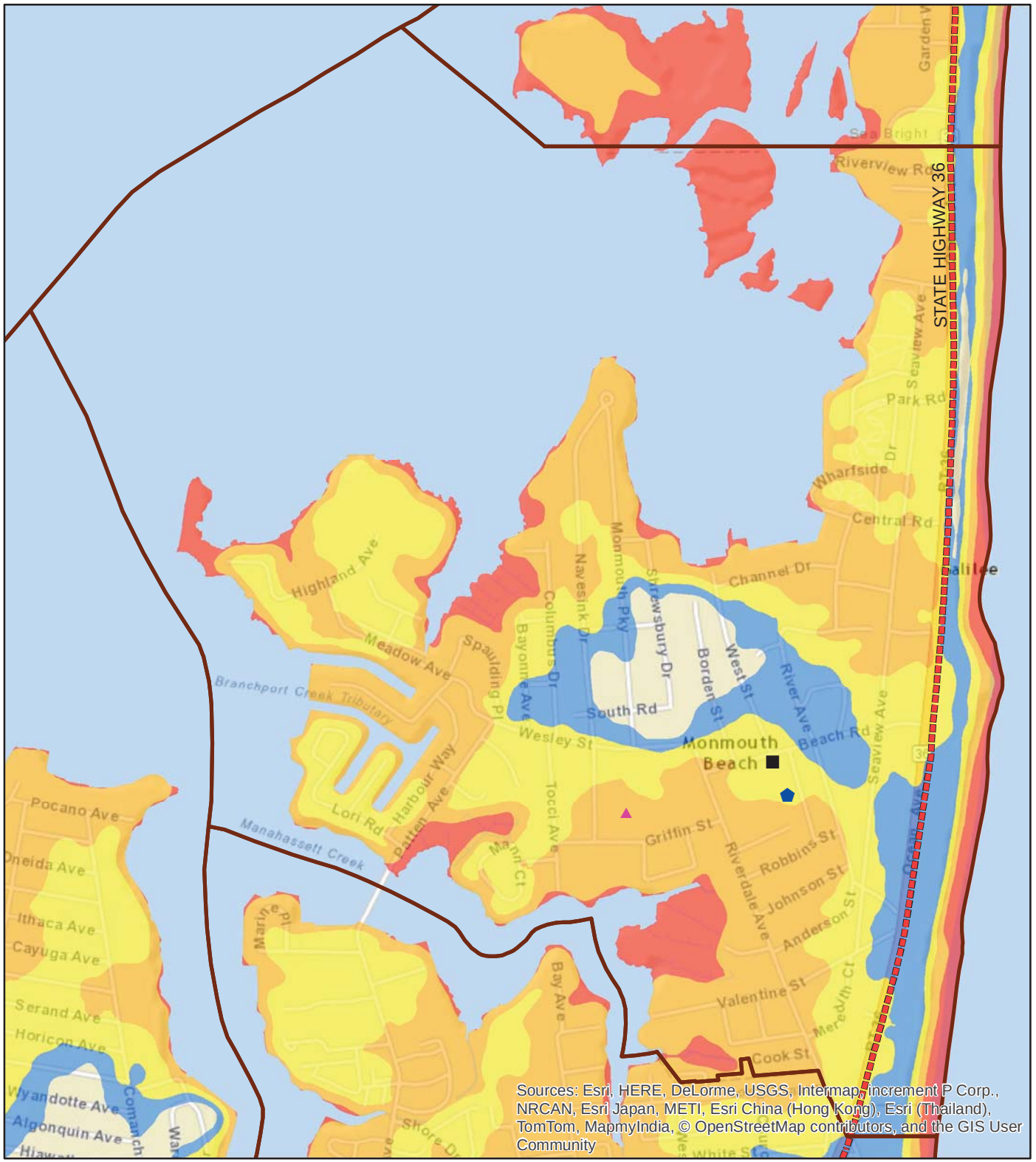
Year 2010 Population: 3279

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.

0 0.125 0.25 0.5 Miles

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

CRSSA



Category 3 SLOSH Model
Monmouth Beach Borough

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

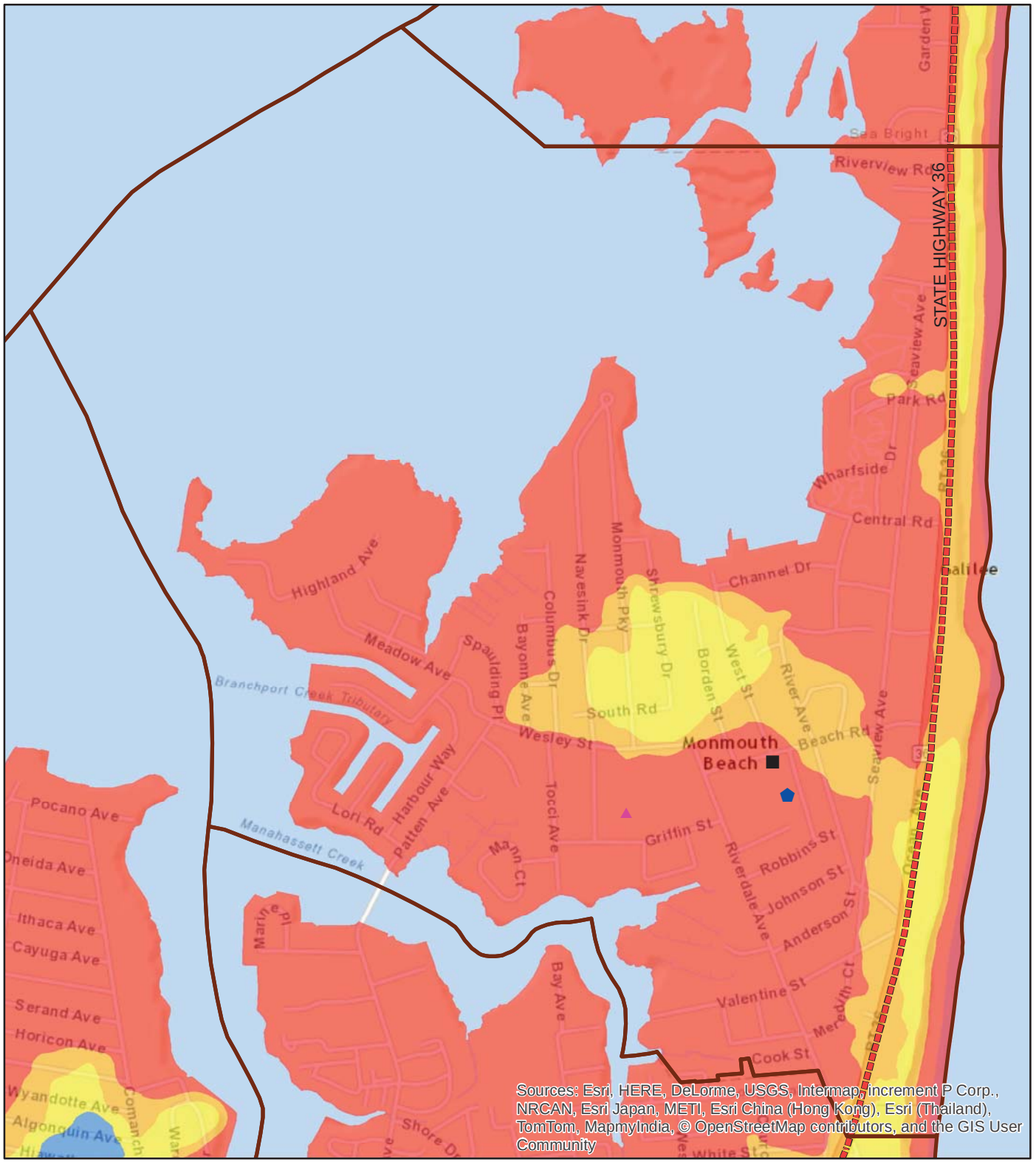
Year 2010 Population: 3279

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.

0 0.125 0.25 0.5 Miles

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

CRSSA



Appendix N: Sea Level Rise Maps

1 Foot of Sea Level Rise
Monmouth Beach Borough

Legend

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

Year 2010 Population: 3279

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.

0 0.15 0.3 0.6 Miles

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

CRSSA

2 Feet of Sea Level Rise
Monmouth Beach Borough

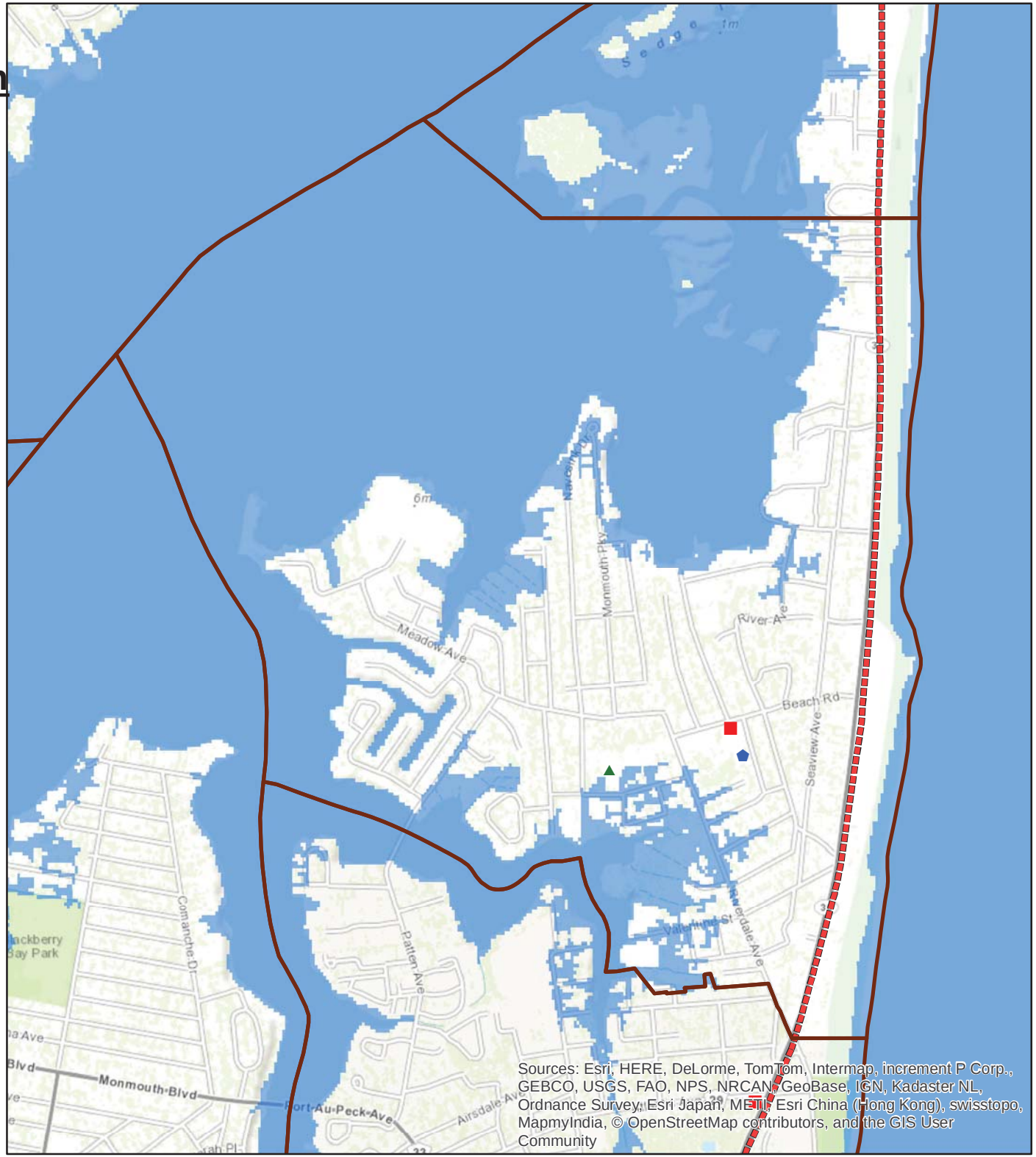
Legend

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

Year 2010 Population: 3279

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.

0 0.15 0.3 0.6 Miles



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

N

CRSSA

3 Feet of Sea Level Rise
Monmouth Beach Borough

Legend

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

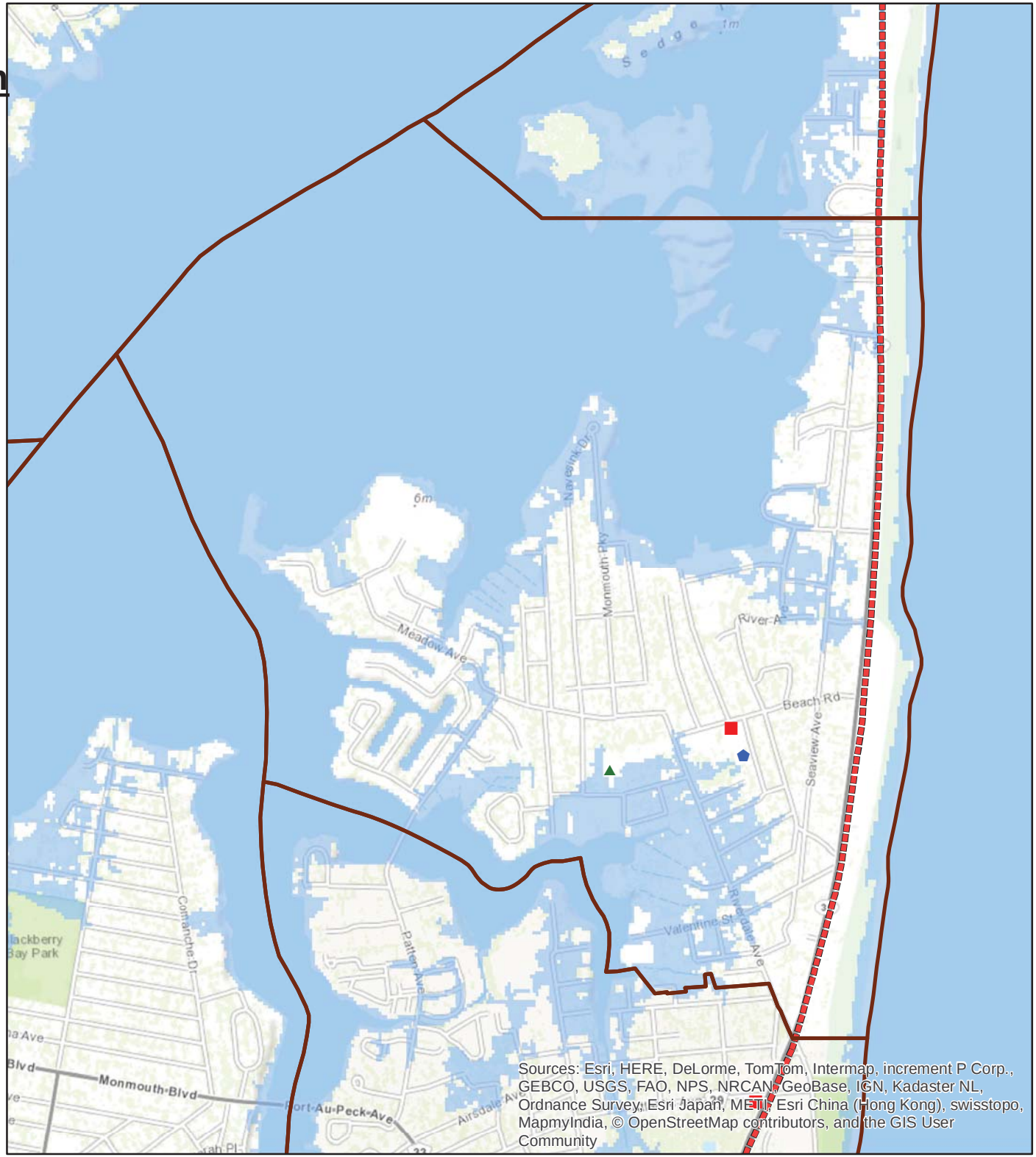
Year 2010 Population: 3279

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.

0 0.15 0.3 0.6 Miles

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

CRSSA



Appendix O: Marsh Retreat Maps

Marsh Retreat at 1 feet of Sea Level Rise Monmouth Beach Borough

Legend

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

Marsh Retreat at 1ft SLR

- Unimpeaded Marsh Retreat Zone
- Impeded Marsh Retreat Zone
- Marsh Conversion: Unconsolidated Shore
- Marsh Conversion: Open Water
- Unchanged Tidal Marsh

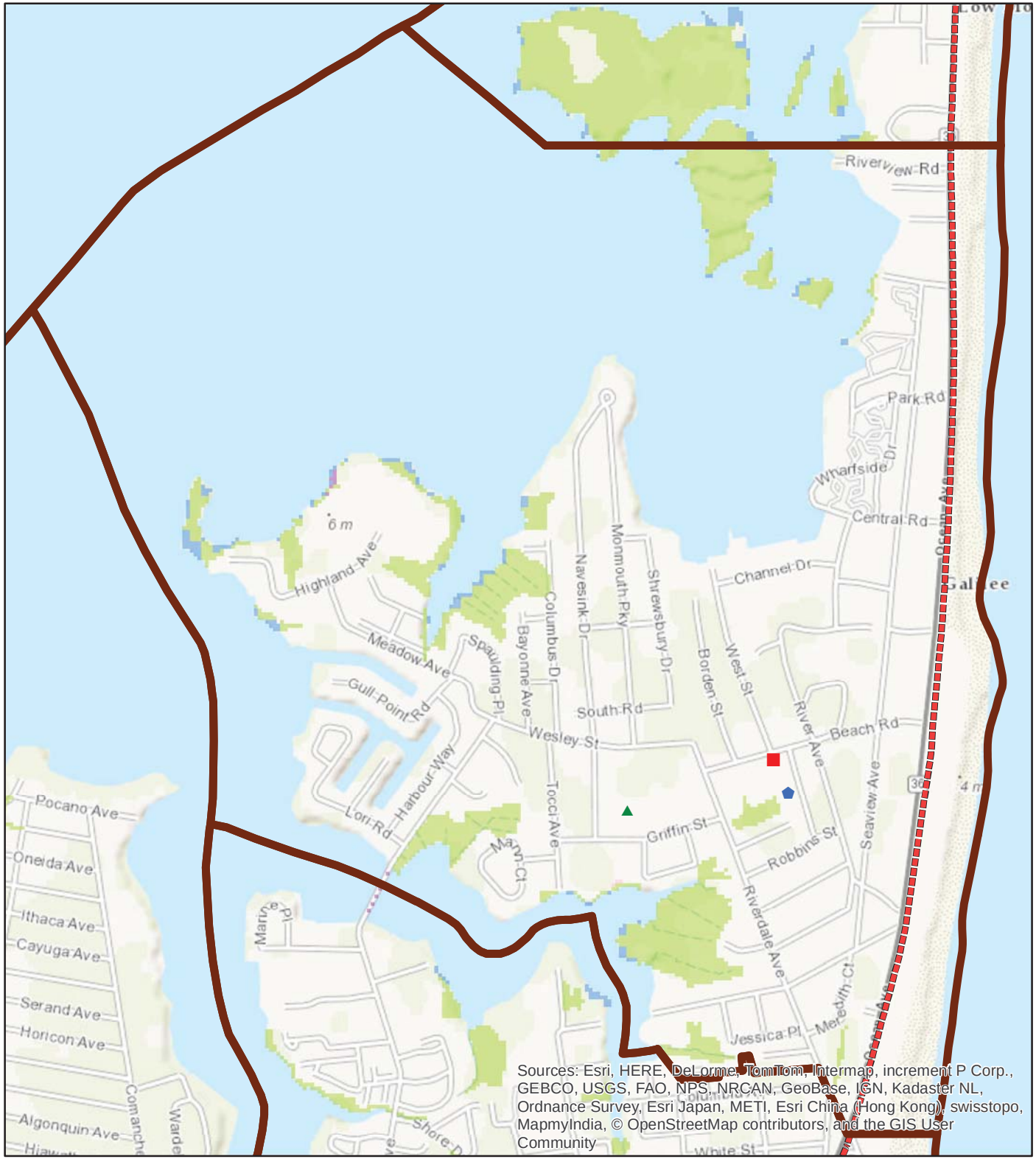
0 0.125 0.25 0.5 Miles

Year 2010 Population: 3279

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 the marsh retreat caused by sea level rise centered on target municipalities.

Map Author: Rachael Sacatelli
Rutgers, New Brunswick
Center for Remote Sensing
and Spatial Analysis

CRSSA



Marsh Retreat at 2 feet of Sea Level Rise Monmouth Beach Borough

Legend

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

Marsh Retreat at 2ft SLR

- Unimpeaded Marsh Retreat Zone
- Impeded Marsh Retreat Zone
- Marsh Conversion: Unconsolidated Shore
- Marsh Conversion: Open Water
- Unchanged Tidal Marsh

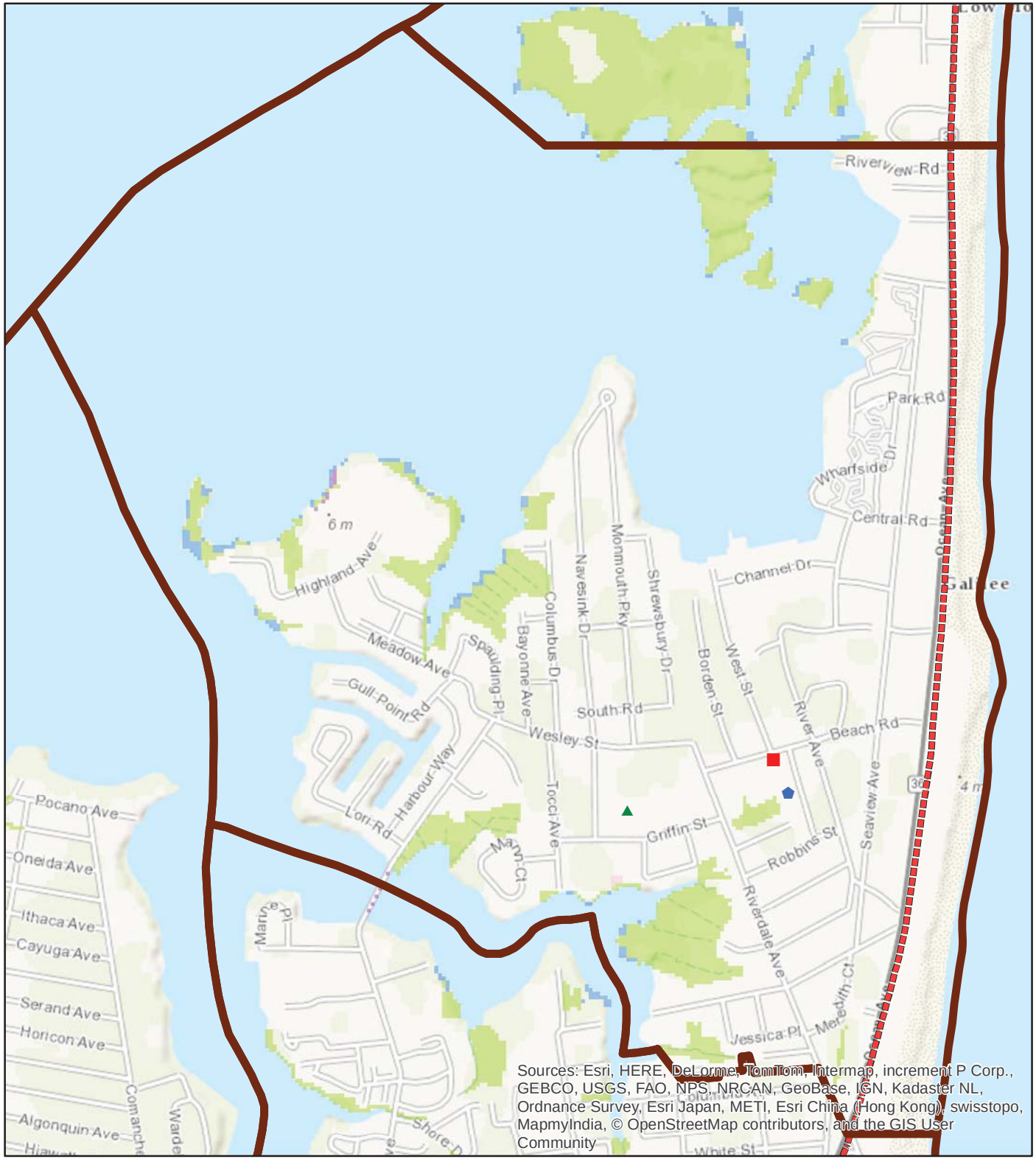
0 0.125 0.25 0.5 Miles

Year 2010 Population: 3279

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 the marsh retreat caused by sea level rise centered on target municipalities.

Map Author: Rachael Sacatelli
Rutgers, New Brunswick
Center for Remote Sensing
and Spatial Analysis

CRSSA



Marsh Retreat at 3 feet of Sea Level Rise Monmouth Beach Borough

Legend

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

Marsh Retreat at 3ft SLR

- Unimpeded Marsh Retreat Zone
- Impeded Marsh Retreat Zone
- Marsh Conversion: Unconsolidated Shore
- Marsh Conversion: Open Water
- Unchanged Tidal Marsh

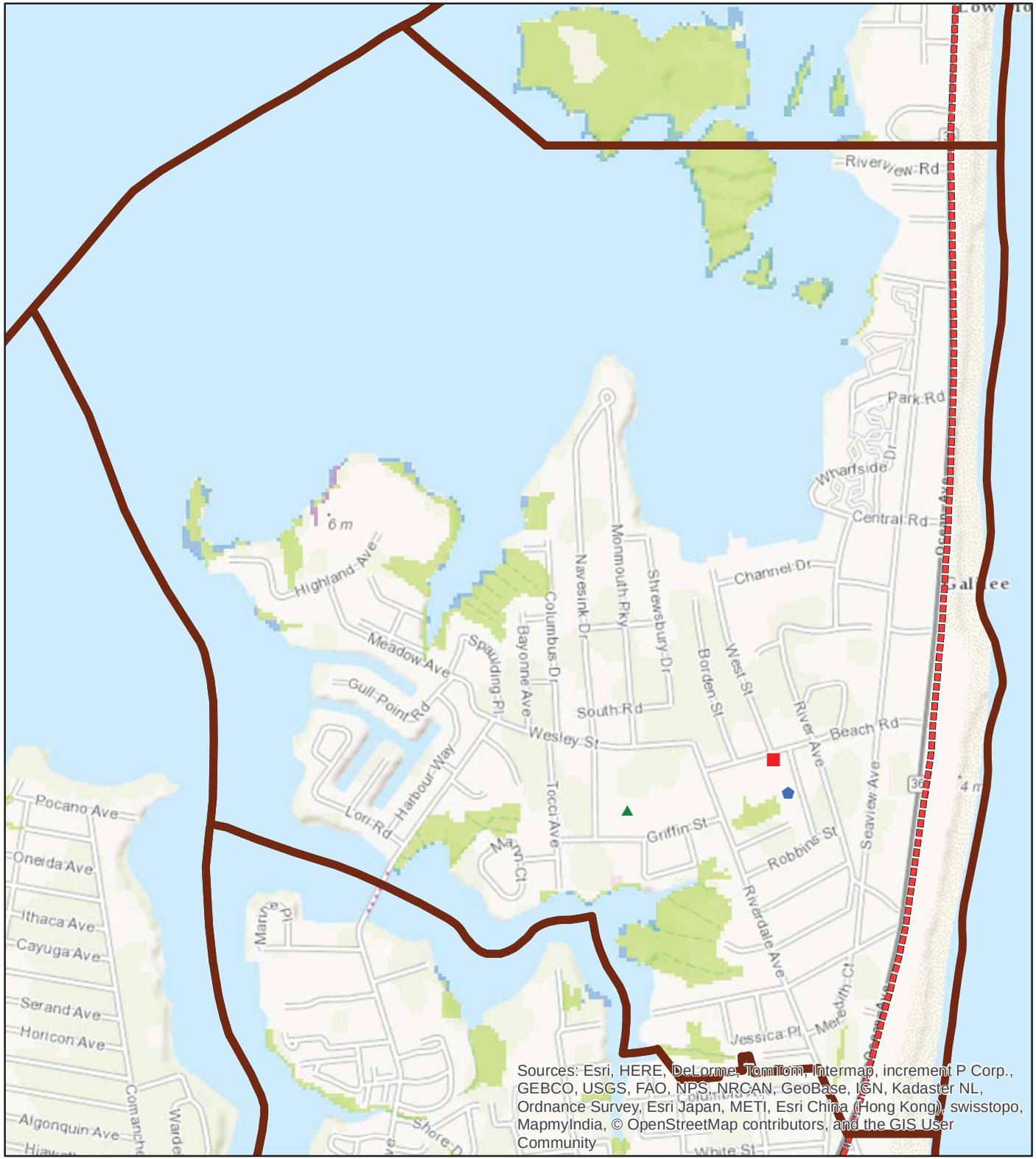
0 0.125 0.25 0.5 Miles

Year 2010 Population: 3279

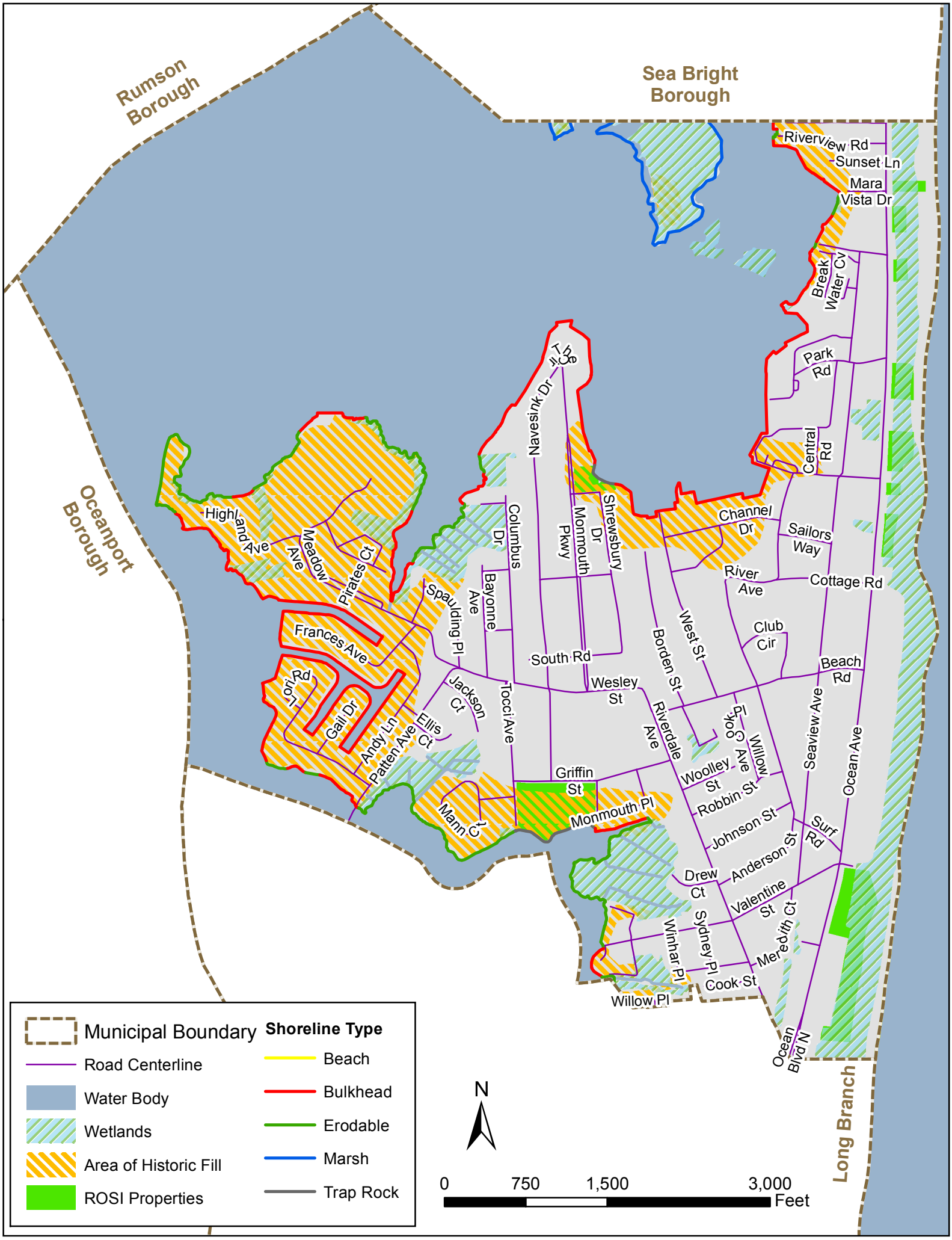
According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts the marsh retreat caused by sea level rise centered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

Map Author: Rachael Sacatelli
Rutgers, New Brunswick
Center for Remote Sensing
and Spatial Analysis

CRSSA



Appendix P: Natural Features Map


Rumson Borough
Sea Bright Borough
Oceanport Borough
Long Branch
Riverview Rd
Sunset Ln
Mara Vista Dr
Break Water Cv
Park Rd
Central Rd
Channel Dr
Sailors Way
River Ave
Cottage Rd
Club Cir
Beach Rd
Seaview Ave
Ocean Ave
Surf Rd
Ocean Blvd N
Navesink Dr
Columbus Dr
Monmouth Pkwy
Shrewsbury Dr
Bayonne Ave
Spaulding Pl
Frances Ave
Pirates Ct
Meadow Ave
Highland Ave
Lori Rd
Gail Dr
Andy Ln
Patten Ave
Ellis Ct
Jackson Ct
Tocci Ave
South Rd
Wesley St
Borden St
West St
Riverdale Ave
Cook Pl
Willow Ave
Griffin St
Monmouth Pl
Mann Ct
Woolley St
Robbin St
Johnson St
Anderson St
Drew Ct
Valentine St
Meredith Ct
Sydney Pl
Winhar Pl
Cook St
Willow Pl
Municipal Boundary
Road Centerline
Water Body
Wetlands
Area of Historic Fill
ROSI Properties
Shoreline Type
Beach
Bulkhead
Erodable
Marsh
Trap Rock
N
0
750
1,500
3,000
Feet

Appendix Q: Resolution Adopting Floodplain Management Plan