

**Repetitive Loss Area Analysis
Brigantine, NJ**



**Prepared by Rutala Associates
April 2020**

Table of Contents

Introduction.....3
Background.....4
Study Methodology, Results, and Analysis.....7
Step 1: Project Notification.....8
Step 2: Planning Coordination and Review.....9
Planning Coordination.....15
Steps 3-5: Documentation and Results.....22
 Area 1: Delmar Court 22
 Area 2: Brigantine Boulevard 23
 Area 3: Bayshore Boulevard..... 24
 Area 4: North End..... 26
 Area 5: Lighthouse District..... 27
 Area 6: Ocean Avenue 29
 Repetitive Loss Area Summary 31
 Current Private Mitigation Projects 31
Recommendations, Alternatives, and Updates.....33
References.....35
Appendix.....36

Table 1: Base Flood Elevations and Transects for Brigantine..... 6
Table 2: Survey Dates 8
Table 3: *Summary of Plans and Ordinances for the City of Brigantine* 12
Table 4: *Brigantine Projects Identified in the Atlantic County Flood Control Study*..... 15
Table 5: Planning Contacts 15
Table 6: Bayshore Boulevard Structure Year of Construction 25
Table 7: Flood Vents..... 32
Table 8: Foundation Type 32
Table 9: Elevation Status 33

Photo 1: Delmar/Lagoon Boulevard Intersection 22
Photo 2: Oceanfront Drainage 30

Introduction

This Repetitive Loss Area Analysis was conducted as part of Brigantine's participation in the Community Rating System to better understand the causes of flooding on the island and determine ways to address future flooding events. The Community Rating System, administered by the Federal Emergency Management Agency, rewards proactive and voluntary floodplain management activities undertaken by the City with discounts on flood insurance premiums. A Repetitive Loss Area Analysis is a creditable activity for the Community Rating System. The repetitive loss area encompasses various sections of Brigantine neighborhoods throughout the island. The areas were determined by the concentration and distribution of repetitive loss properties and properties with substantial historic flood claims.

In 2019, Brigantine completed a Floodplain Management Plan that it adopted in 2020. One of the major recommendations of the Plan was to undertake a Repetitive Loss Area Analysis for its repetitive loss properties. With preliminary survey work completed in 2019, this Repetitive Loss Area Analysis was completed in mid-2020 and is both informed by and incorporates the work of the Floodplain Management Plan.

When an insurable building suffers flood damage with damage claims totaling more than \$1,000 over a given ten-year period, a property becomes a **repetitive loss** property. A **severe repetitive loss** property is one that is covered by the National Flood Insurance Program that has had at least four claim payments over \$5,000 (with a cumulative amount over \$20,000) or had received two separate claim payments for the building with the cumulative amount exceeding the market value of the building. From an actuarial perspective, these buildings are very expensive to insure. Despite comprising less than one percent of all insured properties, severe repetitive loss properties account for over a quarter of flood claims nationwide. Eliminating or mitigating damage to repetitive loss structures is important for ensuring an area's vitality and for reducing the financial burden of flood losses.

Brigantine's repetitive loss areas are marked predominantly by mid-century residential properties that were not constructed to floodplain management standards and have significant exposure to current and future flooding. The concentration of at-risk properties in the neighborhood resulted in the City mapping six areas of concentrated losses as a repetitive **loss area** pursuant to Activity 500 of the Community Rating System. A repetitive loss area includes properties that both are and are not repetitive losses and supports generalized analysis of the neighborhood to protect the confidentiality of individual flood insurance information. A map of the repetitive loss area can be found in Appendices __ of this report.

The Repetitive Loss Area Analysis has followed a five-step process as defined by the *Community Rating System Coordinators Manual (2017)*:

- 1.) Notification of properties in the repetitive loss area via direct mailing.
- 2.) Analyze plans or studies by outside agencies.
- 3.) Perform a site visit of buildings in the repetitive loss area.

- 4.) Review approaches to mitigating flood risk and protecting properties.
- 5.) Document the findings in a report.

Property identifiers such as addresses and pictures of specific buildings in this study have been excluded from the publicly available copy of the report. Addresses and property-specific information can be requested from the City's building office. In addition, this report will be revised annually to reflect any changes in the neighborhood and be available for download from the City's website.

Background

Brigantine is a suburban resort community situated on a barrier island in Atlantic County. The island is situated in the northern section of the South Jersey Coast. Pullen Island – the Jersey Shore's only uninhabited barrier island – is located adjacent to Brigantine to the north. The Little Egg Inlet separates Pullen Island from the Holgate section of Long Beach Island in Ocean County. Atlantic City, Ventnor, Margate, and Longport are located to the south and west of Brigantine on adjacent Absecon Island. A large swathe of wetlands (part of the Absecon Wildlife Management Area and Forsythe National Wildlife Refuge) separates Brigantine from the mainland communities of Absecon and Galloway.

Brigantine was one of the last beachfront Jersey Shore communities to develop. It is the only community that is not directly connected to the mainland by road owing to the challenging topography between the island and the mainland. Initial settlements in Brigantine were located in the vicinity of 10th Street South and the North End. In the late 1800s, a railroad was built between Galloway and Brigantine over the marsh to finally connect Brigantine to the mainland. By the early 1900s, the railroad was damaged and abandoned. The early 1900s saw relatively light development, possibly owing to the lack of a bridge or connection to Brigantine until later in the 1900s. By 1930, Brigantine as it is known today began to take shape, with the Links golf course and North End filled and platted and with Brigantine's grid extending from the North End to 44th Street South. By 1970, owing to the littoral drift of sediment and the construction of a jetty at Absecon Inlet, the southern portion of Brigantine substantially grew in size. This formed the substantial dune system and higher ground seen at the South End of the island.

Over the years, Brigantine has developed into a dense community and remains vulnerable to various types of flooding. In 2019-2020, the City adopted a Floodplain Management Plan to identify and implement strategic priorities with regard to floodplain management. One of the recommendations of that plan was to undertake a Repetitive Loss Area Analysis. The analysis focuses on vulnerabilities to specific properties in neighborhoods where there is a preponderance of vulnerable buildings with historic flood damage.

The floodplain management planning process identified six repetitive loss areas in Brigantine. The repetitive loss areas comprise all of Brigantine's identified repetitive loss properties. These areas are shown on the following map and include the following (discussed in greater detail in the following sections):

- 1) Delmar Court- This area consists of a handful of townhouse properties at the island's South End.
- 2) Brigantine Boulevard- This area is comprised of several residential homes along Atlantic-Brigantine Boulevard.
- 3) Bayshore Boulevard- This area includes structures located along Bayshore Boulevard between the Lighthouse District and the North End.
- 4) North End- This area, Brigantine's largest, includes many residential buildings located in the vicinity of the Links golf course and the School.
- 5) Lighthouse District- This repetitive loss area includes a handful of properties in the vicinity of the Lighthouse Circle.
- 6) Ocean Avenue- The Ocean Avenue Repetitive Loss Area includes properties located on beachfront blocks near the center of the island.

Map 1: Repetitive Loss Areas of Brigantine



The following table is derived from the Flood Insurance Study undertaken for Brigantine in 2014. This identifies the most recent flood data for various locations in the City.

Table 1: Base Flood Elevations and Transects for Brigantine

| Flood Source | Transect | | Starting Wave Conditions for 1% Annual Chance | | Starting Stillwater Elevations Range of Stillwater Elevations (ft NAVD88) | | | |
|----------------|----------|----------------------------------|---|------------------|---|--------------------|----------------------|-----------------------|
| | # | Coordinates | Significant Wave Height | Peak Wave Period | 10% | 2% | 1% | 0.2% |
| Atlantic Ocean | 8 | N 39.437518 W 74.331367 | 11.52 | 13.32 | 7 7.1- 7.0 | 8.6 7.9- 8.6 | 9.5 8.4-9.5 | 12.2 9.7- 12.2 |
| Atlantic Ocean | 9 | N 39.424774 W 74.343753 | 10.12 | 13.38 | 6.7 6.2- 8.3 | 8.5 8-8.8 | 9.3 8.6-9.4 | 12.1 9.9- 12.1 |
| Atlantic Ocean | 10 | N 39.412555 W 74.355625 | 10.27 | 12.74 | 6.6 5.9- 8.3 | 8.6 8-8.8 | 9.5 8.6-9.5 | 12.4 10- 12.4 |
| Atlantic Ocean | 11 | N 39.407162 W 74.360900 | 9.98 | 12.9 | 6.5 6.2- 7.4 | 8.5 8-8.9 | 9.5 8.6-9.8 | 12.4 10- 12.5 |
| Atlantic Ocean | 12 | N 39.400549 W 74.367513 | 10.04 | 12.67 | 6.4 6.2- 7.3 | 8.4 8-8.9 | 9.4 8.6-9.8 | 12.3 10- 12.5 |
| Atlantic Ocean | 13 | N 39.394843 W 74.374633 | 9.56 | 12.45 | 6.3 6.2- 7.6 | 8.4 8-8.9 | 9.3 8.7-9.9 | 12.4 10- 12.8 |
| Atlantic Ocean | 14 | N 39.389310 W 74.382285 | 9.82 | 13.18 | 6.4 6.1-8 | 8.4 8-8.8 | 9.3 8.7-9.7 | 12.4 10- 12.9 |
| Atlantic Ocean | 15 | N 39.382313 W 74.391421 | 10.15 | 12.47 | 6.3 6.2- 8.2 | 8.4 8-8.8 | 9.3 8.6-9.8 | 12.4 10- 13.2 |
| Atlantic Ocean | 16 | N 39.375635 W 74.400483 | 10.48 | 12.55 | 6.2 6.2- 8.3 | 8.4 8-9 | 9.3 8.7- 10.01 | 12.3 10.1- 13.2 |

| Flood Source | Transect | | Starting Wave Conditions for 1% Annual Chance | | Starting Stillwater Elevations Range of Stillwater Elevations (ft NAVD88) | | | |
|---|----------|----------------------------------|---|------------------|---|--------------------|---------------------|--------------------|
| | # | Coordinates | Significant Wave Height | Peak Wave Period | 10% | 2% | 1% | 0.2% |
| St. George's Thorofare | 17 | N 39.393014 W 74.407307 | 2.04 | 2.59 | 6.2 6.2- 7.3 | 8.1 7.8- 8.9 | 8.7 8.4- 10.1 | 10 9.9- 13.3 |
| Bonita Tideway Bay | 18 | N 39.404299 W 74.374859 | 2.74 | 2.78 | 6.2 | 8 | 8.7 8.6-8.8 | 10 10-12 |
| Somers Bay | 19 | N 39.422161 W 74.369806 | 2.11 | 2.33 | 6.2 6.2- 6.7 | 8 8-8.5 | 8.7 8.6-9.3 | 10 10-12 |
| 8- Natural Area (Oceanfront) 9- Natural Area (Oceanfront) 10- North End- 12 th Street (Oceanfront) 11- Roosevelt Boulevard (Oceanfront) 12- 11 th Street South (Oceanfront) 13- 22 nd Street South (Oceanfront) 14- 33 rd Street South (Oceanfront) 15- Rainbow Drive (Oceanfront) 16- Surf Lane (Oceanfront) 17- Between Laurel Way and Gull Cove (Bayfront) 18- 14 th Street South (Bayfront) 19- Somers Bay near Links (Bayfront) Source: 2014 Flood Insurance Study, Atlantic County | | | | | | | | |

Study Methodology, Results, and Analysis

The repetitive loss study was conducted using the five-step process described in the CRS Coordinator’s Manual. These steps include:

- Step 1: Advise all properties of repetitive loss area status.
- Step 2: Contact agencies or organizations that have plans or studies pertaining to flooding. (Completed as part of the Floodplain Management Planning Process)
- Step 3: Visit each building in the repetitive loss area and collect basic information.
- Step 4: Review alternative approaches and determine whether any property protection measures, or drainage improvements are feasible.
- Step 5: Document the findings.

Rutala Associates conducted site visits on the dates listed in the table below. No abnormal tidal conditions were observed during the survey dates.

Table 2: Survey Dates

| Area | Survey Dates |
|------|---|
| 1 | August 7 th , 2019 |
| 2 | August 7 th , 2019 |
| 3 | August 27 th , 2019 |
| 4 | August 7 th , 2019; August 27 th , 2019; August 29 th , 2019; |
| 5 | August 7 th , 2019 |
| 6 | August 7 th , 2019 |

The site visits consisted of taking pictures of identified repetitive loss area properties and documenting the foundation type, whether flood vents were present, and whether mitigation measures were in place. Detailed building information was not available for this study because the Survey did not have access to detailed building data and did not undertake detailed property inspections. Property surveys were limited in detail to what could be obtained visually in the public right-of-way. For a number of properties, ground-level vegetation or building orientation prevented the identification of the presence of flood vents.

The Repetitive Loss Area includes approximately 430 properties. The number of structures was determined based on May 2019 property tax records, the list of unmitigated repetitive loss properties in Brigantine, and a list of per-property flood insurance claims. Twenty properties were found to have no buildings on-site at the time of survey.

Step 1: Project Notification

A notice to property owners notifying them of the analysis and providing an email address to which to send flood-related comments and observations was mailed in late May 2019. An additional mailing comprising an expanded repetitive loss area was mailed in late June 2019. Copies of these notices are found in Appendix 1.

Public Meetings

Meaningful public participation was essential for the planning process. Public meetings were held to disseminate information and to solicit input from community members, as summarized herein.

Meeting Dates:

- June 6, 2019 - Organizational/Kickoff Meeting
- July 11, 2019 - Public Meeting Preparation
- July 30, 2019 - Public Meeting
- August 8, 2019 - Watershed Management Plan Presentation
- September 12, 2019 - US Army Corps/NJDEP Meeting

October 10, 2019 - Review Draft Watershed Management Plan
January 9, 2020 – Review Next Steps/Adoption
January 28, 2020 – Public Meeting
February 19, 2020 – _Anticipated City Council Adoption of Floodplain Management Plan

Public Meeting Notification

Multiple means were used to provide broad public notice of the open house public meetings:

- Notice of all public meetings was posted on Facebook and the City website www.brigantinebeach.org
- Announcements were made at the City Council meetings that are televised.
- Press releases were distributed to the media announcing meeting times and locations.
- Flyers were developed and distributed throughout the community.

Public Meeting Format

The public meeting format allowed attendees to examine maps and handouts and have direct conversations with project staff. Reasons for planning and information generated for the risk assessment were shared with attendees via a PowerPoint presentation. Mapping of Superstorm Sandy impacts, sea level rise, and repetitive loss areas was presented. Each citizen attending the open houses was asked to complete a survey, and each attendee was given an opportunity to provide written comments to the Floodplain Management Committee.

Step 2: Planning Coordination and Review

NFIP- Community Rating System

The City's records show that there were 87 repetitive-loss (RL) properties in Brigantine in 2018, this is down from 158 RL properties in 2016. A property is considered a repetitive-loss property when there are two or more losses reported that were paid more than \$1,000 for each loss. The two losses must be within 10 years of each other and be at least 10 days apart. Only losses from January 1, 1978 that are closed are considered.

The City has been actively involved in the NFIP's Community Rating System and is a statewide leader. The City currently has a Class 5 rating, which provides for a 25 percent discount on flood insurance. More than 1,200 communities nationwide, including 61 in New Jersey, participate in the CRS. Only a dozen communities are in Class 5, the highest ranking for any community in the State of New Jersey. Currently only Roseville, California is in Class 1 which receives a 45 percent insurance discount.

The CRS recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards. In addition to the benefit of reduced insurance rates, CRS floodplain management activities enhance public safety, reduce damage to property and public infrastructure, avoid economic disruption and losses, reduce human suffering and protect the environment. Participating in the CRS provides an incentive to maintain and improve a community's floodplain management program over the years. Implementing some CRS activities can help projects qualify for certain other federal assistance programs. Participating communities can earn credit for undertaking a variety of flood-reduction measures, including preserving open space, mandating that buildings in flood zones be elevated higher than FEMA requires, and incorporating predictions of future sea-level rise into their regulatory maps. Overall, creditable activities are grouped into four categories: public information, mapping and regulations, flood damage reduction, and warning and response. Different amounts of points are awarded for different measures, as explained in the FEMA manual.

US Army Corps of Engineers Involvement

Shore Protection

Throughout the Jersey Shore, the US Army Corps, NJDEP Division of Coastal Engineering, and local municipalities partner for periodic beach replenishments. In this process, sand is pumped from offshore locations onto eroding coastlines and is graded to meet a design height. After the initial beachfill, the project is maintained cyclically. Dunes have been effective in protecting property on the landward side of the dune and for re-creating the typical barrier island habitat and its inherent shore protection qualities.

Brigantine does not currently receive beach replenishments. The southward littoral current has caused sand to accumulate at the Absecon Inlet seawall, giving Brigantine robust and wide dunes particularly towards the southern end of the island. However, the north end of the island (particularly north of 8th Street) has seen continual erosion. The north end of the island in the Natural Area has much more dynamic geomorphology owing to the lack of a human-maintained system.

The Army Corps constructed a seawall between 9th Street North and 15th Street North during the 1990s. The project was funded by a partnership between the Army Corps, NJDEP Shore Protection Fund, and the City of Brigantine. The City is currently seeking a northern extension of the seawall by approximately 275 feet.

Back Bay Study

The Army Corps of Engineers is currently undertaking a study to reduce flooding resulting from storm events in the back-bay areas of the Jersey Shore, including Brigantine. According to the Army Corps, the following efforts will be undertaken:

- *Assess the study area's problems, opportunities and future without project conditions;*

- *Assess the feasibility of implementing system-wide coastal storm risk management solutions such as policy/programmatic strategies, storm surge barriers at selected inlet entrances, or tidal gates at selected lagoon entrances;*
- *Assess the feasibility of implementing site-specific perimeter solutions such as a combination of structural, non-structural, and natural and nature-based features;*
- *Assess the impacts of back bay strategies and solutions on the Atlantic Coast Coastal Storm Risk Management Program towards developing recommendations within a systems context given likely future scenarios.*

An interim report was released in 2019 and serves as a first step towards achieving an engineering solution, project selection, and funding. Efforts being studied currently include nature-based features, floodwalls, storm surge barriers, and non-structural measures such as elevating structures. Environmental concerns and logistical challenges may prevent storm surge barriers in the back-bay areas located north of the City, which indicates that non-structural or smaller-scale solutions may be more feasible for Brigantine specifically. The Plan is currently under development at the time of this Plan's drafting and the City will continually monitor the Army Corps' efforts.

State Coastal Engineering Project/Shore Protection Program

The New Jersey Department of Environmental Protection holds significant influence in Brigantine for its administration of coastal engineering projects/Shore Protection Program and its regulation of coastal areas through permitting and land use. Brigantine is within the State of New Jersey's CAFRA (Coastal Area Facility Review Act) Zone, which includes regulations for a variety of developments in the coastal zone. The state also regulates coastal wetlands, waterfront development, and provides consistency determinations for federally funded projects. The NJDEP also undertakes shore protection projects such as beach nourishment and construction/maintenance of shore protection structures throughout the State. For example, the NJDEP assisted with the construction of the seawall located at the North End.

The New Jersey Department of Environmental Protection is currently undertaking a Coastal Resilience Plan to serve as a guide for future investment in mitigation projects. According to the Department, the plan will function as follows:

The DEP will develop a Coastal Resilience Plan and tools to move New Jersey forward in preparing for sea-level rise and coastal storms. The plan will evaluate policies, programs, and regulations that must be modified or created to reduce risk, increase coordination across and within agencies, improve awareness and support local municipalities in achieving adaptation. It will identify existing and new strategies that will reduce physical, economic, and social risk to flood events, enhance state and local capabilities, and encourage innovative solutions to the complex challenges of rising sea levels. The plan will not prescribe projects for every reach of the shoreline but is intended as a first step to put New Jersey on a path to resilience. The plan will focus on four primary goals:

- *reduce risk from flooding in the coastal zone*
- *improve awareness and understanding of coastal hazards*
- *create consistent guidance for resilience and adaptation*
- *make adaptation easier*

The Coastal Resilience Plan is currently under development as of the time of this Analysis’s drafting.

Local Flood Protection Efforts

The purpose of this review is to present the findings of a review of the City’s planning reports and appropriate development ordinances to identify what Brigantine either has done or proposes to do to address flood hazards. The materials reviewed were:

- City of Brigantine 2010 Master Plan (adopted February 2011)
- Brigantine Beach Bicycle and Pedestrian Master Plan (October 2013)
- Floodplain Damage Prevention (Chapter 181 of the Code of the City of Brigantine)
- Land Use Regulations (Chapter 198 of Code of the City of Brigantine)
- Stormwater Control (Chapter 258 of the Code of the City of Brigantine)
- NFIP Community Rating System
- Atlantic County Multi-Hazard Mitigation Plan
- The Community Plan Checklist includes a list of municipal documents that may be helpful in developing a Strategic Recovery Planning Report.

Table 3: Summary of Plans and Ordinances for the City of Brigantine

| Plans, Ordinances, and Codes | Yes | No | Adopted Year | Update Frequency |
|-------------------------------------|------------|-----------|---------------------|-------------------------|
| Municipal Master Reexamination | x | | 2016 | 6 to 10 years |
| Vision Plan | | x | | |
| All-Hazard Mitigation Plan | x | | | County Adopted |
| Floodplain Management Plan | x | | 2013 | |
| Evacuation Plan | x | | | |
| Emergency Response Plan | x | | 1981 | |
| Long Term CIP | | x | | 5 Year Plan Prepared |
| Post-Disaster Recovery Plan | | x | | |

| Plans, Ordinances, and Codes | Yes | No | Adopted Year | Update Frequency |
|--|------------|-----------|---------------------|-------------------------|
| Economic Development Plan | | x | | |
| Open Space Plan | | x | | |
| Stormwater Management Plan | x | | | Update Frequency |
| Historic Preservation Plan | | x | | |
| Zoning Ordinance | x | | 1999 | As Needed |
| Subdivision Ordinance | x | | 2011 | As Needed |
| Building Code | x | | 1980 | |
| NFIP Flood Damage Prevention Ordinance | x | | 2012 | |
| Cumulative Substantial Damage | | x | | |
| Greater than One Foot Freeboard | x | | 2012 | |
| Bulkhead Ordinance | | | | |

Development Regulations

The Code of the City of Brigantine includes several chapters that contribute to the control and regulation of flood hazards. These include Land Use Regulation (LUR) (Chapter 198), Flooding Damage Protection (Chapter 181) and Stormwater Control (Chapter 258).

The common methods typically found in development regulations to address and/or minimize flood hazards include how building height is defined, building/lot coverage and stormwater management requirements.

The Land Use Regulations define “building height” as being measured from a point two feet above the base flood elevation applicable to the property. While the City has taken the step to create a significant freeboard area, this needs to be coordinated with the Flood Damage Protection ordinance as that chapter of the Code sets the lowest finished floor elevation for residential structures at six-tenths of a foot (0.6 foot) above base flood elevation.

The amount of impervious coverage (both building and lot coverage) allowed in the LUR varies depending on the zoning district and type of development. In one- and two-family residential districts, up to 60 percent impervious coverage is permitted, while a maximum 75 percent impervious coverage is allowed in non-residential zones. The Land Use Regulation does not require stormwater review for residential development on existing lots.

In addition to establishing the minimum floor elevation for structures, the Flood Damage Protection ordinance also incorporates regulations requiring structures to be brought into compliance if they are subject to substantial damage or undergo substantial improvement. Substantial damage is defined as the cost for restoring a structure to pre-damage condition being equal to or greater than 50 percent of the pre-damage market value. Substantial improvement is defined as any improvement the cost of which exceeds 50 percent of the pre-improvement market value of the structure. The substantial improvement definition is limited in that it requires consideration only of an application that is currently submitted to the Construction Official and does not take into consideration the cumulative value of a series of improvements made to a structure over a period of years.

The development regulations include design requirements for stormwater control and stormwater management systems, which are intended to avoid increases in stormwater runoff from new development. It should be noted that stormwater management systems requirements do not apply to single- and two-family residential construction that is not part of a major subdivision. The following recommendations should be considered:

- Reduction of the amount of impervious surface that is permitted on development sites, particularly for individual one- and two family dwellings, in order to lessen stormwater runoff and help reduce ponding and urban flooding.
- Amending the Flood Damage Prevention ordinance so that the minimum finished floor elevation in residential structures is at least two feet above BFE and is consistent with the building height definition in the Land Use Regulations.
- Amending the Flood Damage Prevention ordinance by:
 - Changing the definition of substantial damage to reduce the threshold percentage to 40 percent of the pre-damage market value.
 - Changing the definition of substantial improvement to reduce the threshold improvement value to 40 percent of the pre-improvement market value and required the consideration of all improvements undertaken during a “look back” period (e.g. 5 years).

Atlantic County Multi-Hazard Mitigation Plan 2005

Mitigation plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce damage to lives, property and the economy from future disasters. Hazard mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards.

Atlantic County Flood Control Study 2007

The Atlantic County Flood Hazard Inventory identifies recurring flooded roadways. Each flood hazard mitigation project identified in this study is given a score of up to 100 points based on three major criteria: emergency travel factors – whether it is a major evacuation

route (45 possible points); daily travel factors – traffic counts, population served, etc.; and cost-effectiveness feasibility–estimated cost/traffic volumes.

Table 4: Brigantine Projects Identified in the Atlantic County Flood Control Study

| Road | Score | Cost | Description |
|------------------|--------------|--------------|--|
| Brigantine Blvd. | 75 | \$22,000,000 | Raise road elevation |
| Hackney Place | 64 | \$3,750 | Install check valve |
| Bayshore Avenue | 55 | \$439,717 | Raise road elevation |
| Twelfth Street | 54 | \$1,195,430 | Raise road elevation |
| Sheridan Avenue | 54 | \$300,000 | Pump at Caverly Dr. /Sheridan Boulevard |
| Evans Boulevard | 47 | \$1,080,000 | 1800 LF to bay at 12 th Street North |
| Lafayette Blvd. | 46 | \$1,140,000 | 1900 LF to bay at 6 th St. South street end |
| Sarazan Drive | 43 | \$480,000 | Connect to pump section on Sheridan Ave. |

Planning Coordination

A significant amount of public outreach was undertaken for the Floodplain Management Plan and Repetitive Loss Area Analysis. In addition to public meetings and planning committee meetings, the planning team engaged a number of agencies to determine their interest and activities in Brigantine vis-à-vis floodplain management. A number of these agencies responded and provided useful guidance and information for the project.

All e-mails exchanged with this planning process are attached as an Appendix to the Floodplain Management Plan. The table below summarizes the extent of contact between the Planning Team and outside agencies.

Table 5: Planning Contacts

| Agency | Contact | Contact Dates (Phone/Email) | Notes |
|----------------------------------|---|---|---|
| <i>American Littoral Society</i> | Tim Dillingham Executive Director 732-291-0055 tim@littoralsociety.org | E-Mail sent to Agency on June 24, 2019. No response received. | |
| <i>American Red Cross</i> | Carol Cohen Executive Director 609-646-8330 | E-mail | The American Red Cross is not undertaking mitigation projects but is participating in |

| Agency | Contact | Contact Dates (Phone/Email) | Notes |
|--|---|---|---|
| <i>South Jersey</i> | <i>carol.cohen@redcross.org</i> | | preparedness training and offers programming related to disaster response. |
| <i>Atlantic City Electric Company</i> | <u><i>ACBrigReliability@exeloncorp.com</i></u> | E-Mail: Response June 24, 2019 | ACEC is planning a new substation at Harbor Beach and is submitting for Planning Board review in the fall. ACEC can provide building specifications once submitted for review. The substation will conform to the City's flood ordinance. |
| <i>Atlantic County Department of Regional Planning</i> | <i>John Peterson Department Head (609) 645-5898 peterson_john@aclink.org.</i> | E-Mail: Response June 24, 2019 | Atlantic County does not have plans for resilience projects but is interested in participating in planning efforts and attending floodplain management meetings. The County asked to be included in announcements and invitations. |
| <i>Atlantic County-OEM</i> | <i>Vincent J. Jones III Director (609) 407-6742 jones_vincent@aclink.org</i> | E-Mail sent to Agency on June 24, 2019. No response received. | |
| <i>Brigantine Green Team</i> | <i>brigantinebeachgreenteam@outlook.com</i> | E-Mail sent to Agency on June 24, 2019. No response received. | |
| <i>Builders League of South Jersey</i> | <i>Richard S. Van Osten Executive Vice President <u>856.616.8460</u> <u>rick@blsj.com</u></i> | E-Mail sent to Agency on June 24, 2019. No response received. | |
| <i>Cape Atlantic Conservation District</i> | <i>David Reilly, District Manager (609) 625-3144 davidreilly@capeatlantic.org</i> | E-Mail sent to Agency on June 24, 2019. No response received. | |

| Agency | Contact | Contact Dates (Phone/Email) | Notes |
|--|---|--|---|
| <i>City of Atlantic City</i> | Barbara Wooley-Dillon Direct of Planning and Development | E-Mail sent to Agency on June 24,2019. No response received. | |
| <i>Comcast</i> | Robert Clifton Director of Government and Community Affairs robert.clifton@comcast.net | E-Mail sent to Agency on June 24,2019. No response received. | |
| <i>FEMA-Region 2</i> | Michael Moriarty Direction, Region II Mitigation (347) 838-0427 michael.moriarty@dhs.gov | E-Mail sent to Agency on June 24,2019. No response received. | |
| <i>Jacques Cousteau NERR</i> | Michael P. De Luca Reserve Manager 848-932-3474 deluca@marine.rutgers.edu | E-Mail | JCNERR offers the NJFloodmapper.org tool to examine current and future flood hazards and includes GIS layers that show critical facilities, social vulnerability, etc. JCNERR also offers a Coastal Training Program that has trainings, webinars, and workshops throughout the year to provide continuing education. JCNERR also offers direct technical assistance. |
| <i>National Oceanic Atmospheric Administration</i> | Darlene Finch, Mid-Atlantic Regional Lead Betsy Nicholson Mid-Atlantic Sub-Region Office for Coastal Management 617-869-9148, betsy.nicholson@noaa.gov | E-mail | NOAA provides data, tools, training, and information that supports coastal management efforts. NOAA also directed the City to visit the NOAA Digital Coast website. |
| <i>National Weather Service</i> | Dean Iovino Coastal Flooding Program Leader Jason Franklin | E-mail | The National Weather Service issues Coastal Flood Warnings, Watches, and Advisories for Atlantic |

| Agency | Contact | Contact Dates (Phone/Email) | Notes |
|---|--|--|---|
| | Meteorologist-in-Charge jason.franklin@noaa.gov 609-261-6600 | | County. NWS has developed a correlation between water levels at the Atlantic City tide gauges and the magnitude of tidal flooding in Brigantine. NWS has 20 years of data with regard to water levels and flooding reports. |
| <i>NJ Department of Community Affairs</i> | Nancy B. Diehl Sandy Recovery Division Nancy.diehl@dca.nj.gov (609) 633 2806 | E-mail | DCA has provide funding for a variety of projects in Brigantine through the federal CDBG-Disaster Recovery program. Projects included Local Planning Services Grants, Debris Removal, streetscape improvements, and various public services. |
| <i>NJDEP Climate and Flood Resilience</i> | Dave Rosenblatt Assistant Commissioner/Chief Resilience Officer 609.292.9236 Dave.Rosenblatt@dep.nj.gov | In-Person | Representatives from the Bureau of Flood Resilience met with the Army Corps and Floodplain Management Planning Committee on 12 September 2019. The DEP briefly discussed its coastal resilience plan and issues surrounding the financing of protection projects. |
| <i>NJDEP-Coastal Management Program</i> | Kimberly Springer Office of Policy and Coastal Management Kim.Springer@dep.nj.gov 609-292-2178 | E-Mail sent to Agency on June 24,2019. No response received. | |
| <i>NJDEP-Natural and Historical Resources</i> | Raymond Bukowski Assistant Commissioner Ray.Bukowski@dep.nj.gov 609-292-3541 | E-Mail | The Natural and Historical Resources division manages property in and around the City as a Natural Area and Wildlife Management Area. The properties are maintained in a natural state. |
| <i>NJDEP-NFIP</i> | John H. Moyle, PE State NFIP Coordinator | E-Mail sent to Agency on June | |

| Agency | Contact | Contact Dates (Phone/Email) | Notes |
|--|--|--|---|
| <i>Coordinator</i> | (609) 292-2296 <i>John.Moyle@dep.nj.gov</i> | 24,2019. No response received. | |
| <i>NJDOT</i> | Genevieve Clifton Program Manager- Office of Maritime Resources | E-Mail | The Office of Maritime Resources is interested in being a part of discussions should the City wish to pursue reuse of dredge material. |
| <i>NJOEM</i> | Chris Testa Mitigation Unit Manager 609-508-6557 <i>lpptestc@gw.njsp.org</i> | E-mail | NJOEM directed the City to consult with the State and County Hazard Mitigation Plans. |
| <i>South Jersey Gas</i> | Lauren Hurtt Supervisor, Public Affairs (609) 561-9000 ext. 4181 <i>lhurtt@sjindustries.com</i> | E-Mail sent to Agency on June 24,2019. No response received. | |
| <i>Stockton University Coastal Research Center</i> | Dr. Stewart Farrell Director, Stockton University CRC Stewart.farrell@stockton.edu | E-mail | Stockton CRC provided a list of projects that it has assisted the City with completing. This includes beach profiles, project design, the drafting of the City's Watershed Management Plan, nuisance flood studies, and similar projects. |
| <i>South Jersey Transportation Planning Organization</i> | Jennifer Marandino Executive Director jmarandino@sjtpo.org 856-794-1941 | E-mail | SJTPO encouraged Brigantine to contact John Peterson at Atlantic County and copied David Heller, the program manager for resiliency and other environmental efforts at SJTPO. |
| <i>US Army Corps – Philadelphia District</i> | J. Bailey Smith NJ Back Bay CSRP Project Manager Steve Rochette 215-656-6432 stephen.rochette@usace.army.mil | In-Person | J. Bailey Smith, who manages the Corps' Back Bay Coastal Storm Risk Management Study, met with the DEP and Floodplain Management Planning Committee on 12 September 2019. Smith |

| Agency | Contact | Contact Dates (Phone/Email) | Notes |
|--|--|--|---|
| | | | briefly reviewed the Study project and outlined various conditions and factors determining how the project will advance. The Army Corps requested more information about the City’s mitigation efforts. Committee members expressed concern about the efficacy of proposed projects such as floodwalls and tide gates in preventing flooding. |
| <i>US Fish and Wildlife Service</i> | Steve Mars Senior Fish and Wildlife Biologist Steve_Mars@fws.gov 609-646-9310x5267 | | The US Fish and Wildlife Service reported that it had no actions that would impact flooding or resiliency in the City. |
| <i>USDA-Natural Resources Conservation Service</i> | Hilary Trotman Civil Engineer (856) 205-1225, ext. 3 hilary.trotman@nj.usda.gov | E-Mail sent to Agency on June 24,2019. No response received. | |

In addition to these public agencies, information was collected via email from residents and property owners. Surveys were also distributed to attendees at the public meetings and were available on the City’s floodplain management website. This correspondence is not attached to this Appendix in order to protect the privacy of those who have contacted the Planning Team. Property-specific information was masked and re-characterized to help protect privacy. A summary of these comments is provided below:

E-mail Contributions

- One recent resident described flooding occurring in the vicinity of 30th Street and Bayshore Avenue during extreme high tides. This contributed to traffic issues observed at Bayshore Avenue. The resident recommended bulkheads with “back flow capabilities” owing to the observation that water comes into the streets via sewer grates near the bulkhead (rather than overtopping). The resident advocated for working with the new owners of an adjacent waterfront building to coordinate bulkhead replacement.
- A resident noted possible non-compliance with the City’s bulkhead ordinance in which the resident observed bulkhead cut-outs at least two properties (one at the 800

block of Bayshore Avenue and another in the vicinity of Sheridan and 8th Street South) that appear to allow flood waters to enter into the neighborhood.

- A resident volunteered information that no flood damage was claimed at the respondent's house in the Lighthouse District (36th Street South).
- A resident provided notice of a vacant lot at 28th Street and the bay and 26th Street Beach that may be contributing to flooding.

Survey Contributions

- A resident provided notice of garage flooding at respondent property in The Links neighborhood on the landward side of North Shore Drive. The respondent noted that heavy rains and high tides at the bay create street flooding and that wakes from vehicles are a concern.
- A resident asked the City to require bulkheads of sufficient heights on all waterfront properties.
- A resident in the 400 block of 36th Street South noted that street flooding is experienced with any amount of rain.
- A resident in the 300 block of 18th Street South noted that the street floods during heavy downpours.
- A resident identified the need for funding to be able to finish the respondent's house and personal financial difficulties (presumably related to flooding damage). Various residents were interested in learning about grants and other opportunities for elevation and floodproofing.
- A resident noted that the corner of the 20th Street South and Brigantine Avenue floods during heavy rains and is getting worse.

Steps 3-5: Documentation and Results

Area 1: Delmar Court

Existing Conditions

Delmar Drive repetitive loss area consists of attached townhomes that have not been elevated and are built at-grade or close to it.

The land under these properties ranges between 7.5 and 8 feet. Driveways slope downward to Delmar Drive, which has an elevation of approximately 6 feet directly in front of the houses. Heading west along Delmar Drive, the street slopes downward somewhat, reaching an elevation of 5.0 feet near the intersection with Lagoon Boulevard. Though Lagoon Boulevard has a slightly higher elevation in the median (7.0 feet), the lands on the western side are wetlands that have ground elevations of two feet. No bulkheads are present to prevent floodwaters from entering.

Photo 1: Delmar/Lagoon Boulevard Intersection



Mitigation Projects

Preventive actions: The land opposite the repetitive loss area is privately owned by undevelopable. Due to the density and number of exposed properties, open space acquisition is not a feasible mitigation option at this time.

Property protection: Because the subject properties are attached structures, individual structure mitigation will be logistically challenging. Property elevation and floodproofing should be considered that takes into account these unique circumstances.

Natural resource protection: The Repetitive Loss Area is fully developed. The ecological uplift of the marshes adjacent to the Area should be considered to enhance wave attenuation and ecosystem benefits.

Emergency Services: This neighborhood is and will remain covered by city-wide emergency service activities.

Structural Projects: Structural protection – such as the transformation of Lagoon Boulevard into a protective berm – should be considered to provide a more complete ring of protection for this neighborhood.

Public Information: This neighborhood is and will remain covered by city-wide public information activities.

Action Items

- Explore the potential for a flood wall or berm preventing floodwaters from entering the neighborhood.
- Explore solutions for the floodproofing of attached residential structures.

Area 2: Brigantine Boulevard

Existing Conditions

Atlantic-Brigantine Boulevard was constructed on fill circa 1920-1930 in conjunction with the bridge connection to Atlantic City. Properties along the route were sold and privately developed, resulting in a string of residential and commercial properties along the Boulevard heading into Brigantine.

Brigantine Boulevard has an elevation ranging from 6 feet at its edges to seven feet near the median. Driveways for these properties slope upwards to elevations between 7 and 8 feet. Elevation remains mostly level to the rear bulkhead areas. Brigantine's bulkhead ordinance (§127-1) requires beachfront bulkheads of 11 feet MSL and 9 feet MSL in all other areas. This repetitive loss area consists of three properties located at the intersection of Laurel Way and Brigantine Boulevard.

Flooding in this neighborhood appears to be due to the overtopping of the rear bulkheads or inundation at areas where bulkheads are not present. Widespread overtopping and inundation appears to only occur during exceptional storm events, though some low-lying areas may be impacted during lunar tides. Though they were not directly visible to be measured for this study, a visual inspection from either side of the property indicates that bulkheads appear to be near grade (7 feet) for the edge properties.

Mitigation Projects

Preventive actions: The land opposite the repetitive loss area is privately owned by undevelopable. Due to the density and number of exposed properties, open space acquisition is not a feasible mitigation option at this time.

Property protection: Private mitigation of residential properties – particularly elevation – is likely the most cost-effective method to prevent future flood losses in this neighborhood.

Natural resource protection: The Repetitive Loss Area is fully developed. The ecological uplift of the marshes in the waterways adjacent to the Area should be considered to enhance wave attenuation and ecosystem benefits.

Emergency Services: This neighborhood is and will remain covered by city-wide emergency service activities.

Structural Projects: Atlantic-Brigantine Boulevard was identified for potential elevation in the 2019 Floodplain Management Plan. However, cost and jurisdictional issues may prevent such an elevation from happening for a number of years. Additionally, any road elevation will need to address flooding runoff onto adjacent properties. Bulkhead improvements may be impactful in preventing some degree of flooding; however, the fractal ownership of bulkheads currently prevents a comprehensive bulkhead construction/installation project from being undertaken.

Public Information: This neighborhood is and will remain covered by city-wide public information activities.

Action Items

- Encourage bayfront property owners to install compliant bulkheads
- Undertake floodproofing (including elevation) for properties that are not elevated.

Area 3: Bayshore Boulevard

Existing Conditions

Bayshore Boulevard includes low-lying lands along the street in the middle of the island. The area is desirable for its waterfront access and low traffic. However, the low-lying lands and fractal bulkhead ownership make flooding a significant concern.

More than half of properties surveyed were built before 1970. In Brigantine, homes built during this time period represent the largest losses. Since 2000, an uptick in home construction (resulting in predominantly elevated and floodproofed homes) has decreased both the number and proportion of older, pre-FIRM properties.

Table 6: Bayshore Boulevard Structure Year of Construction

| Building Construction Prior to | Count | Percent |
|--------------------------------|-------|---------|
| 1940 | 2 | 2.5% |
| 1940-1949 | 11 | 13.6% |
| 1950-1959 | 26 | 32.1% |
| 1960-1969 | 9 | 11.1% |
| 1970-1979 | 2 | 2.5% |
| 1980-1989 | 3 | 3.7% |
| 1990-1999 | 1 | 1.2% |
| 2000-2009 | 13 | 16.0% |
| 2010-2019 | 14 | 17.3% |
| Total | 81 | |

Source; NJ MOD-IV Property Data, 2019

Mitigation Projects

Preventive actions: The entirety of the repetitive loss area is developed and protected by a bulkhead system. Acquisition of private properties would not be a feasible activity at this time due to existing land values and development density. Bulkhead standards and flood resistant design standards that take into account future flood conditions will beneficially impact future development.

Property protection: The elevation or demolition of existing, non-floodproofed structures provides the most effective mitigation for property owners in this neighborhood.

Natural resource protection: The Repetitive Loss Area is fully developed. The ecological uplift of the marshes in the waterways adjacent to the Area should be considered to enhance wave attenuation and ecosystem benefits.

Emergency Services: This neighborhood is and will remain covered by city-wide emergency service activities.

Structural Projects: The continued replacement of private bulkheads will provide some measure of flood protection in the form of wave attenuation. However, only a complete solution (bulkhead replacement) will provide comprehensive flood protection.

Public Information: This neighborhood is and will remain covered by city-wide public information activities.

Action Items

- Support the installation of a flood gate at the Recreation Center
- Promote the replacement and elevation of bulkheads
- Support the elevation and floodproofing of both new and existing structures built in the area
- Examine comprehensive bulkheading/floodwall solutions

Area 4: North End

Existing Conditions

The North End is a large residential segment of Brigantine and contains a plurality of the repetitive loss properties and the repetitive loss area. The North End includes a large golf course (now preserved open space), the City's schools, a small number of commercial properties, and hundreds of residential properties set along the waterfront or within the golf course. The neighborhood is almost entirely residential, containing mostly single-family detached homes. There is a small number of attached single-family homes, duplexes, and some triplexes, particularly along the waterfront and in blocks nearer to the beach.

The North End is largely at a low elevation and is protected by a ring of private bulkheads. Similar to the other repetitive loss areas, the fractal ownership of these bulkheads and large number of private waterfront properties complicates a large-scale flood protection project. The North End's relative elevation is perhaps its largest vulnerability. In particular, the golf course area features elevations below 3 feet NAVD88. Many streets are between 4 and 5 feet NAVD88, and homes are generally located on lands between 5 and 6 feet high. Elevations are not uniform across the various sub-developments within the North End. For example, North Shore Drive – particularly near the Links Clubhouse – is at a high elevation that is outside of the mapped Special Flood Hazard Area. On the other hand, the area along Lafayette Boulevard and Evans Boulevard are at low elevations (>3 feet). Quay Boulevard, in the vicinity of the schools, is also at a very low elevation.

Another major vulnerability is the age of the housing stock in the neighborhood. Though there has been some new construction and home elevations, homes built between 1950 and 1980 (prior to Brigantine's adoption of floodplain development standards) comprise nearly two-thirds of all structures in the area.

Table 6b: North End Structure Year of Construction

| Year Built | Count | Percent |
|---------------|-------|---------|
| Prior to 1940 | 1 | 0.4% |
| 1940-1949 | 5 | 2.2% |
| 1950-1959 | 29 | 12.7% |
| 1960-1969 | 71 | 31.0% |
| 1970-1979 | 48 | 21.0% |
| 1980-1989 | 32 | 14.0% |

| | | |
|-----------|-----|------|
| 1990-1999 | 13 | 5.7% |
| 2000-2009 | 16 | 7.0% |
| 2010-2019 | 14 | 6.1% |
| Total | 229 | |

Source; NJ MOD-IV Property Data, 2019

Mitigation Projects

Preventive actions: The area is mostly developed excepting the Links golf course. Enhanced bulkhead and flood resistant design standards can prolong the useful lives of the properties in this neighborhood. Selected, voluntary open space acquisitions in low-lying areas may be able to mitigate future flood damage for properties for which fill and reconstruction are not feasible.

Property protection: The elevation or demolition of existing, non-floodproofed structures provides the most effective mitigation for property owners in this neighborhood.

Natural resource protection: The Repetitive Loss Area is fully developed. The ecological uplift of the marshes in the waterways adjacent to the Area should be considered to enhance wave attenuation and ecosystem benefits.

Emergency Services: This neighborhood is and will remain covered by city-wide emergency service activities.

Structural Projects: A stormwater pump station is currently under construction that will improve drainage throughout the neighborhood. Additionally, bulkhead reconstructions are ongoing on both private and public property.

Public Information: This neighborhood is and will remain covered by city-wide public information activities.

Action Items

- Consider comprehensive waterfront floodproofing improvements that protect the entirety of the neighborhood and do not rely on private property owners to install and maintain.
- Elevate some low-lying roadways
- Accelerate home elevations and redevelopment for minus-rated properties

Area 5: Lighthouse District

Existing Conditions

The Lighthouse District consists of an area of mixed residential and commercial uses in the vicinity of Lighthouse Circle. The Lighthouse District sees considerable traffic owing to the number of businesses. The City's Public Works Department is also located in the neighborhood along Bayshore Avenue.

In this district, all but one of the 12 properties surveyed were built before 1964.

Road elevations in the neighborhood vary between four and six feet, with homes situated at grade that is slightly higher. Properties in this neighborhood tend to be older in age than other sections of the City. All of the subject properties are situated on streets that run between West Brigantine Avenue and Bayshore Avenue. Alleys (some of which are unimproved) bisect the lots.

This district was inundated and heavily damaged during Superstorm Sandy. Though Sandy saw exceptionally higher water levels, the neighborhood remains at risk of inundation and more frequently nuisance flooding resulting from drainage issues. Stormwater drainage in the district is lacking, particularly in the back alleys. Stormwater inlets are located along Bayshore Avenue, but not Brigantine Avenue. Brigantine Avenue is several feet higher than Bayshore Avenue. As a result, runoff is carried westward as the side streets slope westward towards the Bay. One resident of the Repetitive Loss Area noted that during lunar tides and rain events, water will pool at the rear

Mitigation Projects

Preventive actions: The extent of urban development in this area does not make acquisition cost feasible. Limited voluntary acquisition to support drainage projects may provide a benefit. Additionally, regulations that decrease impervious surface coverage and promote infiltration in this neighborhood and areas upland of it may reduce the amount of stormwater that inundates the neighborhood during exceptional conditions.

Property protection: The redevelopment of existing properties into compliant flood-resistant structures through elevation and new construction is ongoing, though to a lesser extent than is observed in other repetitive loss areas. These efforts should be continued.

Natural resource protection: The Repetitive Loss Area is fully developed. Drainage improvements should entail the protection of Brigantine's waterways through debris collectors and maintenance.

Emergency Services: This neighborhood is and will remain covered by city-wide emergency service activities.

Structural Projects: The neighborhood may see improved drainage with a proposed stormwater pump station currently planned for the vicinity of Lighthouse Circle. Due to the neighborhood's distance from waterways, larger-scale flood control projects are not feasible for this neighborhood.

Public Information: This neighborhood is and will remain covered by city-wide public information activities.

Action Items

- Install targeted drainage improvements (including a potential pumping station) for the district.
- Support the elevation and reconstruction of properties to mitigate flood damage.
- Consider stormwater management regulation changes for upland areas of the Lighthouse District's drainage basin to reduce the amount of water that runs off and floods the neighborhood.

Area 6: Ocean Avenue

Existing Conditions

The Ocean Avenue repetitive loss area exhibits some of the highest land of the repetitive loss areas studied.

Street elevations surrounding the area range between eight and nine feet. The lowest points are those on the beach. This includes a watery depression at the terminus of 15th Street South (pictured below) and a lower sandy area in front of the Laguna Beach Bar. This is significantly lower than the beach in front of the repetitive loss area, which slopes upwards towards the dunes at a height of 10 feet at the foot of the dune. As of 2014, some of the dune heights reach upwards of 20 feet.

The structures in the repetitive loss area sit on land that is at least 10 feet NAVD88. The duplexes between 13th and 14th Street have foundations near 12.5 feet, with driveways that slope upward from the street which is at nine feet near the gutter. At the hotel, the center of the property is at a higher elevation (approximately 13.6 feet), and slopes downward to the surrounding streets.

A bulkhead partially protects the 14th Street south end and the properties between 12th and 14th Streets. However, these properties are also protected by a 200' wide dune system between the homes and the beach. The topography demonstrates both a foredune and secondary dune. The height and width of these dunes likely protects the residential properties in this area, whereas the Hotel property is more exposed. The LiMWA line follows the trough between the dunes between 12th and 14th Streets but comes within feet of the base of the hotel.

Photo 2: Oceanfront Drainage



Mitigation Projects

Preventive actions: The RLA properties are protected by a city-owned dune system. With the subject properties already located on higher ground, there is no property to feasibly acquire in support of flood mitigation. Stormwater management regulations, however, should be examined to provide solutions for observed runoff issues.

Property protection: Limited property protection/floodproofing measures should be considered for sections of buildings in the RLA that are located at-grade.

Natural resource protection: The preservation and maintenance of the existing dune system should be supported, particularly with respect to litter removal. The repetitive loss area sees significant visitation owing to the visitor facilities present and mitigating visitor impacts to the ecosystem should be prioritized.

Emergency Services: This neighborhood is and will remain covered by city-wide emergency service activities.

Structural Projects: The high land in the RLA largely diminishes the need for structural projects. However, some limited structural measures should be considered for the base of the Celebrity Resorts timeshare building to prevent inundation from the Atlantic Ocean during high tides.

Public Information: This neighborhood is and will remain covered by city-wide public information activities.

Action Items

- Maintain the existing dune system to ensure protection of the properties behind the dune line.
- Extend the dune system in front of the Hotel and install bulkheading to protect the Hotel building.

- Negotiate with owners of the Hotel property to ensure that mitigation projects do not hinder economic use of the property and can support the existing commercial/restaurant use along with floodproofing.

Repetitive Loss Area Summary

The August surveys examined each structure in the repetitive loss area. Despite the geographic diversity of the areas and neighborhoods affected, the same issues and causes of flooding remain overtopping from bulkheads and low-lying topography. The preponderance of non-mitigated, mid-century residential structures provides conditions that can cause future flood damage. Reconstructing bulkheads is an involved permitting process that is complicated by differing ownership from property to property and the private owner's financial ability to complete such a construction project.

Mitigating flood damage in the repetitive loss areas can be most cost-effectively accomplished through the flood mitigation of private properties through the elevation of existing homes, construction of new ones to higher standards, and through selective land preservation. Larger-scale projects that the City is already undertaking such as drainage improvements and bulkhead replacements provide temporary and incomplete flood mitigation. Through the City's support of private bulkhead replacements and in conjunction with structural mitigation, flood damages can be reduced. Structural solutions proposed by the Army Corps will require additional study to determinate impacts to Brigantine property owners.

Current Private Mitigation Projects

Private property owners (occasionally with the assistance of federal and state funding) have undertaken property mitigation measures that enhance the ability of structures to withstand flooding. Brigantine's floodplain development ordinance has one of the highest standards for development at the Jersey Shore and requires each new and substantially improved structure to be floodproofed and/or elevated to at least three feet above the base flood elevation. These standards help ensure that developments in Brigantine will be floodproofed to a high degree of protection for the years to come.

This Repetitive Loss Area Analysis examined the extent to which structural floodproofing has taken place in the City. The results are described in this section. Please note that due to the small size of some repetitive loss areas, these figures are being presented for the totality of the City's repetitive loss areas and are not broken down by neighborhood.

Flood Vents

Flood vents are an important aspect of floodproofing to their ability to equalize hydrostatic pressure for foundation walls, thereby protecting the structural integrity of the house during a flood. Of the structures surveyed, approximately one-quarter could not be identified as

having flood vents. However, nearly a majority (46 percent) of structures did have some type of foundation vents present.

Table 7: Flood Vents

| Vent Status | Number | Present |
|----------------|--------|---------|
| Unknown | 102 | 23.9% |
| No Vents | 104 | 24.4% |
| Vents Present* | 198 | 46.4% |
| No Vents-Open | 3 | 0.7% |
| No Building | 20 | 4.7% |
| Total | 427 | |

* Includes both foundation vents and flood vents

Foundation

Building foundations are a crucial aspect of building safety, particularly for flooding. Foundations that are not designed and built to withstand flooding can face failure when flooding conditions do occur. A properly designed foundation in a f

Slab homes feature several issues that make them dangerous for flooding. Differential settlement can occur in areas with soft soil, and erosion can scour and undermine concrete foundations. Hydrostatic pressure can crack slab foundations and threaten the structural integrity of the house. Structures that are built on piles and on concrete columns can generally better withstand flooding conditions.

In Brigantine’s repetitive loss areas, nearly two-thirds of surveyed structures were built off-grade on cinderblock stem-wall foundations with crawlspaces or enclosures underneath. A smaller, but significant portion of structures were built on what appeared to be slab foundations. A smaller proportion – approximately 12 percent – of structures were built on pilings or were not enclosed underneath.

Table 8: Foundation Type

| Foundation Type | Count | Percent |
|------------------------|-------|---------|
| 1 or more Cinderblocks | 281 | 65.8% |
| Slab | 69 | 16.2% |
| Pilings/Open | 50 | 11.7% |
| Unknown | 7 | 1.6% |
| No Building | 20 | 4.7% |
| Total | 427 | |

Structure Elevations

Structures that are properly elevated and floodproofed offer some of the best protection against flood damage. By locating habitable living areas and appurtenant equipment out of the flood zone, major flood damage to the building and contents can be mitigated. Structure elevations are often done with reference to a “base flood elevation”, or the height to which waters are expected to rise during a base flood or design storm. In Brigantine, the base flood elevation varies depending on topographic factors. Base flood elevations of 8 and 9 feet NAVD88 are prevailing. In most of the City’s Special Flood Hazard Area, where at-grade elevations are between five and seven feet, this equates to a design inundation of up to three feet. Brigantine incorporates a freeboard standard into its ordinance, which adds an additional three feet of flood water height to which structures must be designed in order to account future flooding conditions and changes to FEMA flood insurance rate maps.

Because detailed building-by-building information was not available for the survey, a building’s elevation status was estimated based on observable building qualities, such as the number of stairs to habitable floor space or the number of cinderblocks on which the structure is observed to sit. These ballpark estimations revealed that just over half of surveyed structures were not high enough to be considered elevated.

Table 9: Elevation Status

| Elevation Status | Count | Percent |
|------------------|-------|---------|
| Elevated | 172 | 40.3% |
| Not Elevated | 225 | 52.6% |
| No Building | 20 | 4.7% |
| Unknown | 10 | 2.3% |
| Total | 427 | |

Recommendations, Alternatives, and Updates

Mitigating future flood losses in Brigantine’s repetitive loss areas will require a comprehensive suite of improvements that address both individual structures’ risk as well as systemic flood protection systems that increase the level of protection for City assets and private property.

Appendix 7 describes the categories of floodplain management activities that can be undertaken to mitigate flood damage. The following measures are proposed for Brigantine’s Repetitive Loss Areas:

Preventive Activities

- Examine the potential for targeted open space acquisitions in low-lying areas that cannot be feasibly protected through structural flood protection measures.
- Continually examine and revise the floodplain management ordinance to account for sea level changes, new flood maps, and other changes.
- Continue drainage improvements and maintenance.
- Develop a Natural Resources Plan that addresses drainage and green infrastructure.
- Examine ordinance improvements governing stormwater management and impervious surface coverage to reduce the amount of runoff that flows into neighborhoods with poor drainage.

Property Protection Measures

- Elevate remaining buildings and utilities above the base flood elevation;
- Install flood vents in elevated homes on stem-wall foundations
- Close existing bulkhead gaps
- Install sewer backup preventers; and

Natural Resource Protection

- Install and maintain stormwater inlets and debris collectors
- Identify locations where living shorelines can be installed

Emergency Services

- Elevate evacuation routes
- Facilitate city-wide emergency response communications through IPAWS

Structural Projects

- Undertake selective road elevations and drainage improvements and examine the potential for streets to act as flood berms
- Implement a backpassing/replenishment operation for the North End
- Work with the Army Corps and partners on comprehensive flood control improvements that minimize disruption to property and prolong mitigation benefits in the face of future flooding conditions

Public Information

- Map elevation certificates and flood data to monitor plan progress

This Repetitive Loss Area Analysis will be evaluated on an annual basis along with the Floodplain Management Plan, and more thoroughly re-examined and reviewed every three years, or prior to a Community Rating System verification visit. The annual evaluation will consist of an analysis evaluation for progress on recommended actions and to what extent mitigation or building demolition activities have occurred and be publicly available. The re-analysis will occur prior to a CRS cycle visit and entail a thorough re-analysis and survey of conditions in the neighborhood.

References

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- (2013). *National Flood Insurance Program- Community Rating System Coordinator's Manual*. Prepared by FEMA.

Appendix

Appendix 1: Letter to Property Owners



CITY OF BRIGANTINE

James C. Bennett
City Manager

1417 West Brigantine Avenue • Brigantine, NJ 08203
Telephone (609) 266-7600 Ext. 212 • Fax (609) 266-3823
Email: jbennett@brigantinebeachnj.com Web: bb-nj.org

May 20, 2019

**Re: FEMA Community Rating System
Repetitive Loss Areas
Brigantine, New Jersey**

Dear Brigantine Property Owner,

You are receiving this letter because your property is in an area that has been flooded several times. The City is undertaking an analysis of flood conditions in your neighborhood. This analysis will allow the City to better understand localized flooding and determine approaches to address it.

This analysis is part of the City's participation in the FEMA Community Rating System. Participation in the Community Rating System has provided policyholders in the City's flood zones a 25 percent discount on their flood insurance premiums. The Repetitive Loss Area Analysis, which studies areas where properties that have witnessed repetitive flood claims are located, is an activity of the Community Rating System that can increase the City's flood insurance discount.

Please note that your property's location in a Repetitive Loss Area does not mean that your property is a repetitive loss property or has experienced flood damage. Please consult your flood insurance policy, provider, or the City to determine whether your property is considered a Repetitive Loss. The Repetitive Loss Area designation is solely an analysis undertaken by the City for planning purposes.

During the month of June, City representatives will tour the neighborhood to look at drainage conditions, topography, and structural flood mitigation measures. They will take photographs or notes of your property from the street but *will not* enter your property or request access to your property. In the analysis, discrete property identifiers such as street numbers and/or owner names *will not* be published. This analysis is not being undertaken for tax assessment, code enforcement, or other purposes.

If you would like to contribute knowledge or observations about flooding on your property or in your immediate vicinity, please send them via email to brigantinecrs@gmail.com or contact Rachael Beckner in the Brigantine Construction Office at 609.266.7600 Ext. 282, to ensure that your valuable feedback is incorporated into the analysis. Please note that no mitigation projects have been decided upon; this is an information-gathering effort. The draft analysis will include recommendations and will be available on the City's website in the fall of 2019 and will later be adopted by the City Council.

For your information, we have attached some steps that you can take to protect yourself and your property from future flooding. Thank you for your cooperation.

Regards,
City of Brigantine



Jim Bennett
City Manager

Our community is concerned about repetitive flooding and has an active program to help you protect yourself and your property from future flooding, but here are some things you can do:

1. Check with the Building Department on the extent of past flooding in your area. Department staff can tell you about the causes of repetitive flooding, what the City is doing about it, and what would be an appropriate flood protection level. The staff can visit your property to discuss flood protection alternatives.
2. Prepare for flooding by doing the following:
 - Know how to shut off the electricity and gas to your house when a flood comes.
 - Make a list of emergency numbers and identify a safe place to go.
 - Make a household inventory, especially of basement contents.
 - Put insurance policies, valuable papers, medicine, etc., in a safe place.
 - Collect and put cleaning supplies, camera, waterproof boots, etc., in a handy place.
 - Develop a disaster response plan. See the Red Cross's website at www.redcross.org for information about preparing your home and family for a disaster.
 - Get a copy of *Repairing Your Flooded Home*. This can be found on the Red Cross' website, too.
3. Consider some permanent flood protection measures.
 - Mark your fuse or breaker box to show the circuits to the floodable areas. Turning off the power to the basement before a flood can reduce property damage and save lives.
 - Check your building for water entry points, such as basement windows, the basement stairwell, doors, and dryer vents. These can be protected with low walls or temporary shields.

- Install a floor drain plug, standpipe, overhead sewer, or sewer backup valve to prevent sewer backup flooding.
- More information can be found at FEMA's website, www.ready.gov/floods.
- Note that some flood protection measures may need a building permit and others may not be safe for your type of building, so be sure to talk to the Building Department.

4. Talk to the Building Department for information on financial assistance.

If you are interested in elevating your building above the flood level, the City can apply for a Federal grant on your behalf to reimburse 75 percent of the cost. If awarded, the grant will be used to elevate your home in accordance with the provisions of the grant. *Participation on the part of property owners will be voluntary.*

To start the application process please complete the Notice of Voluntary Interest (attached) and provide proof of National Flood Insurance Program (NFIP) flood insurance and your flood damage history and email them to Rutala Associates, the City's grant consultant, at jmrutala@comcast.net.

Only properties that have are covered by NFIP flood insurance will qualify for this grant.

5. Get a flood insurance policy.

Homeowner's insurance policies do not cover damage from floods. However, because the City participates in the National Flood Insurance Program, you can purchase a separate flood insurance policy. This insurance is backed by the Federal government and is available to everyone, even properties that have been flooded. Because the City participates in the Community Rating System, you receive a reduction in the insurance premium. This discount appears on your flood insurance bill.

Some people have purchased flood insurance because it was required by the bank when they got a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. During the kind of flooding that happens in your area, there is usually more damage to the furniture and contents than there is to the structure. Be sure you have contents coverage.

Don't wait for the next flood to buy insurance protection. In most cases, there is a 30-day waiting period before National Flood Insurance Program coverage takes effect.

Contact your insurance agent for more information on rates and coverage.

**FEMA Flood Mitigation Grant Program
Homeowner Interest Sign-up Sheet and Voluntary Interest Notice**

Please complete this form if you are interested in exploring further your options for reducing your flood losses and forward it to Jim Rutala, Rutala Associates at jmrutala@comcast.net. Once this form is submitted you will receive a FEMA application to complete.

By signing this Notice of Voluntary Interest, you are declaring:

1. You are financially able to secure funds to pay for all related costs to elevate the structure.
2. The structural elevation will begin construction within FEMA's designated timeframe.
3. All property owners that are listed on the deed have signed this letter.

Property Owner: _____ Co-Property Owner: _____

Property Address: _____

Owner(s) Mailing Address: _____

Contact Telephone Number _____ E-mail address _____

Tax Block _____ Tax Lot _____ Date of Construction _____

Do you have NFIP flood insurance? Yes - No (Circle One)

Insurance Company _____ Flood Insurance # _____

Owner Occupied - Second Home - Rental - Vacant (Circle One)

Single Family - 2-4 Family - Multi-Family (Circle One)

Flood and Damage History

Date: _____ Damages \$ _____ Date: _____ Damages \$ _____

Date: _____ Damages \$ _____ Date: _____ Damages \$ _____

I understand that my participation in this project for elevation is voluntary, and that I am under NO obligation to participate, and that I may withdraw from this program at any time. I currently plan to participate in this voluntary property mitigation program.

Print Name of Property Owner(s)

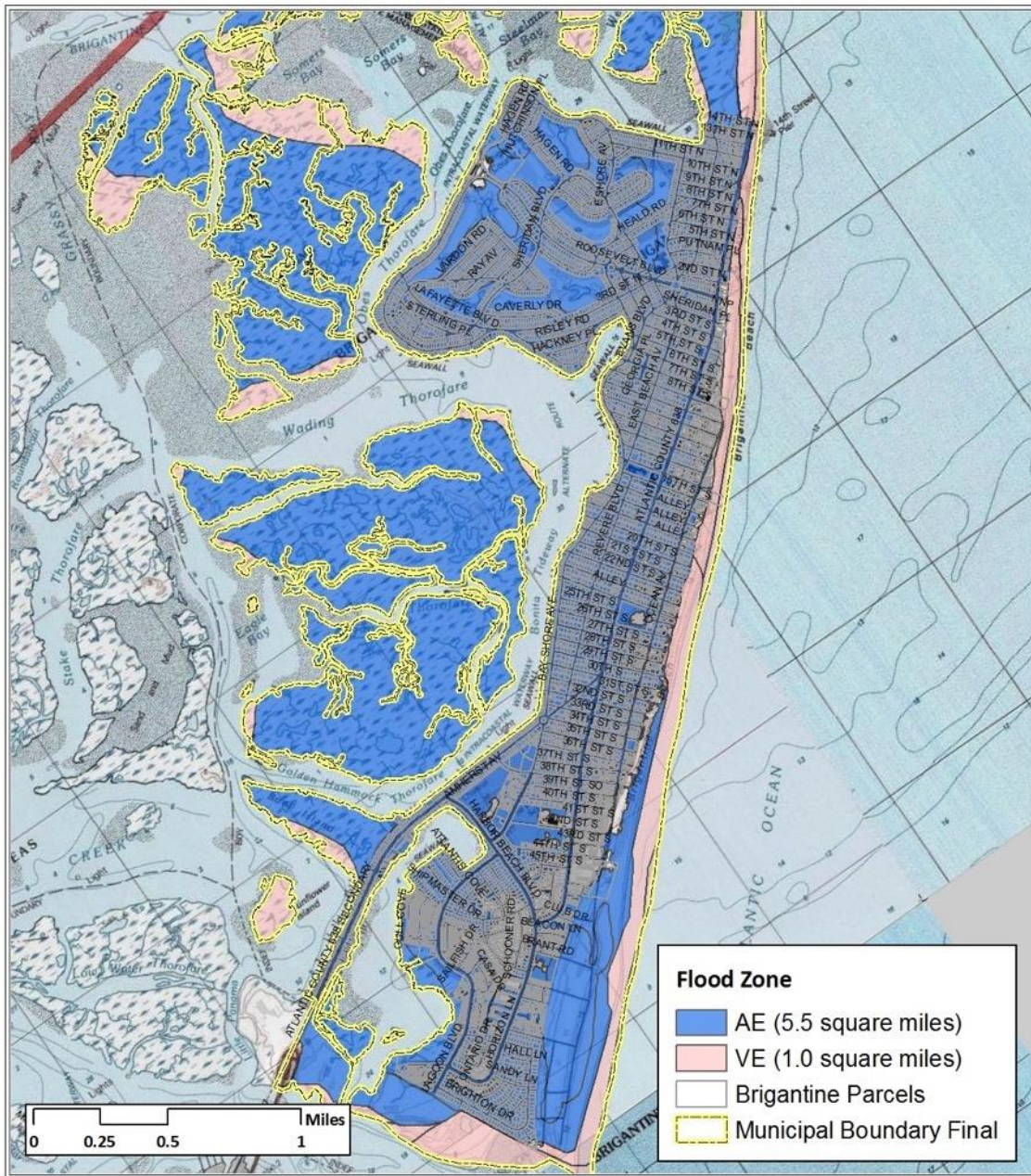
Owners Signature Date

Co-Owners Signature Date

Appendix 2: Copy of Adopted Resolution

TBD

Appendix 3: Map of Brigantine's Flood Zones



Agnoli Engineering, LLC has made every effort to only include GIS data from government sources with published quality control procedures. The flood limits are based on the most recent data available from FEMA, "Preliminary Work Maps," which supersede Advisory Base Flood Elevation maps.

Appendix 4: Map of Repetitive Loss Area



Appendix 5: Survey Results

NOT TO BE INCLUDED FOR PUBLIC REPORT
Documents attached separately.

Appendix 6: Site Visit Photos

NOT TO BE INCLUDED FOR PUBLIC REPORT
Documents attached separately.

Appendix 7: Floodplain Management Activities

- 1. Preventive** activities keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.
 - Floodplain mapping and data
 - Open space preservation
 - Floodplain regulations
 - Erosion setbacks
 - Planning and zoning
 - Stormwater management
 - Drainage system maintenance
 - Building codes
- 2. Property protection** activities are usually undertaken by property owners on a building-by-building or parcel basis.
 - Relocation
 - Acquisition
 - Building elevation
 - Retrofitting
 - Sewer backup protection
 - Insurance
- 3. 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, primarily parks, recreation, or conservation agencies or organizations.
 - Wetlands protection
 - Erosion and sediment control
 - Natural area preservation
 - Natural area restoration
 - Water quality improvement
 - Coastal barrier protection
 - Environmental corridors
 - Natural functions protection
- 4. Emergency services** measures are taken during an emergency to minimize its impact. These measures are usually the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.
 - Hazard threat recognition
 - Hazard warning
 - Hazard response operations
 - Critical facilities protection
 - Health and safety maintenance
 - Post-disaster mitigation actions
- 5. 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 public works staff.
 - Reservoirs
 - Levees/floodwalls
 - Diversions
 - Channel modifications
 - Storm drain improvements
- 6. 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. They are usually implemented by a public information office.
 - Map information
 - Outreach projects
 - Real estate disclosure
 - Library
 - Technical assistance
 - Environmental education

From the CRS Coordinators Manual 2017, Figure 510-4