

Master Plan

Reexamination Report and Update

December 15, 2021

Adopted: _____

Borough of Bay Head

Ocean County, New Jersey



Prepared By

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1. SUMMARY

The Borough of Bay Head Master Plan is reexamined every ten years as required by the New Jersey Municipal Land Use Law. The Master Plan was initially adopted in 1997 and was reexamined in 2003, 2007 and 2017. This *2017 Reexamination Report and Update* incorporates data and information as of 2017. The final review and adoption, occurring in 2021, is further informed by significant changes since 2017.

Bay Head is a low-lying oceanfront town with significant frontage on coastal inland waters of Barnegat Bay, Twilight Lake and Scow Ditch. These physical conditions have influenced zoning decisions in the past and all future zoning decisions should take into account the imperative of protecting our environment. The vulnerability of the community became most apparent on October 29, 2012 when Superstorm Sandy struck the coast of New Jersey. Bay Head suffered major damage from extensive flooding during this event.

This *2017 Reevaluation Report and Update* provides a status and update of each of seven key goals identified in the 2007 Reevaluation Report. Progress has been made in each area. Recommendations are identified on how to further enhance each goal area.

Changes to the demographics, economic profile, and housing since the 2007 Report are reviewed. In general, no dramatic changes were noted. The Report concludes that “Bay Head enjoys a small but stable community.”

A review of the impact of Superstorm Sandy along with the risks of being surrounded by tidal waters identified repetitive areas of flooding and property loss. This review led to a discussion of resiliency and emergency planning to address future storms and sea level rise. The impact to the Bay Head infrastructure such as roadways, storm water management, and beach refurbishment are discussed along with mitigation strategies. The Report encourages the use of native materials and green infrastructure measures to help mitigate potential flooding.

The Borough of Bay Head has completed a number of initiatives that are described herein. Of note is the completion and adoption of the *Borough of Bay Head Municipal Access Plan* as required by the New Jersey Municipal Land Use Law and the *Climate Change-Related Vulnerability Assessment and Mitigation Plan* as required by NJ legislative mandate.

This update is designed to enhance the effectiveness of the Master Plan and its implementation in preserving the charm and beauty of the Borough of Bay Head.

2. INTRODUCTION

Originally home to marshlands and abundant waterfowl, Bay Head's first known human visitors were Lenape native Americans who came each summer to gather clams. Henry Hudson sailed past Bay Head twice and over the years duck hunters, fishermen, clambers, cranberry farmers and boat builders called Bay Head "home."

Bay Head's history is closely linked to the water. In 1854, Morton Johnson built the Borough's first life-saving station. His son, Hubert designed his very first boat as a 14-year-old student at Bay Head School in about 1901. That boat, a 20-foot Sneakbox named *Arran*, remains one of the winningest sailboats in Barnegat Bay history. Hubert later established his own boatyard on West Lake Avenue (at the west end of today's ballfield) where he designed and built thousands of boats, including the world-famous Blackjacks. During World War II, he designed and built silent running "picket boats" in a secret program for the US Navy. They were the first boats ashore during the "Operation Shingle" landings in Anzio, Italy.

Bay Head's land development began in 1877 when three bankers from Princeton, David Mount, Edward Howe, and William Harris, formed the Bayhead Land Company. Its office, built in 1883 in the Queen Ann style on the northwest corner of Bridge and Lake Avenues, now houses Dune Grass Café.

These gentlemen designed a grid of compact lots, most only 50 feet by 100 feet and set the course for Bay Head to become a quiet, residential resort community with buildings oftentimes designed not by architects but by the builders themselves.

In 1881, railroad lines from New York City and Philadelphia arrived and Bay Head flourished. A mix-up with the railroad station sign led to the naming of Bay Head as two-words when before it was one word. By 1888, it claimed about 50 residential and commercial buildings, most of painted clapboard in the stick style. It also boasted several boatyards, its own post office, a yacht club (established 1888), two churches built in 1889 (All Saints Church and the Bay Head Chapel) and a number of hotels, including The Grenville in 1890. By 1896, Bay Head had electricity and a trolley that ran from Johnson Street along Lake Avenue to Point Pleasant Beach's commercial center.

Bay Head has faced flooding risks throughout its history. Residents of 1882 constructed a wooden seawall along the oceanfront. In 1962, residents enhanced and expanded the seawall, constructing a large granite boulder revetment. Oceanfront residents and the Bay Head Improvement Association (BHIA) maintained the dunes and the revetment on their property which provided crucial protection during Superstorm Sandy. As of 2021, federal and state agencies have developed and installed a coastal protection system running the length of the barrier island.

Bay Head suffered significant damage during Superstorm Sandy. The initial onshore ocean surge caused extensive damage to oceanfront properties. Back bay flooding from Barnegat Bay and Twilight Lake caused further damage to low-lying areas within Bay Head. With the help of federal, state and private funds, the Borough has largely recovered. The challenge now is to preserve Bay Head's character while adapting to the new construction requirements. Among other initiatives, this Report recommends that Bay Head cultivate greater community support for historic preservation.

The Borough is now more keenly aware of the environmental sensitivity of the lands we occupy and the importance of achieving greater resiliency, especially along Barnegat Bay and Twilight Lake. There is an increased focus on mitigating flooding in New Jersey, Ocean County and Bay Head as witnessed by an increase in studies and mitigation projects at all levels of government.

As Bay Head attracts more people than ever to its beaches and commercial districts, we are mindful of the demands of increased pedestrian, bicycle and vehicular traffic. The Borough continues to explore ways to enable pedestrians and bicyclists to traverse the Borough safely and to provide adequate parking for our business community.

Bay Head remains a picturesque community of family homes and water views. The Borough's school, fire department and four churches are its main civic centers. Residents, both seasonal and year-round, treasure Bay Head and seek to preserve its character.

THE PURPOSE AND SCOPE OF REEXAMINATION

The Municipal Land Use Law (MLUL) requires every municipality in New Jersey that has adopted a Master Plan and land development regulations to reexamine and, if necessary, revise, those documents every ten years (N.J.S.A. 40:55D-89). Bay Head's Master Plan was adopted in 1997 and reexamined in 2003 and 2007. The most recent Borough of Bay Head *Reexamination of the Master Plan and Development Ordinance Report* was adopted on June 6, 2007¹. The current reexamination process included meetings with representatives of various local groups such as the Environmental Commission and members of the local business community.

This Reexamination Report will review the previous plans and provide updates to the Master Plan. It conforms to the requirements of the MLUL and addresses the five requirements of N.J.S.A. 40:55D-89 by including the following sections:

- A. The major problems and objectives relating to land development in the municipality at the time of the adoption of the last reexamination report.
- B. The extent to which such problems and objectives have been reduced or have increased subsequent to such date.
- C. The extent to which there have been significant changes in the assumptions, policies and objectives forming the basis for such plan or regulations as last revised, with particular regard to the density and distribution of population and land resources, energy conservation, collection, disposition and recycling of designated recyclable materials, and changes in state, county and municipal policies and objectives.
- D. The specific changes recommended for the Master Plan or development regulations, if any, including underlying objectives, policies and standards, or whether a new plan or regulations should be prepared.
- E. The recommendations of the Planning Board concerning the incorporation of redevelopment plans adopted pursuant to the "Local Redevelopment and Housing Law", P.L. 1992, c.79 (C.40A:12A-1 et seq.) into the land use plan element of the municipal Master Plan, and recommended changes, if any, in the local development regulations necessary to effectuate the redevelopment plans of the municipality.

¹ *Reexamination of the Master Plan and Development Ordinance Report*, prepared by Schoor Depalma, Inc., Adopted by the Borough of Bay Head Council on June 6, 2007

3. REEXAMINATION OF GOALS AND OBJECTIVES

This section reviews the 2007 Master Plan Reexamination Goals and Objectives against current conditions, provides a historical perspective for further recommendations and assesses the degree to which the land development problems and objectives have changed.

3.1. 2007 Master Plan Goals

The 2007 Master Plan Reexamination listed goals and objectives to be addressed. They are as follows:

- 1.) To preserve the single-family residential character and traditions of Bay Head, and to provide zoning that recognizes the established residential character of the Borough.
- 2.) To maintain the existing character of the commercial districts.
- 3.) To recognize the increasing importance of environmental protection in the establishment of development regulations and in the review of development proposals.
- 4.) To protect the dunes as an important environmental resource.
- 5.) To maintain the pattern of development established in the Borough and avoid those uses that would increase development intensity or density.
- 6.) To review and modernize the Bay Head Borough land development regulations relating to bulk standards and requirements in various zones.
- 7.) To complete the construction/addition of sidewalks in various “priority locations” in the Borough.

3.2. Review of Actions and Update of Recommendations

This section examines the extent to which Bay Head has served its 2007 objectives and consider whether additional or different objectives should be set for the next ten years. Bay Head suffered significant damage by Superstorm Sandy in October, 2012. The Borough has largely rebounded, with much of the damage having been repaired and major investments to the commercial district of the town ongoing. The revitalization of Bay Head is a testament to the resiliency of the community.

GOALS AND OBJECTIVES

1. 2007 Goal: “Preserve the single-family residential character and traditions of Bay Head.”

In 2007, the Borough Tax Assessor reported that “as of May 2007, there are 945 total housing units in Bay Head, of which 910 are single-family detached. There are 15 two-family structures, two multi-family structures with five units or more, and 20 condominiums.”

Update:

As of 2017, the Borough Tax Assessor reports that there are 956 housing units, of which 928 are single-family detached, 8 are two-family and 2 are multi-family with five units or more, and 20 are condominiums. Census figures confirm that housing stock has remained stable in Bay Head. Nearly all of the Borough’s housing consists of single-family homes. After Superstorm Sandy, the Borough’s zoning regulations were amended to accommodate new standards for the raising of homes and improving resiliency without sacrificing the aesthetics and character of the community. While there were a number of demolitions and rebuilds, historic Bay Head has retained many of its Shingle Style, Stick Style and Queen Anne Style structures.

Recommendations:

The desire is to preserve Bay Head's single-family residential character while addressing its affordable housing obligations. To advance this goal we recommend that the Borough work to:

- 1.) Develop design guidelines to assist residents in achieving well-scaled structures and maintaining an attractive streetscape.
- 2.) Consult with historic preservation experts about ways to encourage community support preserving the Borough's history.
- 3.) Consider passage of a historic preservation ordinance.
- 4.) Evaluate whether height, setback and lot coverage restrictions should be adjusted in light of new building code requirements and to appropriately respond to current FEMA/FIRM building elevation standards.
- 5.) Ensure that the Borough's website is up-to-date and that residents are notified about Planning Board meetings, agendas and resolutions, if possible, by an email, text messaging, or similar method to which residents may subscribe.
- 6.) Reexamine the Borough's affordable housing obligations and take appropriate actions.

2. 2007 Goal: "Maintain the existing character of Bay Head's commercial districts."

The 2007 Reexamination Report recommended a number of steps to address the business community's concerns and preserve Bay Head's small commercial districts. In particular, it recommended amending the Borough's ordinances to permit more than one business use within a building and allow non-owner occupancy of the rental units above businesses. It also recommended that business employees be encouraged to park in the municipal lot to keep street parking open and that the Borough conduct an inventory of parking spaces.

Update:

The Borough amended its zoning ordinances as recommended and Bay Head's business zones attracted new tenants and businesses, with some structures housing two or more businesses.

Most of Bay Head's businesses were severely damaged by Superstorm Sandy. Many lost all of their furnishings and equipment and had to completely rebuild. Commercial, retail and office space in the Lake Avenue and Mount Street district is fully occupied, with the former Applegate's Hardware site now housing multiple businesses and, as of 2020, a second-floor residence. The commercial space on Bridge Avenue is also fully occupied. A new restaurant, Charlie's of Bay Head, has opened. The historic commercial structures at 62 and 68 Bridge Avenue have been preserved and have welcomed popular, seasonal businesses since Superstorm Sandy.

Since 2017, the restaurant and renewed commercial vitality have led to increased car and truck vehicular and pedestrian traffic as well as additional parking demands. The challenge remains how best to achieve a balance between the requirements of a vital local business community with the priorities of local neighborhoods and residents. Both must go hand-in-hand; one cannot succeed without the other.

Recommendations:

Bay Head residents value the Borough's commercial districts. The small shops and local services are an important part of the Bay Head community.

To ensure that they thrive, we recommend the following steps:

- 1.) Consider zoning regulations to ensure that historical retail spaces will be used for retail rather than professional or service enterprises.
- 2.) Monitor parking demands, increased traffic, and increased truck loading and offloading demands as new business development becomes a reality. Explore and pursue any practical means to alleviate existing and possible future parking and truck unloading problems.
- 3.) Thoroughly review circulation, parking, truck loading and offloading and ways to accommodate alternative modes of transportation including expanded pedestrian and bike ways and improved bicycle parking. Continue to explore and pursue practical means to protect the safety of pedestrians, bicyclists and others in commercial districts and elsewhere in Bay Head.
- 4.) The Nonresidential Development Fee Act requires nonresidential developers to pay 2.5 percent of the increased value of nonresidential development projects into an affordable housing trust fund. The Borough should faithfully implement this Legislation.

3. 2007 Goal: “Recognize the increasing importance of environmental protection.”

The 2007 Reexamination Report recommended that the Borough adopt a flood mitigation plan that would identify risks, “approach mitigation through a combination of local and regional measures,” and develop a prioritized list of desired local flood mitigation actions.

Update

Bay Head is increasingly aware of the importance of environmental protection especially since the Borough contains multiple environmentally sensitive areas. The Environmental Commission as well as Bay Head Officials (Bay Head Council and Business Administrator) actively pursue issues to protect and preserve the natural resources of Bay Head.

The discussion of this goal in the 2007 Master Plan focused on flooding. Section 6.0 of this Master Plan provides an extensive discussion of actions taken in response to flooding concerns. Further, three Reports have been issued since 2007 that directly discuss flood mitigation in Bay Head:

- 1.) The Borough of Bay Head published a *Hazard Mitigation Plan*² in May 2017. This Plan reviewed all hazards and reviewed the issues of flood risks, mitigation and flood mitigation action items.
- 2.) The Borough of Bay Head participated in preparing Ocean County’s *2018 Multi-Jurisdictional All-Hazard Mitigation Plan*³. This Plan also addressed all hazards and reviewed the issues of flood risks, mitigation and flood mitigation action items on both a county and a municipality level.

² 2017 Borough of Bay Head: *Hazard Mitigation Plan*, prepared by Remington, Vernick and Vena Engineers for Bay Head, May 2017

³ *2018 Multi-Jurisdictional All-Hazard Mitigation Plan, Ocean County, New Jersey*, prepared by Michael Baker Jr., Inc., FEMA Approved July 16, 2020

- 3.) The Borough of Bay Head published a *Coastal Vulnerability Assessment Report*⁴ in October 2019. The report, prepared under the direction of a Working Committee of Bay Head town officials and volunteers, analyzed and documented the potential impact upon the Borough from the combined effects of storm surge and sea level rise in the year 2050. The report concluded that “overall, the Borough of Bay Head’s critical infrastructures will fare well in the various scenarios analyzed in this report” and that key infrastructure elements in the town “should remain viable and return to normal operation” soon after a storm event though some of the locations may be impacted during the storm itself and immediately afterward.

Two recent Bay Head activities reflect the increased sensitivity and awareness of environmental issues in Bay Head.

- 1.) The Bay Head Environmental Commission completed an update of the 1989 Bay Head Natural Resource Inventory, *Bay Head Natural Resource Inventory*, December 2020.⁵ This is an extensive inventory and description of the Natural Resources (beaches, bays, estuaries, wetlands, hydrology, air quality, climate, geology, watershed management, and flood areas), Biological Resources (dunes, marshes, natural vegetation, animal communities, threatened or endangered plants and birds, and invasive or exotic species), Physical Resources (land use, historical resources, tax map, roads, utilities, parks and recreational areas, and points of access to the ocean and Barnegat Bay), and a list of environmental issues in Bay Head.
- 2.) The Borough of Bay Head has taken recent steps to protect environmentally sensitive areas in the municipality. In October 2020, pursuant to court order, NJ Transit appeared before the Planning Board for a hearing on its plan to construct a new and much larger substation facility on the north shore of Twilight Lake, an environmentally sensitive area. The Board submitted to the New Jersey Department of Law and Public Safety a list of recommendations and environmental concerns raised by this plan and by NJ Transit’s performance history at the site. Work on this issue continues.

The New Jersey Supreme Court has emphasized the importance of protecting the environment in the implementation of the Mount Laurel doctrine. Therefore, all efforts to create affordable housing should be done in such a manner as to protect the environment and the Council on Affordable Housing (COAH) has called for the exclusion of environmentally sensitive sites in the determination of a municipality’s right to vacant land adjustment.

Recommendations:

- 1.) Surrounded by tidal waters, Bay Head is susceptible to flooding. Catastrophic flood events cannot be prevented, but the more common episodes of nuisance and major flooding can be ameliorated. Section 6 of this Master Plan provides a list of recommendations associated with flooding mitigation.

⁴ The Borough of Bay Head: *Coastal Vulnerability Assessment Report*, prepared by Borough of Bay Head Officials and Volunteers, October 2019

⁵ The Borough of Bay Head: *Natural Resource Inventory*, prepared by the Bay Head Environmental Commission, February 2021

- 2.) Bay Head should actively monitor and review NJ Transit plans for any proposed developments and seek ways to minimize the potentially negative aesthetic, environmental and functional impact and overall impact on Bay Head. It is noted the location of the proposed NJ Transit development is in a Conservation Zone per Bay Head Land Use regulations.
- 3.) Bay Head should ensure that all efforts to address affordable housing obligations should adhere to sound environmental protection principles and should take into account the environmental studies referenced herein.

4. 2007 Goal: “Protect the dunes as an important environmental resource.”

The 2007 Master Plan Reexamination recommended that the zoning ordinances be modified “to consider improvable area of oceanfront properties to attempt to contain some of the overbuilding in evidence on the east side of East Avenue.” The 2003 Reexamination noted that the Borough had adopted a Dune Protection Ordinance to “limit dune disturbance and preserve this important environmental resource.”

Update

The Borough adopted ordinance revisions along the lines suggested in 2007. After Superstorm Sandy, oceanfront landowners and the Bay Head Improvement Association extended the rock revetment to a length of 10,000 feet. Private residents, the Borough and the BHIA have maintained the revetment and have protected the dunes through sand-pushing and planting. The dunes and revetment have played an important role in limiting damage to the beachfront portion of the Borough. After 2017, a project was undertaken to restore the groins along the Bay Head beach.

Since 2017, the US Army Corps of Engineers (USACE) Beachfill and Dune Project constructed a berm and beach system running the length of the barrier island to protect the dunes. A new dune system was installed rising to a level of 22 feet North American Vertical Datum (NAVD 1988). This Project also included planting dune grass along the berm. In addition, the Borough of Bay Head passed Ordinance 2020-04 on April 6, 2020 amending and upgrading Article II of Chapter 25 “Protection of Beaches and Dunes.” This Ordinance provides guidance and controls to protect the dune and recently constructed berm and beach protection system.

Bay Head beaches experienced major beach erosion in the winter/spring of 2021. In particular, Winter Storm Orlena on February 2, 2021 resulted in a significant loss of the beach and dune sand added by the Beachfill and Dune Project. A sand push completed by the Bay Head Improvement Association (BHIA) in the spring of 2021 helped restore access to the beaches and recreational use of the beach.

Recommendation:

The Borough must monitor the success of the USACE Beachfill and Dune Project to protect the dunes, and mitigate the disruption of beach access and use, as well as other potential impacts.

5. 2007 Goal: “Maintain the pattern of development” and “avoid those uses which would increase development intensity or density.”

The 2007 Reexamination report stated that the pattern of development had been maintained and noted that the Borough had “addressed its fair share housing obligation by adopting a Housing Element and Fair Share Plan to its Master Plan on September 5, 2006, which was filed with the Council on Affordable Housing on September 6, 2006.”

Update:

Other than the rebuilding efforts resulting from Superstorm Sandy, there has been virtually no change to patterns of development within the Borough. Nearly all of the land within the Borough is fully built and most of it is within historic or environmentally sensitive districts.

Recommendation:

Given the historic nature of the community and the extraordinary environmental sensitivity of lands throughout the community, these factors must be carefully safeguarded in all zoning decisions.

6. 2007 Goal. “Review and modernize Land Use Ordinances relating to bulk standards and requirements in the various zones.”

The Planning Board in 2007 was in the process of evaluating the bulk standards and requirements of various zones, stating that: “Currently, the lot coverage in the residential zones (R-100, R-100-BF, and R-50) is 35 percent. In an effort to better regulate density and overdevelopment, while ensuring quality of natural light and better stormwater management principles the Borough should consider reducing building coverage from 35 to 30 percent in the R-100, R-100-BF, and R-50 zones. For the R-100-OF (Ocean Front Zone), it is recommended to increase the building coverage from 25 to 30 percent, however the non-buildable, riparian rights portion of the lot should be excluded when calculating total building coverage.”

Update:

Bay Head’s Land Use Ordinances were revised to exclude the riparian portion of oceanfront lots from coverage calculations. The Borough elected not to reduce lot coverage in other areas.

Recommendations:

The Borough should reexamine lot coverage as noted above with a view toward flood mitigation and preservation of light, air and open space.

- 1.) Decrease the impervious coverage area and increase green space in front yards of residential properties by defining a percentage of lot area that must be planted.
- 2.) To avoid unnecessary diminution of on-street parking, limit the amount of street frontage that can be used for vehicular access to residential properties based upon a formula of a maximum opening for access per the amount of street frontage.
- 3.) Direct the Planning Board Clerk to forward site plan approval requests to the Bay Head Environmental Commission for review and comment.
- 4.) Review allowable setbacks and coverages to adjust for the change in landscape due to structures being raised to higher elevations.

These considerations should be taken into account with respect to all zoning decisions.

7. 2007 Goal: “Sidewalk Improvements”

The 2007 Reexamination Report noted that “sidewalks along residential and commercial streets are an important asset to the community for pedestrian circulation and safety.” It identified six “priority locations” for the completion/addition of sidewalks and recommended the enactment of an

ordinance requiring that all new construction and major renovations include the construction of a sidewalk. The high-priority areas identified were:

- Bay Avenue between Bridge Avenue and Osborne Avenue
- Meadow Avenue (connecting Club Drive to the Bay Head School and Public Library)
- Clayton Avenue along the western side of the street
- Osborne Avenue (a sidewalk on the south side of Osborne Avenue on the western end of the street towards Bay Avenue has been installed.)
- Club Drive (on the eastern side, across from the ball park, south to the walkway to the bridge at Mount Street)
- Any other areas that are in close proximity to community facilities.

Update:

Since 2007, and due largely to reconstruction after Superstorm Sandy, many of the sidewalks, curbs and pedestrian crossings in town have been repaired, replaced, or improved. The Borough has also modified the Sidewalk Ordinance revising the requirements for sidewalks; Chapter 209 of Bay Head Ordinance (Ordinance No. 2016-20).

As of 2021, significant progress has been made installing sidewalks at the 2007 priority locations. Sidewalks have been added on the east side of Bay Avenue between Bridge and Osborne Avenues, along the western side of Clayton Avenue, along the north and south sides of the western part of Osborne Avenue, and along the southern side of Meadow Avenue. The sidewalk on Club Drive (on the eastern side, across from the ball park, south to the walkway to the bridge at Mount Street) has not been installed.

Recommendation:

The Borough must continue its commitment to maintaining and improving the sidewalks. We recommend that sidewalks be installed at the one remaining 2007 Master Plan priority location at Club Drive.

4. THE EXTENT OF INCREASE OR REDUCTION OF PROBLEMS AND OBJECTIVES

4.1. Shifts Since Superstorm Sandy

Superstorm Sandy, which was classified as an extratropical cyclone when it struck the coast of New Jersey on October 29, 2012, was a major destructive force categorized as a 100-year storm. The Borough's location along the Atlantic Ocean and at the head of the Barnegat Bay led to major flooding and erosion across much of the Borough. Southeasterly winds and unusually high tides caused water to funnel through Scow Ditch and rise until it spilled into the streets. Wave action along the beach caused erosion, but the healthy sand dune ecosystem, as well as the rock revetment, protected many of the beachfront homes. In fact, only one beachfront home in Bay Head was totally destroyed.

Sand dunes have historically been responsible for the formation of barrier islands because high peaks are created as they mature and move inland from the beaches. As one moves inland away from the beaches, these higher peaks or elevations are above the lower grade elevations of the land which is where Barnegat Bay and Twilight Lake are located. For example, East Avenue is approximately 10 feet higher than Lake Avenue. The USACE sand dunes and berm system were installed with a top elevation of 22.0 feet North American Vertical Datum of 1988 (NAVD 1988). Much of Bay Head west of the dunes starting at Lake and Clayton Avenues is at 3.0 to 3.50 feet NAVD 1988.

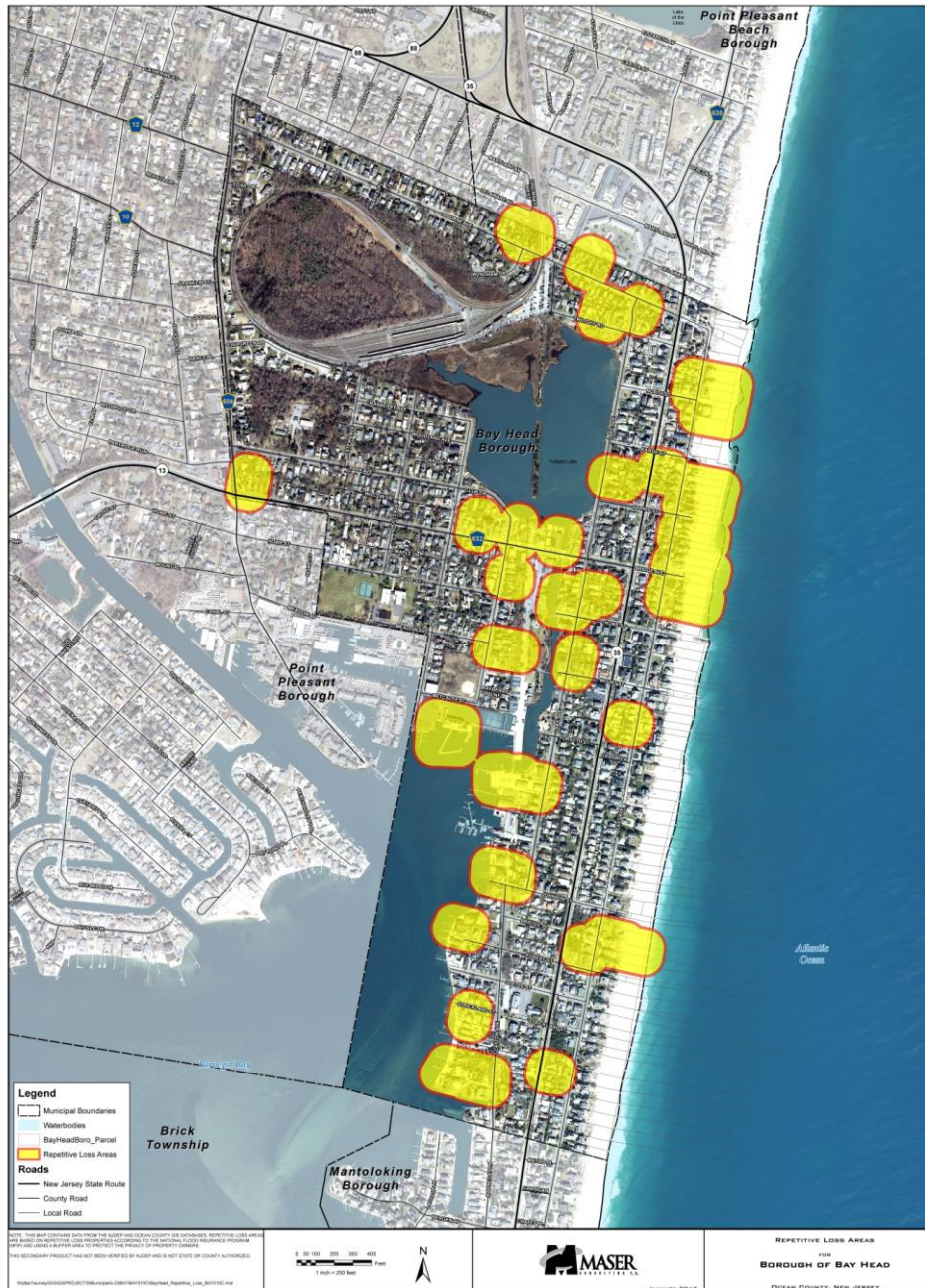
The storm surge from Superstorm Sandy essentially followed the ten-foot contour which resulted in most of the Borough being inundated. Properties along the sections of the town by Barnegat Bay, Scow Ditch and Twilight Lake saw several feet of water. The small downtown area, including Bridge Avenue, Lake Avenue, the police and fire stations and the Borough Hall, were also flooded.

After the initial storm surge, much of East Avenue and Route 35, as well as the northwesterly part of the Borough were the only areas above the floodwater. Despite the large amount of flooding, the total destruction of properties was minimal due to the presence of the rock revetment that existed along the majority of the Bay Head beachfront. According to Jennifer Irish, geoscientist at Virginia Tech, "It was the difference between houses that were flooded in Bay Head and houses that were reduced to piles of rubble in Mantoloking." The revetment was reported to have reduced the potential load of waves during the Superstorm by a factor of two.⁶

The National Flood Insurance Program (NFIP) maintains a database of loss claims. NFIP considers "repetitive loss properties" as parcels with structures insured under the program that had at least two paid flood losses of more than \$1,000 over any ten-year period since 1978. A property is considered a "severe repetitive loss property" when there are at least four losses (each exceeding \$5,000) or when there are two or more losses where the building payments exceed the property value. When Superstorm Sandy struck there were 732 National Flood Insurance Program (NFIP) policies in force within the Borough of Bay Head. By July 31, 2013, 735 claims totaling over \$60.6 million dollars had been paid. Additionally, there have been 108 "repetitive loss events" (at least two losses of \$1000 or more within 10 years) within the Borough since 1978. Those losses have resulted in payments of over \$9.3 million, representing 5.66% of all repetitive loss payments in Ocean County. Map 1 shows areas that NFIP has identified as areas of repetitive loss.

⁶ Press Release 13-126. *Long-Buried New Jersey Seawall Spared Coastal Homes from Hurricane Sandy's Wrath*, National Science Foundation. July 16, 2013.

Map 1: Areas defined as Repetitive Loss Areas in Bay Head (Source: NFIP, September 2013)



5. THE EXTENT OF CHANGES IN POLICIES & OBJECTIVES

5.1. Demographics

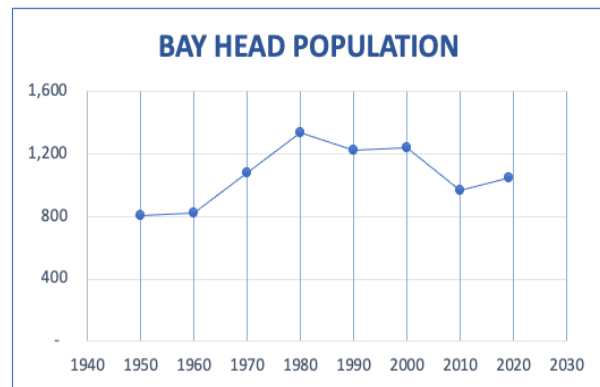
The number of year-round residents in Bay Head has remained relatively steady. Borough policies and objectives, therefore, have been unaffected by demographic change.

The latest 2019 American Community Survey (ACS) estimates, which are published every 5 years, put the Borough's year-round population at 1,048, an 8.3% increase over the 2010 Census figures of 968. The estimated 1,048 residents live in 1,019 housing units and 470 households within the Borough.⁷

✓**NOTE:** The US Census Bureau provides population data through Census reports every 10 years and further provides population estimates every 5 years through the interim ACS reports. At the time of this Master Plan revision, the 2020 Census Data have not yet been released. Instead, this section utilizes the most recent population estimates for 2019 available from the 2019 ACS report.

Table 1: Borough of Bay Head Year-Round Population Change, 1950 – 2019

| POPULATION 1950 - 2019 | | | |
|------------------------|------------|--------|----------|
| Year | Population | Change | % Change |
| 1950 | 808 | -- | -- |
| 1960 | 824 | 16 | 2.0% |
| 1970 | 1,083 | 259 | 31.4% |
| 1980 | 1,340 | 257 | 23.7% |
| 1990 | 1,226 | (114) | -8.5% |
| 2000 | 1,238 | 12 | 1.0% |
| 2010 | 968 | (270) | -21.8% |
| 2019 (est.) | 1,048 | 80 | 8.3% |
| 2040 (est.) | 1,270 | 222 | 21.2% |



Source: 1950-2010 US Census Bureau;
2019 - American Community Survey (ACS)

The North Jersey Transportation Planning Authority (NJTPA) projects that Bay Head's year-round population will increase to 1,270 as shown in Table 1 above by the year 2040.⁸ Since the Borough is almost entirely developed, any increase in full-time population would likely come from second homes becoming primary residences. Demographic shifts suggest that retirees are the most likely to convert vacation homes to primary residences.

Bay Head has thousands of part-time residents and seasonal visitors, with the summer population increasing to several thousand over the year-round population. Neither the Census nor the ACS figures include seasonal residents or visitors.

Bay Head has been a fully developed municipality since at least 1980. Consistent with this fact, the population of the community has remained relatively stable over the years.

⁷ The 1950-2010 US Census Bureau, 2019 – American Community Survey (ACS), Population

⁸ North Jersey 2012 Transportation Planning Authority (NJTPA) Population Projections

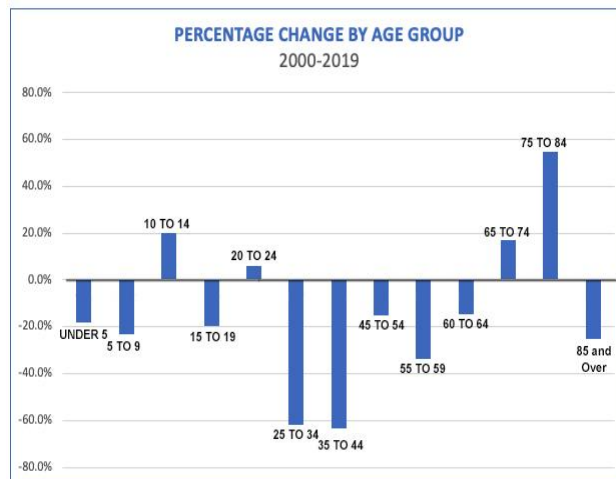
5.1.1. Composition of Population

Bay Head’s population went from a median age of 51.5 in 2000 to 57.2 in 2010. The latest ACS estimate for the median age of the Borough population in 2019 is 58.0 years.⁹

Table 2: Borough of Bay Head Population and Age Characteristics, 2000-2019

| AGE GROUP | 2000 | 2010 | 2019 EST. | PERCENTAGE CHANGE | |
|-------------------|--------------|-------------|-------------|-------------------|---------------|
| | | | | 2000-2010 | 2000-2019 |
| Under 5 | 39 | 25 | 32 | -35.9% | -17.9% |
| 5 to 9 | 61 | 49 | 47 | -19.7% | -23.0% |
| 10 to 14 | 65 | 39 | 78 | -40.0% | 20.0% |
| 15 to 19 | 41 | 47 | 33 | 14.6% | -19.5% |
| 20 to 24 | 34 | 32 | 36 | -5.9% | 5.9% |
| 25 to 34 | 97 | 42 | 37 | -56.7% | -61.9% |
| 35 to 44 | 172 | 83 | 63 | -51.7% | -63.4% |
| 45 to 54 | 191 | 135 | 162 | -29.3% | -15.2% |
| 55 to 59 | 109 | 76 | 72 | -30.3% | -33.9% |
| 60 to 64 | 117 | 107 | 100 | -8.5% | -14.5% |
| 65 to 74 | 185 | 170 | 217 | -8.1% | 17.3% |
| 75 to 84 | 95 | 120 | 147 | 26.3% | 54.7% |
| 85 and over | 32 | 43 | 24 | 34.4% | -25.0% |
| ** Total | 1,238 | 968 | 1048 | -21.8% | -15.3% |
| Median Age | 51.5 | 57.2 | 58.0 | 11.1% | 1.4% |

Source: DP-1 2000 & 2010, ACS 2019.



The increase in the median age between 2000 and 2019 is attributable to the decline in most of the younger and middle age groups in conjunction with the increase in the older age groups spanning the 65 to 84 age ranges. Notably, because Bay Head is a small community, even slight changes can seem disproportionate. For example, a change of 6 people can translate to almost 5% points in some instances.

⁹The 1950-2010 US Census Bureau; Data Profile-1 2000 & 2010, American Community Survey (ACS) 2019

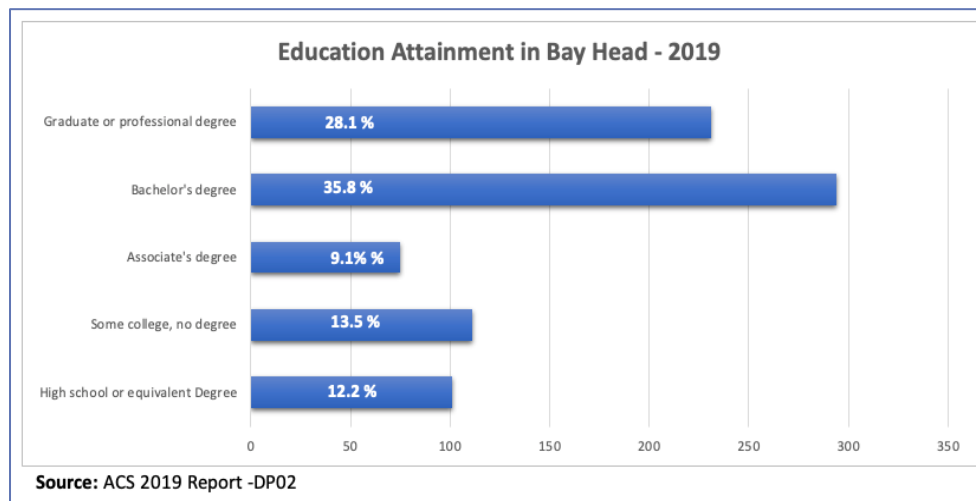
5.1.2. Educational Attainment

Census figures and the latest 2019 ACS estimate¹⁰ indicate that the percentage of year-round residents with college degrees went from 52.8% in 2000 to 63.9% in 2019. Further in 2019, 98.8% of the year-round residents graduated from high school or higher. These figures exclude Bay Head’s seasonal residents.

Table 3: Education attainment and School Enrollment in Bay Head (2000 - 2019)

| EDUCATIONAL ATTAINMENT | 2000 | 2010 | 2019 (Est.) |
|---|-------|-------|-------------|
| Population 18 to 24 years | 70 | 46 | -- |
| Less than high school graduate | 19 | 9 | -- |
| High school graduate (includes equivalency) | 20 | 12 | -- |
| Some college or associate's degree | 17 | 10 | -- |
| Bachelor's degree or higher | 14 | 15 | -- |
| Population 25 years and over | 1029 | 939 | 822 |
| Less than 9th grade | 13 | 5 | 10 |
| 9th to 12th grade, no diploma | 16 | 19 | 0 |
| High school graduate (includes equivalency) | 192 | 111 | 101 |
| Some college, no degree | 191 | 99 | 111 |
| Associate's degree | 74 | 69 | 75 |
| Bachelor's degree | 338 | 389 | 294 |
| Graduate or professional degree | 205 | 247 | 231 |
| Percent high school graduate or higher | 97.2% | 92.3% | 98.8% |
| Percent bachelor's degree or higher | 52.8% | 33.4% | 63.9% |

Source: 2000 QT-P20; 2010, 2014, 2019 - ACS-S1501



¹⁰ American Community Service Survey (ACS) 2019 Educational Attainment

Regarding school enrollment, 172 residents were enrolled in various schools and educational institutions as reported in the 2019 ACS estimates.

Table 4: School Enrollment in Bay Head (2019)

| SCHOOL ENROLLMENT | 2019 Est. | Percent |
|--|-----------|---------|
| Population 3 years and over enrolled in school | 172 | -- |
| Nursery school, preschool | 0 | 0 |
| Kindergarten | 20 | 11.6% |
| Elementary school (grades 1-8) | 101 | 58.7% |
| High school (grades 9-12) | 33 | 19.2% |
| College or graduate school | 18 | 10.5% |

Source: 2019 - ACS-S1501

5.2. Housing

Superstorm Sandy damaged a good portion of the existing housing in 2012, temporarily displacing a segment of the population. Storm-related demolitions and rebuilding have allowed the Borough to upgrade and update housing to be more storm resilient.

Table 5: Housing Stock in Bay Head (1990 - 2014)

| Housing Units | | |
|---|--------|--------|
| Year | Number | Change |
| 1990 | 1,001 | - |
| 2000 | 1,053 | 52 |
| 2010 | 1,023 | (30) |
| 2014 (est.) | 1,033 | 10 |
| Source: http://lwd.dol.state.nj.us/labor/lpa/census/1990/hhgq90-1.htm ; 2000 DP-1; 2010 QT-H1; 2014 ACS DP04 | | |

Borough officials report no decline in number of housing units since Superstorm Sandy. The 2014 ACS estimate¹¹ indicates a decline of 20 residential units between 2000 and 2014.

The most likely explanation for this divergence is that homes rendered uninhabitable after Superstorm Sandy have been rebuilt since the 2014 estimate.

The Borough should consider ways to satisfy affordable housing needs in a manner that is sensitive to the environment and sound planning.

¹¹ 2014 American Community Survey (ACS) 2014 Housing Data Estimate

5.2.1. Units in Structure

Table 6: Residential units in structure (2000 - 2014)

| Type of Structure | | | | | | | |
|----------------------------|-------|-------|-------|-------|-------|-------|-----------------------------|
| Type / Year | 2000 | 2010 | 2011 | 2012 | 2013 | 2014 | Change in Units (2000-2014) |
| Total housing units | 1,053 | 1,079 | 1,078 | 1,072 | 1,063 | 1,033 | (20) |
| 1-unit, detached | 931 | 927 | 960 | 961 | 961 | 947 | 16 |
| 1-unit, attached | 27 | 30 | 29 | 30 | 27 | 13 | (14) |
| 2 units | 35 | 54 | 47 | 47 | 41 | 37 | 2 |
| 3 to 4 units | 13 | 22 | 8 | 14 | 6 | 5 | (7) |
| 5 to 9 units | 27 | 28 | 18 | 6 | 16 | 18 | (9) |
| 10 to 19 units | 27 | 15 | 13 | 14 | 12 | 13 | (14) |

Source: 2000 DP-4; 2010 ACS B25024; 2011-2014 ACS DP04

According to the ACS data, the total number of housing units has seen minimal fluctuation and the overwhelming majority (90%) of the Bay Head’s housing is classified as single family detached.

5.2.2. Occupancy & Tenure

This section of the report relies on data gathered in the 2000 and 2010 Census reports and the 2014 ACS estimate. These sources do not reflect the resort nature of locations such as Bay Head. An “owner-occupied” unit is one that is occupied as a primary residence. All other housing units within the Borough will be considered Seasonally Occupied housing units, as the Borough of Bay Head has no real vacant houses.

Bay Head enjoys a small but stable community.

Table 7: Housing occupancy (2000 - 2014)

| Housing Occupancy | | | |
|---------------------------------------|------|------|-------------|
| Type | 2000 | 2010 | 2014 (est.) |
| Occupied | 584 | 459 | 459 |
| Owner-Occupied | 480 | 396 | 393 |
| Renter-Occupied | 104 | 63 | 66 |
| Seasonal or Occasionally Used Housing | 469 | 564 | 574 |

Source: 2000 DP-1 & H005; 2010 DP-1; 2014 ACS DP04

5.2.3. Age of Housing Structures

According to the 2014 ACS, 47.5% of the homes in Bay Head were built in or before 1939 and 14.1% between 1950 and 1959. In total, 82% of the housing was built in or prior to 1979.

Table 8: Year structure built in Bay Head as of 2014 ACS

| Years | Estimate | Percent |
|-----------------------|--------------|---------|
| 1939 or earlier | 491 | 47.5% |
| 1940 to 1949 | 33 | 3.2% |
| 1950 to 1959 | 146 | 14.1% |
| 1960 to 1969 | 99 | 9.6% |
| 1970 to 1979 | 75 | 7.3% |
| 1980 to 1989 | 68 | 6.6% |
| 1990 to 1999 | 74 | 7.2% |
| 2000 to 2009 | 44 | 4.3% |
| 2010 or later | 3 | 0.3% |
| Total Units | 1,033 | |
| Source: 2014 ACS DP04 | | |

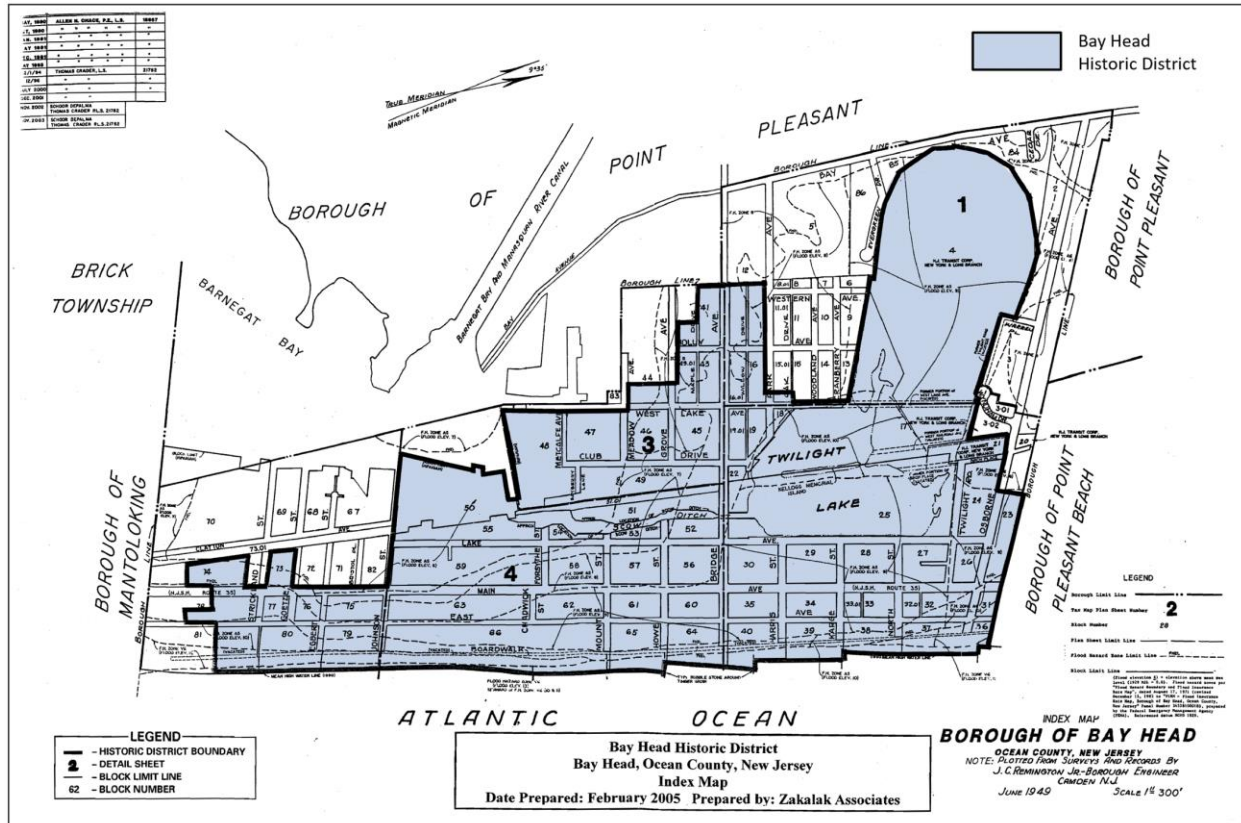
The historic nature of the housing helps define the character of the Borough. It is worth noting that many of the older homes damaged by Superstorm Sandy have been restored rather than torn down, thus maintaining the prevalence of Shingle Style, Stick Style, and Queen Anne Style architecture.

5.2.4 Historic District

The Bay Head Historic District was designated on the *New Jersey Register of Historic Places* on November 18, 2005 and on the National Register of Historic Places on February 1, 2006.

The Bay Head Historic District is primarily residential area, occupying most of the land area within the municipal boundaries of the Borough of Bay Head. General geographic boundaries of the approximately 52 block area includes the boundary of the Atlantic Ocean on the east, the boundary with the Borough of Mantoloking on the south, an irregular boundary on the west, and the border with the Boroughs of Point Pleasant Beach and Point Pleasant on the north. Map 2 shows the Historic District.

Map 2: Bay Head Historic District



There are 649 primary buildings in the Bay Head Historic District, 1 structure (New Jersey Transit train loop), 228 secondary buildings, and two sites (Bay Head Yacht Club and Howe Park). The New Jersey Transit train loop is a Key structure and the Bay Head Yacht Club is a Key site. Of the primary buildings, 6 are Key, 384 are Contributing and 254 are Non-Contributing. The non-contributing fall into two categories: there are 159 newer buildings built between 1950 and 2004; and 95 older, altered buildings that have the potential for rehabilitation or have been renovated beyond recognition. There are 276 secondary buildings such as garages, carriage houses, and utilitarian buildings. Of these, 121 are Contributing and 155 are Non-Contributing.

On June 20, 2007, the Borough adopted a *Historic Preservation Plan Element of the Borough of Bay Head Master Plan*. This enabling legislation was adopted pursuant to N.J.S.A. 40:55D-65.1 which requires that a municipal planning board adopt a plan element as the foundation for a historic preservation ordinance. The Plan Element identifies the significance, location, and criteria for designating historic sites and the historic district. The Element incorporates all of the properties identified within the Borough's State and Federally approved Historic District.

Previously, the Planning Board developed and recommended passage of a preservation/demolition ordinance to encourage preservation of historic structures and establish a Historic Preservation Commission. The proposed ordinance met with public opposition and, to date, no preservation ordinance has been adopted.

Recommendation:

- 1) The Borough should consider re-visiting a preservation/demolition ordinance to gauge and cultivate public support for the preservation of Bay Head’s historic structures and sites.
- 2) We recommend historic preservation factors be taken into account whenever the Borough is conducting affordable housing planning.
- 3) We recommend updating the inventory of homes listed in the Historic District Registry to reflect changes since 2006.

5.3. Economic Profile

The recession of 2008-2010 and Superstorm Sandy in 2012 caused significant economic harm in New Jersey and are the most important changes since the 2007 Reexamination, but Bay Head appears to have recovered well.

5.3.1. Employment

The 2019 U.S. Census Bureau 5-Year American Community Survey (ACS) placed Bay Head’s unemployment rate at 2.4%. Conversely, the 2019 ACS survey indicated that 51.2% of the Bay Head population was employed. 22.1% of the employed population were in professional, scientific, management, administrative and waste management services, 21.5% in educational, health care and social services and 13.5% in finance, insurance and real estate. Employment figures focus solely on the current labor force and exclude retirees.

5.3.2. Income

Bay Head’s income levels suggest stability and relative affluence.

Table 9: Household and Family income in Bay Head, Ocean County and New Jersey (2000 - 2019)

BAY HEAD INCOME - COMPARED TO COUNTY AND STATE

| ENTITY | INCOME TYPE | 2000 | 2010 | 2014 (Est.) | 2019 (Est.) |
|---------------------|-------------------------|------------|------------|-------------|-------------|
| Borough of Bay Head | Median Household Income | \$ 108,710 | \$ 97,577 | \$ 94,239 | \$ 103,571 |
| | Median Family Income | \$ 138,428 | \$ 148,526 | \$ 133,764 | \$ 129,063 |
| County of Ocean | Median Household Income | \$ 65,195 | \$ 66,093 | \$ 63,143 | \$ 70,909 |
| | Median Family Income | \$ 79,201 | \$ 81,670 | \$ 78,745 | N.A. |
| State of New Jersey | Median Household Income | \$ 55,146 | \$ 69,811 | \$ 72,062 | \$ 85,751 |
| | Median Family Income | \$ 65,370 | \$ 84,904 | \$ 87,999 | N.A. |

Source: 2000 and 2010 - U.S. Census Bureau; 2014 and 2019 - ACS 5 Year Estimate.

5.4. Borough Initiatives

This section summarizes important planning, policy, and other significant programs that the Borough of Bay Head has advanced since the 2007 Reexamination.

5.4.1. Strategic Recovery Planning Report

The Strategic Recovery Planning Report (SRPR) was completed by planning consultants Maser Consulting, P.A., adopted by the Borough Council and approved by the New Jersey Department of Community Affairs (NJDCA) May 2016.¹²

The approval of the SRPR by the NJDCA allowed the Borough to be awarded funding from the State to complete five additional planning and engineering studies, which include this Master Plan Reexamination; updates to the Borough's Zoning Ordinances; Bayfront Neighborhood Plan; Twilight Lake Neighborhood Plan; and a Borough-specific Hazard Mitigation Plan.

5.4.2. Borough of Bay Head Hazard Mitigation Plan

In conjunction with the Zoning Ordinance Updates the Borough of Bay Head prepared a Borough-specific *Bay Head Hazard Mitigation Plan (HMP)* in May 2017.¹³ The plan follows up on Ocean County's Multi-Jurisdictional All-Hazard Mitigation Plan with much more detail about the Borough's vulnerabilities and specifics for how to implement the recommendations.

An examination of all the planning documents reveals that they echo one another and establish a consistent theme: namely, that Bay Head is plagued by serious environmental constraints that with climate change are likely to grow even worse. By way of example, consider the Borough's Strategic Recovery Planning Report and Hazard Mitigation Plan. The key findings contained within these documents align with the key findings contained within the Ocean County Multi-Jurisdictional All-Hazard Mitigation Plan with respect to the presence of flood hazard areas, severe repetitive loss properties and other environmental constraints. This vertical alignment of findings underscores the environmental sensitivity in the community.

5.4.3. Zoning Ordinance Updates

The Borough continues to update its zoning ordinances.

5.4.4. Complete Streets Policy

The Borough of Bay Head adopted a Complete Streets Policy by Resolution No. 2016-27 on January 4, 2016. The Policy was guided by the vision statement of the Borough of Bay Head Bicycle and Pedestrian Plan and the New Jersey Department of Transportation's (NJDOT) Complete Streets policy.

The Borough policy reaffirms that the Borough wishes to reinforce its commitment to a comprehensive, integrated, connected, and safe street network for all users and abilities.

¹² *The Borough of Bay Head Strategic Recovery Planning Report (SRPR)*, prepared by Maser Consulting, P.A., Adopted by the Borough of Bay Head Council and approved by the New Jersey Department of Community Affairs (NJDCA) May 2016.

¹³ Borough of Bay Head: *Hazard Mitigation Plan (HMP)*, prepared by Remington, Vernick & Vena Engineers, May 2017.

The Resolution states:

“All public street projects, both new construction and reconstruction (excluding maintenance), undertaken by the Borough of Bay Head shall be designed and constructed as “complete streets” whenever feasible to do so as determined by the Borough of Bay Head Mayor and Council in order to safely accommodate travel by pedestrians, bicyclists, public transit, and motorized vehicles and their passengers, with special priority given to bicyclist and pedestrian safety, and subject to the following conditions:

- a. Pedestrian and bicycle facilities shall not be required where they are prohibited by law.
- b. Public transit facilities shall not be required on streets not serving as transit routes and the desirability of transit facilities will be determined on a project specific basis.”

5.4.5. Borough of Bay Head Complete Streets – Bicycle and Pedestrian Plan

The *Borough of Bay Head Complete Streets - Bicycle and Pedestrian Plan* was prepared by The RBA Group with Stokes Creative Group for The New Jersey Department of Transportation and The Borough of Bay Head.¹⁴ The Plan provides an overview, vision, goals and objectives, evaluation and analysis, recommendations, and implementation and funding strategies to create a safer, stronger, and more efficient bicycle and pedestrian network throughout the Borough.

5.4.6. National Flood Insurance Program (NFIP) Community Rating System (CRS)

The Borough of Bay Head is one of sixteen communities in Ocean County currently participating in the *Community Rating System (CRS)* through the National Flood Insurance Program (NFIP).¹⁵ According to the State of New Jersey Office of Emergency Management, “CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS:

- 1) reduce flood losses;
- 2) facilitate accurate insurance rating; and
- 3) promote the awareness of flood insurance.”

The rating system ranges from Class 1 (best-rated) to Class 9 and Bay Head is rated Class 6. This rating generates a flood insurance discount of 20% for properties in Special Flood Hazard Areas (SFHAs) and 10% for non-SFHA properties. In 2021, the Bay Head Borough Administrator is working to maintain/improve the Borough’s CRS rating.

Recommendation:

We recommend that the Borough continue to explore efforts to raise the Community Rating System Class level to higher levels.

¹⁴ Borough of Bay Head: *Complete Streets - Bicycle and Pedestrian Plan*, prepared by The RBA Group with Stokes Creative Group for The New Jersey Department of Transportation and The Borough of Bay Head, December 2015.

¹⁵ Table 5.6-1. *Participating Community Rating System (CRS) Communities in New Jersey*, Contained in “New Jersey State 2019 Hazard Mitigation Plan,” prepared by Michael Baker International, Inc., January 25, 2019.

5.4.7. Adoption of Master Plan Elements

The Borough of Bay Head has enhanced the Master Plan by adopting four Master Plan Elements:

- 1) On September 5, 2006, pursuant to N.J.S.A. 40:55D-28b, the Planning Board adopted the *Master Plan Housing Element and Fair Share Plan*, prepared by Schoor Depalma, Inc.¹⁶ This Plan was then endorsed by the Borough Council on September 6, 2006 and forwarded to the Council on Affordable Housing (COAH).

An updated review of the 2006 Plan is appropriate. It is recommended the Borough reexamine the affordable housing obligations with respect to unmet need. In particular, the Borough should review its right to a vacant land adjustment, without waiving its right to demonstrate that the Legislature never intended a land-poor municipality to take actions beyond addressing adjusted fair share.

It is recommended that the Borough reconsider the decision of the Court on September 12, 2000, supported by the recommendations of the Master, to allow the Borough to address its unmet need without overlay zones. Certainly, the considerable planning at all levels of government that followed the entry of the Court's order on September 12, 2000 should be taken into consideration when making this planning judgment about the propriety of overlay zones. In addition, the Borough should consider satisfying the unmet need through an Accessory Apartment Program and consider adopting a Mandatory Set Aside Ordinance to ensure that any project of five or more units reserves 20 percent of the units as affordable units.

Another change associated with the Housing Element and Fair Share Plan since the 2007 Master Plan Reexamination is the passage of legislation in 2008 establishing The Non-Residential Development Fee Act requiring non-residential developers to pay 2.5 percent of the increased value of nonresidential redevelopment projects into an affordable housing trust fund. It is recommended the Borough implement this fee requirement.

- 2) On June 20, 2007, the Borough adopted a *Historic Preservation Plan Element of the Borough of Bay Head Master Plan* prepared by Schoor Depalma, Inc.¹⁷ This document was adopted pursuant to N.J.S.A. 40:55D-65.1 which requires that a municipal planning board adopt a plan element as the foundation for a historic preservation ordinance.

¹⁶ Borough of Bay Head: *Master Plan Housing Element and Fair Share Plan*, prepared by Schoor Depalma, Inc., September 6, 2006.

¹⁷ Borough of Bay Head: *Historic Preservation Plan Element of the Borough of Bay Head Master Plan* prepared by Schoor Depalma, Inc., June 20, 2007.

- 3) On February 3, 2020, the Borough adopted a *Municipal Public Access Plan Element of the Borough of Bay Head Master Plan* prepared by Maser Consulting, PA¹⁸ This document was adopted pursuant to N.S.J.A. 40:55D which requires the municipal planning board adopt a plan element to preserve and enhance public access to tidal waters and shorelines.

The Bay Head Access Plan has been approved by the New Jersey Department of Environmental Protection. It includes an inventory of public physical and visual access locations and plans to preserve and enhance access to tidal waters and shorelines within Bay Head which include:

- Atlantic Ocean
- Scow Ditch
- Barnegat Bay
- Twilight Lake
- Bay Head Harbor

The Plan includes consideration of maintenance of and enhancements to accessways, parking, rest rooms, signage and disability access. The Plan discusses access to the ocean and Twilight Lake for recreational purposes and lists five locations where access to Barnegat Bay is available for viewing only.

Recommendation:

It is recommended that consideration be given to provide the residents of Bay Head not only visual access to the beauty of Barnegat Bay, but also for recreational purposes such as boat ramp access or even dock access to a floating dock located at one of the five street ends listed in the Access Plan.

- 4) Climate Change Related Master Plan Element

Section 6 of this Master Plan provides a Climate Change Related Master Plan Element. It provides an assessment of climate change hazards, identifies mitigating actions and lists recommendations. Affordable housing planning should be done consistent with this climate change analysis.

5.4.8. Athletic Field Rehabilitation

In 2020 and 2021 the Borough rehabilitated the field at Metcalf and Club Drive, commonly known as “Howe Field.”

5.4.9. Environmental Resource Inventory

Published by the Bay Head Environmental Commission (BHEC) in February 2021, the *Environmental Resource Inventory* (ERI) for the Borough of Bay Head provides a comprehensive and integrated collection of data that identifies and reviews Bay Head’s natural resources (e.g., beaches, landscape topology, wetlands, soils, plant and animal life, etc.) as well as reviewing Bay Head’s physical man-made resources (e.g., roads, parks, stormwater management system, etc.). Drawing information from multiple sources, the ERI contains numerous maps, charts, tables, pictures, and textual descriptions that together provide a complete reference detailing the environmental conditions in Bay Head.

¹⁸ Borough of Bay Head: *Municipal Public Access Plan*, prepared by Maser Consulting, P.A., Approved by the NJ DEP and approved for incorporation into the Bay Head Master Plan, February 3, 2020.

The ERI recognizes that there are relatively few man made environmental concerns within the Borough with the only contaminated site in the Borough being on the NJ Transit yard property. However, other environmental issues such as sea level rise/flooding, water quality, beach erosion, air quality, loss of shade trees and open space are critical issues that require consideration when moving into the future and maintaining the health, safety, and welfare of the Borough's residents. It is clear that ongoing issues of climate change, sea level rise and increased flooding potential have an impact on the developability and redevelopment of the Borough.

Recommendation:

The ERI is an important planning tool as the natural resources it identifies should be taken into account to assure full consideration of environmental impact during land use decision making processes. Affordable housing decisions should also take the ERI into account.

5.4.10. Twilight Lake Categorization

According to officials from Save Barnegat Bay, Scow Ditch has been determined to be a natural stream (not man made) tributary connecting Twilight Lake to Barnegat Bay. Scow Ditch and Twilight Lake are tidal waters affecting the water quality of Barnegat Bay. This provides the basis for declaring Scow Ditch and Twilight Lake as New Jersey protected waters. New Jersey waters are protected from any measurable change in existing water quality because of their exceptional ecological significance. As tidal waters flow through Scow Ditch, Twilight Lake provides an ecological link between the environmentally sensitive wetlands and marsh lands at the north end of Twilight Lake with Barnegat Bay.

5.4.11. Cell Tower Installation

Cell phone service and emergency response communications services are provided by four cell towers in and surrounding Bay Head. Antennae on the Bay Head water tower provide the majority of the coverage to Bay Head. New Jersey American Water has informed Bay Head the water tower along with all communication equipment will be removed. In response, a temporary cell tower has been installed and is operational starting on or about July 1, 2021. A permanent tower is planned on Municipal property at the Department of Public Works site (also known as the Recycling Center.) Approval for and construction of the permanent tower is in progress.

Recommendation:

The Borough should continue to monitor advances in cellular communication technology such as 5G wireless and consider the best approach for incorporating such advances into Bay Head's infrastructure.

5.5. County Changes

Changes and planning efforts initiated by Ocean County and potentially impacting Bay Head are highlighted in this section.

5.5.1. Ocean County Planning Board 2011 Comprehensive Master Plan

The most recent County Master Plan is *Ocean County, New Jersey 2011 Comprehensive Master Plan* dated December 2011.¹⁹ The County Plan does not contain any specific recommendations for Bay Head, however many of the recommendations in this Master Plan Reexamination and Update are consistent with those contained in the 2011 County Plan.

5.5.2. Ocean County Multi-Jurisdictional All-Hazard Mitigation Plan

The Borough of Bay Head participated with Ocean County in the preparation of the 2014 Multi-Jurisdictional All-Hazard Mitigation Plan (OCHMP), which was approved by FEMA on May 13, 2014. In addition, the Borough also participated with Ocean County in the preparation of the 2018 OCHMP, which was approved by FEMA on July 16, 2020. The updated 2018 OCHMP contains a thorough analysis of vulnerability, natural hazards, human-made hazards and climate change hazards, with special focus on their effect upon critical facilities and populations. The OCHMP contained recommendations for Bay Head (described in the Recommendations section of this document).

5.5.3. Ocean County Long-Term Community Recovery Plan

The Ocean County Long-Term Community Recovery Plan, dated February 10, 2015²⁰, addresses six areas of long-term recovery for the entirety of Ocean County, including: community planning and capacity building; economic recovery; health and social services; housing; infrastructure systems; and natural and cultural resources. The Recovery Plan provides a 'Recovery Needs Assessment' and a "SWOT" (Strengths, Weaknesses, Opportunities, and Threats) analysis, a Recovery Strategy and a summary of Recovery Value, which include regional connections, implementation, and next steps.

Affordable housing planning should take planning studies and principles established at the County level into account.

¹⁹ *Ocean County, New Jersey 2011 Comprehensive Master Plan*, prepared by the Ocean County Planning Board, December 2011.

²⁰ *Ocean County Long-Term Community Recovery Plan*, prepared by Michael Baker International, Inc. dated February 10, 2015

6. CLIMATE CHANGE-RELATED HAZARD VULNERABILITY ASSESSMENT

6.1. Background

Senate Bill No. 2607 was approved and enacted February 4, 2021 amending Section 19 of P.L. 1975, c291 (C40:55D-28) NJ Law Title 40 “Municipalities and Counties,” Section 40:55D Part 28 “Preparation, Content and Modification,” which deals with the preparation, contents and modification of Master Plans. This law became effective immediately and requires municipalities to include a climate change-related hazard vulnerability assessment in the next update to the land use element of Master Plans. The assessment must:

- 1) Consider environmental effects and extreme-related events associated with climate change, including, but not limited to, temperature, drought, and sea-level rise, and
- 2) Contain measures to mitigate reasonably anticipated natural hazards, including, but not limited to coastal storms, shoreline erosion, flooding, storm surge, and wind, following best management practices recommended by the Federal Emergency Management Agency.

Section 6 of this Master Plan provides the Borough of Bay Head response to this requirement.

Bay Head is a small town with limited negative impact on climate change and has limited ability to have a major impact on the occurrence and extent of climate change. Where possible, however, Bay Head has taken steps to mitigate the negative consequences of climate change locally and to minimize any adverse impact on the environment. This section reviews the effects that extreme weather events have had on Bay Head in the past; summarizes the mitigation actions that have been or are currently being taken to reduce vulnerability to climate change with special focus on local flooding; and provides a comprehensive list of recommendations and future mitigation steps to serve as a blueprint for Bay Head going forward.

The *2018 Multi-Jurisdictional All Hazard All-Hazard Mitigation Plan*²¹ for Ocean County lists potential hazards influenced by climate change which is summarized in Table 10.

²¹ *2018 Multi-Jurisdictional All-Hazard Mitigation Plan, Ocean County, New Jersey*, prepared by Michael Baker Jr., Inc., FEMA Approved July 16, 2020

Table 10: List of Hazards and Those Influenced by Climate

| Hazard | Influenced by Climate |
|--|------------------------------|
| Natural Hazard | |
| • Coastal Erosion | √ |
| • Droughts | √ |
| • Earthquakes | |
| • Extreme Temperatures | √ |
| • Hurricanes, Tropical Storms and Nor'easters | √ |
| • Tornadoes and Wind Storms | √ |
| • Wildfires | √ |
| • Winter Snow (Ice) Storms | √ |
| Man-Made Hazards | |
| • Environmental Hazards | √ |
| • Nuclear Incidents | |
| • Terrorism | |
| • Transportation Accidents | √ |
| • Fires and Explosions | √ |
| • Utility Supply Interruptions (Water, Gas, Electrical, Sewer, Communications, etc.) | √ |

As Table 10 shows, climate has an influence on almost all hazards both natural and man-made. Bay Head may experience any and all of these hazards over the next hundred years. For example, temperature extremes are possible. The direct and extensive influence of the Atlantic Ocean greatly tempers the extent of temperature extremes, however. With an eye on historical experience in Bay Head, the probability that increasing sea levels will have a significant impact on Bay Head is highly likely. Therefore, the hazards that will most challenge Bay Head as a result of climate change are hurricanes, tropical storms and nor'easters which all result in flooding. This Master Plan will concentrate on the most significant risk of flooding.

6.2. Resiliency Planning

Emergency readiness was tested and stressed in August 2011 by Tropical Storm Irene, in October 2012 by Superstorm Sandy and in August 2020 by Tropical Storm Isaias. Vulnerability to flooding, the lack of redundancy in the power, gas and water supply, and gaps in our ability to communicate during these storms were all evident to varying degrees. The statutory Master Plan elements such as Land Use, Circulation, Housing, Utilities, Open Space & Recreation, Economic Development, etc., are examined through the lens of resiliency.

Resiliency planning can be summarized in four basic steps:

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

Because Bay Head is a part of a barrier island system and was developed on top of what was once a natural dune system, the elevations are generally higher along the ocean and lower along the back bays (Barnegat Bay, Scow Ditch, and Twilight Lake). The ocean side of the island is exposed to storm surge from northeast winds, while the back bays rise up from tides hemmed in by south winds that flood the lower elevations. These conditions occur multiple times per year. They become catastrophic when there are storm surges of the size that Superstorm Sandy created.

Although no planning can completely address these issues, we should do our best to learn the “lessons of history” and avoid future problems. The Borough has taken steps to repair bulkheads at vulnerable street ends, to raise some municipal buildings and to elevate several low roads in town. It will continue to make repairs and upgrades as needed. Private landowners and the Bay Head Home Improvement Association (BHIA) have maintained the rock revetment that spared most of the Borough during Superstorm Sandy. As of June 2020, the USACE Beachfill and Dune Project was completed to further protect against ocean flooding.

6.2.1. Sea Level Rise and the Future of Infrastructure

The Resiliency Plans for all Post Superstorm Sandy Planning areas have been developed to deal with the immediate needs of the community, as well as to anticipate measures for improving the resiliency of existing and future development to future storm events. A rising sea level, even if only measured in inches, may make the existing neighborhood pattern and infrastructure unsustainable in the most vulnerable areas. Appendix 1 provides additional information about resiliency of treating our shorelines as well as reviewing open space within the Borough of Bay Head.

The *North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk (NACCS)* was published in January 2015.²² The NACCS was commissioned by Congress in the Disaster Relief Appropriations Act of 2013 (P.L. 113–2, H.R. 152, 127 Stat. 4, enacted January 29, 2013). The NACCS Study outlines a methodical process of evaluating and mitigating risk associated with flooding. It provides a realistic perspective that has helped frame the assessment and mitigation steps taken by Bay Head in this Master Plan Update. The study notes that: “In New Jersey, coastal storm risk is managed along the Atlantic Ocean coast by a number of Federal coastal storm risk management projects. However, the low-lying areas of tidal rivers, back bays, and Delaware Bay coasts have a limited number of coastal storm risk management projects.” This is one reason that the USACE commenced a massive project studying back bay coastal flooding along the entire New Jersey coast.

It is critical that this study as well as the Environmental Resource Inventory and other Borough and Ocean County Hazard Mitigation Plans, should be considered in all planning and land use decisions for residential uses, including affordable housing, commercial uses and recreational uses. Additionally, all land use decisions will be impacted by the ever-increasing cost of flood insurance, which without substantial subsidy impacts the viability of all uses in the Borough.

²² *North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk (NACCS)*, prepared by the US Army Corps of Engineers, January 28, 2015

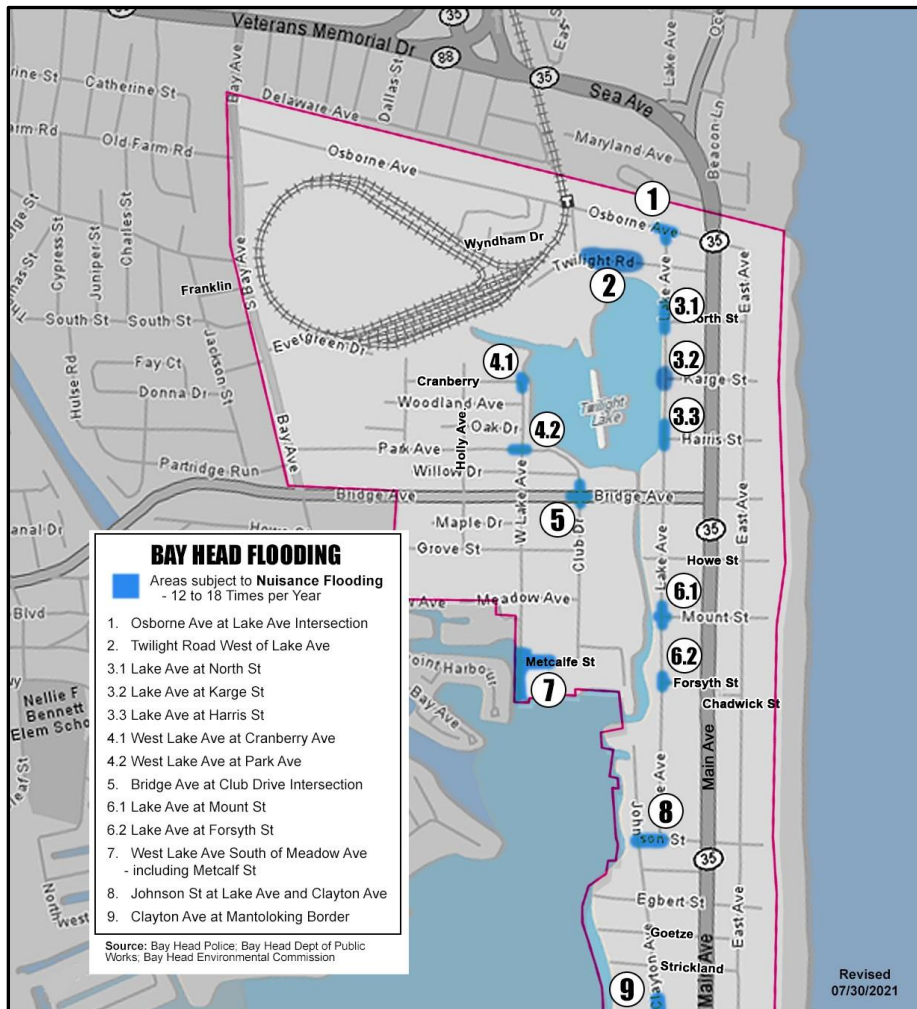
A. Current Flooding in Bay Head

Bay Head is currently experiencing flooding based on various factors such as tides, storm surges, wind direction, wind strength, phases of the moon, and land elevation. The Bay Head Police Chief has identified and the Superintendent of Public Works has confirmed that two types of flooding have occurred in Bay Head in recent years:

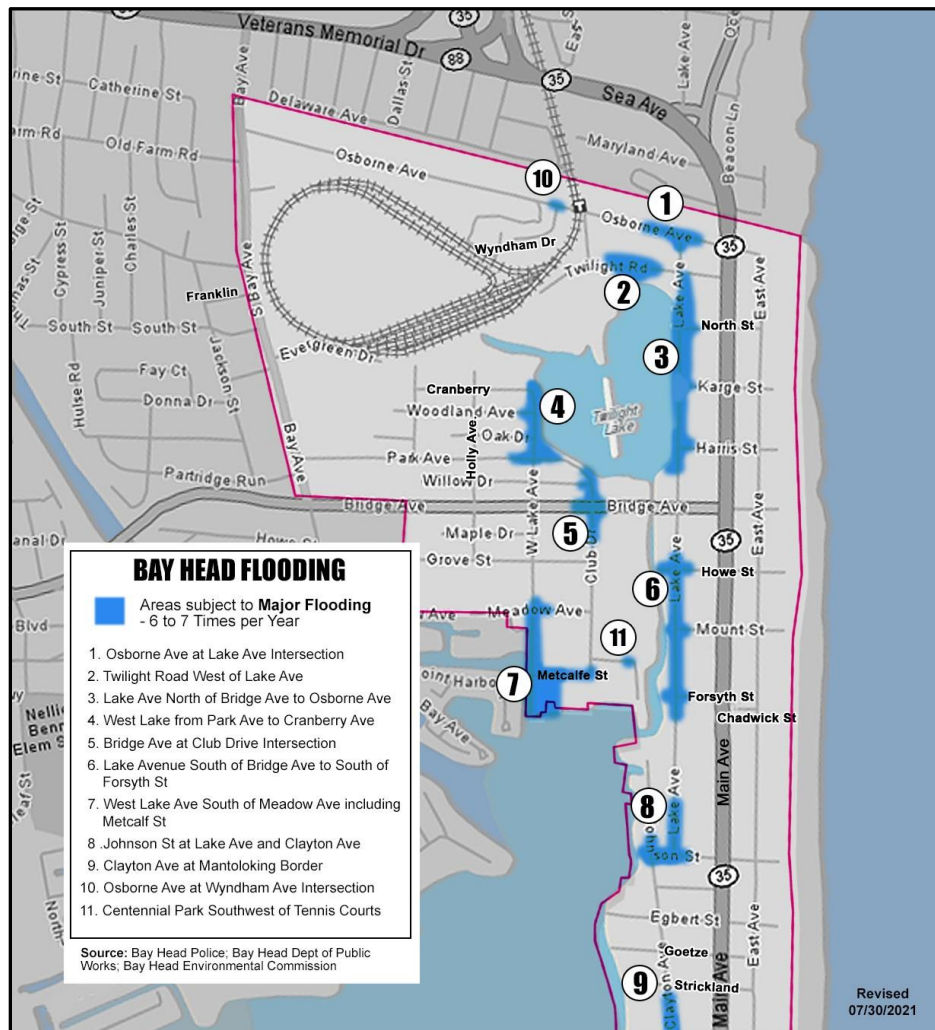
- *Nuisance flooding*, characterized by the pooling of water in normally dry, self-contained low-lying locations, causes minimal disruption of normal activities and/or damage to property. Nuisance flooding is occurring 12 to 18 times per year at the locations identified in Map 3.
- *Major flooding* is more severe flooding - characterized by standing water covering larger areas, often including spill-over between smaller adjacent areas, and resulting in more substantial disruption of activities (street closing or heavily limited vehicular passage, cancellation/delay of planned activities including business), as well as observable concern for physical or financial damage. Major flooding has occurred 6 times in Bay Head from April 1, 2020 to August 15, 2021 at the locations shown in Map 4.

These data were compiled in April 2021 based on recorded data from the Bay Head Police Department, interviews with the Bay Head Police Department, interviews with the Superintendent of Public Works and input from the Bay Head Environmental Commission.

Map 3: Nuisance Bay Head Flooding Events (12 to 18 Times Per Year)



Map 4: Major Bay Head Flooding Events (6 to 7 Times Per Year)



B. Projected Flooding in Bay Head

There are multiple reports and studies projecting sea level rise in New Jersey coastal waters. Most New Jersey studies use data developed by Rutgers University and the NJ Department of Environmental Protection. In November 2019 under contract to the NJ DEP, Rutgers completed an extensive review of sea level rise in the future. Rutgers University's *New Jersey Climate Adaptation Alliance Science and Technology Advisory Panel Report (The STAP Report)*²³ estimates, with a 66% probability of occurrence, that the sea level will rise between 0.9 and 2.1 feet above the existing mean high tide between 2000 and 2050. The STAP Report estimates, with a 5% probability of occurrence, that the sea level will exceed 1.3 feet above the existing mean high tide between 2000 and 2050. The central estimate from the STAP Report is 1.4 feet by 2050.

²³ *New Jersey Climate Adaptation Alliance Science and Technology Advisory Panel Report (The STAP Report)* prepared by the 2019 Science and Technical Advisory Panel, Rutgers University, November 2019

Ocean County prepares and periodically updates a County Hazard Mitigation Plan. The first Plan was issued in 2014, which was then updated in 2018.²⁴ The 2018 Plan provides a summary of sea level rise and references the 2016 STAP Report. The 2018 Plan takes a conservative approach and increases the sea level rise on the low end of 0.9 to 1.0-foot and the high-end estimate of 2.1-feet is increased to 3.0-feet. The 2018 Plan provides resulting flooding level maps for the 1.0- and 3.0-foot sea level rise in Bay Head.

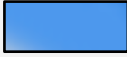
Map 5 shows the impact of flooding should the sea level rise 1.0 foot and Map 6 shows the impact of flooding should the sea level rise 3.0-feet. These maps show the vulnerable areas of Bay Head are adjacent to Twilight Lake, Scow Ditch, and Barnegat Bay. A 3.0-foot level rise would inundate most of the Borough. The beachfront is one of the highest elevated areas of the Bay Head and sea level rise will pose accessibility issues for residents along the ocean. The progression of the level of flooding and its impact is evident when comparing what is being experienced now in Maps 3 and 4 and what is projected in Maps 5 and 6.

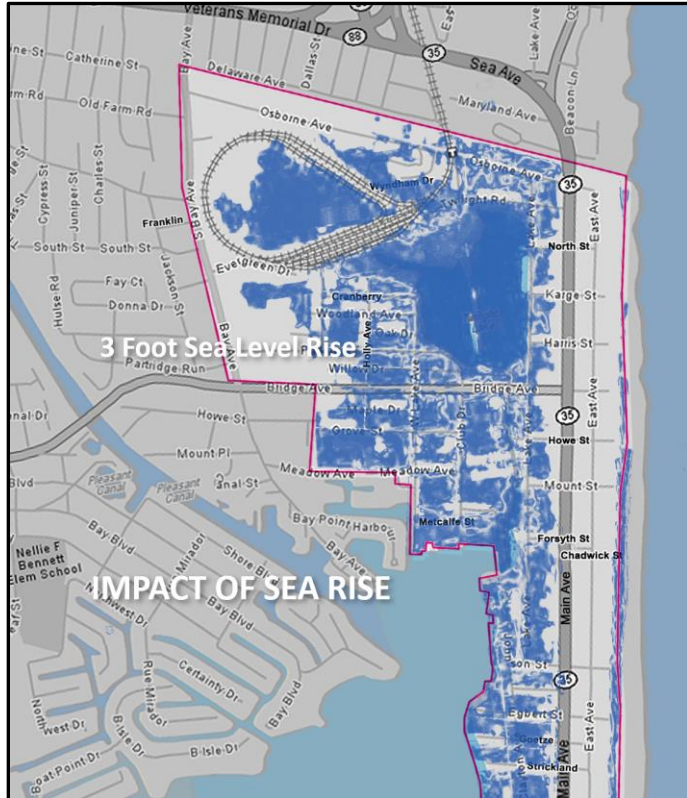
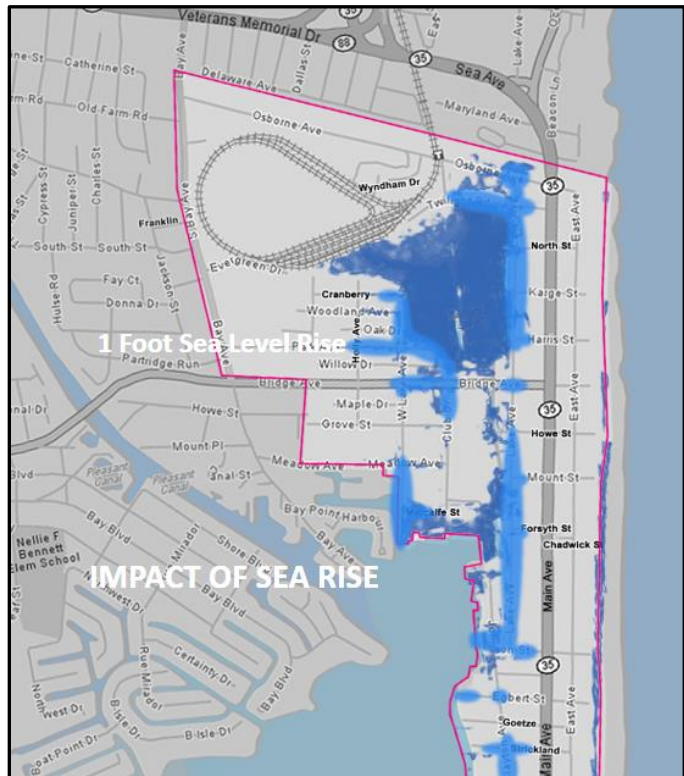
In October 2019 Bay Head performed a coastal vulnerability assessment. A review of projected flood levels was performed and it was decided using a projected flood level of 2.0-foot sea level increase was an appropriate estimate when evaluating the impact on critical infrastructure. In addition, interactive maps of a 2.0-foot sea level rise were available on the NJ DEP ArcGIS web site (njfloodmapper.org). The data on this web site references back to the NJ DEP sponsored 2016 STAP Report for sea level rise information.


In addition to current (and past) flooding conditions discussed above which can be objectively observed and measured, future flooding conditions in Bay Head may also be predicted using computer-based models. Since these forecasts are predictive, the forecasts typically provide a range of probability in their estimates in order to better evaluate the degree of certainty to the predictions.

²⁴ *2018 Multi-Jurisdictional All-Hazard Mitigation Plan, Ocean County, New Jersey*, prepared by Michael Baker Jr., Inc., FEMA Approved July 16, 2020

Map 5: Projected Bay Head Borough Sea Level Rise by 2050

 Projected flooding caused by a 1-Foot Sea Level Rise by 2050.



 Projected flooding caused by a 3-Foot Sea Level Rise by 2050.

6.3. Coastal Vulnerability Assessment

This Updated Master Plan assesses Climate-Related Hazard Vulnerability from two perspectives.

- 1) Hazard and risk to Bay Head Critical Infrastructure Assets
- 2) Hazard and risk to Bay Head Non-Critical Infrastructure Assets

6.3.1. Hazard and Risk to Bay Head Critical and Non-Critical Infrastructure Assets

Bay Head is a low-lying shore community with much of the municipality at elevation of 3.0 to 3.5 NAVD 1988. Since utilities (gas, water, sewer and storm water drain systems) are often quite shallow, any permanent rise in sea level may find these assets under water more than normal. The existing high-water table throughout Bay Head results in these underground systems either being submerged or are in fully saturated soils. Fortunately, all of these systems are designed to withstand this environment. Active components (components that must change position such as start/stop or open/close during normal operation) are often more vulnerable to salt water conditions since salinity may attack and corrode components detrimentally effecting performance. The only active components in any of these systems are pumps (no automatically controlled valves that reposition based on sensing parameters). The pumping systems for water, sewer and storm water drains are all designed to be submerged and their electrical power supplies have been hardened and raised to avoid the effect of flooding. The current assessment is that gas, water, sewer and storm water drain systems will not be detrimentally affected by rising sea level, but this should be reviewed over time.

Bay Head completed a *Coastal Vulnerability Assessment Report* in October 2019.²⁵ This assessment considered environmental effects of storm surge and sea-level rise. The assessment did not attempt to address the reasons for sea level rise, nor explore options to slow, stop, or reverse the trend. The Assessment evaluated how twelve high-priority structural assets in Bay Head will be impacted by current flood conditions and projected future flood conditions.

Each asset was studied to determine whether the properties, infrastructure or natural resources of high value to the Bay Head community and/or facilities are vulnerable to climate-related hazards. The review included the possibility of flooding the asset and the consequence of loss.

The Bay Head *Coastal Vulnerability Assessment Report* evaluated twelve critical structural infrastructure assets for three flooding scenarios:

- 1) **Scenario 1:** Major Flooding Events resulting in flooding conditions in low lying areas resulting from rainfall, tides, southerly winds and storms.

Impact on Critical Assets:

Flooding from storms with medium to major severity occurs 6 to 7 times per year and is shown in Map 4. Bay Head's critical infrastructure assets, identified on Table 11, experience no significant consequences and are expected to perform their functions during scenario 1 flood conditions.

²⁵ Borough of Bay Head *Coastal Vulnerability Assessment Report*, prepared by the Bay Head Coastal Vulnerability Commission, October 2019.

Table 11 Impact on Critical Infrastructure Resulting from Current Flooding Scenario

| CRITICAL INFRASTRUCTURE ASSET | ASSET CATEGORIZATION/ FUNCTION | VULNERABILITY (APPENDIX 7) | CONSEQUENCES (APPENDIX 7) |
|--|-----------------------------------|-------------------------------|------------------------------|
| 1. BOROUGH HALL | Borough Hall | Insignificant | Insignificant |
| 2. POLICE DEPARTMENT | Police Department | Insignificant | Insignificant |
| 3. FIRE DEPARTMENT | Fire Department | Insignificant | Insignificant |
| 4. PUBLIC WORKS DEPARTMENT | Public Works Department | Insignificant | Insignificant |
| 5. BRIDGE AVE PUMP STATION | Utility | Insignificant | Insignificant |
| 6. STRICKLAND AVE PUMP STATION | Utility | Insignificant | Insignificant |
| 7. BAY HEAD TRAIN STATION | Transportation | Insignificant | Insignificant |
| 8. BAY HEAD ELEMENTARY SCHOOL | School/Place of Last Resort | Insignificant | Insignificant |
| 9. SACRED HEART CHURCH | Place of Last Resort | Insignificant | Insignificant |
| 10. ST. PAUL'S UNITED METHODIST CHURCH | Place of Last Resort | Insignificant | Insignificant |
| 11. BAY HEAD CHAPEL MANSE | Place of Last Resort | Insignificant | Insignificant |
| 12. ALL SAINTS EPISCOPAL CHURCH | Place of Last Resort | Insignificant | Insignificant |

Impact on Non-Critical Assets:

The Bay Head *Coastal Vulnerability Assessment Report* did not identify streets or sidewalks as critical assets. This Master Plan considers streets as critical assets since they are needed for emergency evacuation. However, to be consistent with the *Coastal Vulnerability Assessment Report*, streets and sidewalks are being discussed as a Non-Critical Asset. The degree of impact on streets and sidewalks depends on the severity of the rainfall, tide, wind direction and speed, back bay water level surges and the elevation of areas within Bay Head. The greater the severity, the greater the depth of water and the greater the impact. With more significant flooding there is an impact on Transportation, Commerce and Pedestrian Movement.

A. Transportation – Vehicular Traffic

- Vehicular Traffic Blocked and Detoured: Bay Head has needed to close and detour traffic on multiple roads due to flooding caused by more significant storms and storm conditions. This is due to concerns that cars may not be able to safely travel through the deep water. Based on Bay Head Police Department records this level of flooding occurred 7 times from Jan 1, 2020 to September 17, 2021.
- Vehicular Traffic Restricted: A number of other roads in low areas require vehicular traffic to be restricted to the middle of the road to avoid deep water. Besides Bridge and Osborne Avenues, Map 4 shows nine other locations where restricted travel occurs. The height of road crowns has been increased on a number of roads allowing traffic to safely transverse flooded roads by driving in the middle of the road. This requires traffic to alternate driving through these partially flooded streets.

- Potential Loss of Reliable North-South Barrier Island Vehicular Traffic: Lake and Clayton Avenues serve as backup for north and south Route 35 traffic should Route 35 close due to a major accident, construction or other mishap. Lake Ave and Clayton Ave are low areas and during major storms flood significantly. This restricts vehicular movement to the center of the road. Should Route 35 closure occur at the same time as major flooding, the restricted movement of traffic on Lake and Clayton Avenues would greatly slow and backup Barrier Island north and south traffic traveling through Bay Head.
- Potential Loss of Reliable Barrier Island Evacuation: Route 35 is the main north south evacuation route on the barrier island. If Route 35 is not available, then traffic is diverted to Lake and Clayton Avenues in Bay Head. If these roads are not available when evacuation is needed, then safe, reliable evacuation will be restricted.

B. Commerce – Restricted Business

When Bay Head experiences major storm flooding on Bridge Avenue near the intersection with Club Drive high water levels restrict pedestrian access to four to five businesses near that intersection. During these conditions, access is also restricted to five to six businesses near the intersection of Lake Ave. and Mount Street. Similarly, access is greatly restricted to one business at Metcalf Street and West Lake Ave. When flood levels at these intersections reach approximately nine inches above storm water grate level (approximately 2.82 North American Vertical Datum of 1988), the roads and surrounding areas at low elevations will flood to the extent that access is restricted to commercial businesses in the flooded areas. Storm conditions may last for 6 to 12 hours until tide levels go down. During the last six major flood events from April 1, 2020 to May 9, 2021, water has twice entered the business at the corner of Bridge and Club Drives at 91 Bridge Avenue, requiring the business to shut down.

C. Pedestrian Movement

Flooding of sidewalks and roads restrict pedestrian usage during Scenario 1 flood conditions.

D. Private Property

When Scenario 1 flooding occurs, roads, sidewalks and low-level yards and parking areas also flood. Flooding of yards and parking areas on both private and public property limits their use for recreational or vehicle parking purposes. Although an impact, it is not judged to be overly restrictive or significantly detrimental. Flooding has not been reported entering or close to entering private residences.

E. Public Parks/Playgrounds

Low lying parks and playgrounds such as Centennial Park flood during Scenario 1 conditions which restricts their use.

- 2) **Scenario 2:** The Bay Head *Coastal Vulnerability Assessment Report* conducted an evaluation of critical infrastructure from a 2.0-foot sea level rise occurring in 2050 due to climate change.

Impact on Critical Assets:

The assessment for Scenario 2 determined that three critical infrastructure assets would be impacted: Bridge Avenue Sewer Treatment System Pumping Station, St. Paul’s United Methodist Church and All Saints Episcopal Church as shown on Table 12. The assessment determined that each will continue to operate and fulfill their function, but access might be hindered by standing water until tides subside.

Table 12 Impact on Critical Infrastructure Resulting from Predicted 2 Foot Sea Rise Flooding in 2050

| CRITICAL INFRASTRUCTURE ASSET | ASSET CATEGORIZATION/ FUNCTION | VULNERABILITY (APPENDIX 7) | CONSEQUENCES (APPENDIX 7) |
|--|-----------------------------------|--------------------------------|-------------------------------|
| 1. BOROUGH HALL | Borough Hall | Insignificant | Insignificant |
| 2. POLICE DEPARTMENT | Police Department | Insignificant | Insignificant |
| 3. FIRE DEPARTMENT | Fire Department | Insignificant | Insignificant |
| 4. PUBLIC WORKS DEPARTMENT | Public Works Department | Insignificant | Insignificant |
| 5. BRIDGE AVE PUMP STATION | Utility | Low | Minor |
| 6. STRICKLAND AVE PUMP STATION | Utility | Insignificant | Insignificant |
| 7. BAY HEAD TRAIN STATION | Transportation | Insignificant | Insignificant |
| 8. BAY HEAD ELEMENTARY SCHOOL | School/Place of Last Resort | Insignificant | Insignificant |
| 9. SACRED HEART CHURCH | Place of Last Resort | Insignificant | Insignificant |
| 10. ST. PAUL'S UNITED METHODIST CHURCH | Place of Last Resort | Low | Minor |
| 11. BAY HEAD CHAPEL MANSE | Place of Last Resort | Insignificant | Insignificant |
| 12. ALL SAINTS EPISCOPAL CHURCH | Place of Last Resort | Low | Minor |

Impact on Non-Critical Assets:

The Bay Head *Coastal Vulnerability Assessment Report* did not identify streets or sidewalks as critical assets. This Master Plan considers streets as critical assets since they are needed for emergency evacuation. However, to be consistent with the *Coastal Vulnerability Assessment Report*, streets and sidewalks are being discussed as a Non-Critical Asset. The degree of impact depends on the severity of the rainfall, tide, southerly winds, moon level and storms. The greater the severity, the greater the depth of flood waters and the greater the impact. Scenario 1 outlines the impact that is being experienced in Bay Head today about 6 times per year. A two-foot level rise will have a much greater impact on Transportation, Commerce and Pedestrian Movement. More roadways will be blocked requiring detours and a reliable backup to Route 35 will be lost. Commercial buildings in the low areas such as Bridge Avenue near Club Drive and Lake Avenue near Mount Street will experience flooding on the first level. Some homes may also experience flood water introduction to the first level. Yards and parking areas will also be flooded restricting their use.

- 3) **Scenario 3:** Category I storm occurring in 2050 resulting in significant flooding throughout Bay Head.

Impact on Critical Assets:

The assessment for this scenario determined that three impacted infrastructure assets are the Fire Department, Bridge Avenue Sewer Treatment System Pumping Station, and All Saints Episcopal Church, as shown on Table 13. Firefighting equipment would be moved prior to a storm of this severity and the Fire Department House and generator have been retrofitted post-Superstorm Sandy and are not vulnerable. The Fire Company will continue to perform its function once the streets are cleared and fire

equipment return to the Fire House. All Saints Church will witness water damage similar to Superstorm Sandy. The Bridge Avenue sewer pumping station was refurbished after Superstorm Sandy, but some damage to control systems is expected. The storm drain pumping stations at Mount and Goetze streets are designed to operate during severe Category I storm conditions.

Table 13 Impact on Critical Infrastructure Resulting from Category I Storm in 2050

| CRITICAL INFRASTRUCTURE ASSET | ASSET CATEGORIZATION/ FUNCTION | VULNERABILITY (APPENDIX 7) | CONSEQUENCES (APPENDIX 7) |
|--|-----------------------------------|-------------------------------|------------------------------|
| 1. BOROUGH HALL | Borough Hall | Low | Minor |
| 2. POLICE DEPARTMENT | Police Department | Low | Minor |
| 3. FIRE DEPARTMENT | Fire Department | Moderate | Moderate |
| 4. PUBLIC WORKS DEPARTMENT | Public Works Department | Low | Minor |
| 5. BRIDGE AVE PUMP STATION | Utility | Moderate | Moderate |
| 6. STRICKLAND AVE PUMP STATION | Utility | Low | Minor |
| 7. BAY HEAD TRAIN STATION | Transportation | Low | Minor |
| 8. BAY HEAD ELEMENTARY SCHOOL | School/Place of Last Resort | Low | Minor |
| 9. SACRED HEART CHURCH | Place of Last Resort | Low | Minor |
| 10. ST. PAUL'S UNITED METHODIST CHURCH | Place of Last Resort | Low | Minor |
| 11. BAY HEAD CHAPEL MANSE | Place of Last Resort | Low | Minor |
| 12. ALL SAINTS EPISCOPAL CHURCH | Place of Last Resort | Moderate | Moderate |

Impact on Non-Critical Assets:

The impact on non-critical assets will be extensive as experienced with Superstorm Sandy. Superstorm Sandy saw Twilight Lake rise approximately 5.5 feet above its mean high tide level. Barnegat Bay experienced a similar storm surge rise and during the breakthrough of the Barrier Island at the Mantoloking Bridge, the storm surge was greater than 5.5 feet. This caused all roads surrounding Barnegat Bay and Twilight Lake to be flooded to levels that precluded vehicular traffic. Some homes and commercial businesses that were not raised, witnessed flooding making the homes uninhabitable and requiring extensive reconstruction. The recovery in the Borough of Bay Head took about five years, but even now, nine years after the storm, there are homes not fully rebuilt and recovered.

The *Coastal Vulnerability Assessment Report* concluded that:

“Overall, the Borough of Bay Head’s critical infrastructure will fare well in the various scenarios analyzed in the Report. Given the experience the Borough gained during landfall of Superstorm Sandy, the majority of critical infrastructures in Bay Head have either been elevated or retrofitted with flood limiting or preventing elements since the storm. As a result, these high priority assets should remain viable and return to normal operations once clean-up operations are complete, fulfilling their functions to the community even though several of the locations may be impacted during the storm event and the immediate aftermath.”²⁶

²⁶ Ibid, Page 17

6.4. Hazard Mitigation

6.4.1. Hazard Mitigation from Ocean Flood Risk

Primary responsibility for mitigating risks from ocean coastal storms, ocean shoreline erosion, and storm surge transferred from the Borough of Bay Head to the USACE and the NJ Department of Environmental Protection (NJDEP) in May 2017 under the terms of the Beachfill and Dune Protection Project. However, future costs to restore the USACE-built beach and dunes to 2017 design standards will be shared by the Federal Government, New Jersey and Bay Head.

1) Rock Revetment:

Bay Head ocean front property owners, the Bay Head Improvement Association and Bay Head officials must remain vigilant to assure that the integrity of the 1962/2015 rock revetment and dune system are maintained. The rock revetment demonstrated its ability to withstand a category I equivalent storm, Superstorm Sandy, and protect Bay Head from ocean flooding.²⁷

2) USACE Beachfill and Dune Project:

The USACE constructed a large sand dune and beach running the length of the barrier island from Manasquan Inlet south to Barnegat Inlet. This Beachfill and Dune Project provides an additional margin of protection beyond the rock revetment system. Nevertheless, seasonal erosion of the beach and dunes has been significant since it was installed in May 2017. Bay Head must continue to work toward the restoration of this system that was designed to mitigate hazard vulnerability from ocean storms, surges, and sea-level changes. It must be noted that the cost of rework of the USACE Beachfill and Dune Project will require cost-sharing with the Federal Government which will be responsible for 50% of the costs, the State of New Jersey will be responsible for 25% of the costs and Bay Head will be responsible for 25% of the costs. This potential cost places significant uncertainty on the Borough's annual budget. Excessive beach erosion as experienced in the Spring of 2021 resulted in the loss of access and use of the critically important ocean natural resource. Sand pushes to regain access to and the use of the beach have been funded by residents of Bay Head by contributions to the BHIA.

3) Dune Protection:

The Borough of Bay Head and Bay Head residents must remain vigilant in complying with the Bay Head Dune Protection Ordinance to help retain the integrity and functionality of the dunes.

4) Groin Project:

Bay Head residents through the Bay Head Preservation Alliance have committed to rebuilding five ocean groins from Osborne Avenue to Chadwick Street. The rebuilding of the groins at Chadwick Street and Osborne Avenue are complete. The groin rebuilding at Karge, Bridge and Mount Streets is planned for the future. The purpose of the groins is to reduce beach sand erosion and wave damage. In this way, the integrity of the beach and dune systems will be enhanced and it will help retain sand on the beach thereby contributing to the width of the beach for recreational purposes. The Borough of Bay Head must support and encourage the groin project.

²⁷ Press Release 13-126. *Long-Buried New Jersey Seawall Spared Coastal Homes from Hurricane Sandy's Wrath*, National Science Foundation, July 16, 2013.

6.4.2. Hazard Mitigation from Back Bay Coastal Water Flood Risk

The Borough of Bay Head experiences frequent flooding from the Back Bay Coastal Waters of Barnegat Bay and Twilight Lake as described previously in Section 6.2.1. Bay Head is continuing an effort to maintain and upgrade the infrastructure for mitigating this flooding. Some of the projects that have been completed and/or are ongoing are:

Active/Pending Bay Head Flooding Mitigation Efforts

1) Storm Drain Grate Cleaning

Bay Head's Department of Public Works cleans debris from storm drain catch basins and grates to assure they drain as designed. Clogging from materials such as leaf buildup, sand deposition, and other debris prevents or slows street drainage contributing to street flooding.

2) Street Sweeping

Bay Head sweeps roadways to remove the buildup of sand and other debris on them. Onshore winds blow across the beach and dunes and carry sand onto Bay Head streets. If this sand is left untended, rain washes the sand into the storm drain system and greatly slows, if not clogs, the storm drain system. Street sweeping reduces this potential effect.

3) Storm Drain System Check Valves

Check valves are mechanical devices that help prevent backflow in the drainage system. Check valves allow storm water to flow in one direction only. In this way, storm waters are allowed to drain from the Bay Head storm drain system into Barnegat Bay, Scow Ditch and Twilight Lake, but reverse flow is prevented. When Barnegat Bay, Scow Ditch and Twilight Lake water levels are higher than the check valves, drainage from the streets and land collect in the storm drain catch basins and eventually this back-flow results in street flooding as shown during major storms of Map 4. High Barnegat Bay tides and winds from the south exacerbate this flooding.

Bay Head has installed check valves in four storm drain system locations:

- Two at the south end of West Lake Avenue near the intersection of Metcalf Street
- One at Bridge Avenue near the intersection with Club Drive
- One near the intersection of West Lake Ave and Oak Drive

Although these check valves do not stop flooding, they reduce the extent of flooding, especially during more routine rain/flood conditions of Map 3.

Two more check valves are scheduled for installation in 2021 at:

- Johnson Street at Barnegat Bay Outflow Bulkhead
- Storm Water Grate Near the intersection of Johnson Street and Lake Avenue

The Borough of Bay Head continues to evaluate adding more check valves to the storm drain system and to monitor existing valves to insure they are operating correctly.

- 4) Flood Mitigation Project: North End of Lake Avenue at Intersection of Lake and Osborne Avenues
Ocean County has a funded capital project to study and implement corrective actions to mitigate the flooding on Osborne Avenue, in particular at the intersection of Lake and Osborne Avenues (Location #1 on both Maps 3 and 4). The County has evaluated several alternatives and the final plan is expected in 2021. Initial plans show the roadway will be raised 12 inches in the center of the road crown and 4 inches along the sides of the road. Storm drain piping will be reconfigured to reverse the pitch and direction of storm water flow at this intersection toward the north to the Point Pleasant Beach pumping station on Route 35. The Osborne Avenue storm drain catch basin and piping will gravity drain to a large collection basin in the Point Pleasant Beach Route 35 pumping station and then be pumped to the ocean. The large pumping capacity will handle routine and large storms, as demonstrated during Superstorm Sandy. This reconfiguration will eliminate reverse flow from Twilight Lake back through the storm drain system and should greatly reduce the flooding at the intersection of Lake and Osborne Avenues.

- 5) Flood Mitigation Project: Lake Avenue from Bridge Avenue North to Osborne Avenue
Bay Head has a funded capital project (NJ DOT Municipal Aid Grant) to study and implement corrective actions to mitigate flooding on Lake Avenue from Bridge Avenue north to Osborne Avenue (Locations #3.1, #3.2 and #3.3 on Map 3 and Location #3 on Map 4). The very northern part of Lake Avenue from Twilight Road to Osborne Avenue will be integrated with the Ocean County Osborne Avenue project. Integration will require ramping the elevation of the northern section of Lake Avenue to match the new elevation of the Osborne and Lake Avenue intersection. Changes to the Lake Avenue storm drain system have not been determined. The plans are expected to be finalized and work started in 2021.

- 6) Flood Mitigation Project: South End of Clayton Avenue at Mantoloking Border
Mantoloking has a funded capital project (NJ DOT Municipal Aid Grant) to study and implement corrective actions to mitigate flooding at the low spot in the area of 900 Barnegat Lane in Mantoloking which is adjacent to 858 Clayton Avenue in Bay Head (Bay Head and Mantoloking Municipal Border; location #9 on Maps 3 and 4). This is a particularly low spot which experiences flooding from reverse flow from Barnegat Bay back into the drain system. During more significant storms Barnegat Bay overflows its banks also flooding this intersection. Flooding from this low spot spreads north on Clayton Avenue and south on Barnegat Lane, both of which are heavily traveled. The scope of this work is being prepared. The plans are expected to be finalized and work started in 2021.

- 7) Twilight Lake Study: Development of Twilight Lake Protection and Watershed Plan Project
The Borough of Bay Head has received a grant and has contracted for a study of Twilight Lake that is scheduled to start in mid-2021. The scope of this project is to:
 - a) Provide a Watershed Plan that assesses and recommends actions to enhance the water quality and environmental health of the lake.

 - b) Provide a Lake Protection Plan that models and assesses water influx and outflow of the Lake to recommend actions to mitigate flooding in the area of Twilight Lake.

 - c) Provide an assessment and recommendations for the creation and establishment of a living shoreline, green infrastructure and habitat enhancements throughout the Watershed of the Lake.

- d) Provide a preliminary cost estimate for implementing each recommendation and identify needed regulatory permits and constraints for each recommendation.

This report will provide a valuable tool to assess actions needed to manage the critically sensitive and important natural resource of Twilight Lake and its Watershed. It will also provide additional understanding of options for mitigating flooding from Twilight Lake.

- 8) Flood Mitigation Study: Lake Avenue from Bridge Avenue South Three Blocks to Forsyth Street
The Borough of Bay Head has a pending study of flooding along Lake Avenue from Bridge Avenue South three blocks to Forsyth Street (Locations #6.1 and #6.2 on Map 3 and Location #6 on Map 4). This has been assigned to the Bay Head Engineer. Lake Avenue was surveyed in mid-2021 to collect information to assess mitigation options.
- 9) Flood Mitigation Study: West of Twilight Lake along Club Drive and West Lake Avenue
The Borough of Bay Head has a pending study of flooding west of Twilight Lake along Club Drive and West Lake Avenue (Locations #4.1 and #4.2 on Map 3 and Location #4 on Map 4). This area has been surveyed and has been assigned to the Bay Head Engineer and is on a future action plan.
- 10) Storm Drain Pumping Stations
There are two storm drain pumping stations in Bay Head at Mount and Goetze Streets. The associated gazebo-style structures house backup electrical supply systems for the pumping stations. The actual pumps are in vaults beneath the road surfaces. These stations were added by the NJ Department of Transportation in 2014-2015 and are maintained by NJ Department of Transportation to enhance drainage from Route 35. Storm drainage from Route 35 is directed to these pumping stations where it is roughly filtered and surface skimmed and then pumped into Scow Ditch from the Mount Street pumping station and Barnegat Bay from Goetze Street pumping station. The pumping stations increase drain water flow and also increases the velocity of waterflow in piping. The increased flow volume and flow velocity greatly increases the movement of storm drain waters and entrains sand and debris that may collect in the piping to reduce restricted flow due to partial pipe blockage. Pumping Station filtration and increased entrainment helps “flush” any residual sand and debris from piping, reducing the potential for flow restriction and blockage.
- 11) Twilight Lake and North Scow Ditch Dredging
In the summer of 2015 dredging of Twilight Lake and the north end of Scow Ditch was performed to remove the buildup of silt in the northwest corner of the lake and remove sand and debris washed into the Lake from Superstorm Sandy. The primary purpose of this project was to enhance the ecological health of the Lake. Increasing the depth of Twilight Lake does not directly mitigate flooding in the vicinity of the Lake. Dredging of the north side of Scow Ditch north of Bridge Avenue increased the depth of Scow Ditch. A greater cross sectional flow area of Scow Ditch increases the capacity, flow volume and flow rate of tidal water flowing to and from Twilight Lake and Barnegat Bay. This results in less restricted movement of tide changes, ocean surges, and increased water flow due to southerly winds from Barnegat Bay entering Twilight Lake. It also allows Twilight Lake to drain more readily when the tide changes and Lake levels are higher than Barnegat Bay.
- 12) Blocking Pumping of Point Pleasant Beach Pumping Station to Twilight Lake
The Point Pleasant Beach Route 35 pumping station collects water from storm drains from Route 35, Point Pleasant Beach road storm drains, and high-water levels/overflow from the Lake of the

Lilies in Point Pleasant Beach. The pumping station has the ability to pump to Twilight Lake and the Atlantic Ocean. The reason for this arrangement is to provide a means for assuring the removal of storm waters to either the ocean directly or to a location that is connected to the ocean indirectly through Twilight Lake, Scow Ditch, and Barnegat Bay. In the past four years a decision was made by Bay Head, Point Pleasant Beach and the operator of the Point Pleasant Beach Route 35 pumping station, Brick Township Municipal Utilities Association (BTMUA), to pump to the ocean only. The pipeline to Twilight Lake is isolated and locked with strict controls to prevent its opening and the pumping of runoff to Twilight Lake.

13) Protection of Essential Services

Bay Head and other organizations have completed actions to protect essential services during times of flooding, both from routine and major storm flooding. These actions are:

- Raised Police Headquarters and Offices including backup power supplies
- Raised Bay Head Borough Town Hall
- Raised Cell Tower Communications Electrical Services and backup power supplies – The services for the Temporary Cell Tower were raised by the tower developer, as required by Bay Head and State permit requirements. The services for the permanent tower will be raised per contract with Bay Head and New Jersey State permit requirements.
- Installed and raised backup power to sewer system pumping systems at Strickland and Bridge Avenue pumping stations – The backup power was raised by the State to comply with State permit requirements.
- Installed and raised backup power (explained further in 10 above) to storm drain pumping stations at Mount Street and Goetz Street (Performed by NJ DOT).

14) Protection of Residential Homes

- Bay Head has implemented an ordinance requiring homeowners to raise newly constructed homes and homes that are being substantially altered (greater than 50%) in accordance with FEMA flood guidelines. The number of homes being raised continues to increase in Bay Head.
- Bay Head has also implemented a Storm Management Ordinance to assure new developments have proper storm water management systems and utilize green infrastructure measures. (See discussion in section 6.4.3 of this Master Plan Update.)

15) Reducing Rain Water Runoff

Bay Head and the Environmental Commission have encouraged residents to increase the use of pervious materials and expand green areas on properties. Pervious materials and green space increase the absorption of rain into the soil which then adds to the subsurface water table. This helps reduce amount of rain water run off that ends up in the storm water management systems which would otherwise contribute to flooding.

16) Twilight Lake Shoreline Stabilization

A project in the past 15 years installed stones on the majority of the banks of Twilight Lake and the perimeter of Kellogg Island, in the center of Twilight Lake. The purpose of this stabilization effort was to mitigate shoreline erosion. Twilight Lake water level changes with tides and strong winds will cause some wave action on the Lake. This combined effect could cause shoreline erosion. Erosion sends soil sediment to the bottom of Twilight Lake and/or is deposited in Scow Ditch or further to Barnegat Bay. Sedimentation buildup could restrict flow through Scow Ditch which could contribute to flooding. The stability of the shoreline is being reviewed as part of the planned Twilight Lake evaluation scheduled for 2021-2022.

17) Bay Head Environmental Commission (BHEC) – Flood Study Group

The BHEC Commission has formed a subgroup to increase the attention and study of flooding and how best to mitigate flooding in Bay Head. This effort along with such initiatives as the Bay Head Preservation Alliance plan on assisting Bay Head Officials in accessing, planning and taking action to mitigate flooding in Bay Head.

Future Mitigation Efforts

There are mitigation steps that may require significant analysis and funding to study and implement. These are part of long-term steps as discussed in the action plan below in this Master Plan.

1) Twilight Lake Long Term: Shoreline Raising

Once the Twilight Lake Protection and Watershed Study results are provided, Bay Head should perform an assessment of raising the shoreline around Twilight Lake to 3.0 feet above mean high tide, which is the top level of the sheet pilings installed along both sides of Scow Ditch north of the Bridge Avenue bridge. In the past five years Twilight Lake flood waters have overflowed the top of the 3.0-foot NAVD 1988 sheet pilings only twice and only slightly. At this elevation, Twilight Lake should rarely overflow its banks and thereby reduce flooding directly from the Lake to the streets. Higher shore lines coupled with check valve backflow prevention devices will greatly reduce flooding through the north and center part of the town. Raising the Twilight Lake shore line will require reconfiguring the beaches at the southeast and northeast ends of Twilight Lake to allow recreation access to the lake for canoes, kayaks, wind surfers, paddle boards, etc.

2) Twilight Lake Long Term: Scow Ditch Water Flow Control

Much of the flooding in Bay Head occurs when high tide, full moon, heavy rain, storm surge and southern winds converge such as during Tropical Storm Isaias and Superstorm Sandy. The influx of water from Barnegat Bay and the large water surge when the Mantoloking beach breakthrough occurred during Superstorm Sandy resulted in extreme water levels in Scow Ditch and Twilight Lake.

One option that should be evaluated is restricting flow from Barnegat Bay through Scow Ditch to Twilight Lake. This would require a barrier wall along the south end of Scow Ditch as well as the means of allowing water in Twilight Lake to flow to Barnegat Bay. Water flows into Twilight Lake from storm water drainage, groundwater flow, surface water flow, rain, and the stream feeding fresh water at the northwest corner of Twilight Lake from the NJ Transit property. There are times when the Twilight Lake water level will rise just due to this influx and a means of either pumping from Twilight



Figure 1 – Image 1: Scow Ditch dammed and drained. Photo taken standing adjacent to the south end of Fire Company parking lot looking NNE.

Lake/Scow Ditch onto the Barnegat Side of the barrier wall or gate would be required.

In June 2013, this concept was demonstrated (Photos 1, 2, and 3 of Figure 1) when a cofferdam was installed in Scow Ditch just south of Bridge Avenue. Scow Ditch was drained to allow for the installation of new sewer pipes running east-west through Scow Ditch from the sewer treatment plant to the Fire Company parking lot. During a period of about four weeks, the dam and pumps effectively controlled the level of Twilight Lake which was isolated from Barnegat Bay. A significant storm also occurred during these four weeks, and the dam and pumps were effective in controlling Twilight Lake and Barnegat Bay storm water levels. The pump moved water from the Twilight Lake side of the Scow Ditch to the Barnegat Bay side of Scow Ditch.

Figure 1: Scow Ditch Dam and Drain for Sewer Line Installation, June 2013 (Three Photos)



Figure 1 – Image 2: Dam installed on north side of Scow Ditch. Photo taken standing adjacent to the north end of Fire Company parking lot looking NNE.



Figure 1 – Image 3: Scow Ditch dammed. Photo taken standing on Bridge Ave Bridge looking SSE.

3) Barnegat Bay Long Term: Selective Bulkhead Upgrade

As shown in Maps 3 and 4 there is repetitive flooding from Barnegat Bay along Lake Avenue, West Lake Avenue, Metcalf Street and Clayton Avenue. This flooding comes from overflow of the Barnegat Bay bank and backflow from Barnegat Bay through the storm drain system catch basins and grates. The installation of check valves in the storm drain system as discussed previously will help reduce back flow occurrence. In addition, a study should be conducted to identify and prioritize the low-lying areas that frequently flood to identify candidate areas for repairing bulkheads that may have deteriorated and/or raising the shoreline or installing barrier walls in selective locations.

4) Twilight Lake and Barnegat Bay Long Term: USACE Back Bay Project

Much of the flooding in Bay Head occurs from high water levels of Barnegat Bay and Twilight Lake. These two bodies of water make up 2 of the 14 Back Bay Coastal Waters in Ocean and Monmouth Counties. Other towns along the New Jersey shore also experience flooding due to high water levels from Back Bay waters. In response, in October 2016, the USACE commenced the USACE New Jersey Back Bays (NJBB) Coastal Storm Risk Management (CSRM) Study. Bay Head is part of the North Region in this study that extends from Manasquan Inlet and the Manasquan River estuary south to Little Egg Harbor inlet and the Mullican River/Great Bay estuary. (i.e., the Mullican River/Great Bay estuary is south of Beach Haven and north of Atlantic City).

In August 2021 *New Jersey Back Bays Coastal Storm Risk Management Draft Integrated Feasibility Report and Tier 1 Environmental Impact Statement*²⁸ was published by the US Army Corps of Engineers; it included recommendations that are reviewed in this Section.

The Draft Report indicated that vulnerability to coastal storms more damaging than Superstorm Sandy may occur due to rising sea level and climate change. It further stated that “Rising sea levels represent an inexorable process causing numerous, significant water resource problems such as: increased widespread flooding along the coast, changes in salinity in estuarine areas that impact ecosystems; increased inundation at high tide, decreased capacity for storm water drainage; and declining reliability of critical infrastructure services such as transportation, power, and communications.” The Interim Report indicated that the North Region (Bay Head area coastline) of the Back Bay Coastal Waters is at a very high risk of storm damage as sea levels rise.

The study considered multiple methods to mitigate flooding from back bays. The five main methods considered are:

- Storm Surge Barriers (Inlet Closures)
- Interior Bay Closures/Barriers
- Perimeter Levees and Floodwalls
- Changes to Structures (homes and businesses) such as relocation, raising and flood proofing.
- Nature Based Feature Enhancements/Upgrades

²⁸ *New Jersey Back Bays Coastal Storm Risk Management Draft Integrated Feasibility Report and Environmental Impact Statement*, August 2021, U.S. Army Corps of Engineers.

Multiple combinations of storm damage mitigating techniques and methods were identified and evaluated for environmental impact, effectiveness, acceptability and cost benefit. Some alternatives did not represent attractive cost benefit ratios or had high negative environmental impact and were not recommended for further consideration. Table 14 provides the list of alternatives recommended for further study for the North Region.

The US ACE provided a verbal update of their study in May 2021 which indicates that alternatives 3A Raising Structures and 3E (2) Installing Storm Surge Barriers and Raising Structures are the preferred alternates that will be studied further for the North Region.

Table 14 USACE Back Bay Interim Study – Alternatives for North Region (Bay Head Area)

| USACE Alternative | Description | Detail of Alternative | Initial Cost | Average Annual Cost (Note 1) | Average Annual Benefit (Note 2) | Benefit Cost Ratio | Percent of "Other" Not Protected Property damaged by flooding |
|-------------------|--|---|--------------|------------------------------|---------------------------------|---------------------------------------|---|
| | | | Millions | Millions | Millions | Annual Benefit Divided by Annual Cost | |
| 3A | Raising Structures | 16,421 residential structures will be raised including 912 in Bay Head (89.9%) (Note 3) | \$3,629 | \$134 | \$203 | 1.51 | 63% |
| 3D | Installing Floodwalls, Levees and Raising Structures | 6 Miles of Floodwalls and 2 miles of levees in the area of Manasquan Inlet, plus 15,565 residential structures raised in Great Bay and Mullican River Embayment, Little Egg Harbor and portions of Manahawkin Bay (None in Bay Head) | \$461 | \$23 | \$26 | 1.16 | 95% |
| 3E(1) | Installing Storm Surge Barriers (SSB) Only | One SSB at Manasquan Inlet and one SSB at Barnegat Inlet | \$2,549 | \$154 | \$308 | 1.99 | 44% |
| 3E(2) | Installing Storm Surge Barriers (SSB) and Raising Structures | One SSB at Manasquan Inlet, one SSB at Barnegat Inlet, and Raising 5,843 residential structures in the area of Long Beach Island | \$3,837 | \$202 | \$362 | 1.79 | 34% |
| 3E(3) | Installing Storm Surge Barriers (SSB), Floodwalls, and Levees and Raising Structures | One SSB at Manasquan Inlet, one SSB at Barnegat Inlet, 75 miles of flood walls and 3 miles of levees along Long Beach Island and Manahawkin Bay, closing 10 roads and raising 3,780 residential structures in the area of Long Beach Island | \$4,838 | \$268 | \$399 | 1.49 | 27% |

Note 1: Average Annual Costs: This includes operations and maintenance (O&M), average annual damage to infrastructure and vehicles, transportation delays and emergency costs.

Note 2: Average Annual Benefits: This includes the cost savings due to reduction in storm damage which comes from implementing the alternative.

Note 3: Bay Head Structure Raising: By 2050 flooding levels will exceed the USACE Design Flood Elevation (DFE) of 912 residential structures in Bay Head (89.9%). The Design Base Flood Elevation is equal to the existing FEMA Base Flood Elevation plus sea level rise projection plus projected flood level margin of error (0.16 feet) plus any additional state or local ordinance elevation requirement.

Map 6 and Figure 2 below show the general configuration and location of the proposed Storm Surge Barriers. (Reference: Figure 96 New Jersey Back Bay Coastal Storm Risk Management Draft Feasibility Report, August 2021).

A draft USACE Feasibility Report with recommendations was released for review on August 19, 2021. This Report provides the Tentatively Selected Plan for the New Jersey including Cape May, Atlantic, Ocean, Monmouth and Burlington Counties. The Plan includes:

- Storm Surge Barriers or Inlet Closures at Manasquan Inlet, Barnegat Inlet and Great Egg Harbor Inlet;
- Cross-Bay Barriers or Interior Bay Closures at Absecon Boulevard, and southern Ocean County;
- Elevation and floodproofing of 18,800 structures concentrated in the vicinity of Shark River Inlet and southern Ocean County; and
- Perimeter measures including floodwalls, levees and seawalls which tie the storm surge barriers and cross-bay barriers into adjacent higher ground.

The Plan has a Benefit-to-Cost Ratio of 1.8 which maximizes financial benefits while accounting for project performance, adaptability to changing conditions, and risk to life safety. Funding follows the Water Resources Development Act of 1986, as amended, in which the federal government funds 65% of construction costs and non-federal government (State and Local Governments) funds 35%. Operation and Maintenance is to be funded by non-federal government sources. The Final Report is due in 2022 which will initiate funding authorization and project implementation. It is estimated that construction would not start before 2030.

Bay Head should follow this activity closely, and actively support this action as its implementation would facilitate a mitigation of flooding from Twilight Lake and Barnegat Bay in Bay Head. That being said, flood hazard areas will remain a significant issue and development constraint as it pertains to development in Bay Head until regional flood mitigation projects such as those described above are fully implemented and tested.

Map 6 USACE Storm Surge Barriers for Tentatively Selected Plan

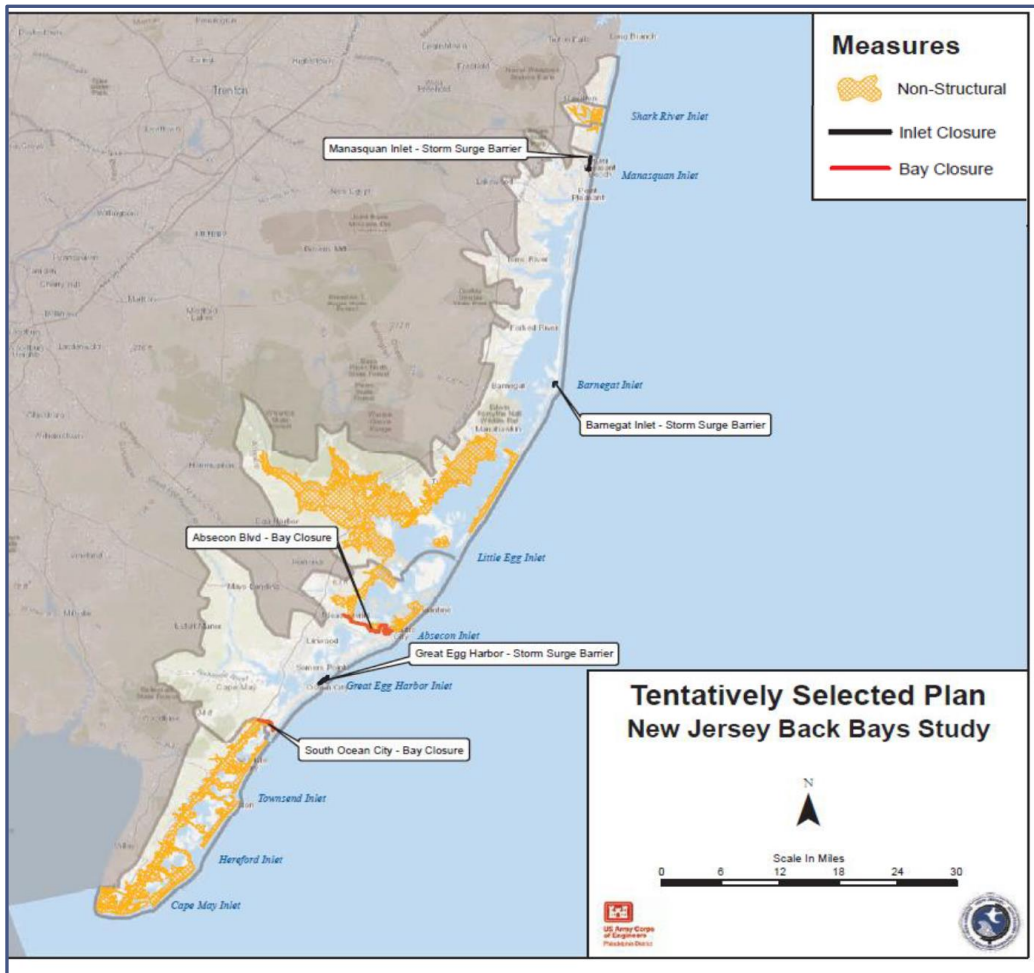
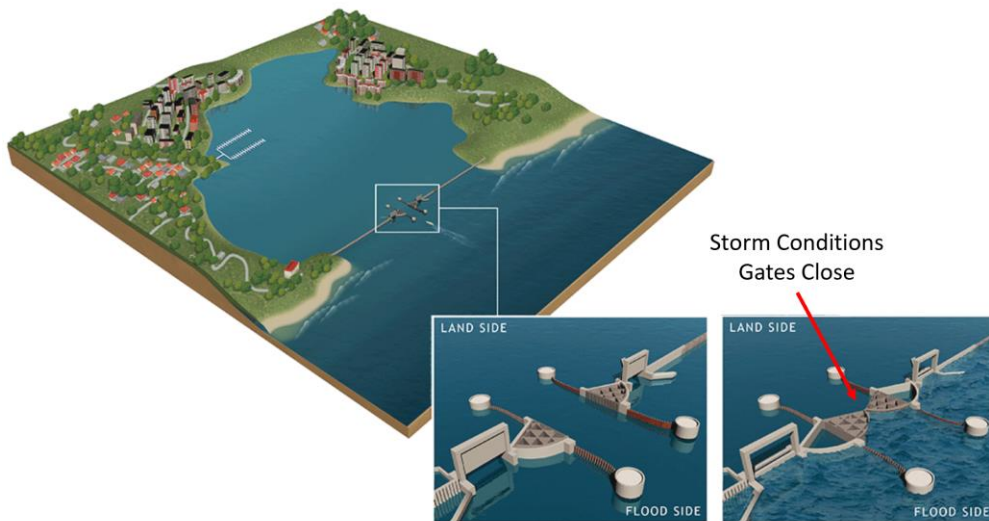


Figure 2 Example of USACE Storm Surge Barrier



6.4.3. Green Infrastructure Elements

The Green Infrastructure measures for shore communities incorporate both means of mitigating potential flooding through introduction of good planning and design practices, and an encouragement of the use of native materials, in particular plants that help the overall environment and reduce the need for artificial means of maintenance and watering. These green measures include:

- Rainwater management - reducing rainwater runoff directed to the storm drain system or sewer system is imperative through:
 - Planting areas with native or adapted plant material (e.g., trees shrubs, etc.)
 - Using permeable paving
 - Installing permanent absorption or collection features, including:
 - ✓ Vegetated bioswales
 - ✓ Rain gardens
 - ✓ Rainwater cistern or rain barrels to disconnect gutter systems that might be directed to the storm water drain system and capture and re-direct this rainwater to lawn areas.
- Renewable energy production

Portions of Bay Head are ideally situated for solar panel systems, as the nature of the sea air and high wind levels limits large vegetation in what is largely a grassland (salt marsh) ecosystem. In addition, the street grid, in some areas, is oriented so that the long portions of the blocks face southwest (about 50 degrees west of due south), while the general lot configurations cause the long facades of buildings to be oriented at about 20 degrees east of due south. Optimal solar orientation for temperate climate zones is 17.5 degrees east of due south.

To further these objectives, the Bay Head Council passed Resolution 2019-95 in August 2019 which formally adopted a Green Grounds and Maintenance Policy for the Borough of Bay Head. The policy affirmed the Borough's commitment to "protect, preserve, and enhance the environmental quality and health of the residents" through an integrated approach incorporating landscape design, minimization of water consumption, recycling, and environmentally conscious maintenance.

In August 2020, the New Jersey Department of Environmental Protection awarded the Borough of Bay Head a grant to develop water quality protection and management plan for Twilight Lake including ongoing monitoring of water conditions and further planning for green infrastructure improvements. The preparation of this Plan is scheduled to commence in 2021.

In January 2021, the Bay Head Council passed Ordinance No. 2021-03 that further emphasized the importance of Green Infrastructure. The Ordinance requires that "flood control, groundwater recharge, and pollutant reduction shall be achieved through the use of stormwater management measures, including green infrastructure Best Management Practices (GI BMPs) and nonstructural stormwater management strategies." The ordinance further directs that all major development projects provide a formal Storm Water Management Plan based upon explicit Green Infrastructure Standards specified in the Ordinance.

6.4.4. Green Checklist Elements

In addition to the Green Infrastructure Elements listed above and the recommendations for the use of Native Plantings in Shore Areas discussed below, the following is a listing of possible Green Checklist items:

- Use of managed wetlands for stormwater management for any newly or re-developed lots;
- Capturing rainwater on green roof surfaces or in cisterns to reduce stormwater runoff and substitute rainwater for potable water used for irrigation and other purposes;
- Developing standards designed to reduce noise or pollution emission from emergency powered diesel generators.
- Better control of lighting, including building lighting and infrastructure lighting (street lights, traffic signals, etc.) to reduce energy consumption and reduce night glare and reduce light pollution. As existing lights and/or signals burn out and require changeout, energy efficient lighting should be installed.
- Reduce heat island effects with requirements for reflective surfaces for building roofs and ground surfaces, as well as for tree-lined and shaded streets.

Recommendation:

A review should be conducted to determine if an ordinance is appropriate to better control and limit light pollution.

6.4.5. Native Plantings in Shore Areas

There are many native trees and plants that are of both ornamental value and tolerant of both salt spray and salty soils. The advantage of using these species is that they are naturally adapted to the conditions that can sometimes be severe and they require less maintenance and ongoing care. As discussed above the use of native plants will help manage and control water demands, reduce the need for irrigation and thereby reduce the need for plant fertilization in Bay Head and should be considered, when feasible.

6.4.6. Environmental Sustainability Considerations

It is important to consider actions to improve the environmental sustainability of Bay Head to help mitigate climate related hazards. The following is a list of considerations:

1) Bay Head Borough Facility Energy Consumption

There may be potential ways to reduce the carbon signature of Bay Head Borough facilities. An energy study should be performed to determine if Borough facilities can be modified to be more energy efficient to reduce their carbon signature, such as installing solar panels, LED lighting, timed thermostat controls, etc.

2) Bay Head Transportation

Bay Head should consider steps to help reduce emissions that contribute to climate change. Like other Coastal towns, Bay Head is vulnerable to increased carbon emissions. A primary source of CO₂ emissions in Bay Head is gasoline powered automotive traffic that passes through Bay Head. Bisected by State Highway 35, Bay Head experiences a steady flow of stop-and-go traffic primarily

during the summer months. Bay Head will continue to work with the County and State to better time and control traffic stoppage at red lights along Route 35 and Bridge Avenue in order to help limit unnecessary delays. Further, CO₂ levels may decrease as electric vehicles replace gas powered vehicles over the next decade. Bay Head residents and the Bay Head Borough Town Council can contribute to this reduction by greater use of electric vehicles and through other energy conservation efforts, such as promoting the ENERGY STAR qualified assessment of residential homes and continuing to make Bay Head municipal buildings more energy efficient. A transportation study should be performed designed to reduce vehicle emissions further.

A second source of emissions that contribute to climate change in the Borough of Bay Head is the use of diesel locomotives used by New Jersey Transit to power trains in and out of Bay Head throughout the day. Trains also idle for long periods of time in the Bay Head train yard for warmup, maintenance or preparation for use. Switching to electric or battery-operated locomotives would reduce the carbon signature of Bay Head. Bay Head has recommended such a change to NJ Transit and should continue to push for this change.

3) Electric Cars

The momentum in vehicle car transportation is shifting from fossil fuel vehicles to electric vehicles. Bay Head should anticipate the continuation of this trend and make it easier for electric car use in the Borough. There are three actions that should be considered:

- a) Consider adding electric charging stations in the Municipal Parking Lot and other locations throughout Bay Head (Yacht Club, School, Restaurants, Public Works, etc.) to support and encourage electric car use to reduce carbon emissions.
- b) There are an estimated 36 homes in Bay Head that do not have driveways, requiring residences to park on the street. There is no way for these homeowners to charge an electric car without the electric charging line passing across a sidewalk. One solution is to allow charging stations to be installed in the right of way between the sidewalk and roadway. This may pose safety concerns due to a source of electricity close to roadways. Providing a means of owning and charging electric cars by homeowners without a driveway should be reviewed to encourage electric vehicle use, but also to anticipate the needs of the residents of Bay Head.
- c) Similarly, the Borough should explore the costs and benefits of converting over time part (or eventually all) of the municipal fleet to electric vehicles (EV's) including integrating hybrid-electric police vehicles into the fleet as technology advances.

4) Environmental and Ecological Upgrades

Actions should be taken to upgrade the natural resources and the environment of the Borough of Bay Head in order to be more effective in mitigating climate-related hazards. Examples of such actions include a living shoreline, assured health of sensitive environmental areas like wetlands, purchase by the Borough of wetland properties to preserve and protect wetlands, increased pervious ground cover, and increased health of Twilight Lake. These actions would help mitigate climate change-related hazards. An effort should be made to identify these actions, prioritize them and establish an action plan.

5) Energy Conservation and Renewable Energy

Bay Head should pursue installing energy efficient heating and cooling systems in municipal, residential and commercial buildings. Consideration should be given to conducting an energy efficiency study to determine if the use of sustainable energy sources (wind, solar, geothermal, etc.) would prove to be cost beneficial.

6.4.7. Bay Head Mitigation Action Plan

In summary resiliency planning involves five steps:

Step 1: Generate Awareness of Coastal Risk

This Master Plan has been prepared to inform Bay Head residents and Bay Head Officials of coastal risks. Multiple references are identified in this Master Plan which provide details of the risk. Bay Head should continue to monitor updated studies and reports by the USACE, FEMA, NJ Department of Environmental Protection, Rutgers University, Ocean County, and other government agencies. As these reports and documents are updated, the information should be studied and Bay Head action plans adjusted, as needed. Bay Head officials (Council Members, Mayor and the Business Administrator) have participated and provided input to previous studies and should continue to do so. In particular, the comprehensive USACE Back Bay Study, which is in progress, should be closely monitored and as recommendations are identified, Bay Head should take an active role in gaining approval for projects directed at remedying flooding in Bay Head.

Step 2: Assess Coastal Risks and Opportunities

This Master Plan assesses coastal risks and the potential impact on Bay Head. It summarizes assessments performed by other organizations and opportunities for mitigating the risks.

Step 3: Identify Short Term Options or Choices for Addressing Priority Risks and Vulnerabilities

The following actions are recommended:

- 1) Bay Head should develop a detailed Capital Budget Flooding Mitigation Action Plan and seek funding (FEMA Flood Mitigation Grants) for conducting necessary studies and implementing changes.
 - a) This action plan should have the following elements: List of specific roadways, intersections, road-ends, etc. where frequent flooding is occurring.
 - b) Prioritize each flood location in terms of negative impact.
 - c) Identify potential options to mitigate flooding at each flood locations such as check valves, raising of roadways, more drainage collection basins, upgraded outfalls, barrier walls, raised coastline, etc.
 - d) Identify studies and projects to evaluate options to mitigate flooding. Studies should include cost benefit analyses.
 - e) Gain approval by Bay Head officials to implement options.
 - f) Integrate approved options with the Borough of Bay Head budget needs.

- 2) Public Works should continue actions to maintain the functionality of the storm drain system, especially by cleaning storm drain catch basins and grates and sweeping streets. Public Works should obtain as-built drawings of the storm drain system so as to better understand its operation when evaluating upgrades.
- 3) The Borough should evaluate the operation and effectiveness of the four existing check valves installed in the storm drain system.
- 4) As roadways are repaved the elevation of the road crowns should be increased.
- 5) The Borough must remain vigilant in protecting the dunes.
- 6) The Borough must interface with the State DOT to ensure NJ is maintaining the two storm drain pumping stations/systems so they operate efficiently.
- 7) The Borough must support the groin reconstruction project in whatever way possible.

Step 4: Identify Mid-Term Options or Choices for Addressing Other Risks and Vulnerabilities

The following mid-term actions are recommended:

- 1) Check Valves
 - a) Evaluate the benefit of installing two check valves one at the Clayton Avenue outfall at the border with Mantoloking and the second at the outfall at Woodland Ave. If the check valve benefit is justified, install the two check valves.
 - b) Review the locations of flooding due to reverse flow from Twilight Lake and Barnegat Bay and consider installing additional check valves.
 - Evaluate High Priority Flooding Locations First: Intersection of Bridge Ave and Club Drive
 - Evaluate Medium Priority Flooding Locations Second: Lake Ave north of Bridge and Lake Ave south of Bridge
 - Evaluate Lower Priority Flooding Locations Third: Twilight Road, and Centennial Park
- 2) Authorized and Funded Twilight Lake Evaluation Study
 - a) Actively participate in and study the results of the pending Twilight Lake Evaluation
 - b) Suggest adding to the Study an assessment of dredging Scow Ditch north and south of Bridge Avenue to determine impact of improved flow.
 - c) Identify actions to implement from the Study, e.g., shoreline stabilization, living shoreline implementation, etc.
 - d) Encourage inclusion in the Study additional environmental sustainability projects that would be considered for implementation.
- 3) Pursue a grant to study the mitigation of flooding from Twilight Lake overflowing its shoreline. This involves a more extensive and expensive mitigation approach, which may include one of the two options:

- a) Raising the shoreline surrounding Twilight Lake to 3.0 feet vertical datum based on the North American Vertical Datum of 1988 (NAVD 1988). This elevation was selected since it is the current elevation of the bulkhead installed along Scow Ditch north of Bridge Avenue bridge. In the past five years this 3.0-foot NAVD 1988 elevation was exceeded only twice and to a very minor extent.
- b) Installing a system of controlling water movement through Scow Ditch. This option would involve a gate or a bulkhead with a weir along with pumping provisions similar to that used when Scow Ditch was dammed in 2014.

Both options will require an analysis of the consequences of flood water management that this action might affect. Since flow limitation would only occur when major flooding from Barnegat Bay was anticipated, this action is temporary and short lived. Even so, the environmental impact and potential changes in other storm water management operations of this action must be considered.

- 4) Pursue a Grant to Study the Mitigation of Barnegat Bay Overflowing its Bulkhead
 - a) Pursue a grant to study the mitigation of flooding in Bay Head due to Barnegat Bay overflowing its bulkhead. Since Barnegat Bay is so large, it is not feasible to raise the entire bulkhead surrounding Barnegat Bay. Therefore, this study would be to raise portions of the bulkhead most susceptible to causing significant flooding in Bay Head due to overflowing specific locations of the shoreline.
- 5) USACE Beachfill and Dune Project
 - a) Bay Head should continue to pursue the USACE and the NJ Department of Environmental Protection to restore the beach and dunes to the 2017 design standards to regain the margin of protection provided by the USACE Beachfill and Dune Project.
- 6) Electric Vehicles
 - a) As Bay Head vehicles come due for replacement consider purchasing electric vehicles.
- 7) Assess and improve Bay Head's Public Notification System
 - a) Consider upgrading the existing Emergency Alert System to provide real time/more reliable information regarding street flooding/street closures as well as alerting for other extreme weather events.
- 8) Employ Sustainability Methods to reduce flood risk.
 - a) Continue to investigate the use of permeable surfaces and other green infrastructure methods to abate flooding risk.
 - b) Encourage native plantings and green spaces to enhance water percolation;
 - c) Require new construction and other significant projects to provide grade elevations before and after construction to ensure that water is retained on each property to the greatest extent possible.

Step 5: Identify Long Term Options or Choices for Addressing Other Risks and Vulnerabilities

The following long-term actions are recommended:

- 1) USACE Back Bay Project
 - a) Bay Head must keep actively involved, informed, and support decisions of the USACE Back Bay Project **which have the greatest potential to reduce climate-related flooding hazards in Bay Head.**
- 2) Implement Mitigation of Twilight Lake Overflowing Coastline
 - a) If the Twilight Lake study shows it is beneficial to control/limit Twilight Lake from overflowing its coast line, the Borough should seek a grant to implement the method best suited to mitigate this source of flooding.
- 3) Implement Mitigation of Barnegat Bay Overflowing Bulkhead
 - a) If the Barnegat Bay study shows it is beneficial to control/limit Barnegat Bay from overflowing its bulkhead, the Borough should seek a grant to implement the method best suited to mitigate this source of flooding.

7. OTHER RECOMMENDATIONS

The recommendations in this section are provided for reference purposes. The various recommendations have been culled from other planning efforts as well as responses to recent storm events. The recommendations offer a variety of possible actions while not drastically changing the existing infrastructure or pattern of development for the Borough of Bay Head.

The Bay Head Planning Board does not specifically recommend each of these items for action at this time but presents them as suggestions for further consideration.

A comprehensive list of all recommendations in this document is provided in APPENDIX 3 - List of Recommendations.

7.1. General Recommendations

The following is a list of additional General Recommendations based upon the evaluation of the 2007 Master Plan Reexamination and discussions with Borough officials.

- 1.) Look to develop and provide residents timely and relevant information from sources relating to recovery resources, evacuation routes, etc.
- 2.) Continue participation in Community Rating System Program and National Flood Insurance Program.
- 3.) Encourage the investigation and potential use of green building and green infrastructure techniques adapted for the unique shore environment, such as pervious Americans with Disabilities Act (ADA) accessible paving for walkways and parking lots, and the use of native plant material wherever possible to reduce the need for irrigation and fertilization in the sensitive shore environment.
- 4.) Encourage the continued evaluation of Resiliency Planning techniques as they relate to shore environments, including the awareness of coastal risk and prioritization of risks and vulnerabilities.
- 5.) Investigate balancing the needs of vehicular (car and truck) access and parking with those for pedestrians and bicyclists. Traffic of all types is increasing, and Bay Head residents and visitors will benefit from safe crossings, more accessible and safer routes for walking and biking, improved bicycle parking, and other user-friendly amenities.
- 6.) Consider developing unique wayfinding signage to direct visitors to landmarks and recreation access points, such as the beach and the bay, while creating an identity unique to Bay Head. At the same time, the Borough should review and possibly reduce the growing number of signs throughout community that distract from the visual aesthetic in Bay Head and that cause confusion or sign overload.
- 7.) Revisit implementation of the Bay Head Historic District as part of the land development ordinances and adoption of the Historic Preservation Element of the Master Plan.
- 8.) Evaluate existing open spaces and look for ways to link neighborhoods and encourage a variety of recreation opportunities for all age groups, such as developing an environmental education park at the corner of Twilight Road and Lake Avenue.

7.2. Land Use Recommendations

The following recommendations are directed toward the Land Use Plan Element which serves as the foundation and basis for the Zoning Ordinances. The Master Plan will generally include a Statement of Objectives and Recommendations while the Land Use Plan Element is the actual enforcement and regulatory document consisting of the Zoning Ordinance and Codes for the Borough.

Possible Zoning Ordinance revisions include:

- 1.) Decrease the impervious coverage area and increase green space in front yards of residential properties by introducing a percentage of area that must be planted.
- 2.) Review allowable setbacks and coverages to adjust for the change in landscape due to structures being raised to higher elevations.
- 3.) Review the value of a tree ordinance to encourage retaining existing trees and planting new trees to maintain the beauty of Bay Head. This should be balanced with the need to provide an unobstructed view of the sky and the sun for possible installation of solar panels.

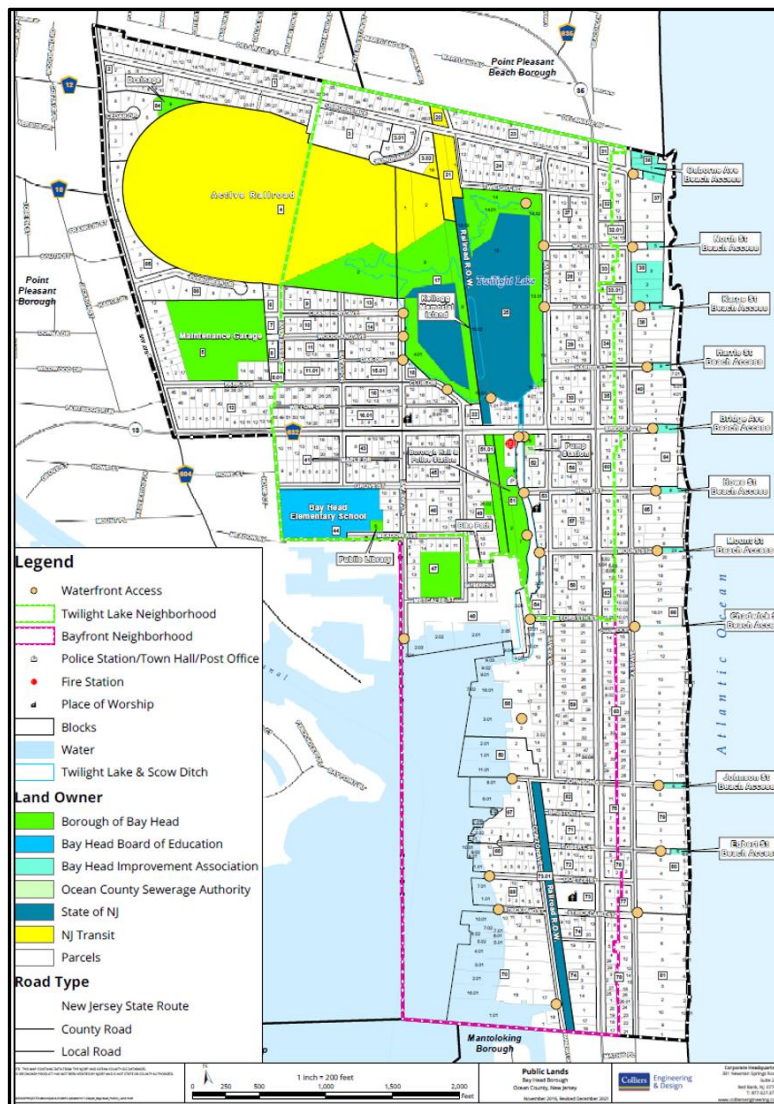
7.3. Ocean County Multi-Jurisdictional All Hazard Mitigation Plan

The Ocean County 2018 Multi-Jurisdictional All Hazard Mitigation Plan lists recommendations for Bay Head (Appendix B.3 - Action 6.4.3-1 through 6.4.3-25). They are listed below for information only and are not recommendations of the Planning Board:

- 1.) Elevation of 165 homes to the new FEMA Building Flood Mitigation Guidelines in Bay Head Borough
- 2.) Verbal Mutual Aid Agreement among Point Pleasant Beach, Point Pleasant, Bay Head, and Mantoloking
- 3.) USACE replenishment project and dune restoration (dunes are located on the street side)
- 4.) Yearly Fall Dune grass planting
- 5.) Upgrade CRS Class Level
- 6.) Raise Six Road Intersections
- 7.) Raise Four Roads
- 8.) Point Pleasant Pump Station Diversion
- 9.) Install Flood Gates at Scow Ditch
- 10.) Replace/Raise Bulkheads in the area of the Bay Head Yacht Club
- 11.) Installation of Tide Flex Valves along West Lake Avenue
- 12.) Flood Proof One Commercial Property
- 13.) Storm Sewer Assessment
- 14.) Neighborhood Flood Mitigation and Resiliency Plans

APPENDIX 1 - OPEN SPACE AND RESILIENCY

Map 7: Map of Public Lands or Publicly Open Spaces in Bay Head



Open Space and Parks

Along the eastern, northern, and western edges of Twilight Lake there are strips of land that are open space. To the east along Lake Avenue, there are two small public docks and a sandy beach area that allow launching of small, non-motorized watercraft, such as paddleboards and kayaks. To the northeast, at the corner of Lake Avenue and Twilight Road, there is a sizeable piece of public land, which remains open space and was resurfaced with Twilight Lake dredge spoils, seeded and small trees planted. Twilight Lake was dredged in 2014 to remove debris deposited in the Lake from Superstorm Sandy.

The northwestern portion of Twilight Lake is mostly inaccessible marshland and/or under New Jersey Transit ownership. The west side of the Lake is also bordered by a narrow strip of Borough-owned land that is mostly vegetated with some benches to sit on.

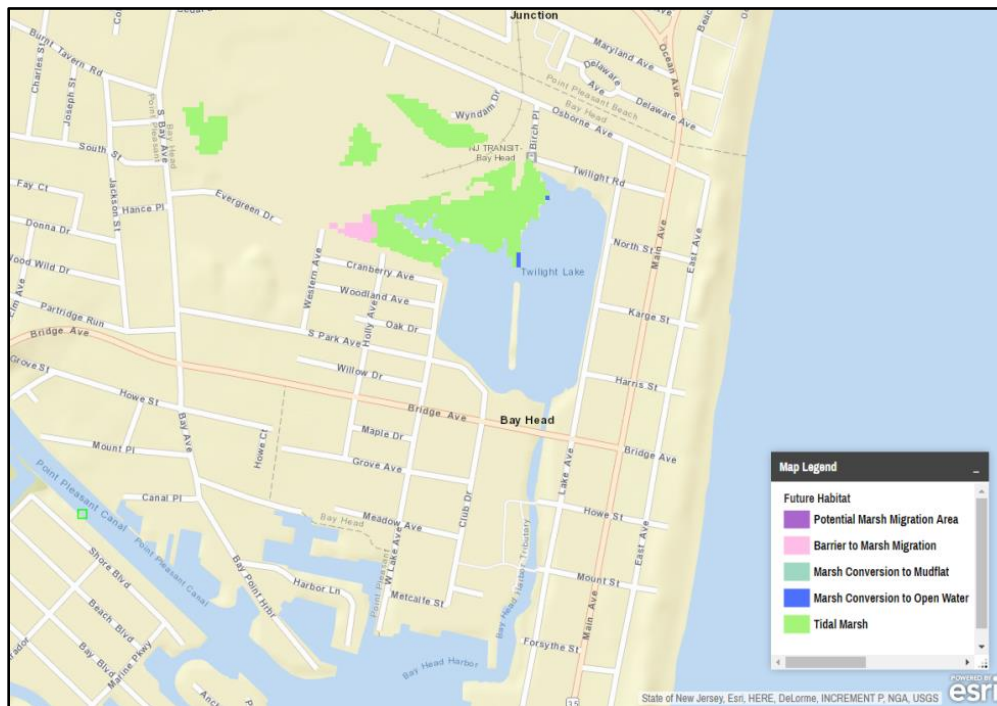
Twilight Lake is Bay Head’s major open space area with the Scow Ditch connection to the Bay as accessory open space, making the entire area tidally influenced.

The 66’ wide strip of open space along Clayton Avenue belonging to the State of New Jersey was the railroad right away for the Pennsylvania and Atlantic Railroad. In a February 1979 Agreement the Borough of Bay Head agreed to be responsible for the maintenance of the strip of land.

Shoreline Treatments

Storms and flood events may increase the rate of erosion or movement of sediment, in addition to flooding nearby properties, which make them more vulnerable to flooding in the future. Although accretion of sediment also occurs along the shoreline and within Scow Ditch, it is often sediment brought downstream that causes backup or deflection of water elsewhere. The accretion is likely also minimal compared to the impact of sea level rise. Map 8 shows the projected shoreline change around Twilight Lake, as well as the future habitat in 2050 with a 1-foot sea level rise.

Map 8: Future Habitat Change in Twilight Lake in 2050, 1 Foot of Sea Level Rise



The Nature Conservancy (TNC) developed the Restoration Explorer App that maps out the New Jersey shorelines and proposes enhancement techniques for areas experiencing disturbance, such as erosion. TNC and researchers at the Center for Remote Sensing and Spatial Analysis at Rutgers University in New Jersey found that at least 85% of the seven set parameters affecting shoreline disturbance (6 out of 7) must be met in order to qualify the technique as applicable to an area of shoreline.²⁹ These parameters were only available for Scow Ditch, so the mapping done for Twilight Lake is estimated based on best practices for existing conditions.

Parameters described as “not applicable”, or N/A, are counted as a “yes”. The parameters are listed below:

- Tidal Range (feet)

- Shoreline Change (Erosion vs. Accretion) (feet/year)
- Coastal Ice Cover (frequency)
- Wave Height (feet)
- Slope (%)
 - Shoreline Slope
 - Nearshore Slope
- Salinity (ppt = parts per trillion)

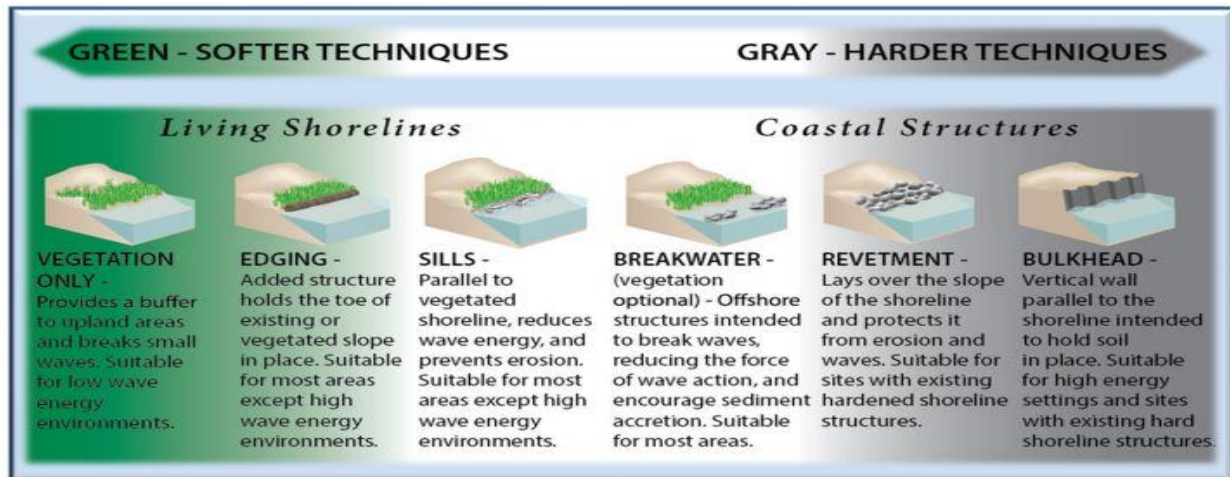
Additionally, the USACE has identified twenty (20) risk management strategies for coastal communities through their *2015 North Atlantic Coast Comprehensive Study Report*.³⁰ Some of the approaches are structural, while others are natural and nature-based features (NNBF), and others are non-structural (policy-based). Some strategies may not be applicable to the Twilight Lake or Scow Ditch shoreline, but may need to be considered at a larger-scale to minimize risk around the Borough. Those that may be considered, to varying degrees, are included below, divided between areas of low-level wave energy and moderate to high-level wave energy. Some of the non-structural strategies are included in the Zoning and Land Use recommendations section. It is important to consider all alternatives strategically for their short and long-term impacts on the community.

The USACE stated further study must be done for each solution and appropriate locations. While some areas may have several possible solutions that could be effective, it is possible that they will not all work together and that one solution may be more effective than others.

²⁹ Lathrop, Richard. *Documentation for The Nature Conservancy Restoration Explorer App*. August 2015.

³⁰ *North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk (NACCS)*, prepared by the US Army Corps of Engineers, January 28, 2015

Table 14: Various shoreline stabilization methods are shown ranging from “green” living shorelines to hardened structures, shown in gray (Image: NOAA)



Tidal Marshes (Low-Level Wave Energy)

Tidal marshes are marine landscapes that contain wetlands along the coasts of tidal basins, including estuaries, which are frequently inundated by flooding from the daily tidal flow of the adjacent ocean or major water body. Within the Twilight Lake area, there are tidal marshes located toward the north and northwest of the Lake, that are influenced by the Barnegat Bay and Atlantic Ocean via Scow Ditch.

Tidal marshes can range between freshwater, brackish, and saline, and are normally categorized into the lower, or intertidal, marsh and the upper, or high, marsh. The intertidal zone in saline marshes is flooded daily and then re-exposed by the tide. Tidal marshes are typically characterized as having a mix of tall and short saline-tolerant grasses, such as tall and short Smooth Cordgrass (*Spartina alterniflora*), Spike Grass, and Salt-meadow Rush (*Juncus gerardii*). Tidal marshes are important because they help to buffer stormy seas, slow shoreline erosion, and are able to absorb excess nutrients before they reach oceans and estuaries.²⁵

For the saline and brackish tidal marsh shorelines, which exist primarily along the north and northwest portions of Twilight Lake along the New Jersey Transit property, there are at least five shoreline enhancement options that can address shoreline edge erosion and marsh migration. Techniques that may be appropriate to consider for Twilight Lake include nature-based living shorelines and marsh sills because the area is protected from wave action.

Living Shorelines

The USACE suggests that the Borough may want to consider “living shorelines” along much of Twilight Lake. Living shorelines have a beach, strand of coastal wetlands, breakwater of rocks, then a bank, and an upland buffer. Wetlands and natural structures are better at absorbing the impact of floodwater, particularly long-term.³¹

³¹ *Community Rating System Classification and Types of Wetlands*, US Environmental Protection Agency, EPA Website

In certain strategic areas where bulkheads and other hard structures exist, but that are relatively protected from wave action, the USACE suggests that the Borough could conduct a study about replacing the hard structures with living shorelines. This may not be practical along certain areas on the Bay due to potential high-level wave action and sediment erosion; however, Scow Ditch and Twilight Lake provide an easier and calmer transition zone.

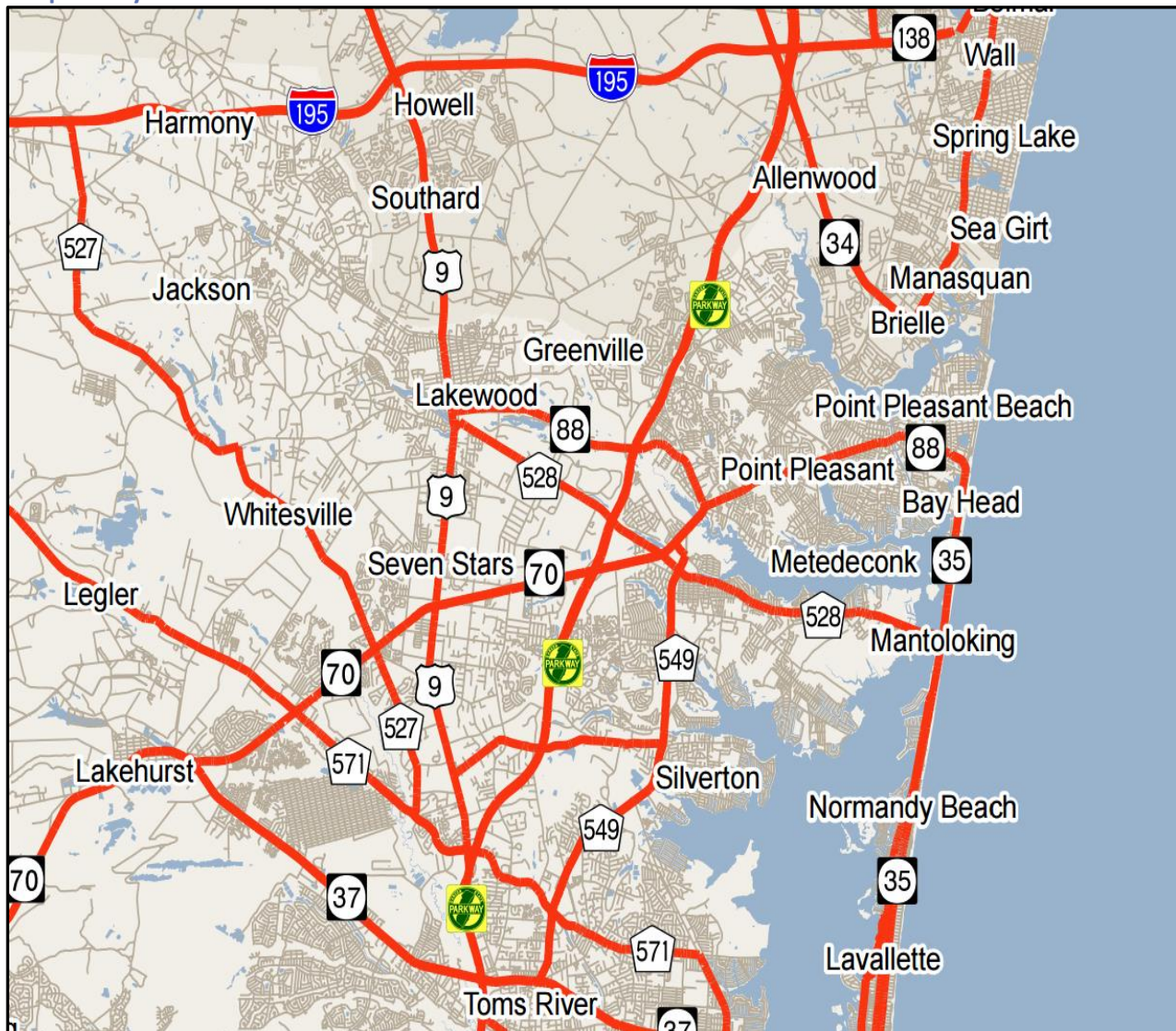
In addition, living shorelines provide a healthy habitat and nesting and breeding area for some marine species, as well as a transition zone for wetlands that is protected. Educational components, including signage and programming can be incorporated to teach residents and visitors about the importance of these areas when they are placed along existing accessible parks and street-ends.

APPENDIX 2 - EVACUATION ROUTES

Evacuation Routes

With potentially increased sea level and frequency and intensity of storms that affect storm surge and flooding, it is critical for coastal communities to have contingency plans for residents to get to safety or for emergency access into an area. There is currently one main and one alternative evacuation route established for the Borough of Bay Head. The Ocean County evacuation route uses Route 35 North and then Route 88 through the Borough of Point Pleasant for this portion of the County, or optionally Route 35 South to Mantoloking and Route 528.

Map 9: Bay Head Evacuation Routes



APPENDIX 3 - LIST OF RECOMMENDATIONS

| Item | Page | Recommendations |
|------|------|---|
| 1 | 6 | ...this Report recommends that Bay Head cultivate greater community support for preserving historic heritage... |
| 2 | 9 | ...To advance this goal (preserve Bay Head single family residential character) we recommend that the Borough work to: 1) Develop design guidelines to assist residents in achieving well-scaled structures and maintaining an attractive streetscape. |
| 3 | 9 | 2) Consult with historic preservation experts about ways to encourage community support preserving the Borough's history. |
| 4 | 9 | 3) Consider passage of a historic preservation ordinance. |
| 5 | 9 | 4) Evaluate whether height, setback and lot coverage restrictions should be adjusted in light of new building code requirements and to appropriately respond to current FEMA/FIRM building elevation standards. |
| 6 | 9 | 5) Ensure that the Borough's website is up-to-date and that residents are notified about Planning Board meetings, agendas and resolutions, if possible, by an email, text messaging, or similar method to which residents may subscribe. |
| 7 | 9 | 6) Reexamine the Borough's affordable housing obligations and take appropriate actions. |
| 8 | 10 | ...To ensure that they (Commercial Districts) thrive, we recommend the following steps. 1) Consider zoning regulations to ensure that historical retail spaces will be used for retail rather than professional or service enterprises. |
| 9 | 10 | 2) Monitor parking demands, increased traffic, and increased truck loading and offloading demands as new business development becomes a reality. Explore and pursue any practical means to alleviate existing and possible future parking and truck unloading problems. |
| 10 | 10 | 3) Thoroughly review circulation, parking, truck loading and offloading and ways to accommodate alternative modes of transportation including expanded walk and bike ways and improved bicycle parking. Continue to explore and pursue practical means to protect the safety of pedestrians, bicyclists and others in commercial districts and elsewhere in Bay Head. |
| 11 | 10 | 4) The Nonresidential Development Fee Act requires nonresidential developers to pay 2.5 percent of the increased value of nonresidential development projects into an affordable housing trust fund. The Borough should faithfully implement this Legislation. |

| Item | Page | Recommendations |
|------|------|---|
| 12 | 12 | Bay Head should actively monitor and review NJ Transit plans for any proposed developments and seek ways to minimize the potentially negative aesthetic, environmental and function impact and overall impact on Bay Head. |
| 13 | 12 | Bay Head should ensure that all efforts to address affordable housing obligations should adhere to sound environmental protection principles and should take into account the environmental studies referenced herein. |
| 14 | 12 | The Borough must monitor the success of the USACE Beachfill and Dune Project to protect the dunes, and mitigate the disruption of beach access and use, as well as other potential impacts. |
| 15 | 13 | Given the historic nature of the community and the extraordinary environmental sensitivity of lands throughout the community, we recommend these factors be carefully considered and safeguarded in all zoning decisions. |
| 16 | 13 | The Borough should re-examine lot coverage area with a view toward flood mitigation and preservation of light, air and open space. The Borough should: 1) Decrease the impervious coverage area and increase green space in front yards of residential properties by defining a percentage of lot area that must be planted. |
| 17 | 13 | 2) To avoid unnecessary diminution of on-street parking, limit the amount of street frontage that can be used for vehicular access to residential properties based upon a formula of a maximum opening for access per the amount of street frontage. |
| 18 | 13 | 3) Direct the Planning Board Clerk to forward site plan approval requests to the Bay Head Environmental Commission for review and comment. |
| 19 | 13 | 4) Review allowable setbacks and coverages to adjust for the change in landscape due to structures being raised to higher elevations. |
| 20 | 14 | We recommend the Borough continue its commitment to maintaining and improving the sidewalks. It is specifically recommended that a sidewalk be installed at the one remaining 2007 Master Plan priority location at Club Drive. |
| 21 | 20 | The Borough should consider ways to generate affordable housing in a manner that is sensitive to the environment and sound planning. |
| 22 | 24 | The Borough should consider re-visiting a preservation/demolition ordinance to gauge and cultivate public support for the preservation of Bay Head’s historic structures and sites. |
| 23 | 24 | We recommend historic preservation factors be taken into account whenever the Borough is conducting affordable housing planning. |
| 24 | 24 | We recommend updating the inventory of homes listed in the Historic District Registry to reflect changes since 2006. |

| Item | Page | Recommendations |
|------|------|---|
| 25 | 26 | We recommend that the Borough of Bay Head continue to explore efforts to raise the Community Rating System Class level to higher levels. |
| 26 | 27 | We recommend the Borough reexamine the affordable housing obligations with respect to unmet need. In particular, the Borough should review its right to a vacant land adjustment, without waiving its right to demonstrate that the Legislature never intended a land-poor municipality to take actions beyond addressing adjusted fair share. |
| 27 | 27 | We recommend the Borough reconsider the decision of the Court on September 12, 2000, supported by the recommendations of the Master, to allow the Borough to address its unmet need without overlay zones. In addition, the Borough should consider satisfying the unmet need through an Accessory Apartment Program and consider adopting a Mandatory Set Aside Ordinance to ensure that any project of five or more units reserves 20 percent of the units as affordable units. |
| 28 | 27 | We recommend the Borough implement the Non-Residential Development Fee Act which requires non-residential developers to pay 2.5 percent of the increased value of nonresidential redevelopment projects into an affordable housing trust fund. |
| 29 | 28 | We recommend that consideration be given to provide the residents of Bay Head not only visual access to the beauty of Barnegat Bay, but also for recreational purposes such as boat ramp access or even dock access to a floating dock located at one of the five street ends listed in the Access Plan. |
| 30 | 29 | We recommend the ERI be taken into account to assure full consideration of environmental impact during land use decision making processes. Affordable housing decisions should also take the ERI into account. |
| 31 | 29 | We recommend that the Borough continue to monitor advances in cellular communication technology such as 5G wireless and consider the best approach for incorporating such advances into Bay Head's infrastructure. |
| 32 | 43 | Bay Head ocean front property owners, the Bay Head Improvement Association and Bay Head officials must remain vigilant to assure that the integrity of the 1962/2015 rock revetment and dune system are maintained. |
| 33 | 43 | The Borough and Bay Head residents must remain vigilant in complying with the Bay Head Dune Protection Ordinance to help retain the integrity and functionality of the dunes. |
| 34 | 43 | The Borough of Bay Head must support and encourage the groin project. |
| 35 | 55 | We recommend a review be conducted to determine if an ordinance is appropriate to better control and limit light pollution. |

| Item | Page | Recommendations |
|------|------|---|
| 36 | 56 | We recommend a Bay Head transportation study be performed to determine ways to reduce vehicular emissions in Bay Head. |
| 37 | 56 | We recommend that Bay Head continue to encourage and push NJ Transit to change locomotives from diesel to electric or battery operation to reduce carbon emissions. |
| 38 | 57 | Bay Head should implement <u>Short Term Actions</u> to mitigate flooding: a) Bay Head should develop a detailed Capital Budget Flooding Mitigation Action Plan. |
| 39 | 57 | b) Public Works should continue actions to maintain the functionality of the storm drain system, especially by cleaning storm drain catch basins and grates and sweeping streets. Public Works should obtain as-built drawings of the storm drain system to better understand its operation when evaluating upgrades. |
| 40 | 57 | c) The Borough should evaluate the operation and effectiveness of the four existing check valves installed in the storm drain system. |
| 41 | 57 | d) As roadways are repaved the elevation of the road crowns must be increased. |
| 42 | 57 | e) The Borough must remain vigilant in protecting the dunes. |
| 43 | 57 | f) The Borough must interface with the State DOT to ensure NJ is maintaining the two storm drain pumping stations/systems so they operate efficiently. |
| 44 | 58 | Bay Head should implement <u>Mid Term Actions</u> to mitigate flooding: a) Evaluate the effectiveness of check valves in the storm drain system, and if found beneficial, install additional check valves. |
| 45 | 58 | b) Actively participate in and support the authorized and funded Twilight Lake Evaluation Study. |
| 46 | 58 | c) Pursue a NJ grant to study the mitigation of flooding from Twilight Lake overflowing its shoreline. |
| 47 | 59 | d) Obtain a Grant to Study the Mitigation of Barnegat Bay Overflowing its Bulkhead |
| 48 | 59 | e) Pursue the restoration of the beach and dunes to the 2017 design standards by the USAEC and NJ Department of Environmental Protection to regain the margin of protection provided by the USACE Beachfill and Dune Project |
| 49 | 59 | f) Consider purchasing electric vehicles as existing vehicles come due for replacement. |
| 50 | 59 | g) Consider upgrading the existing Emergency Alert System to provide real time/more reliable information regarding street flooding/street closures as well as alerting for other extreme weather events. |
| 51 | 59 | h) Employ Sustainability Methods to reduce flood risk. |

| Item | Page | Recommendations |
|------|------|---|
| | | (1) Continue to investigate the use of permeable surfaces and other green infrastructure methods to abate flooding risk |
| 52 | 59 | (2) Encourage native plantings and green spaces to enhance water percolation. |
| 53 | 59 | (3) Require new construction projects provide grade elevations before and after construction to ensure that water is retained on each property or directed to the street. |
| 54 | 60 | Bay Head should implement <u>Long Term Actions</u> to mitigate flooding: a) Keep actively involved, informed, and support decisions of the USACE Back Bay Project which have the greatest potential to reduce climate-related flooding hazards in Bay Head. |
| 55 | 60 | b) If the Twilight Lake study shows it is beneficial to control/limit Twilight Lake from overflowing its coast line, the Borough should seek a grant to implement the method best suited to mitigate this source of flooding |
| 56 | 60 | c) If the Barnegat Bay bulkhead study shows it is beneficial to control/limit Barnegat Bay from overflowing its bulkhead, the Borough should seek a grant to implement the method best suited to mitigate this source of flooding. |
| 57 | 61 | The following is a list of General Recommendations based upon the evaluation of the 2007 Master Plan Reexamination and discussions with Borough officials. They are presented here solely as <u>suggestions for further consideration</u> . 1) Look to develop and provide residents timely and relevant information from sources relating to recovery resources, evacuation routes, etc. |
| 58 | 61 | 2) Continue participation in Community Rating System Program and National Flood Insurance Program. |
| 59 | 61 | 3) Encourage the investigation and potential use of green building and green infrastructure techniques adapted for the unique shore environment, such as pervious Americans with Disabilities Act (ADA) compliant accessible paving for walkways and parking lots, and the use of native plant material wherever possible to reduce the need for irrigation and fertilization in the sensitive shore environment. |
| 60 | 61 | 4) Encourage the continued evaluation of Resiliency Planning techniques as they relate to shore environments, including the awareness of coastal risk and prioritization of risks and vulnerabilities |
| 61 | 61 | 5) The Borough should investigate balancing the needs of vehicular (car and truck) access and parking with those for pedestrian and bicyclists. Traffic of all types is increasing and Bay Head residents and visitors will benefit from safe crossings, more accessible and safer routes for walking and biking; improved bicycle parking; and other user-friendly amenities. |
| 62 | 61 | 6) The Borough should consider developing unique wayfinding signage to direct visitors to landmarks and recreation access points, such as the |

| Item | Page | Recommendations |
|------|------|---|
| | | beach and the bay, while creating an identity unique to Bay Head. At the same time, the Borough should review and possibly reduce the growing number of signs throughout community that distract from the visual aesthetic in Bay Head and that cause confusion or sign overload. |
| 63 | 61 | 7) Revisit implementation of the Bay Head Historic District as part of the land development ordinances and adoption of the Historic Preservation Element of the Master Plan. |
| 64 | 61 | 8) The Borough should evaluate existing open spaces and look for ways to link neighborhoods and encourage a variety of recreation opportunities for all age groups such as developing an environmental education park at the corner of Twilight Road and Lake Avenue. |
| 65 | 62 | <p>The following recommendations are directed toward the Land Use Plan Element which serves as the foundation and basis for the Zoning Ordinances. They are presented here solely as suggestions for further consideration.</p> <p>1) Decrease the impervious coverage area and increase green space in front yards of residential properties by introducing a percentage of area that must be planted.</p> |
| 66 | 62 | 2) Review allowable setbacks and coverages to adjust for the change in landscape due to structures being raised to higher elevations. |
| 67 | 62 | 3) Review the value of a tree ordinance to encourage retaining existing trees and planting new trees to maintain the beauty of Bay Head. This should be balanced with the need to provide an unobstructed view of the sky and the sun for possible installation of solar panels. |

APPENDIX 4 - LIST OF REFERENCED REPORTS

| REPORT PAGE | REFERENCED REPORT | AVAILABILITY |
|-------------|--|---|
| 7 | ¹ Borough of Bay Head: <i>Reexamination of the Master Plan and Development Ordinance</i> , prepared by Schoor Depalma, Inc., Adopted by the Borough of Bay Head Council on June 6, 2007 | http://bayheadnj.org/bhni/Departments/Planning%20Board/Various%20Planning%20Reports/Borough%20of%20Bay%20Head%20-%20Reexamination%20of%20Master%20Plan%20-%20206-6-07.pdf?1604257672 |
| 10 | ² 2017 Borough of Bay Head: <i>Hazard Mitigation Plan</i> , prepared by Remington, Vernick and Vena Engineers for Bay Head, May 2017 | http://bayheadnj.org/bhni/Departments/Planning%20Board/Various%20Planning%20Reports/Borough%20of%20Bay%20Head%20-%20Hazard%20Mitigation%20Plan%20Final.pdf?1604257672 |
| 10 | ³ <i>2018 Multi-Jurisdictional All-Hazard Mitigation Plan, Ocean County, New Jersey</i> , prepared by Michael Baker Jr. Inc., FEMA Approved July 16, 2020 | http://www.co.ocean.nj.us//WebContentFiles//d99c7d03-cbe7-47ca-9d49-8fea931376c5.pdf |
| 11 | ⁴ Borough of Bay Head: <i>Coastal Vulnerability Assessment Report</i> , prepared by the Borough of Bay Head Officials and Volunteers, October 2019 | http://www.bayheadnj.org/bhni/Community/Environmental%20Commission/Resources/Coastal%20Vulnerability%20Report%20-10-31-2019.pdf |
| 11 | ⁵ The Borough of Bay Head: Natural Resource Inventory, prepared by the Bay Head Environmental Commission, February 2021 | http://www.bayheadnj.org/bhni/_zumu_user_doc_cache/BHEC%20Environmental%20Resource%20Inventory%20-%202002-02-2021.pdf |
| 15 | ⁶ Press Release 13-126. <i>Long-Buried New Jersey Seawall Spared Coastal Homes from Hurricane Sandy's Wrath</i> , National Science Foundation, July 16, 2013. | http://www.nsf.gov/news/news_summ.jsp?cntn_id=128545&org=NSF&from=news |
| 17 | ⁷ The 1950-2010 US Census Bureau, 2019 – American Community Survey (ACS), Population | https://www.census.gov/programs-surveys/acs |
| 17 | ⁸ North Jersey 2012 Transportation Planning Authority (NJTPA) Population Projections | https://www.njtpa.org/NJTPA/media/Documents/Archive/Planning/Plan%202040/Plan2040Appendices_approved_draft.pdf |
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