Multi-Jurisdictional Natural Hazard Mitigation Plan Atlantic County, New Jersey

Prepared for

Atlantic County
Office of Emergency Preparedness
5033 English Creek Avenue
Egg Harbor Township, New Jersey 08234

Prepared by

AECOM
1255 Broad Street, Suite 201
Clifton, New Jersey 07013-3398

2021 DRAFTPLAN UPDATE

PLAN ADOPTION RESOLUTIONS

In accordance with Part 201.6 of the Disaster Mitigation Act of 2000 (DMA 2000), as amended, Atlantic County, New Jersey, has developed this Update of its Multi-Jurisdictional Natural Hazard Mitigation Plan to identify hazards that threaten the County and ways to reduce future damages associated with these hazards.

Following this page are the signed adoption resolutions of the County and all participating jurisdictions that have adopted this Plan Update, authorizing municipal government staff to carry out the actions detailed herein.

FEMA deemed this plan to be Approvable Pending Adoption on INSERT DATE HERE. Thereafter, the County and participating jurisdictions formally adopted the document. Copies of each jurisdiction's adoption resolution are included following Page i.

EXECUTIVE SUMMARY

Across the United States and around the world, natural hazards occur each day, as they have for thousands of years. As the world's population and development have increased, so have natural disasters and their effects. The time and money required to recover from these events often strain or exhaust local resources. The purpose of hazard mitigation planning is to identify policies, actions, and tools for implementation that will, over time, work to reduce risk and the potential for future losses. Hazard mitigation is best realized when community leaders, businesses, citizens, and other stakeholders join together an in effort to undertake a process of learning about hazards that can affect their area and use this knowledge to prioritize needs and develop a strategy for reducing damages.

Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act ("the Stafford Act"), enacted by Section 104 of the Disaster Mitigation Act of 2000 ("DMA 2000"), provides new and revitalized approaches to mitigation planning. Section 322 continues the requirement for a State mitigation plan as a condition of disaster assistance, and established a new requirement for local mitigation plans. In order to apply for Federal aid for technical assistance and post-disaster funding, local jurisdictions must comply with DMA 2000 and its implementing regulations (44 CFR Part 201.6).

While Atlantic County has always sought ways to reduce their vulnerability to hazards, the passage of DMA 2000 helped County officials to recognize the benefits of pursuing a long-term, coordinated approach to hazard mitigation through hazard mitigation planning. The County has received grant funds from the Federal Emergency Management Agency (FEMA) for both developing this very hazard mitigation plan, and its first required update. This **Atlantic County Multi-Jurisdictional Natural Hazard Mitigation Plan** represents the collective efforts of Atlantic County and each of its 23 participating jurisdictions, the general public, and other stakeholders. Natural disasters cannot be prevented from occurring. However, over the long-term, the continued implementations of this Plan will gradually, but steadily, lessen the impacts associated with hazard events.

The Atlantic County Multi-Jurisdictional Hazard Mitigation Plan has been developed by the Atlantic County Hazard Mitigation Planning Committee (the "Planning Committee"), with support from outside consultants. The efforts of the Planning Committee were headed by the Atlantic County Office of Emergency Preparedness's Hazard Mitigation Coordinator. The overall Planning Committee was divided into a Core Planning Group (CPG) and Jurisdictional Assessment Teams (JATs), with one JAT for each of the County's participating jurisdictions. The JATs consisted of a wide range of position titles for each community, from key individuals involved in emergency management, planning, engineering, floodplain management, and local administrators. In addition there was a County JAT which oversaw the process, headed by the Atlantic County Office of Emergency Preparedness (ACOEP).

Atlantic County's first hazard mitigation plan was approved pending adoption by FEMA on September 23, 2010; it was subsequently adopted by each participating jurisdiction[1]. FEMA requires that the plan be monitored and evaluated regularly, and updated at least once every five years. The first plan update process was initiated in earnest in the summer of 2014 with a Project Initiation Meeting between the County and its consultant held on August 13, 2014. A Kickoff Meeting of the full CPG was conducted on September 10, 2014. Thereafter, CPG members met on January 13, 2015; March 24, 2015; April 29, 2015; and July 16, 2015. JATs in each jurisdiction met individually throughout the plan development process as they deemed necessary. The County received agency approval for the first plan update February 5, 2016 and adopted the first Plan Update via Resolution #62 on February 23, 2016.

This document represents the second Plan Update. The second plan update process was initiated with the County issuing its consultant a contract on April 19, 2021. A Project Initiation Meeting between the County and its consultant was held on April 21, 2021. A Kickoff Meeting of the full CPG was conducted on May 20, 2021. The consultant held a full week of full day, back-to-back Jurisdictional Assistance Sessions via Zoom during the week of June 14-18, 2021 (with makeup sessions held on June 22, June 23, and July 6) to provide direct, one-on-one support to the County and each participating community. During the months of August and September 2021 the consultant also participated in numerous telephone calls with individual JAT members to provide further guidance and support in completing the required deliverables. A Progress Meeting of the CPG was held on July 15, 2021, and a meeting to review the draft plan prior to submission for State review was held on November 9, 2021. Key countywide stakeholders were invited to each CPG meeting. The County received agency approval on _____ and adopted the first Plan Update via Resolution #___ on _____.

Community support is vital to the success of any hazard mitigation plan. **The County and each participating community were responsible for conducting outreach within their respective jurisdictions. Since the second plan update process began in the spring of 2021, more than 100 outreach activities have been undertaken by the planning team members.** These efforts provided the general public and other stakeholders with opportunities to take part in the decisions that will affect their future.

County-Led Outreach Activities. The County-led outreach actions during the plan update were similar to those undertaken during the development of the initial plan. The County performed ongoing maintenance of its online hazard mitigation planning web presence at https://www.atlantic-county.org/hazard-mitigation/ with information regarding the planning process and where to go for additional information or comments. Press releases were issued on May 20, 2021, July 23, 2021, and August 3, 2021. Press releases were posted to the county web site, and shared via social media platforms including Facebook and Twitter. In addition, the press releases were also shared with County email subscribers which number about 1,500. Project fact sheets were widely distributed by ACOEP at various meetings throughout the process. They were also made available at the Atlantic County 4H Fair and National Night Out, both held in August 2021. The plan update was discussed at open public meetings of the County Board of Chosen Freeholders on March 3, 2020 (Resolution #96, approved); August 18,

[1] With the County's adoption on September 28, 2010.

2020 (Resolution #373, approved); March 2, 2021 (Resolution #128, approved); and (insert info here for plan adoption resolution at time of Final). ACOEP also conducted numerous activities to reach a broader audience, including meetings with local Community Emergency Response Team participants, and the general public through display booths at local fairs and festivals. ACOEP also contributed to public information videos on mitigation (YouTube video posted July 2021 online at:
https://www.youtube.com/watch?v=wBIVo6STwts&t=7s and
https://www.atlantic-county.org/hazard-mitigation/.

The County's JAT met throughout the plan update process to discuss progress and work on development of the County's mitigation strategy. The County JAT included direct membership and participation from the following individuals who attended various meetings throughout the process and provided input on action items being considered for the County's mitigation strategy:

Vincent Jones:	OEM Director/Emergency Manager
Karen Koptic:	Operations and Training Officer, Office of Emergency Preparedness
Bob Lindlaw:	Asst. Planning Director, Department of Regional Planning and Development
Jay Steinmetz:	Chief Engineer/Public Works Director, Department of Public Works
Bonnie Lindaw:	Treasurer and Chief Financial Officer
Jerry DelRosso:	County Administrator
John Peterson:	Department Head, Department of Regional Planning and Development
Brian Walters:	Supervising Planner, Department of Regional Planning and Development
Gregory Brookins:	Department Head, Department of Public Works
Mark Shourds:	County Engineer

Municipal JAT Outreach Activities. Each of the 23 participating communities supplemented the above range of County-led efforts with outreach targeted toward members of the general public and other stakeholders within their respective municipalities to get the word out even further and to supplement the County's larger outreach activities. JATs employed a wide range of techniques for providing opportunities for feedback and participation from the public and other stakeholders. Many distributed copies of the project fact sheet, posted information on their web sites, discussed the plan update at open public meetings in their communities, reached out to key stakeholder groups, and collectively undertook hundreds of activities throughout the plan update process to ensure that the public and other stakeholders were made aware of the process and their opportunity to participate and provide feedback and input.

The initial hazard mitigation planning process consisted of the following key steps:

- Researching a full range of natural hazards to identify which hazards could affect the County;
- Identifying the location and extent of hazard areas;
- Identifying assets located within these hazard areas;
- Characterizing existing and potential future assets at risk;
- Assessing vulnerabilities to the most prevalent hazards; and

- Formulation and prioritization of goals, objectives, and mitigation actions to reduce or avoid long-term vulnerabilities to the identified hazards.

For the 2015 and 2021 Plan updates, the CPG:

- Assessed current development patterns and development pressures
- Evaluated new hazard or risk information
- Described progress in local plan maintenance and plan integration efforts
- Assessed previous goals and actions
- Summarized progress in implementing actions
- Adjusted actions to address current realities
- Explained changes in priorities
- Addressed changes in Federal/State requirements

Natural hazards that can affect Atlantic County that are included in the Plan are as follows:

- ***Atmospheric hazards***, including: extreme temperatures, extreme wind, hail, hurricanes and tropical storms, lightning, nor'easters, tornados, and severe winter weather;
- ***Hydrologic hazards***, including: coastal erosion and sea level rise, dam failure, drought, floods, storm surge, tsunami, and wave action;
- ***Geologic hazards***, including: earthquakes; and
- ***Other hazards***, including: wildfires.

After evaluating these hazards and identifying the assets within the County that are vulnerable to them, each participating jurisdiction developed an updated hazard mitigation strategy to increase the disaster resistance of the County, along with procedures for monitoring, evaluating and updating the Plan to ensure that it remains a "living document." Almost 300 mitigation actions are included in this plan update to reduce the impacts of natural hazards throughout the County, of which approximately one third are new actions developed specifically for this plan update. In addition, more than 50 mitigation actions in the previous plan update were reported as completed by the individual jurisdictions. Most jurisdictions intend to apply for various types of grant funding for at least some portion of their activities to offset the local cost burden.

This Hazard Mitigation Plan is a living document; it is implemented on an ongoing basis and is formally updated every five years. If you have any questions or comments on the Multi-Jurisdictional Natural Hazard Mitigation Plan for Atlantic County, New Jersey, please contact:

Vincent Jones
County OEM Coordinator
Atlantic County Office of Emergency Preparedness
5033 English Creek Avenue
Egg Harbor Township, New Jersey 08234
Phone: (609) 407-6740
E-Mail: jones_vincent@aclink.org

or

Karen Koptic
Operations and Training Officer
Atlantic County Office of Emergency Preparedness
5033 English Creek Avenue
Egg Harbor Township, New Jersey 08234
Phone: (609) 407-6767
E-Mail: koptic_karen@aclink.org

For specific information regarding a particular community, please contact the Jurisdictional Representative and/or Alternate as identified in that community's Jurisdictional Annex.

FEMA deemed this plan Approvable Pending Adoption on pending-insert date here. Thereafter, the County and participating jurisdictions formally adopted the Final Plan Update. Copies of each jurisdiction's adopting resolution are included following Page i.

ACKNOWLEDGEMENTS

The following jurisdictions (Atlantic County and each of its 23 municipalities) participated in the development of this plan:

County of Atlantic

Absecon, City of
Atlantic City, City of
Brigantine, City of
Buena Vista, Township of
Buena, Borough of
Corbin City, City of
Egg Harbor City, City of
Egg Harbor, Township of
Estell Manor, City of
Folsom, Borough of
Galloway, Township of
Hamilton, Township of
Hammonton, Town of
Linwood, City of
Longport, Borough of
Margate City, City of
Mullica, Township of
Northfield, City of
Pleasantville, City of
Port Republic, City of
Somers Point, City of
Ventnor City, City of
Weymouth, Township of

The following stakeholders also participated by attending one or more Core Planning Group meetings:

American Red Cross
New Jersey Office of Emergency Management
Salvation Army

AECOM (Clifton, NJ) acted as the plan development consultant providing hazard mitigation plan update services.

TABLE OF CONTENTS

List of Appendices

SECTION 1 - INTRODUCTION

Purpose

Atlantic County is susceptible to a number of different natural hazards. Each hazard event has the potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. The time and money required to recover from these events often strain or exhaust local resources. While an important aspect of emergency management deals with disaster recovery (those actions that a community must take to repair damages and make itself whole in the wake of a disaster), an equally important aspect of emergency management involves **hazard mitigation** - sustained actions taken to reduce long-term risk to life and property. They are things you do today to be more protected in the future. Hazard mitigation actions are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, they can be long-term, cost-effective means of reducing risk and helping to create a more sustainable and disaster-resilient community. Hazard mitigation actions are most effective when they are based on a comprehensive, long-term plan that is developed before a disaster occurs. When community leaders, businesses, citizens, and other stakeholders undertake a joint process of evaluating the hazards that can affect their area, and use this knowledge to develop a strategy for reducing risk and the potential for future losses, this process is known as hazard mitigation planning. A **hazard mitigation plan**[1] describes an area's vulnerability to the various natural hazards that are typically present, along with an array of actions and projects for reducing key risks. This list of actions and projects is known as a **mitigation strategy**. While natural disasters cannot be prevented from occurring, the continued implementation of mitigation strategies identified in the plan will gradually, but steadily, increase community sustainability and disaster-resilience.

Initial Plan. The initial Multi-Jurisdictional Natural Hazard Mitigation Plan for Atlantic County was prepared between 2008 and 2010 to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), which requires all states and local governments to have a hazard mitigation plan in order to be eligible to apply for certain types of federal hazard mitigation project grants. FEMA grant monies were received to cover the costs of the plan's development. Atlantic County used a 'multi-jurisdictional' approach, inviting all of the municipalities within the County to participate in the plan. At that time, 19 of the County's 23 jurisdictions participated[2] (and became eligible to apply to FEMA for hazard mitigation project funding, including monies that became available under the recent Federal disaster declarations for Superstorm Sandy. Participating jurisdictions have been working to implement their mitigation actions since the plan was initially approved by FEMA in 2010.

[1]Hazard mitigation plans are not intended to serve as a reference for immediate disaster response. They focus on actions that can be implemented prior to disaster events in order to reduce potential loss of life and property damage; however, they are referred to in the recovery process.

[2] The four non-participating communities (Buena Vista, Egg Harbor City, Port Republic, and Somers Point) later went on to create their own, multi-jurisdictional plan as the "Atlantic County 4" (with that document being approved by FEMA on February 4, 2015).

First Update. Hazard mitigation plans must be: (a) implemented on an ongoing basis, and (b) updated every five years to ensure that they remain applicable representations of local risk and locally preferred risk reduction strategies. Atlantic County and its jurisdictions initiated the first required plan update in August 2014. At that time, all 23 municipalities in the County opted to participate. Each jurisdiction attended meetings, provided feedback in a wide range of topic areas, reached out to the public and other key stakeholders in their community, and developed an updated mitigation strategy. The 2016 Plan Update was reapproved by FEMA February 2016 and adopted by all communities. It is maintained on the County web site at: https://www.atlantic-county.org/hazard-mitigation/index.asp.

Second Update. In 2018, as the end of the second five-year update cycle approached, the County has, once again, obtained FEMA grant funding to cover costs associated with the update, and has opted to continue its multi-jurisdictional approach. Again, all 23 municipal jurisdictions participated in this latest plan update process and updated their respective mitigation strategies. To maintain eligibility to apply for mitigation project grants, each jurisdiction must formally adopt the plan and participate in the plan's ongoing maintenance and implementation. The second plan update began in 2021. Information is maintained on the County web site at: https://www.atlantic-county.org/hazard-mitigation/index.asp.

For questions or other feedback, or to find out how you can become involved, contact your community's local elected officials or Emergency Management Coordinator. At the County level, please feel free to reach out to Mr. Vincent Jones, County OEM Coordinator, Atlantic County Office of Emergency Preparedness (ACOEP) at 609-407-6740 or via email to jones_vincent@aclink.org; or Ms. Karen Koptic, Operations and Training Officer, ACOEP at 609-407-6767 or via email to koptic_karen@aclink.org. More information about the plan is maintained on the County web site at: https://www.atlantic-county.org/hazard-mitigation/

Document Organization

This Multi-Jurisdictional Hazard Mitigation Plan for Atlantic County is organized into the following major sections.

- **Section 1 - Introduction**. Plan purpose, overview of the planning area, summary of plan development process, document organization, and key terms.
- **Section 2 - Identification of Potential Hazards.** Documentation of the Planning Committee's evaluation of a full range of natural hazards, and indication of which hazards were identified for inclusion in this plan (and why) versus those that were not identified (and why not).
- **Section 3 - Risk Assessment.** Hazard profiles, identification and characterization of assets in hazard areas, damage estimates, summary of land uses and development trends in hazard areas, and key risk findings.
- **Section 4 - Capabilities and Resources.** Overview of local, state, and federal resources for hazard mitigation.

- **Section 5 -Mitigation Goals.** Summary of hazard mitigation goals for the State Hazard Mitigation Plan and also for this county-wide multi-jurisdictional hazard mitigation plan.

- **Section 6 – Mitigation Strategies.** Information about the hazard mitigation actions identified by each jurisdiction to address their key risk findings.

- **Section 7 – Plan Maintenance and Integration.** Procedures selected for monitoring, evaluating, and updating this mitigation plan, including participation of the public and other stakeholders in plan maintenance, and plan integration.

- **Section 8 – For More Information.** Contact information for questions, comments, or how to become involved in the plan's ongoing maintenance and implementation, and future updates.

- **Section 9 – Jurisdictional Annexes**. For each jurisdiction, a municipality-specific annex has been prepared to capture key information from the main text, along with a summary of all feedback provided by each community for the purposes of the plan update. Key information from the main text that is incorporated into each annex includes things such as the community's highest hazards and key risks. Local feedback incorporated into each annex includes information such as: who participated in the process on the local Jurisdictional Assessment Team (JAT), internal activities of the JAT, the JAT's outreach activities to the public and other stakeholders, its updated assessment of local capabilities, feedback on growth and development trends, information regarding the community's local implementation of the National Flood Insurance Program (NFIP), its status of past projects from the prior version of the plan, its updated hazard mitigation strategy, and its intended plan integration approach for the next plan maintenance cycle.

Key Terms

For the purpose of clarity throughout this document, the following definitions are briefly outlined:

- A **natural hazard** is any hazard that occurs or results from acts of nature such as floods, earthquakes, hurricanes, tornadoes and coastal storms, to name a few. *This plan addresses natural hazards only. It does not assess man-made / technological hazards or terrorism.*
- A **disaster** is any catastrophic event that causes loss of life, injuries and widespread destruction to property. For the purpose of this document, a disaster is the result of a natural hazard, whether anticipated (such as flash floods with warnings) or fortuitous (such as earthquakes).
- **Hazard mitigation** is the method by which measures are taken to reduce, eliminate, avoid or redirect natural hazards in order to diminish or eradicate the long-term risks to human life and property.

- A **hazard mitigation plan** is a well-organized and well-documented evaluation of the natural hazards and the extent that the events will occur. In addition, the plan identifies the vulnerability to the effects of the natural hazards typically present in a certain area, as well as the goals, objectives and actions required for minimizing future loss of life and property damage as a result of natural hazards.
- **Hazard mitigation planning** is the process of managing actions taken by individual citizens and professional organizations involved in mitigation activities. The process involves carrying out plans to reduce loss of life, injuries and damage to property, as well as reducing the costs associated with losses from natural hazards. It is a long-term process with benefits best realized over time.

About the Planning Area

The planning area for this plan encompasses the whole of Atlantic County. Atlantic County is located in south-eastern New Jersey. It is on New Jersey's southern shore of the Atlantic Ocean. Atlantic County is bounded by Ocean, Burlington, Camden, Gloucester, Cumberland, and Cape May Counties (from Ocean County in the northeast and moving in a counterclockwise direction to Cape May County in the south). Eastern sections of Atlantic County are bounded by the Atlantic Ocean. Atlantic County has a land area of 561 square miles, making it New Jersey's third largest county in terms of area. As of July 2019, it had a population of approximately 266,105[3], according to US Census Bureau estimates.

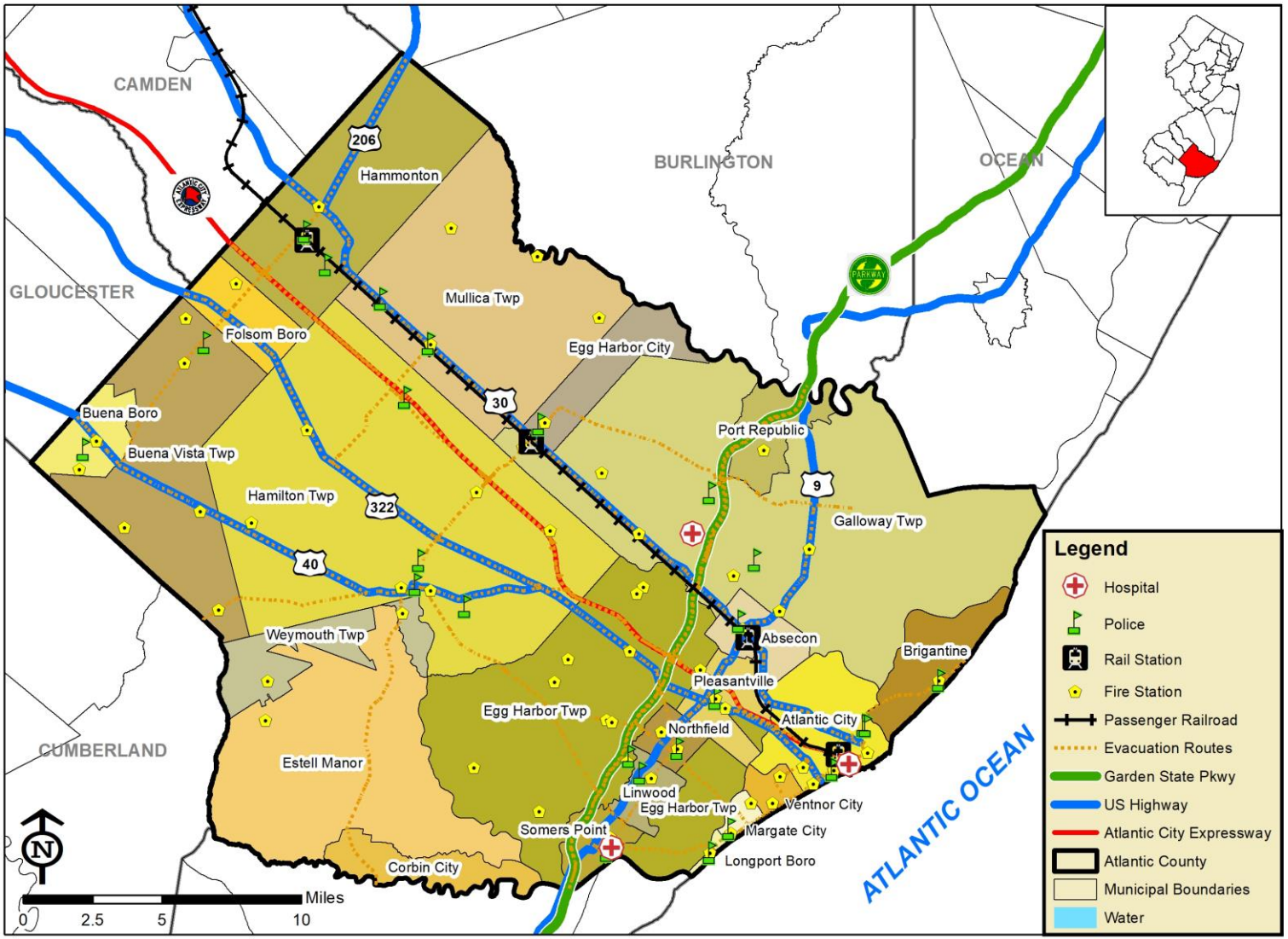
Atlantic County is the home to 23 municipalities each with its own distinct character, including 13 cities, three boroughs, six townships and one town. They are the Cities of Absecon, Atlantic City, Brigantine, Corbin City, Egg Harbor City, Estell Manor, Linwood, Margate City, Northfield, Pleasantville, Port Republic, Somers Point and Ventnor City; Boroughs of Buena, Folsom and Longport; Townships of Buena Vista, Egg Harbor, Galloway, Hamilton, Mullica and Weymouth; and the Town of Hammonton.

Atlantic County is approximately 100 miles to the south of New York City and is located 60 miles to the east of Philadelphia. The close proximity to urban areas has had a profound effect on the County's past and will no doubt influence its future. Located on the outer coastal plain of New Jersey, Atlantic County has significant natural amenities.

The coastal plain dips gently from west to east, so that most of the hills and highest elevations occur in the western part of the County. The soil of Atlantic County is sandy, with low clay content. As a result, it is low in natural fertility, buffering and filtering ability. It is also extremely permeable, being well to excessively drained in upland locations. The sand, along with layers of clay, forms a wedge a mile thick at the shore. Within this wedge are two aquifers: the Cohansey and Kirkwood Formations. These contain great quantities of pure, readily available groundwater. Water from the Cohansey provides the base flow for all of the streams and rivers in the County.

[3] U.S. Census Bureau, Annual Population Estimates and American Community Survey 2019 5-Year Estimates https://www.census.gov/quickfacts/fact/table/atlanticcountynewjersey,US/PST045219

On the east, the County borders the Atlantic Ocean and three narrow, flat, barrier beach islands: Little Beach, Brigantine and Absecon. The northern boundary is the Mullica River with the Great Egg Harbor and Tuckahoe Rivers forming the southern border. The estuaries of these rivers and the bays behind the barrier islands encompass wide areas of salt marsh. The western boundary is a man-made line separating Atlantic from Gloucester and Camden Counties, roughly halfway between the Delaware River and the Atlantic Ocean. Most of the interior of the County is part of the Pine Barrens region, a unique ecological area whose vegetation responds to soil and water conditions, and which has a history of forest fires. Upland is typically oak-pine forest on droughty soils, while lowland is often hardwood swamp, pitch pine or white cedar on saturated soil. Some lowland areas provide prime conditions for growing blueberries. Around the Borough of Buena, Buena Vista Township, Egg Harbor City, Hammonton and Galloway Township prime agricultural land is abundant supporting a significant area of upland agriculture including both row crops and orchards.



SOURCE: Atlantic County Office of GIS: Hospital, Police, Fire Station, Evacuation Route, 2021; US Highway, Atlantic City Expressway, and Garden State Pkwy, 2003. NJGIN: NJ Passenger Rail Station and Line, 2021; County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002.

Figure 1.1: Atlantic County Base Map

As noted in the County's Open Space Plan[4], pressure to develop and redevelop land in Atlantic County remains strong due to the revitalization of Atlantic City and the subsequent secondary growth during the past two decades. The challenge in the County is to provide ample open space facilities for a growing population while facing growing competition for suitable land. A growing population, competition for diminishing land resources, escalating property values, and increasing public demand for control of growth and provision of recreation services point toward the importance of preserving open space. As of 2018, Atlantic County contains over 108,000 acres of publicly owned open space. Approximately 74,765 acres are preserved by the State, 19,400 acres consist of a Federal wildlife refuge, 7,435 acres are owned and managed by the County, and 6,475 acres are preserved by municipal governments. In total, these preserved open spaces account for approximately 27% of the County's total land area. Much of Atlantic County is flat and low-lying. Buena Borough contains the tallest point in the County at approximately 124 feet above sea level.

The City of Atlantic City has always been a major driving force in the overall development of the County. Historically, Atlantic City served as a seaside destination while today it is world renowned as a casino resort.

During the Great Depression and war years, growth slowed to a standstill in Atlantic County. After World War II and into the 1950s, Atlantic City retained its popularity as a resort and remained relatively prosperous. However, its population began to decrease while the rest of the County's population was increasing, reflecting the national trend of suburban growth and urban decline. In marked contrast to Atlantic City, the rest of Atlantic County continued to grow and prosper as its economy diversified and became less dependent on the resort/convention industry in the city.

During the 1970s, suburban growth moved out of the bay communities and into Egg Harbor and Galloway Townships. In November 1976, the New Jersey State Legislature was authorized to allow casino gambling in Atlantic City, bringing with it a spike in not only casino development and construction of new hotels but also condominium and housing development. A Casino Control Commission was established to revitalize Atlantic City without using public funds; to reduce unemployment in the area; and to allocate a percentage of the casino revenue in the form of aid to the elderly.

Atlantic County continued to grow substantially during the 1980s, and the County experienced explosive population growth from 1980 to 1990 as a direct result of the maturation of the casino industry. Substantial retail, warehousing, office, hotel, and residential development on the mainland bolstered the regional economy. Within Atlantic County the passage of the Coastal Area Facilities Review Act of 1973 (CAFRA) and the Pinelands Protection Act of 1979 has resulted in significant growth in CAFRA Coastal Centers and Pinelands Regional Growth Areas such as Egg Harbor, Galloway, and Hamilton Townships.

Throughout the 1990s there was generally a moderation in population growth. Many municipalities (including Somers Point, Absecon, Brigantine, Hammonton, and Hamilton

[4] Atlantic County Open Space Plan, 2018. .

Township) expanded through the addition of regional shopping centers. The County witnessed a surge in the popularity of golf due to the construction of the Galloway National, Blue Heron Pines, and Harbor Pines Golf Courses. In Atlantic City, growth was characterized primarily by casino improvements (addition of hotel rooms, construction improvements/expansions at existing facilities), though several new facilities were constructed such as the Atlantic City Convention Center, New Jersey Transit Bus Terminal, and the Renaissance Plaza -- a modern shopping center located in the heart of Atlantic City.

In the early part of this century, Atlantic County was in the midst of what was commonly referred to as the "second wave" of development spurred by a relatively strong economy, low inflation, and unyielding demographic trends. Traditional single-family developments tended to replace the 1980s multi-family development. Age restricted units (those limited to persons age 55 and above, for instance) and assisted living facilities for those needing varying degrees of medical assistance have also been on the rise as the nation's population ages. These housing developments have been predominately located in the Pinelands Regional Growth Areas of the County: Egg Harbor, Galloway, and Hamilton Townships. Over time, it appears residential and commercial growth will continue to move farther west while the Island and Bay communities will demonstrate slower growth because of their already developed condition.

The goal of Atlantic County and the communities in the County is to provide a safe place to work and live. Atlantic County Executive Dennis Levinson has noted that "Atlantic County services touch the lives of every family in providing access to health care services, job training, recreation and cultural activities, senior services, road improvements, human services, public safety and more. We are here to protect and enhance the lives of our residents and the communities in which they live."

Population. According to the US Census, the population of Atlantic County in 1990 was 224,327, whereas in 2000 it increased to 252,552 – an increase of approximately 12.6 per cent over ten years. The U.S. Census Bureau, 5-Year American Community Survey (2009-2013) estimated the population of the County at 274,960 - approximately 9 per cent of increase since the year 2000. Current Census Bureau estimates (2019 ACS 5-year) give Atlantic County a population of 266,105 as of 2019, which represents a decrease of 3.2% from 2013. **Table 1.1** shows key County population changes (county-wide and for each municipality) as reported in the Atlantic County Master Plan and by the U.S. Census Bureau from 1970 to 2019.

Current publications from the New Jersey Department of Labor and Workforce Development (NJDLWD)[5] are in agreement with the Census Bureau that the population of Atlantic County has recently declined, but they also continue to project a future population increase in the County. By 2034, the NJDLWD [6] estimates that the county's overall population will increase by roughly 7,900 people over 2013 values to a total of 282,900 persons.

[5] New Jersey Department of Labor and Workforce Development, June 2021). https://nj.gov/labor/lpa/pub/factbook/atlfacts.pdf
[6] https://www.nj.gov/labor/lpa/dmograph/lfproj/lfproj_index.html

While the 2000 Atlantic County Master Plan divided the County into three areas (the Shore Area, the regional Growth Area, and the Rural Area), the 2018[7] version of the Plan now considers the County to be comprised of four distinct regions:

- The Barrier Island Region: comprising the easternmost barrier islands in the County, and containing the municipalities of Brigantine, Atlantic City, Ventnor, Margate City, and Longport.
- The Back Bay Region: the portion of the County bound by Route 9 on its western edge and the Barrier Island Region at its eastern edge, containing the municipalities of Port Republic, Galloway, Absecon, Pleasantville, Northfield, Linwood, Somers Point, and Egg Harbor Township.
- The Suburban Region: three non-contiguous portions of the County sharing similar characteristics and coverage by various planning initiatives, and containing large sections of Galloway, Egg Harbor Township, Hamilton, smaller areas within Egg Harbor City, Mullica, and Hammonton, along with the portions of Absecon, Pleasantville, Northfield, Linwood City, and Somers Point that are not within the Back Bay Region.
- The Rural Region: consisting of the remainder of the County and including the entire municipalities of Folsom, Buena Vista, Buena, Weymouth, Estell Manor, and Corbin City, plus the portions of Hammonton, Mullica, Egg Harbor City, Port Republic, Galloway, Hamilton, and Egg Harbor Township that are not within the other Regions.

According to the U.S. Census Bureau, Atlantic County has a total area of 671 square miles, of which 561 square miles is land and 110 square miles is water.

The 1990 U.S. Census population density per square mile of land in Atlantic County was 312 persons per square mile; whereas, in the 2000 U.S. Census, there were 450 persons per square mile – an increase of 44.2 per cent. The 2010 U.S. Census[8] showed Atlantic County population density was 494 persons per square mile, while the 2019 Census estimates translate to a population density of 479 persons per square mile. By 2034, the population density based on NJDLWD data is projected to be 504 persons per square mile – an increase of 12 per cent over the year 2000 values.

Atlantic County's population is also aging. In 2000, the median age in the County was 37 and by 2010 this had increased to 40.5, according to the 2018 County Master Plan, with the 45 to 54 and 55 to 64 age cohorts the most rapidly growing segments of the population. This trend is expected to continue in the near future, with consequent policy and planning implications regarding the demand for healthcare services and facilities and flexible transportation options.

Roads and Bridges. The Atlantic County Department of Public Works maintains over 371 miles of county roads and rights of way, 254 bridges and over 100 traffic signals. Atlantic County has excellent access to all major modes of transportation. Major highways include the Garden State Parkway; The Atlantic City Expressway (toll road); U.S Routes 9, 30, 40, 206, and 322; and, State Routes 49, 50, 52, 54, 87, and 152.

[7] atlantic-county.org/documents/planning/Master%20Plan_5-1-18.pdf
[8] http://quickfacts.census.gov/qfd/states/34/34001.html

Table 1.1 Key County Population Changes									
Municipality	**Population 1970 Census**	**Population 1980 Census**	**Population 1990 Census**	**Population 2000 Census**	**Population 2013 Census**	**Population 2019 Census**	**Absolute Change 1970-2000**	**Absolute Change 2000-2013**	**Absolute Change 2013-2019**
Atlantic County	**175,043**	**194,119**	**224,387**	**252,552**	**274,960**	**266,105**	**77,509**	**22,408**	**-8,855**
Absecon, City of	6,094	6,859	7,298	7,638	8,394	8,362	1,544	756	-32
Atlantic City, City of	47,859	40,199	37,986	40,517	39,591	37,999	-7,342	-926	-1,592
Brigantine, City of	6,741	8,318	11,354	12,594	9,480	8,832	5,853	-3,114	-648
Buena Vista, Township of	4,239	6,959	7,655	7,436	7,576	7,295	3,197	140	-281
Buena, Borough of	3,283	3,642	4,441	3,873	4,620	4,356	590	747	-264
Corbin City, City of	258	254	412	468	573	537	210	105	-36
Egg Harbor City, City of	4,304	4,618	4,583	4,545	4,232	4,100	241	-313	-132
Egg Harbor, Township of	9,882	19,381	24,544	30,726	43,403	42,714	20,844	12,677	-689
Estell Manor, City of	539	848	1,404	1,585	1,708	1,728	1,046	123	20
Folsom, Borough of	1,767	1,892	2,181	1,972	1,813	1,697	205	-159	-116
Galloway, Township of	8,276	12,176	23,330	31,209	37,356	36,094	22,933	6,147	-1,262
Hamilton, Township of	6,445	9,499	16,012	20,499	26,568	25,973	14,054	6,069	-595
Hammonton, Town of	11,464	12,298	12,208	12,604	14,781	14,139	1,140	2,177	-642
Linwood, City of	6,159	6,144	6,866	7,172	7,099	6,742	1,013	-73	-357
Longport, Borough of	1,225	1,249	1,224	1,054	1,001	869	-171	-53	-132
Margate City, City of	10,576	9,179	8,431	8,193	6,385	5,997	-2,383	-1,808	-388
Mullica, Township of	3,391	5,243	5,896	5,912	6,164	5,925	2,521	252	-239
Northfield, City of	8,646	7,795	7,305	7,725	8,608	8,153	-921	883	-455
Pleasantville, City of	14,007	13,435	16,027	19,012	20,391	20,301	5,005	1,379	-90
Port Republic, City of	586	837	992	1,037	1,016	1,121	451	-21	105
Somers Point, City of	7,919	10,330	11,216	11,614	10,807	10,321	3,695	-807	-486
Ventnor City, City of	10,385	11,704	11,065	12,910	10,681	10,095	2,525	-2,229	-586
Weymouth, Township of	998	1,260	1,957	2,257	2,713	2,755	1,259	456	42

Rail. New Jersey Transit provides passenger service on the Atlantic City Line between Philadelphia and Atlantic City, with additional passenger stations in Atlantic County serving Absecon, Egg Harbor City, and Hammonton. The Atlantic City Line also serves additional stations in neighboring Camden County, some of which incorporate connections to the Port Authority Transit Corporation (PATCO) Speedline rapid transit system which connects communities in the Philadelphia – Camden area. In addition, New Jersey Transit operates a weekend express service between Atlantic City and Penn Station in New York, in association with some of the Atlantic City casino owners.

Bus. Although rural parts of the County have minimal service provided to transit dependents, mass transit in Atlantic County has proven to be a highly successful mode of travel for day-visitors, work commuters and others. This is particularly true on Absecon Island communities of Atlantic City, Ventnor, Margate, Longport and the island of Brigantine. Given the high volume of ridership in these areas, it does have an impact on reducing traffic volume and vehicular pollution. There are high ridership volumes on all of the intracounty routes providing service between Atlantic City and the island communities, and the 553 route providing service between Cumberland County and Atlantic City has proven to be one of the most successful regional routes in the State. Franchise bus service to Atlantic City peaked in 1986/1987 and has gradually leveled off at approximately 515,000 visitors per year.

Airports. Air Travel has recently seen a marked increase at Atlantic City International Airport. This increase has been driven primarily by expansion of service by Spirit Airlines and increased charter activity. According to the 2018 County Master Plan, Atlantic City International Airport handled just over 1.2 million commercial and charter passengers in 2015. The only other airport in the County is the Hammonton Municipal Airport, which, at the time of writing, does not operate scheduled services.

Public Water and Sewer. Atlantic County communities rely on both surface and ground water supply sources for their water needs. According to the 2018 Atlantic County Master Plan, average water demand in the County in 2010 (when the County population was around 274,500) was approximately 60 million gallons per day (MGD), up from 44 MGD in 2000. Approximately 55 MGD was derived from groundwater sources such as the Kirkwood-Cohansey aquifer and the Atlantic City 800-foot sand aquifer, and 5 MGD from surface water sources including two reservoirs operated by the Atlantic City Municipal Utilities Authority (ACMUA). The NJDEP Water Supply Plan of October 2017[9] projects that while demand for water will continue to rise across the whole state, the demand due to population increases may be tempered by reductions in non-residential water use and the integration of more efficient plumbing fixtures and appliances. The NJDEP's report "The Status of the Water Supply in Southeastern New Jersey" dated September 2003 concluded that some aquifers supplying Atlantic County were already being over-drawn beyond sustainable yields, and that migration of salt water into coastal aquifers was a potential future problem. The NJDEP Water Supply Plan of October 2017 reported that water extraction from the confined Cohansey and Atlantic City 800-foot sand aquifers have lowered water levels and caused the intrusion of salt water inland in neighboring Cape May County.

[9] New Jersey Water Supply Plan 2017-2022: NJDEP, October 2017

For planning purposes, the County is divided into three regions to facilitate the design and implementation of County-wide sewage systems, based on the specific sewage treatment plant which is authorized to accept and treat wastewater from each region: Coastal Region, Lower Great Egg Harbor River region, and Mullica/Upper Great Egg Harbor River Region. Rural areas rely on individual septic disposal systems, but principal wastewater treatment plants for the sewer service regions are located in Buena Borough, the Town of Hammonton, and on City Island in the City of Atlantic City. The 2018 County Master Plan notes that since development trends in the County have slowed considerably since the mid-2000s, future impacts on wastewater demand are anticipated to be less than previously projected. The 2018 County Master Plan also identifies the City Island plant as particularly vulnerable to flooding from storm surges and states that the Atlantic County Utility Authority intends to use funds from the New Jersey Environmental Infrastructure Trust to implement resiliency projects including portable flood barriers, seawalls, and sumps installed in the lower elevated buildings of the plant.

Income. According to the 2000 U.S. Census, median household income in Atlantic County was $43,933 and in the 2013 estimates the income had risen to $54,235. By 2019 the median household income in the county had risen to $62,110. In Atlantic County, the percentage of individuals below the poverty level was 11.3% in 2019 versus a State per centage of 9.2 per cent.

Employment. According to the U.S. Census Bureau data for 2019, 64.6 per cent of the population 16 years or over were in the labor force and 8.4 per cent were unemployed. The Census Bureau data records the three largest employment sectors of the County economy in 2019 as education, healthcare, and social services (23.8 per cent), arts, entertainment, recreation, and accommodation (22.5 per cent) and retail (11.6 per cent).

Tourism. While the 2018 County Master Plan recognizes that troubles in the casino industry have caused a recent decline in tourism to Atlantic County, tourism is still the dominant economic sector, accounting for approximately 73 per cent of the local economy in Atlantic County. The County also contributes 17 per cent of the entire State of New Jersey's overall tourism sales, including 33 per cent of the State's accommodation revenue and 13 per cent of food and beverage expenditures. In 2019[10], more than 16 per cent of the tourism workforce in the State was employed in Atlantic County, more than double the share of any other county. The COVID-19 pandemic which began to affect the USA in early 2020 had a devastating impact on employment and the economy in Atlantic County: temporary closures of casinos and convention venues contributed to a loss of 33,000 jobs in the county in June 2020, compared to June of the previous year, which at 34% was the biggest decrease of any county in the Nation[11]. While the casinos and hotels in Atlantic City have subsequently reopened at or near full capacity, in the Spring of 2021 Atlantic County still had the highest unemployment rate in the state (11%[12], down from a peak of 33% in the summer of 2020), and the long-term impacts of the COVID pandemic will not be fully known for some time.

[10] Economic Impact of Tourism in New Jersey,2019: https://www.visitnj.org/sites/default/files/2019-nj-economic-impact.pdf
[11] https://www.nj.com/atlantic/2020/11/this-nj-county-suffered-the-biggest-job-losses-in-america-this-year-new-study-shows.html
[12] https://www.nj.gov/labor/lpa/content/maps/laus_month.pdf

While the City of Atlantic City and its casinos are obviously the major attraction, visitors are also drawn to Atlantic County for golf, boating, fishing, camping, bird watching, wineries, shopping, and general beach recreation. There are almost 12,000 second or vacation homes in Atlantic County, ranking Atlantic County third in the state, behind Cape May and Ocean Counties.

FEMA Disaster Declarations. Disaster declarations, for the county or counties affected by a disaster, are declared by the President of the United States under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the "Stafford Act"). FEMA then manages the entire process, including making federally-funded Public Assistance (PA) and/or Individual Assistance (IA) available in declared areas; coordinates emergency rescue and response efforts; provides emergency resources; and provides other related activities/funding in the process of aiding citizens and local governments in a nationally-declared disaster. Tables 1.2, 1.3 and 1.4 provide a summary of disaster and emergency declarations for the State of New Jersey (based on review of the FEMA web site and the New Jersey State Hazard Mitigation Plan), with an indication as to whether Atlantic County was part of the declared area. Since the last version of this plan was updated during 2015, Atlantic County has been a part of three new major disaster declarations, and one new emergency declaration.

Table 1.2
New Jersey State Major Disaster Declarations: 1955 – 2021
(Source: FEMA, online at http://www.fema.gov/disasters)

Year	Date	Disaster Type	Disaster Number	Was Atlantic County Declared?
2021	28-Apr	Severe Winter Storm and Snowstorm	4597	No
2020	11-Dec	Tropical Storm Isaias	4574	Yes
2020	25-Mar	COVID-19 Pandemic	4488	Yes
2018	8-Jun	Severe Winter Storm and Snowstorm	4368	No
2016	7-Jul	Severe Winter Storm and Snowstorm	4264	Yes
2015	23-Jun	Severe Storm	4231	Yes
2012	30-Oct	Hurricane Sandy	4086	Yes
2012	19-Jul	Severe Storms and Straight-Line Winds	4070	Yes
2011	30-Nov	Severe Storm	4048	No
2011	14-Oct	Remnants of Tropical Storm Lee	4039	No
2011	15-Sep	Severe Storms and Flooding	4033	No
2011	31-Aug	Hurricane Irene	4021	Yes
2011	4-Feb	Severe Winter Storm and Snowstorm	1954	Yes
2010	2-Apr	Severe Storms and Flooding	1897	Yes
2010	23-Mar	Severe Winter Storm and Snowstorm	1889	Yes
2010	5-Feb	Snowstorm	1873	Yes
2009	22-Dec	Severe Storms and Flooding Associated with Tropical Depression Ida and a Nor'easter	1867	Yes
2007	26-Apr	Severe Storms and Inland and Coastal Flooding	1694	Yes
2006	7-Jul	Severe Storms and Flooding	1653	No
2005	19-Apr	Severe Storms and Flooding	1588	No

Table 1.2
New Jersey State Major Disaster Declarations: 1955 – 2021
(Source: FEMA, online at http://www.fema.gov/disasters)

Year	Date	Disaster Type	Disaster Number	Was Atlantic County Declared?
2004	1-Oct	Tropical Depression Ivan	1563	No
2004	16-Jul	Severe Storms and Flooding	1530	No
2000	17-Aug	Severe Storms, Flooding and Mudslides	1337	No
1999	18-Sep	Hurricane Floyd	1295	No
1998	3-Mar	Coastal Storm	1206	Unknown
1997	23-Sep	Flooding	1189	Unknown
1996	19-Nov	Severe Storms/Flooding	1145	Unknown
1996	13-Jan	Blizzard	1088	Unknown
1992	18-Dec	Coastal Storm, High Tides, Heavy Rain, Flooding	973	Unknown
1992	3-Mar	Severe Coastal Storm	936	Unknown
1985	15-Oct	Hurricane Gloria	749	Unknown
1984	12-Apr	Coastal Storms, Flooding	701	Unknown
1977	8-Feb	Ice Conditions	528	Unknown
1976	21-Aug	Severe Storms, High Winds, Flooding	519	Unknown
1975	23-Jul	Heavy Rains, High Winds, Hail, Tornadoes	477	Unknown
1973	7-Aug	Severe Storms, Flooding	402	Unknown
1971	4-Sep	Heavy Rains, Flooding	310	Unknown
1968	18-Jun	Heavy Rains, Flooding	245	Unknown
1965	18-Aug	Water Shortage	205	Unknown
1962	9-Mar	Severe Storm, High Tides, Flooding	124	Unknown
1955	20-Aug	Hurricane, Floods	41	Unknown

Table 1.3
New Jersey State Emergency Declarations: 1955 – 2021
(Source: FEMA, online at http://www.fema.gov/disasters)

Year	Date	Emergency Type	Declaration Number	Was Atlantic County Declared?
2020	3-Mar	COVID-19 Pandemic	3451	Yes
2012	28-Oct	Hurricane Sandy	3354	Yes
2011	27-Aug	Hurricane Irene	3332	Yes
2005	19-Sep	Hurricane Katrina Evacuation	3257	Yes
2003	23-Sep	Power Outage	3188	No
2003	20-Mar	Snowstorm	3181	Yes
2001	19-Sep	Terrorist Attack Emergency Declaration	3169	Unknown
2000	1-Nov	Virus Threat	3156	Unknown
1999	17-Sep	Hurricane Floyd	3147	Unknown
1993	17-Mar	Severe Blizzard	3106	Unknown
1980	19-Oct	Water Shortage	3083	Unknown
1974	24-Dec	Severe Storms, High Winds & High Tides	3005	Unknown

Table 1.4 New Jersey State Fire Management Assistance Declarations *(Source: FEMA, online at http://www.fema.gov/disasters)*				
Year	**Date**	**Emergency Type**	**Declaration Number**	**Was Atlantic County Declared?**
2007	16-May	Warren Grove Fire	2695	No – fire was located in Burlington and Ocean Counties
2002	2-Jun	Double Trouble Fire	2411	No-fire was located in Ocean County

Participating Jurisdictions

Atlantic County took a multi-jurisdictional approach to preparing its initial hazard mitigation plan and subsequent updates including this one, inviting all 23 of its municipalities to participate. County and local levels of government bring unique resources to the table. The County has personnel, funding, data, and capabilities that many local jurisdictions lack, while municipalities have the legal authority to enforce compliance with land use planning and development issues.

For the initial 2010 Plan, 19 of the County's municipalities opted to participate in, and were covered by, the Plan with the exceptions of Buena Vista, Egg Harbor City, Port Republic, and Somers Point. These four communities later went on to create their own, multi-jurisdictional plan as the "Atlantic County 4" (with that document being approved by FEMA on February 4, 2015). For the first Plan Update (2016) and the current Plan Update (anticipated adoption 2022), Atlantic County and all 23 of its constituent municipalities participated – including the "Atlantic County 4" communities.

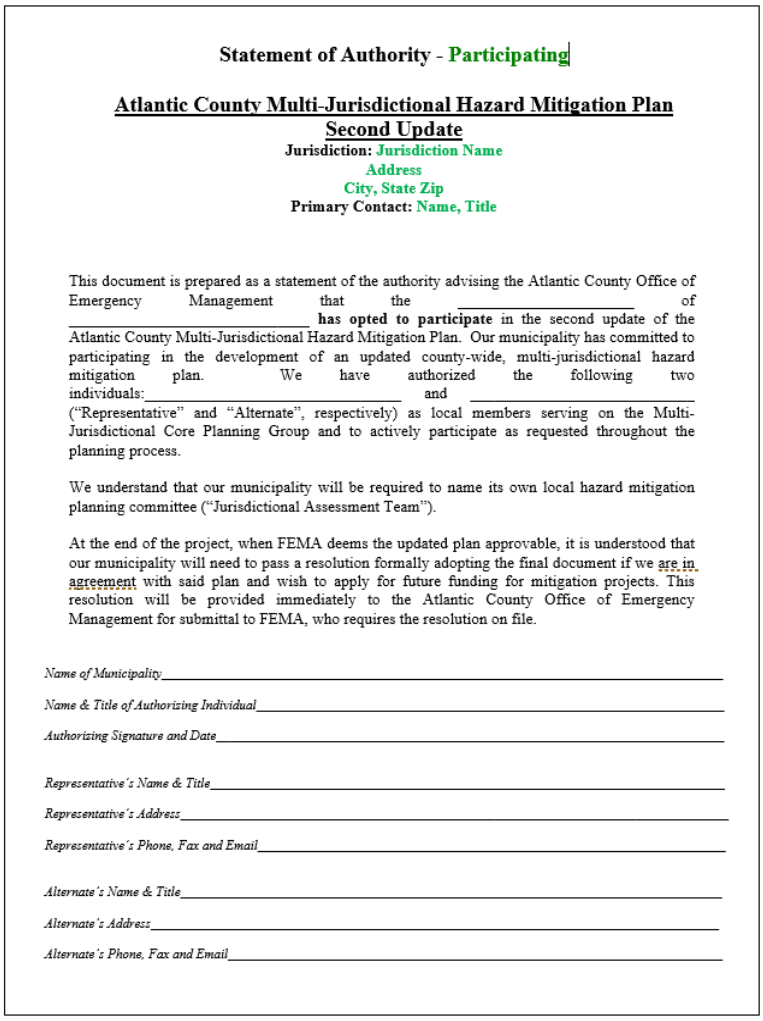
Jurisdictions covered by this plan update are:

County of Atlantic

Absecon, City of	Estell Manor, City of	Mullica, Township of
Atlantic City, City of	Folsom, Borough of	Northfield, City of
Brigantine, City of	Galloway, Township of	Pleasantville, City of
Buena Vista, Township of	Hamilton, Township of	Port Republic, City of
Buena, Borough of	Hammonton, Town of	Somers Point, City of
Corbin City, City of	Linwood, City of	Ventnor City, City of
Egg Harbor City, City of	Longport, Borough of	Weymouth, Township of
Egg Harbor, Township of	Margate City, City of	

At the outset of the current plan update process in 2021, participation commitments were demonstrated through each jurisdiction submitting a fully executed **Statement of Authority to Participate** to ACOEP[13]. **Figure 1.2** shows a blank version of this letter of commitment. Completed statements are included in **Appendix 1.1 – Statements of Authority to Participate.**

[13] Some municipalities opted to pass a formal resolution in lieu of, or in addition to, the referenced Statement of Authority to Participate. Either or both were deemed to be acceptable.



Statement of Authority - Participating

Atlantic County Multi-Jurisdictional Hazard Mitigation Plan
Second Update
Jurisdiction: Jurisdiction Name
Address
City, State Zip
Primary Contact: Name, Title

This document is prepared as a statement of the authority advising the Atlantic County Office of Emergency Management that the _____ of _____ **has opted to participate** in the second update of the Atlantic County Multi-Jurisdictional Hazard Mitigation Plan. Our municipality has committed to participating in the development of an updated county-wide, multi-jurisdictional hazard mitigation plan. We have authorized the following two individuals: _____ and _____ ("Representative" and "Alternate", respectively) as local members serving on the Multi-Jurisdictional Core Planning Group and to actively participate as requested throughout the planning process.

We understand that our municipality will be required to name its own local hazard mitigation planning committee ("Jurisdictional Assessment Team").

At the end of the project, when FEMA deems the updated plan approvable, it is understood that our municipality will need to pass a resolution formally adopting the final document if we are in agreement with said plan and wish to apply for future funding for mitigation projects. This resolution will be provided immediately to the Atlantic County Office of Emergency Management for submittal to FEMA, who requires the resolution on file.

*Name of Municipality*_____

*Name & Title of Authorizing Individual*_____

*Authorizing Signature and Date*_____

*Representative's Name & Title*_____

*Representative's Address*_____

*Representative's Phone, Fax and Email*_____

*Alternate's Name & Title*_____

*Alternate's Address*_____

*Alternate's Phone, Fax and Email*_____

Figure 1.2 – Statement of Authority

Hazard Mitigation Planning Team Organizational Structure

The Atlantic County Multi-Jurisdictional Hazard Mitigation Plan has been developed by the Atlantic County Hazard Mitigation Planning Committee (the "**Planning Committee**"), with support from outside consultants (AECOM Technical Services, Inc.[14] – Clifton, NJ, "AECOM") who guided all jurisdictions through the planning process and ultimately authored the initial plan in 2010, the 2016 Plan Update, and this current plan update.

As was the case with the initial plan's development and the first update, the overall Planning Committee for this plan update consisted of representatives for Atlantic County, each participating jurisdiction, and the public and other stakeholders. The Planning Committee did not meet together in one place during the planning process; instead, a team concept was used to more evenly distribute responsibilities and to make best of use of every participant's

[14] The consultant for the original plan and the first update was URS Corporation, which merged with AECOM in 2015. The key URS personnel who authored the original plan and 2016 update were retained and also authored the 2021 update.

unique capabilities. The overall Planning Committee was divided into a Core Planning Group (CPG) and a series of Jurisdictional Assessment Teams (JATs), with one JAT for each participating jurisdiction (see **Figure 1.3**). The Core Planning Group includes representation of the participating jurisdictions.

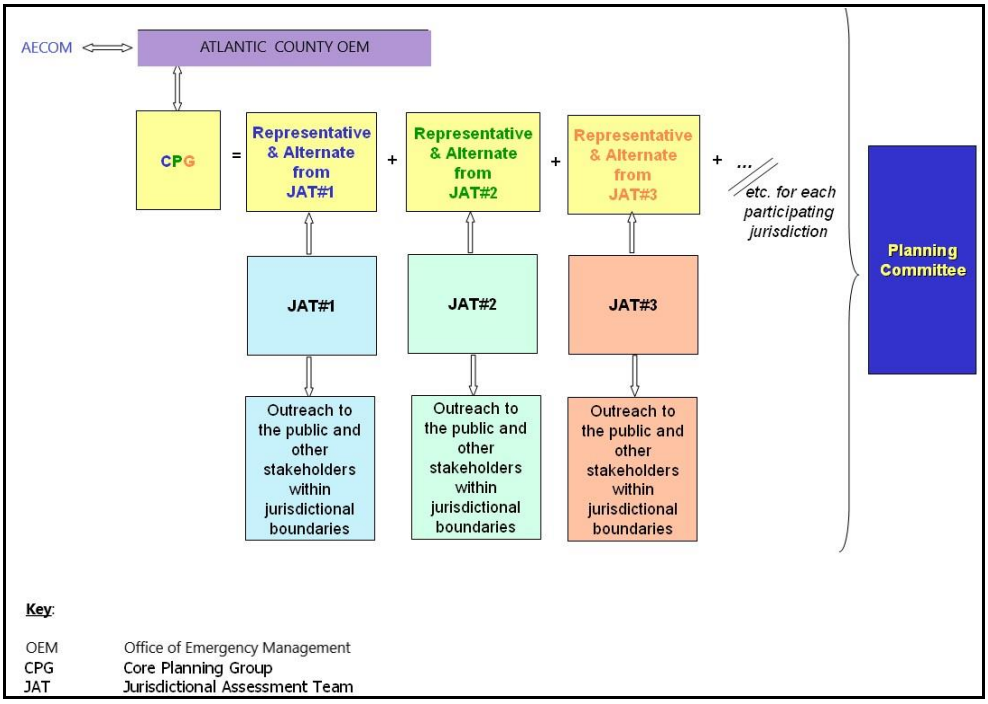


Figure 1.3 – Planning Committee Organizational Structure

The **County JAT** is the Hazard Mitigation Plan Steering Committee, who is responsible for managing overall plan formulation activities under the direction of ACOEP's Vincent Jones and Karen Koptic. **ACOEP** was responsible for setting meeting dates and times and notifying all team members of upcoming meetings. They also played a very large role in reminding CPG members of certain project deadlines. The Consultant prepared meeting agendas, handouts, and PowerPoint presentations for delivery in the virtual meetings hosted via online webinar platforms. ACOEP ensured that all meeting materials and report deliverables were posted on the County web site.

Local JATs were identified for each participating jurisdiction, and included a range of expertise - from elected officials and administrators to staff in planning, public works, and engineering, for example. Each JAT was responsible for coordinating and facilitating local planning efforts; providing information and feedback to the contractor regarding a wide range of topic areas from land uses and development trends, to local capabilities and floodplain management initiatives through completing various worksheets; involving the public and local community stakeholders in the planning process; assessing mitigation alternatives; selecting a course of action to be followed for their community; adopting the plan; reviewing draft documents; and participating in plan monitoring and implementation. JATs fulfilled these responsibilities under the leadership of their CPG members (the "representative" and "alternate" designated on the Statement of Authority to Participate).

The **CPG** as a whole - made up of head members of each JAT – was the day-to-day planning team for the overall multi-jurisdictional planning process. CPG members were the primary local points of contact for both the County Steering Committee and the consultant and were the go-betweens between the local JATs and the larger CPG. CPG members were responsible for fulfilling their jurisdiction's plan update process obligations, with assistance and direct support from the members of their JAT. CPG members attended planning meetings; conveyed meeting information back to their JAT members; solicited information and feedback needed from JAT members for incorporation into the plan (typically, on an as-needed basis depending upon the nature of the information request as compared to JAT member areas of specialty), and had primary responsibility for providing opportunities for the public and other stakeholders within their jurisdiction to be involved in the planning process. Readers are invited to review the jurisdictional annexes of **Section 9** for a list of JAT members for each jurisdiction. CPG Representatives and Alternates are identified on the Statements of Authority of **Appendix 1.1.**

At the end of the plan update process, each jurisdiction will formally adopt the Final Plan, documenting their commitment to strive to implement the actions and projects identified in the mitigation strategy to reduce or eliminate long-term risk from natural hazards and disasters in their community.

Planning Team Meetings

The initial version of this plan was prepared between 2008 and 2010. It was approved by FEMA and adopted by local communities in 2010, and subsequently updated for re-approval by FEMA in 2016. Participating jurisdictions have been working since the approval of the initial plan to implement the actions that were listed in their respective mitigation strategies. FEMA requires ongoing plan implementation, regular monitoring of progress, and formal updates every five years thereafter. The 2016 Plan provided the details of the initial plan development process and the first update, which will not be reiterated here. Instead, this subsection will focus strictly on the process undertaken during the current (second) plan update.

For this update, the County advertised a Request for Proposals (RFP#202008.3) from qualified bidders for the hazard mitigation plan update in May 2020, and bids were received in June 2020. A resolution was passed by the Board of County Commissioners on March 2, 2021. A contract was executed in April, with AECOM in receipt of an executed contract on April 19, 2021. Key planning team meetings held during the plan update process are summarized in **Table 1.5.**[15] Meeting materials such as agendas, sign in sheets, and presentations are provided in **Appendix 1.3**.

[15] Local JAT meetings are not presented in this table. Individual JATs met on a fairly ad-hoc basis throughout the plan update process as they deemed necessary.

Table 1.5 Key Planning Team Meetings		
Date	**Title**	**Details**
April 21, 2021	Project Initiation Meeting (Atlantic County OEP, AECOM)	Project Initiation Meeting – Atlantic County OEP met with AECOM to discuss the details of the scope of work and project approach and to work hand in hand with the County to establish a more definitive and mutually-achievable schedule (based on the ultimate date of the Notice to Proceed of April 19, 2021), tailoring the timing of execution of key tasks such as meeting dates based on the County's particular preferences and constraints where possible while working within the framework of the overall project timeline.
May 20, 2021	CPG Kickoff Meeting	Topics discussed included: the importance of the plan update, overview of the 2016 plan, benefits of continued participation in the plan update, key steps of the plan update process, participation requirements for the update, project timeline, near term actions items for participating jurisdictions, outreach to the public and other stakeholders, long term action items for participating jurisdictions, expanded mitigation strategies. The importance of their ongoing and future activities to reach out to the public and key stakeholders in their communities was stressed (using Guidance Memo 1 as a guide, and documenting their activities in the provided Outreach Log). Feedback would be provided on various worksheets. Atlantic County OEP distributed copies of the worksheets after the Kickoff Meeting on May 27, 2021.
June 14 – 19, 2021 *(with one make-up session on each of June 22, June 23, and July 6)*	Plan Update Worksheet Assistance Sessions for CPG Members	During the week of June 14, 2021, the AECOM project manager was available to meet virtually with each participating jurisdictions for up to one hour per community, individually, for Plan Update Worksheet Assistance Sessions. The purpose of these sessions was to provide guidance and support with plan update feedback required (worksheets) and additional outreach requirements. AECOM also provided an introduction to the new, password-protected CPG internal information website, online at www.atlantichmp2021.com, Signup Genius was used to distribute the dates and timeslots, and each municipality and the County had an opportunity to sign up for a time that was convenient for them. Five time slots were available per each of five days from June 14th through the 19th (9:15 am, 10:30 am, 1:30 pm, 2:45pm, and 7pm). Make up sessions were scheduled as needed to accommodate municipal requests and availability, with one makeup session held on 6/22/21 at 1:30 pm, another on 6/23/21 at 9:15 am, and the last on 7/6/21 at 10 am. CPG members left their respective sessions with a clear understanding of the process and their role in it at both the CPG and JAT levels, as well as a clear picture of the updated information they would need to be providing to the consultant, the outreach that would be required, and the platform that would be used for information exchange during the update (CPG internal website, www.atlantichmp2021.com).
July 15, 2021	CPG Progress Meeting	At this meeting of the CPG, AECOM presented an overview of the project timeline, key activities since the May 20th CPG Kickoff Meeting, a reintroduction to the CPG internal website (www.atlantichmp2021.com) and its contents, and presented reminders of to-do actions for CPG members.
November 9, 2021	Review of Draft Plan	At this CPG meeting, AECOM presented the full draft plan (made available online the previous day), highlighted findings and changes from the previous version, outlined the next steps in the process, and requested that CPG members and JAT s review the plan and return and submit comments for inclusion in in the draft version of the plan to be submitted for agency review. (Scheduled)

Roles and Responsibilities – County, Municipalities, and Contractor

County. In addition to acting as a participating jurisdiction in its own right, Atlantic County took on the role of lead agency and facilitator in the plan development and update processes. ACOEP secured the grant funding for the 2010 Plan, its 2016 and 2021 Plan Updates, and solicited the participation of all 23 jurisdictions. They selected the consultant and administered the contract; managed communications between the consultant and the CPG (principally through email); distributed deliverables and outreach materials to jurisdictions, the public, other stakeholders, and reviewing agencies; facilitated meetings; procured meeting venues and presentation equipment; distributed meeting invitations; and conducted an extensive outreach strategy for the public and other stakeholders. They continue to maintain a central hazard mitigation planning website and use social media (Facebook, Twitter) to solicit feedback.

Municipalities. Each participating jurisdiction contributed throughout the overall plan development and update processes under the support and guidance of ACOEP and AECOM. Municipal JATs conducted outreach to the public and other stakeholders within their respective jurisdictions, assessed risk and hazard mitigation alternatives, and ultimately developed a mitigation action plan for their community. Each JAT was responsible for providing staff to participate in the CPG, attending CPG meetings, and holding their own JAT meetings as they deemed necessary. JATs were responsible for reviewing information, data and documents; submitting feedback to the consultant; completing questionnaires/forms; reaching out to the public and other stakeholders in their respective jurisdictions; developing a unique updated mitigation strategy for their jurisdiction; and reviewing and commenting on draft documents. CPG members documented activities undertaken by their municipal JAT for AECOM incorporation into the document, and prepared the following written documentation at key junctures in the plan update process:

- Each municipality formally advised ACOEP of their desire to participate in the multi-jurisdictional hazard mitigation plan update process. Statements of "Authority to Participate" from participating jurisdictions are included in **Appendix 1.1**.

- Each CPG member was responsible for developing a local JAT for their community. "Worksheet 1 – JAT Membership" documents, for a range of position titles, who was approached by the CPG member and when, and whether or not that person agreed to participate in the plan update (along with their contact information). In this worksheet, CPG members also tracked the activities of their respective JATs, including who was invited to which events and who attended. Information from the Worksheet 1 submittals has been incorporated into the jurisdictional annexes of **Section 9.**

- At the CPG project kickoff meeting on May 20, 2021, CPG members learned about the plan update process and their role in it. They also were asked to provide feedback on whether they felt any hazards should be added to – or omitted from – the list of hazards that were previously included in the updated 2016 plan. Meeting materials from this kickoff meeting and others throughout the plan update process are provided in **Appendix 1.3**.

- All of Atlantic County's municipalities participate in FEMA's NFIP. Each CPG member coordinated with their local floodplain manager to describe their community's participation in the NFIP and describe their floodplain management program for continued compliance with NFIP requirements. "Worksheet 2 – NFIP Participation" documents this information, and copies of each response are included in jurisdictional annexes of **Section 9.**

- Each CPG member coordinated with their JAT to document changes in land uses and development trends since the last plan was prepared. "Worksheet 3 - Land Uses and Development Trends Worksheet" documents this step. Each JAT's Worksheet 3 response has been incorporated into the jurisdictional annexes of **Section 9.**

- Each CPG member coordinated with their JAT to document changes in local capabilities since the last plan was prepared. "Worksheet 4 – Capability Assessment" documents this step, elaborating on each jurisdiction's existing authorities, policies, programs and resources, and its ability to expand on and improve these existing policies and programs. Each JAT's Worksheet 4 response has been incorporated into the jurisdictional annexes of **Section 9.**

- Each CPG member coordinated with their JAT to evaluate and demonstrate progress made in the past five years in achieving goals and implementing actions outlined in their community's 2016 mitigation strategy, including an explanation of if and how any priorities may have changed since the plan was previously approved; and a summary of all mitigation initiatives undertaken by the community since the last 2016 Plan was approved, regardless of whether or not they were in the plan at that time or whether they were completed with local or outside funding. "Worksheet 5 – Status of Past Projects" documents this step, and copies of each JAT's response are included in jurisdictional annexes of **Section 9.**

- Each CPG member coordinated with their JAT to document the status of plan integration[16] activities over the first plan maintenance cycle, and jurisdiction-specific activities projected for the next plan maintenance cycle. "Worksheet 6 – Plan Integration" documents this step, and copies of each JAT's response are included in jurisdictional annexes of **Section 9.**

- Each CPG member coordinated with their JAT to develop an updated mitigation strategy. "Worksheet 7 – Action Worksheets" document this step (with one worksheet for each action). Each JAT's action plan describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction. Copies of the action worksheets for projects comprising each jurisdiction's local mitigation strategy are included in jurisdictional annexes of **Section 9.**

16 Plan integration is the process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate.

- Each JAT provided opportunities for the general public and other stakeholders to be made aware of the plan update process, and to be given the opportunity for them to participate and provide feedback. Outreach to both public and stakeholder groups was undertaken throughout the plan update timeline, and was undertaken using various methods (such as in-person meetings, print media, website online, social media sites, etc.) Outreach Logs were completed by each JAT to document these opportunities as activities were undertaken. Comments Logs were completed by each JAT to document public/stakeholder feedback as a result of these efforts. Information from each jurisdiction's Outreach Log and Comments Log are included in jurisdictional annexes of **Section 9.**

A detailed summary of the participation demonstrated by each jurisdiction, including attendance at meetings and submission of requested deliverables, is presented in **Table 1.6** on the next page. **Please note: detailed information regarding each JAT member's activities are included in the jurisdictional annexes of Section 9.**

Contractor. AECOM was contracted by the County to guide participating jurisdictions through the process and author the plan in a manner consistent with applicable regulations, criteria, and guidance. AECOM was the lead firm for this assignment for the 2010 Plan, the 2016 Plan Update and the 2021 Update. AECOM was the direct County point of contact, and assisted in all aspects of the plan update, guided local municipalities through their participation in key aspects of the update in a manner that would meet current requirements, led the hazard mitigation planning efforts, was the primary presenter at CPG meetings, authored the plan document, and provided overall contract administration. AECOM conducted the analyses necessary to provide team members with the information they needed to make sound decisions, and helped guide them through the necessary steps of the plan development and update processes. AECOM also prepared a project fact sheet; sample press release about the plan update for use by municipalities, at their option (in full or in part); also for use by municipalities, at their option (in full or in part) - both to facilitate consistent messaging across participating municipalities and for the sake of efficiency by ensuring that 23 different municipalities didn't have to each spend time generating separate presentation materials. These were provided to participating jurisdictions via the CPG Internal Website www.atlantichmp2021.com for their use throughout the project.

Table 1.6: Atlantic County Jurisdictions Plan Participation

Entity	Returned Statement of Authority to Participate	Planning Team Meetings						Worksheets Submitted							Outreach to Public and Other Stakeholders
		Project Initiation Meeting 04/21/21	CPG Kickoff Meeting 05/20/21	Worksheet Assistance Sessions (June 2021)	CPG Progress Meeting 07/15/21	County JAT meeting 7/22/21	CPG Plan Review Meeting 11/9/21	1	2	3	4	5	6	7	
Atlantic County:	N/A	■	■	6/22/21	■	■		■	N/A[17]	■	■	■	■	■	■
Office of Emergency Preparedness	N/A	■	■	6/22/21	■	■		County JAT members provided feedback for various worksheets and assisted with outreach.							
Department of Regional Planning and Development	N/A					■									
Department of Public Works	N/A					■									
Treasurer's Office	N/A					■									
Manager/Administrator	N/A					■									
Elected Officials	N/A					■									
Municipalities															
Absecon, City of	■		■	6/15/21	■			■	■	■	■	■	■	■	■
Atlantic City, City of	■		■	6/16/21	■			■	■	■	■	■	■	■	■
Brigantine, City of	■		■	6/14/21	■			■	■	■	■	■	■	■	■
Buena Vista, Borough of	■		■	6/16/21	■			■	■	■	■	■	■	■	■
Buena, Township of	■		■	6/18/21				■	■	■	■	■	■	■	■
Corbin City, City of	■			6/16/21	■			■	■	■	■	■	■	■	■
Egg Harbor City, City of	■			6/14/21				■	■	■	■	■	■	■	■
Egg Harbor, Township of	■		■	6/17/21				■	■	■	■	■	■	■	■
Estell Manor, City of	■				■			■	■	■	■	■	■	■	
Folsom, Borough of	■			6/17/21				■	■	■	■	■	■	■	■
Galloway, Township of	■		■	6/15/21	■			■	■	■	■	■	■	■	■
Hamilton, Township of	■		■	6/18/21	■			■	■	■	■	■	■	■	■
Hammonton, Town of	■			6/18/21				■	■	■	■	■	■	■	■
Linwood, City of	■		■	6/18/21	■			■	■	■	■	■	■	■	■
Longport, Borough of	■		■	6/14/21	■			■	■	■	■	■	■	■	■
Margate City, City of	■		■	6/18/21	■			■	■	■	■	■	■	■	■
Mullica, Township of	■		■	6/21/21	■			■	■	■	■	■	■	■	■
Northfield, City of	■			6/17/21	■			■	■	■	■	■	■	■	■
Pleasantville, City of	■			7/6/21				■	■	■	■	■	■	■	
Port Republic, City of	■		■	6/15/21	■			■	■	■	■	■	■	■	■
Somers Point, City of	■		■	6/15/21	■			■	■	■	■	■	■	■	■
Ventnor City, City of	■		■	6/16/21	■			■	■	■	■	■	■	■	■
Weymouth, Township of	■			6/17/21	■			■	■	■	■	■	■	■	■
Stakeholders															
Atlantic County Utilities Authority	N/A														
NJOEM	N/A				■										
Red Cross	N/A		■												
Salvation Army	N/A		■		■										
Stockton College	N/A														
Consultant															
AECOM	N/A	■	■	■	■		■	N/A							N/A

Key: [blank] = Not invited; ■ = Invited and attended / Submitted relevant worksheet; [Blank] = Invited but did not attend / did not submit relevant worksheet

[17] Worksheet 2 regarding jurisdictional implementation of FEMA's NFIP is not an applicable document for the County as the County government is not a participating community in the NFIP (this is done at the municipal level in the State of NJ)

Outreach to the Public and Other Stakeholders

A key element in the mitigation planning process is the discussion it promotes among community members about creating safer, more disaster-resilient communities. To meet Federal requirements, opportunities must be provided for the general public and other stakeholders[18] to be involved throughout hazard mitigation planning and plan update processes.

Outreach to the public and other stakeholders was undertaken concurrently by both the County and each participating jurisdiction. County outreach activities were broader efforts aimed at a larger, county-wide scale; while each participating jurisdiction's JAT was responsible for providing outreach opportunities for the general public and other stakeholders within their municipal borders. Additionally, JATs provided additional opportunities at a more local level. **While this subsection of the plan presents a general overview of County-led activities for outreach to the public and other stakeholders, details of the specific activities undertaken by the County and each participating jurisdiction are provided in each jurisdictional annex of Section 9.**

- Stakeholders on the County Jurisdictional Assessment Team (JAT). The County formed a JAT to provide feedback on the plan and on mitigation actions. A list of specific member names and position titles is included in the County's annex within **Section 9.** The County JAT consisted of the following entities:

  Atlantic County Office of Emergency Preparedness
  Atlantic County Department of Public Safety
  Atlantic County Department of Regional Planning and Development
  Atlantic County Department of Public Works
  Atlantic County Treasurer's Office
  Atlantic County Administrator's Office

- Other Stakeholders Attending Key Planning Team Meetings. The following additional stakeholders also participated by attending one or more multi-jurisdictional planning team meetings (see **Table 1.6**):

  NJOEM
  Salvation Army
  Red Cross

- Press. Information regarding the plan update appeared in various news outlets over the course of the project to provide opportunities for the public and other stakeholders to be informed and to participate in the process. A press release was issued by the

[18] A stakeholder is any person, group, or institution that can affect or be affected by a course of action, such as neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, businesses, academia, and other private and nonprofit interests.

County on May 21, 2021, discussing the plan update process (https://www.atlantic-county.org/news/details.asp?ID=5073); and August 3, 2021, seeking public input for the plan (https://www.atlantic-county.org/news/details.asp?ID=5154).

- The County also used social media posts on County Facebook and Twitter pages and the mitigation plan web site. Copies of County Press Releases and a sampling of local media[19] articles are in **Appendix 1.3**.

- Public Meetings. The plan update was included in the annual Downbeach Community meeting, held on July 22, 2021 to educate the public on municipal and county-level emergency services and mitigation plans.

- External Website. A public-facing hazard mitigation planning page was initiated by ACOEP in 2008 at the onset of development of the initial plan. The County maintained this web presence (https://www.atlantic-county.org/hazard-mitigation/), and updated its content to reflect subsequent updates. Most recently, for the current plan update, the website was updated in May 2021. The purpose of the web content is to inform the public and other stakeholders about the purpose and need for the plan and the update and to solicit their feedback and participation. Content includes general information about the process, participating jurisdictions, planning group and meeting information, contact information, a link for the plan, and more. **Figure 1.4** shows a screen capture of the main page for the plan update. **Figure 1.5** shows a screen capture of the General Information page.

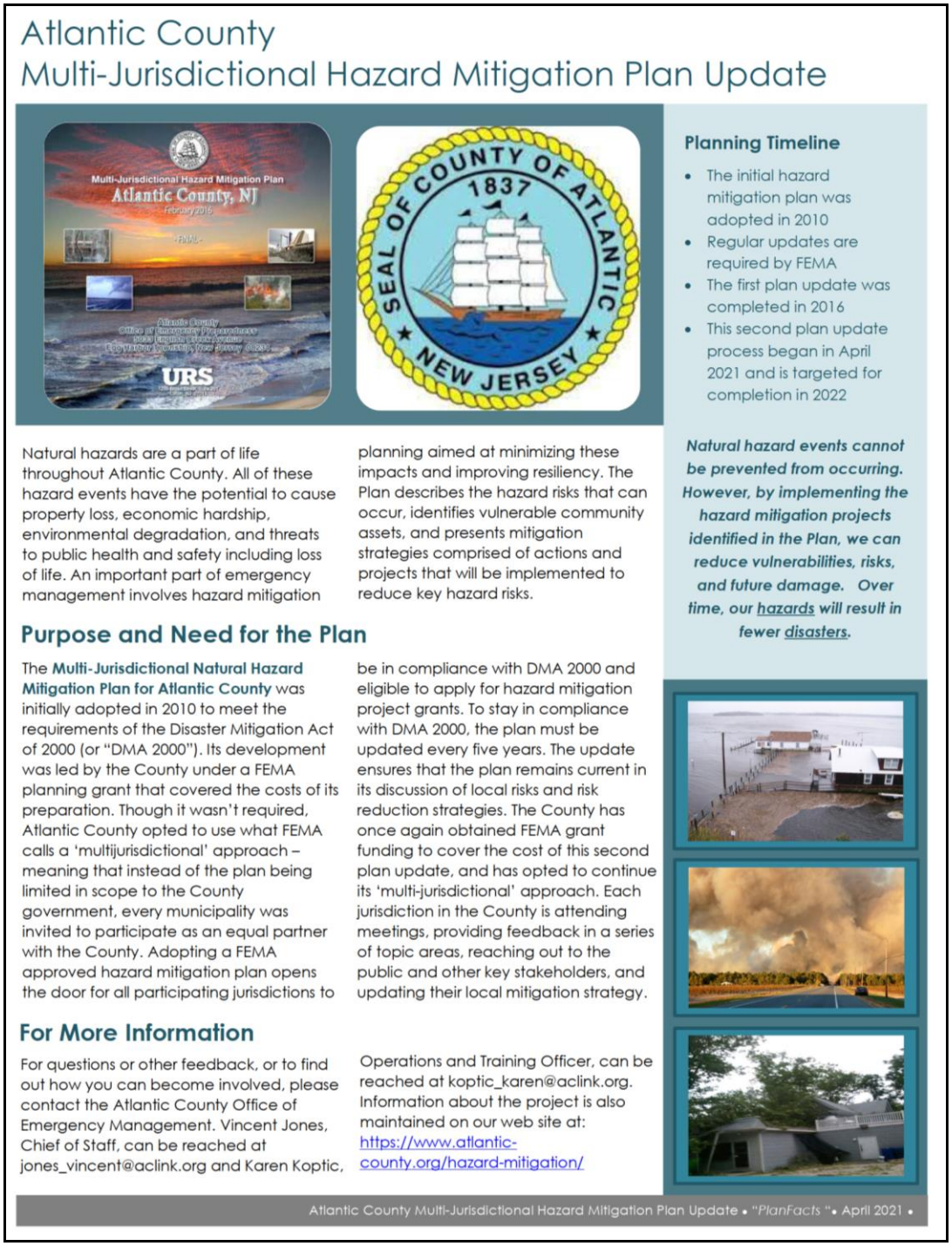
[19] News articles in **Appendix 1.4** do not represent comprehensive coverage of the plan update by local news media. Other articles may have been published that do not appear in the appendix. The appendix is intended to give a flavor for the type of article s that appeared throughout the update.

Figure 1.4 – Plan Update Web Content on https://www.atlantic-county.org/hazard-mitigation/

Figure 1.5 – Plan Update Web Content on https://www.atlantic-county.org/hazard-mitigation/general-information.asp

- Fact Sheet. Participating jurisdictions found the use of the plan update fact sheet to be of great use for getting the word out regarding the initial plan, and the CPG opted to use this as one component of its outreach strategy for the plan update as well. **Figure 1.6** on the next page shows the fact sheet used for the second plan update. In addition to describing the purpose and need for the plan, and information about the plan update, the fact sheet also gave ACOEP contact information for interested parties to reach out to for questions or other feedback, or to learn more about how they could become involved in the plan update process. CPG members distributed this fact sheet on notice boards and at various meetings with the public and other stakeholders. Some examples of ways the County, in particular, used the fact sheet for its outreach strategy include but are not limited to: ACOEP distribution of the fact sheet to interested parties at its various outreach meetings and events, including the Annual Downbeach Community Meeting on July 22, 2021.

The fact sheet was also distributed throughout the process by County staff and participating jurisdictions, and was posted on the plan update web site. Details are included in the Jurisdictional Annexes of **Section 9**.



Atlantic County
Multi-Jurisdictional Hazard Mitigation Plan Update

Multi-Jurisdictional Hazard Mitigation Plan
Atlantic County, NJ
February 2016
-FINAL-
URS

SEAL OF COUNTY OF ATLANTIC 1837 NEW JERSEY

Planning Timeline

- The initial hazard mitigation plan was adopted in 2010
- Regular updates are required by FEMA
- The first plan update was completed in 2016
- This second plan update process began in April 2021 and is targeted for completion in 2022

Natural hazards are a part of life throughout Atlantic County. All of these hazard events have the potential to cause property loss, economic hardship, environmental degradation, and threats to public health and safety including loss of life. An important part of emergency management involves hazard mitigation planning aimed at minimizing these impacts and improving resiliency. The Plan describes the hazard risks that can occur, identifies vulnerable community assets, and presents mitigation strategies comprised of actions and projects that will be implemented to reduce key hazard risks.

Natural hazard events cannot be prevented from occurring. However, by implementing the hazard mitigation projects identified in the Plan, we can reduce vulnerabilities, risks, and future damage. Over time, our hazards will result in fewer disasters.

Purpose and Need for the Plan

The **Multi-Jurisdictional Natural Hazard Mitigation Plan for Atlantic County** was initially adopted in 2010 to meet the requirements of the Disaster Mitigation Act of 2000 (or "DMA 2000"). Its development was led by the County under a FEMA planning grant that covered the costs of its preparation. Though it wasn't required, Atlantic County opted to use what FEMA calls a 'multijurisdictional' approach – meaning that instead of the plan being limited in scope to the County government, every municipality was invited to participate as an equal partner with the County. Adopting a FEMA approved hazard mitigation plan opens the door for all participating jurisdictions to be in compliance with DMA 2000 and eligible to apply for hazard mitigation project grants. To stay in compliance with DMA 2000, the plan must be updated every five years. The update ensures that the plan remains current in its discussion of local risks and risk reduction strategies. The County has once again obtained FEMA grant funding to cover the cost of this second plan update, and has opted to continue its 'multi-jurisdictional' approach. Each jurisdiction in the County is attending meetings, providing feedback in a series of topic areas, reaching out to the public and other key stakeholders, and updating their local mitigation strategy.

For More Information

For questions or other feedback, or to find out how you can become involved, please contact the Atlantic County Office of Emergency Management. Vincent Jones, Chief of Staff, can be reached at jones_vincent@aclink.org and Karen Koptic, Operations and Training Officer, can be reached at koptic_karen@aclink.org. Information about the project is also maintained on our web site at: https://www.atlantic-county.org/hazard-mitigation/

Atlantic County Multi-Jurisdictional Hazard Mitigation Plan Update • "PlanFacts "• April 2021 •

Figure 1.6 – Fact Sheet for the Second Plan Update

- Municipal OEM Coordinators Meetings: ACOEP hosted meetings of the Municipal OEM Coordinators on May 21, and September 23, 2021. At each meeting, coordinators were made aware of the plan update and invited to participate in the process.

- Public Information Video on Hazard Mitigation. A video about the hazard mitigation plan update was prepared jointly with the ACOEP and the County Public Information Officer, and posted in July 2021 on YouTube and on the County mitigation planning page at https://www.youtube.com/watch?v=wBIVo6STwts&t=7s and https://www.atlantic-county.org/hazard-mitigation/, respectively.

- Social Media: Facebook and Twitter. Facebook and Twitter accounts registered to the County and various participating jurisdictions were used periodically throughout the plan update process to inform the public and other stakeholders about the plan update and solicit their feedback and participation. One such example includes an ACOEP Facebook and Twitter posts in May and July 2021.

Feedback from the Public and Other Stakeholders

As discussed in the preceding subsection and detailed in the Outreach Logs for each jurisdiction (as provided in municipal annexes of **Appendix 1.2**) the County and each participating jurisdiction collectively undertook many actions to raise awareness of the plan update process and provide the public and other stakeholders with a forum for participating in - and providing feedback throughout - the plan update. These activities ranged from web site and social media postings to use of print media, public meetings, and targeted outreach to key stakeholder groups.

Overview of Feedback Provided by the General Public

The feedback provided by the general public during the course of the second plan update resulted from outreach sessions conducted at various meetings/events throughout the County. Also, outreach to the public was conducted at local fairs and festivals, including the National Night Out August 3, 2021, and the County 4-H Fair on August 6-8, 2021. Comments and questions by the public regarding the plan from all outreach activities included the identification of locations of localized flooding that need to be addressed, facilities with a need for generators, and shoreline areas requiring beach stabilization. Other questions were related to the cost of flood insurance premiums, the location of emergency shelters, and the availability of funding to elevate floodprone homes.

Review and Incorporation of Existing Plans, Studies, Reports, and Technical Information

In the process of preparing this hazard mitigation plan update, many other existing plans, studies, reports, and technical information were evaluated. These sources are noted throughout this report as various topics are discussed. As shown in **Table 1.7**, the development of this hazard mitigation plan included the review and incorporation of data from existing plans, studies, reports, and technical information. Relevant information was referenced or included, as applicable, to form the content of this mitigation plan.

Table 1.7
Review and Incorporation of Data from Outside Sources

Data Source	How Incorporated
Readily available on-line information from federal and state agency web sites such as: FEMA, NJOEM, NJ Department of Environmental Protection, NJ Geological and Water Survey, US Forest Service National Avalanche Center, US Geological Survey, National Oceanic and Atmospheric Administration (including National Weather Service, National Climatic Data Center, National Centers for Environmental Information, and the National Severe Storms Laboratory), University of Buffalo Multidisciplinary Center for Earthquake Engineering Research (MCEER), USGS National Earthquake Information Center, NASA Space Environment Center, and the US Department of Transportation Federal Highway Authority.	Referenced throughout this report as various topics are discussed. Primarily, these sources were consulted to develop lists of historic occurrences of various hazards as well as areas at risk, probability of future occurrences, and impact information.
New Jersey State Hazard Mitigation Plan (2019)	Hazard information including historic occurrences, areas at risk, probability of future occurrences, and impact information. Also: State capabilities that can support local hazard mitigation efforts, State goals and actions (to compare against local goals and actions to ensure that the two go hand-in-hand), etc.
FEMA Flood Map Data and Municipal Flood Insurance Studies	Areas susceptible to flooding. Also, FISs included information about local flood protection features. DFIRMs were combined with parcel data in GIS to evaluate the area of the floodplain in each municipality, the value of improvements in each area.
Atlantic County GIS data	Quantification of assets at risk from various hazards. County GIS data included: fire stations, police stations, hospitals, public works facilities, schools, and emergency shelters.
New Jersey Geographic Information Network (NJGIN)	Used to obtain GIS improved property parcel data (MODIV data, 2021) and nursing home data.
FEMA's HAZUS-MH	The database of assets from HAZUS was imported on a GIS platform to determine assets at risk from delineable hazards for: emergency operations centers, power generating stations, potable water treatment plants, wastewater treatment plants, significant public works buildings, airports, and ferry ports
Atlantic County Master Plan (2018)	Used to describe historic land uses and development trends as

Table 1.7 Review and Incorporation of Data from Outside Sources	
Data Source	**How Incorporated**
	well as overall future growth and development of Atlantic County, as well as current and expected future trends.
Atlantic County Open Space and Recreation Plan (2018)	Used to describe historic land uses and development trends as well as overall future growth and development of Atlantic County, as well as current and expected future trends.
Atlantic County Flood Insurance Study	Areas susceptible to flooding. Also, FISs included information about local flood protection features. DFIRM data was combined with parcel data in GIS to evaluate the area of the floodplain in each municipality, the value of improvements in each area.
USGS Earthquake History of New Jersey	Historic earthquake event occurrences
NJGS Earthquakes Epicentered in New Jersey	Historic earthquake event occurrences
NEHRP Soil Class Mapping	The severity of impact of an earthquake can be exacerbated by certain soil types, and soils mapping was used in the earthquake hazard profile to inform the degree to which soil type might exacerbate earthquake impacts.
New Jersey Geological Survey Landslide Event Database	Historic landslide event occurrences. Landslides are more likely to occur in areas where they have happened in the past.
USGS National Landslides Program Landslide Mapping	Historic landslide event occurrences. Landslides are more likely in areas where they have happened in the past.
USGS Fact Sheet 165-00, Land Subsidence in the United States	Land subsidence hazard maps were evaluated to determine whether land subsidence is a significant hazard
USDA National Agricultural Statistics Service, Census of Agriculture, Atlantic County	Information regarding agricultural uses in the County to characterize how widespread the potential impacts of some hazards might be (drought and hail, for example).
Stanford University National Performance of Dams Program web site	Dam inventory data was used to quantify the number, type, and hazard ranking of dams in the County (as applicable for the flood hazard).
U.S. Army Corps of Engineers National Inventory of Dams	Dam inventory data was used to quantify the number, type, and hazard ranking of dams in the County. (as applicable for the flood hazard).
Atlantic County Department of Regional Planning and Development, Division of Engineering	Emergency Action Plans for High and Significant Hazard dams (Lake Lenape Dam (2020, 6th Revision), Bargaintown Mill Pond Dam (2020, 7th Revision), and Pleasant Mills Dam (2020)).
The American Society of Civil Engineers Standard 7-02, Minimum Design Loads for Buildings and Other Structures; and "Wind Zones in the United States" map	Map used to determine which wind region the County is in; this informed the wind hazard profile.
FEMA Publication 320 - Taking Shelter from the Storm: Building a Safe Room for your Home or Small Business	Typical damage for each Enhanced Fujita scale tornado and hurricane category, as well as wind zones and tornado activity maps
FEMA NFIP Community Status Book	NFIP participating communities, numbers of policies, historic numbers and values of paid claims, etc.
FEMA data for NFIP Repetitive Loss Properties and Community Rating System communities	Numbers of losses, value of paid claims, communities with repetitive loss properties, communities participating in the CRS (and their class), etc.
FEMA's "NFIP Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials (FEMA-480)"	Types of mitigation measures, definitions of the different categories of flooding for the hazard profile, and a table showing the odds of being flooded (for various time periods and flood events)

Table 1.7 Review and Incorporation of Data from Outside Sources	
Data Source	**How Incorporated**
Rutgers University Science and Technical Advisory Panel (STAP) Report (2019)	Reviewed for projections of sea level rise under a range of future scenarios.
Stockton University Coastal Research Center	For information on sea level rise, coastal erosion, renourishment projects.
National Tsunami Hazard Mitigation Program	Incidence of tsunamis affecting New Jersey and Atlantic County
Maine State Hazard Mitigation Plan	Reviewed for information on tsunami risk
USGS Landslide Overview Map of the Conterminous United States, prepared in hard copy format in 1982 by Dorothy H. Radbruch-Hall, Roger B. Colton, William E. Davies, Ivo Lucchitta, Betty A. Skipp, and David J. Varnes (Geologic Survey Professional Paper 1183), compiled digitally by Jonathan W. Godt (USGS Open File Report 97-289), as viewed on NationalAtlas.gov	Landslide incidence and susceptibility
American Society of Civil Engineers (ASCE) Standard 7-98: Minimum Design Loads for Buildings and Other Structures	Minimum design loads for wind
FEMA's "Multi-Hazard Identification and Risk Assessment" (1997)	Several hazard definitions and information to support the hazard profile, as well as ideas for types of mitigation approaches
American Meteorological Society "Glossary of Meteorology"	Definitions of meteorological hazards
FEMA's "Mitigation Ideas"	Provided information to the CPG about a range of mitigation measures for various types of hazards.
Local plans, codes, and ordinances (such as building codes, zoning ordinances, subdivision ordinances, special purpose ordinances, site plan review requirements, growth management ordinances, comprehensive plans, capital improvements plans, economic development plans, emergency response plans, post-disaster recovery plans, post-disaster recovery ordinances, local waterfront revitalization plans, and real estate disclosure ordinances)	Jurisdictions were asked to review local plans and ordinances and consider all local capabilities when developing their mitigation strategies as the enhancement of existing capabilities, or bridging identified gaps in capabilities, can further mitigation goals and objectives. Responses were recorded in the Capability Assessments of Section 4.
US Census (2019 ACS)	Population, people per household, income, age, etc.
New Jersey State Development and Redevelopment Plan (State Plan) and Atlantic County's Cross Acceptance Report	Areas envisioned for growth, limited growth, and conservation; development trends.
USDA Understanding Soil Risks and Hazards (2004)	Reviewed for information regarding expansive soils
USGS Hydrologic Atlas 730-L (1997)	Reviewed to evaluate groundwater resources
New Jersey Drought Emergency Plan (1991)	Reviewed to determine how actions during a drought emergency mitigate impacts
USDA Atlantic County Soil Survey	Reviewed for local potential for expansive soils
In the Wake of Doria (1971)	Reviewed for local event impacts
NJDEP Floods of August and September 1971 in New Jersey, Special Report 37 (1972)	Reviewed for local event impacts
USGS Open File Report 79-559, Flood of	Reviewed for local event impacts

Table 1.7 Review and Incorporation of Data from Outside Sources	
Data Source	**How Incorporated**
November 8-10, 1977 in Northeastern and Central New Jersey (April 1979)	
National Weather Service, Eastern Region, Disaster Survey Report, The Great Nor'easter of December 1992 (June 1994)	Reviewed for local event impacts
New Jersey Historic Preservation Office GIS shape files for state and federally listed historic and cultural resources	Used to identify historic and culturally significant assets in hazard areas
New Jersey Administrative Code 7:7E; Coastal Zone Management Rules	Reviewed for information about management of the county's coastal zones
FEMA's "NFIP Floodplain Management Requirements: a Study Guide and Desk Reference for Local Officials (FEMA-480)"	Used to evaluate the impact of future development in flood hazard areas on overall risk (i.e., how well do existing regulations provide protection for new development where new development is in compliance with current codes and standards
NOAA's Atlantic Oceanographic and Meteorological Laboratory's mapping – "Empirical Probability of a Named Storm"	Reviewed to report on annual probability of a named storm for the hurricane and tropical storm risk assessment
New Jersey Department of Labor and Workforce Development, Division of Labor Market and Demographic Research, County Community Fact Book, Atlantic County Edition, June 2013	Used to show change in exposure and potential vulnerability of people to natural hazards
Earthquake Risk in New Jersey, NJOEM	Used in the earthquake risk assessment
"Getting to Resilience" Recommendations Reports, New Jersey Resilient Coastal Communities Initiative, prepared by the Resilience Team at JCNERR	New Jersey Resilient Coastal Communities Initiative. The Resilience Team at JCNERR provides assistance to communities in New Jersey, guiding municipal leadership in discussing their community's current and future risk preparedness. Mitigation action recommendations are included in their "Getting to Resilience" Recommendations Reports. Atlantic County communities with Resiliency initiatives include Atlantic City, Somers Point, and Ventnor City (www.prepareyourcommunitynj.org/municipal-maps/atlantic-county/). Other work has been undertaken in Brigantine and Hamilton. Communities considered Resiliency Recommendations Report initiatives when formulating their mitigation strategies as part of this plan update

Regulatory Compliance

This Hazard Mitigation Plan was prepared in a manner consistent with applicable regulations, criteria, and guidance. The Plan's components address the local hazard mitigation planning requirements of the DMA 2000. The planning team used FEMA's Local Mitigation Planning Handbook (March 2013) and its "Regulation Checklist" as a guide. Each element of the Regulation Checklist must be addressed satisfactorily for a plan to be approved by FEMA. **Table 1.8** summarizes the FEMA regulations, and where the regulation is addressed in this plan.

Table 1.8 FEMA Plan Review Criteria	
Regulation	**Location in the Plan[20]**
Element A - Planning Process	
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction (Requirement 201.6(c)(1))	Section 1
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interest to be involved in the planning process? (Requirement 201.6(b)(2))	Section 1
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement 201.6(b)(1))	Section 1
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 201.6(b)(3)	Section 1
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (requirement 2016(c)(4)(iii))	Section 7
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement 201.6(c)(4)(i))	Section 7
Element B – Hazard Identification and Risk Assessment	
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction? (Requirement 201.6 (c)(2)(i))	Sections 2 and 3a
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement 201.6(c)(2)(i))	Section 3a
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement 2016(c)(2)(ii))	Sections 3b,3c, 3d, and 3e
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement 201.6(c)(2)(ii)	Section 3a
Element C – Mitigation Strategy	
C1. Does the plan document each jurisdiction's existing authorities, policies, programs, and resources and its ability to expand on and improve these existing policies and programs? (Requirement 201.6(c)(3))	Section 4
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 201.6(c)(3)(ii))	Section 3a
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 201.6(c)(3)(i))	Section 5
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 201.6(c)(3)(ii))	Section 6
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement 201.6(c)(3)(iii))	Section 6
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 201.6(c)(4)(ii))	Section 7

[20] "Location in the Plan" is referring to the primary plan Section where the requirement is met, and any appendices referenced in that section.

Table 1.8 FEMA Plan Review Criteria	
Regulation	**Location in the Plan[20]**
Element D – Plan Review, Evaluation, and Implementation (applicable to plan updates only)	
D1. Was the plan revised to reflect changes in development? (Requirement 201.6(d)(3))	Section 3d
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement 201.6(d)(3))	Section 6
D3. Was the plan revised to reflect changes in priorities? (Requirement 201.6(d)(3))	Section 6
Element E – Plan Adoption	
E1. Does the Plan include documentation that the Plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement 201.6(c)(5))	Page i[21]
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement 201.6(c)(5))	Page i[21]
Element F – Additional State Requirements	
Add here	

General Overview of Modifications to the 2016 Plan as part of the 2021 Plan Update

This section documents how the planning team reviewed and analyzed each section of the prior version of the plan (February 2016) and whether each section was revised as part of the 2021 Plan Update. As part of this update, every section of the earlier plan has been reviewed and comprehensively updated as needed to achieve compliance with FEMA mitigation planning requirements outlined in the Local Mitigation Plan Review Guide in October 2011 and the Local Mitigation Planning Handbook in March 2013.

The document has been streamlined, with a good deal of supporting documentation moved into appendices reproduced only on CD but not in hard copy in order to make the hard copy version of the plan more portable and user-friendly for those benefiting from its contents. Printed hard copies of all data and appendices reproduced on CD will be kept on file by ACOEP for inspection upon request. Applicable and relevant information from the last version of the plan has been carried through to the updated text on a case by case basis.

Highlights of some key additional information appearing in this updated document include:

- A description of the planning process and associated outreach activities (to the public and other stakeholders) that was undertaken as part of this update.
- A listing of historical occurrences of the identified hazards since the last version of the plan was prepared in 2016 (including but not limited to major disaster and emergency declarations).

[21] Participating jurisdictions will each be responsible for passing their resolutions after agency reviews are completed and FEMA indicates that the plan is "Approvable Pending Adoption". Each jurisdiction is responsible for providing a copy of their adoption resolution to ACOEP. ACOEP is responsible for providing a copy of all resolutions to FEMA, and inserting hard copies into the bound document following Page i.

- Current information regarding changes in development, progress on local mitigation efforts, and any changes in priorities.
- The status of past projects and plan maintenance activities, as well as identification of new mitigation strategies, for the County and each of the 23 municipalities who participated in the plan update.
- A full summary of local capabilities with local assessments of how their capabilities could be improved to foster mitigation goals.
- Incorporation of recently published information not available at the time of the 2016 Plan (such as the New Jersey State Hazard Mitigation Plan of 2019).

Table 1.9 documents how each section of the plan was reviewed and analyzed, and whether each section was revised as part of the update process.

Table 1.9
Overall Summary of Plan Transition – 2016 to 2022

2016 Plan Section (s)	2021 Plan Update Section(s)	Comments
Plan Adoption Resolutions Placeholder	Plan Adoption Resolutions Placeholder	Reviewed and updated to refer to the 2021 Plan Update, but presentation remains largely unchanged.
Acknowledgements	Acknowledgements	Reviewed and updated to present details for the 2021 Plan Update.
Executive Summary	Executive Summary	Reviewed and updated to reflect current conditions
Section 1 – Introduction	Section 1 – Introduction	Reviewed and updated to present details of the 2021 Plan Update process but presentation remains largely unchanged.
Section 2 – Identification of Potential Hazards	Section 2 – Identification of Potential Hazards	Reviewed and updated to present details for the 2016 Plan Update, and to align more closely with the setup of the 2019 State HMP.
Section 3a – Hazard Profiles	Section 3a - Hazard Profiles	All hazard profiles were updated to incorporate the latest readily available data, including NFIP data, hazard occurrences and their impacts since the last plan update, plus information for hazards not previously profiled in detail.
Section 3b – Identification and Characterization of Assets in Hazard Areas	Section 3b – Identification and Characterization of Assets in Hazard Areas	Updated for the latest asset data from Atlantic County GIS and HAZUS. Historical properties updated according to state and national sources.
Section 3c – Damage Estimates	Section 3c – Damage Estimates	Damage estimates updated to incorporate current data. Also HAZUS-based damage analysis methodology used in place of previous approach for applicable hazards.
Section 3d – Land Uses and Development Trends in Hazard Areas	Section 3d – Land Uses and Development Trends in Hazard Areas	Updated to reflect jurisdictional reassessments of current trends and developments.
Section 3e – Conclusions on Hazard Risk	Section 3e – Conclusions on Hazard Risk	Priority Risk Index analysis updated to include additional hazards previously not included.
Section 4 – Capabilities and Resources	Section 4 – Capabilities and Resources	Updated to reflect jurisdictional reassessment of capabilities.
Section 5 – Mitigation	Section 5 – Mitigation	Updated to reflect current state plan goals, and to include plan

Table 1.9 Overall Summary of Plan Transition – 2016 to 2022		
2016 Plan Section (s)	**2021 Plan Update Section(s)**	**Comments**
Goals	Goals	vision statement and streamlined set of Atlantic County goals.
Section 6 – Mitigation Actions	Section 6 – Mitigation Actions	Presentation changed to restructure and simplify the description of the strategy development process, and to present a revised array of potential mitigation actions in line with current FEMA reference literature. Overview of all jurisdictional strategies replaced with table presenting comprehensive list of all actions in the plan and the hazards they address.
Section 7 – Plan Maintenance and Integration	Section 7 – Plan Maintenance and Integration	Reviewed and updated to reflect current conditions and jurisdictional preferences.
Section 8 – For More Information	Section 8 – For More Information	Presentation remains unchanged; contact information was updated to reflect change in staffing at Atlantic County OEP since the prior update.

SECTION 2 – HAZARD IDENTIFICATION

Atlantic County, New Jersey is vulnerable to a wide range of natural and human-caused hazards that threaten life and property. FEMA's current regulations and interim guidance under the Disaster Mitigation Act of 2000 (DMA 2000) require, at a minimum, an evaluation of a full range of natural hazards. An evaluation of human-caused hazards (i.e., technological hazards, terrorism, etc.) is encouraged, though not required, for plan approval. Atlantic County has focused solely on natural hazards at this time. Incorporation of human-caused hazards may be evaluated in future versions of the plan, as it is a "living document" which will be monitored, evaluated and updated regularly.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, as well as the suite of hazards required for consideration in the 2019 New Jersey State Hazard Mitigation Plan (NJSHMP) Standardized Risk Template for Multijurisdictional Mitigation Plans, Atlantic County has identified a number of hazards that are to be addressed in its Multi-Jurisdictional Hazard Mitigation Plan. These hazards were identified through an extensive process that utilized input from three key sources: Planning Committee members, research of past disaster declarations in the County, and the New Jersey State Hazard Mitigation Plan. Readily available online information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources. The most prominent online sources of data used in this assessment to identify the occurrence of various hazards were records of declared disasters and emergencies maintained by FEMA and NJOEM, and the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information (NCEI) Storm Event Database.

AECOM conducted research and prepared initial updates to this plan section for planning team review and comment. AECOM solicited feedback from the planning team regarding their preliminary assessments and whether there was a need for adding or omitting any hazards that were previously covered in the 2016 Plan Update. The Atlantic County OEP was the first to review and comment on this section, during email coordination with AECOM on June 1, 2021 and subsequent telephone coordination on June 2, 2021. Thereafter, this section was provided to the CPG via email on June 3, 2021 and via posting on the internal CPG website on that same date. County OEP gave CPG members one week to review and return comments, which were requested by June 11, 2021. Feedback from the CPG on this section was positive, with respondents indicating their concurrence. As a result of this review and coordination, all hazards identified in the 2016 plan were deemed to have continued relevance and were recognized as continuing to be significant hazards meriting risk assessment in subsequent sections of this document.

Importantly, the following hazards were added into the suite of hazards considered during the 2021 plan update to better align with guidance set forth in the 2019 NJSHMP: levee failure, tsunamis, sea level rise, sinkholes, and abandoned mines and quarries. **Table 2.1** provides a summary of the hazard identification and reevaluation process noting which of the evaluated hazards were identified as significant enough for further evaluation through Atlantic County's multi-jurisdictional hazard risk assessment (marked with a "☑"). It also shows how these identified hazards will be carried forward to and presented in the Section 3 Risk Assessment in order to align with the State HMP organizational structure.

Table 2.1 Summary Results of the Hazard Identification and Evaluation Process, 2016 versus 2022		
2016 Plan	**2022 Plan**	**Organizational Structure of Identified Hazards for 2022 Section 3 - Risk Assessment [1]**
ATMOSPHERIC ☐ Avalanche ☑ **Extreme Temperatures** ☑ **Extreme Wind** ☐ Hailstorm ☑ **Hurricane and Tropical Storm** ☑ **Lightning** ☑ **Nor'easter** ☑ **Tornado** ☑ **Winter Storm**	**ATMOSPHERIC** ☐ Avalanche ☑ **Extreme Temperatures** ☑ **Extreme Wind** ☑ **Hail** ☑ **Hurricane and Tropical Storm** ☑ **Lightning** ☑ **Nor'easter** ☑ **Tornado** ☑ **Severe Winter Weather**	**ATMOSPHERIC** Hurricane and Tropical Storms Nor'easters Severe Weather (high winds, tornadoes, thunderstorms, hail, and extreme temperatures) Severe Winter Weather (snow, blizzards, and ice storms)
HYDROLOGIC ☑ **Coastal Erosion** ☑ **Dam Failure** ☑ **Drought** ☑ **Flood** ☐ Ice Jams ☑ **Storm Surge** ☑ **Wave Action**	**HYDROLOGIC** ☑ **Coastal Erosion and Sea Level Rise** ☑ **Dam/Levee Failure** ☑ **Drought** ☑ **Flood** ☐ Ice Jams ☑ **Storm Surge** ☑ **Wave Action**	**HYDROLOGIC** Coastal Erosion and Sea Level Rise Dam/Levee Failure Drought Flood (riverine, coastal, storm surge, tsunami, and stormwater flooding)
GEOLOGIC ☑ **Earthquake** ☐ Expansive Soils ☐ Landslide ☐ Land Subsidence ☐ Tsunami ☐ Volcano	**GEOLOGIC** ☑ **Earthquake** ☐ Expansive Soils ☐ Landslide ☐ Land Subsidence/Sinkholes /Abandoned Mines and Quarries ☑ **Tsunami** ☐ Volcano	**GEOLOGIC** Earthquake **note - tsunamis moved up to the flood hazard*
OTHER ☑ **Wildfire**	**OTHER** ☑ **Wildfire**	**OTHER** Wildfire

☑ = Hazard considered significant enough for further evaluation through Atlantic County's multi-jurisdictional hazard risk assessment.

[1] Reorganized to better align with State HMP 2019

Table 2.2[2] documents the evaluation process rationale used for determining which of the initially identified hazards are considered significant enough for further evaluation through Atlantic County's multi-jurisdictional hazard risk assessment. For each hazard considered, the table indicates whether or not the hazard was identified as a significant hazard to be further assessed, how this determination was made, and why this determination was made. The table works to summarize not only those hazards that *were* identified (and why) but also those that *were not* identified (and why not). Hazard events not identified for inclusion at this time may be addressed during future evaluations and updates of the risk assessment if deemed necessary by the Planning Committee during the plan update process. Table 2.2 also documents the planning team's reassessment of hazard significance during the first plan update as part of its ongoing maintenance of the plan to ensure that it reflects current conditions.

Appendix 2.1 lists the full range of natural hazards initially considered for inclusion in the plan and provides a brief description for each. Some of these hazards are considered to be interrelated or cascading (i.e., hurricanes can cause flooding, storm surge and tornadoes), but for preliminary hazard identification purposes these individual hazards are broken out separately. It should also be noted that some hazards, such as earthquakes or winter storms may impact a large area yet cause little damage, while other hazards, such as a tornado, may impact a small area yet cause extensive damage.

[2] Table 2.2 was updated to include events captured by readily available data sources (particularly NCEI records) to January 2021; with updates in May 2021. The sources themselves are not updated to the same end date across all hazards; hence, Table 2.2 may show event records through different end dates. Most were current through late 2020, though particular variability across hazards is reflected in the table. Hazards included in bold in Table 2.2 are considered significant hazards.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
ATMOSPHERIC HAZARDS					
Avalanche	⊘	Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • US Forest Service National Avalanche Center web site • FEMA's Multi-Hazard Identification and Risk Assessment (MHIRA) • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• The State Plan does not identify avalanches as a hazard of concern for New Jersey. • The current Atlantic County Plan does not identify avalanches as a hazard of concern. • The topography and climate of Atlantic County does not support conditions required for the occurrence of avalanches.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Extreme Temperatures	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.** **To better align with the state plan, this hazard will be further assessed under the risk assessment for severe weather.**	• **NJ State Hazard Mitigation Plan (2019)** • **FEMA's Multi-Hazard Identification and Risk Assessment** • **NOAA National Centers for Environmental Information (NCEI) Storm Events Database** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **Extreme temperature events are identified in the State Plan (in the context of the drought hazard for extreme heat, and in the context of winter storms for extreme cold).** • **Extreme temperatures are also identified in the current Atlantic County Plan under severe storms.** • **NCEI reports 117 days of extreme temperature events (cold/wind chill, excessive heat, extreme cold/wind chill, frost/freeze, heat) for Atlantic County between February 1996 and January 2021 (approximately 74% extreme heat events and 26% extreme cold events). For these events there are no recorded property damages, crop damages, or deaths; but there are a number of attributed injuries reported (36, in total).** • **Primary impacts of concern for extreme temperatures include the life-threatening effects of heat stress or hypothermia on people, particularly the elderly or people in poor physical health. Other significant impacts include strains on livestock and agriculture and excessive demands for electricity during extended heat waves that can lead to power outages and intentional rolling blackouts. During periods of extreme cold, power outages caused by downed power lines can have tremendous impacts on members of the public whose homes do not have secondary heat sources. Pipes freezing and bursting can cause structural damage.**

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Extreme Wind	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.** **To better align with the state plan this hazard will be assessed further under the risk assessment for severe weather.**	• **NJ State Hazard Mitigation Plan (2019)** • **FEMA's Multi-Hazard Identification and Risk Assessment** • **NOAA NCEI Storm Events Database** • **Maximum 3 second wind gust per the American Society of Civil Engineers (ASCE) Standard 7-98.** • **Atlantic County Hazard Mitigation Plan (2014)** • **Input from CPG**	• **Extreme wind events are identified in the State Plan.** • **Extreme wind events are identified in the Atlantic County 4 Plan as part of severe storms.** • **NCEI reports 332 days with high winds, strong winds, and thunderstorm winds for Atlantic County between September 1956 and January 2021. These events have resulted in recorded estimates of 8 injuries and more than $424 million in property damage (of which roughly $400 million are attributable to Superstorm Sandy).** • **Atlantic County is located in a climate region that is highly susceptible to numerous types of extreme wind events including severe thunderstorms, hurricanes, tropical storms, nor'easters and severe winter storms.** • **The maximum 3 second wind gust for Atlantic County per ASCE 7-98 is 160 mph.**

Hailstorm	✓	Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and to better align with the state plan, hail will be discussed briefly (but not analyzed in detail)as a component of the severe weather risk assessment	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment • NOAA NCEI Storm Events Database and National Severe Storms Laboratory (NSSL) web site • Atlantic County 4 Hazard Mitigation Plan (2014) • Input from CPG	• Hailstorms are discussed in the State Plan under the section on severe weather. • Hailstorms are discussed in the Atlantic County 4 Plan in the context of severe storms. • NCEI reports 37 hail days (with 3/4 inch size hail or greater) for Atlantic County between July 1974 and January 2021. For these events there are no recorded deaths or injuries, but $10,000 in property damage and $5.01 million in crop damages. These damages were incurred during only two of the total number of reported events: (a) August 2008, Hammonton, with ping pong ball sized hail causing $5M in crop damages; and (b) $20,000 in damages to vehicles and crops in Buena Vista Township in June 2011. • Hail probability data available on the NSSL web site indicates that Atlantic County is at minimal risk to severe weather threats from damaging hail (at least 2 inches in diameter). NCEI reports only two events in which hail of this magnitude fell in Atlantic County (June 1980 and May 1993; neither event record included a report of deaths, injuries, property damages, or crop damages). • Atlantic County is located in a part of the country with the lowest annual number of days with hailstorms (less than 2). • Damaging hailstorm events in Atlantic County are not very likely, nor are they likely to be very intense. While hailstorms are possible and do occur in the County, they are not identified as a hazard of concern for the purposes of this mitigation plan. There are minimal hazard mitigation techniques available to reduce hailstorm impacts outside of the emergency preparedness procedures and severe weather warning systems already in place (i.e., mass public notifications that recommend immediate protective actions).

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Hurricane and Tropical Storm	✓	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • Analysis of NOAA NHC storm return periods • NOAA NCEI Storm Events Database • National Hurricane Center web site • FEMA's Multi-Hazard Identification and Risk Assessment • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Hurricane and tropical storm events are identified as a hazard of concern in the State Plan. • The Atlantic County 4 Plan also identifies hurricanes and tropical storms as a hazard of concern. • NOAA NHC estimates the return period for hurricanes passing within 50 nautical miles of Atlantic County is approximately 18 years; for major hurricanes (Categories 3, 4, 5) the return period is estimated to be approximately 76 years. • Recent tropical storm events including Bertha (1996), Floyd (1999), Isabel (2003), Hanna (2008) and Irene (2011) have caused significant wind, flood and coastal erosion related damages in Atlantic County. • The remnants of Hurricane Sandy (Superstorm Sandy) in October 2012 caused catastrophic damage in Atlantic County. • NOAA NCEI records one additional tropical storm event affecting Atlantic County since 2014: the remnants of Hurricane Isaias, which passed through New Jersey in August 2020.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Lightning	✓	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update. To better align with the state plan, this hazard will be further assessed under the severe weather risk assessment.	• NJ State Hazard Mitigation Plan (2019) • Vaisala's National Lightning Detection Network • NOAA NCEI Storm Events Database, NOAA lightning statistics, and National Severe Storms Laboratory (NSSL) web site • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Lightning is identified as a hazard of concern in the State Plan, in the context of severe weather events. • Lightning is also identified as a hazard of concern in the Atlantic County 4 Plan (in the context of severe storms). • Atlantic County lies in an area that experiences a very low annual lightning flash density. Vaisala's National Lightning Detection Network for cloud-to-ground lightning incidence in the continental US (1997-2010) shows Atlantic County in a region experiencing 2 to 3 events per square kilometer per year. • NCEI reports 24 days with lightning events for Atlantic County between April 2001 and January 2021. These events have resulted in a recorded 2 deaths, 6 injuries and more than $1.3 million in property damage.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Nor'easter	✓	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Nor'easters are discussed in the State Plan as a significant hazard of concern for New Jersey communities, particularly those located along the Atlantic shore. • Nor'easters are identified as a hazard of concern for the current Atlantic County Plan. • Atlantic County has a lengthy history of devastating impacts wrought by nor'easters. This includes major damages caused by the effects of high wind, rain, snow, heavy surf, coastal flooding and severe beach erosion. • Atlantic County's shore is vital to the local economy but remains highly susceptible to the effects of major coastal storms, including nor'easters.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Tornado	✓	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update. To better align with the state plan update, this hazard will be assessed under the severe weather hazard risk assessment.	• NJ State Hazard Mitigation Plan (2016) • FEMA's Multi-Hazard Identification and Risk Assessment • NOAA NCEI Storm Events Database and National Severe Storms Laboratory (NSSL) web site • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Tornados are discussed in the state plan as a hazard of concern, including historic events in Atlantic County. • NCDC reports seven tornado events affecting Atlantic County between November 1970 and January 2021. Of these, three were classed F2 on the Fujita Tornado Scale (considerable damage), one was classed F1 (moderate damage) and the remainder were classed F0 (light damage). A total of three injuries and just over $1 million in property damage was attributed to these events. No events have been reported since the last version of this plan was prepared. • According to NSSL data, Atlantic County is located in an area which is likely to experience between 0.25 and 0.50 tornado days per year within 25 miles of any point from 1990 to 2009, but life-threatening and damaging events do remain very possible.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Winter Storm (Severe Winter Weather)	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.**	• **NJ State Hazard Mitigation Plan (2019)** • **FEMA's Multi-Hazard Identification and Risk Assessment** • **NOAA NCEI Storm Events Database** • **Office of New Jersey State Climatologist web site** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **Winter storms including snowstorms, blizzards and ice storms are discussed in the state plan. The State Plan notes that Atlantic County averaged about 16.5 inches of normal seasonal snowfall from 1981 to 2010 (the northernmost corner of the county averaging closer to 18.1 inches per season) with six winter storm disaster declarations.** • **NCEI reports 124 days with winter storms (blizzards, ice storm, winter storms, winter weather) in Atlantic County between January 1996 and January 2021. These events resulted in one reported death and approximately $5.3 million in property damage.** • **According to the Office of New Jersey State Climatologist, the extreme depth of snow on ground at individual weather stations across New Jersey ranges from roughly 22 to 24 inches per year (at individual weather stations over a minimum of 20 years).**
HYDROLOGIC HAZARDS					

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Coastal Erosion and Sea level Rise	✓	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update. Sea level rise has been added to better align with the state plan.	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment • New Jersey Department of Environmental Protection (NJDEP) Coastal Management Program web site • Richard Stockton College of New Jersey, Coastal Research Center: New Jersey Beach Profile Network (NJBPN) website • Atlantic County Hazard Mitigation Plan (2016) • Rutgers University Science and Technical Advisory Panel (STAP) Report (2019) • Input from CPG	• Coastal erosion is identified in the State Plan and in the current Atlantic County Plan as a hazard of concern for Atlantic County. indicates that since 1986 most of the ocean shoreline in the county has experienced alternating periods of accretion and erosion, rather than a constant long-term movement in one direction or the other, even when accounting for periods of beach renourishment in certain areas. • Shoreline areas of Atlantic County remain vulnerable to occasional severe coastal erosion from periodic storm events such as hurricanes, tropical storms, and nor'easters. • Shore protection projects are routinely initiated and funded in the county through NJDEP and the U.S. Army Corps of Engineers. These projects, in addition to many other elements of NJDEP's Coastal Management Program, serve to reduce damages to public and private property caused by coastal erosion. • The Rutgers STAP report includes a range of future sea level rise projections for New Jersey: under a low emissions scenario, levels have a 50% probability of rising by 1.9 ft by 2070 and 2.8 ft by 2100. Under a high emissions scenario, there is a 50% probability that levels will rise by 2.4 ft by 2070, by 3.9 ft by 2100, and there is a 5% probability that levels will rise by 8.8 ft by the same year. • With a significant number of coastal communities, including many on barrier islands, Atlantic County is considered highly vulnerable to the impacts of sea level rise.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
					• While the obvious impact of sea level rise is the permanent loss of land for human habitation, economic activity, and ecosystem conservation, even small amounts of sea level rise may significantly increase the annual probability that periodic coastal flooding events reach damaging or critical elevations.
Dam and Levee Failure	✓	Dam Failure was identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update. Consideration of levee failure is new to this second plan update.	• NJ State Hazard Mitigation Plan (2019) • NJDEP Bureau of Dam Safety and Flood Control website and coordination with bureau staff • U.S. Army Corps of Engineers National Inventory of Dams (NID) database • U.S. Army Corps of Engineers National Levee Database (NLD) • Stanford University's National Performance of Dams Program website • Dam Emergency Action Plans (EAPs) in possession of Atlantic County, specifically: Lake Lenape Dam Emergency	• Dam and Levee Failure is identified in the State Plan as a hazard of concern for Atlantic County. • The National Levee Database (NLD), developed by the U.S. Army Corps of Engineers (USACE), is the focal point for comprehensive information about our nation's levees. The database contains information to facilitate and link activities, such as flood risk communication, levee system evaluation for the National Flood Insurance Program (NFIP), levee system inspections, flood plain management, and risk assessments. The NLD continues to be a dynamic database with ongoing efforts to add levee data from federal agencies, states, and tribes. The USACE NLD shows no levees in Atlantic County. The State Plan does not indicate the presence of levees in Atlantic County. However, it is reasonable to assume some smaller, agricultural type levees may exist.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
				Action Plan (EAP) (2020); Pleasant Mills Dam EAP (2020); Bargaintown Mill Pond Dam EAP (2020) • FEMA FIRMs for Atlantic County (effective August 2018) • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• New Jersey has seen property damages as a result of small dam failures (including damage to or loss of bridges, roads and buildings), but has not experienced a catastrophic dam failure to date. • According to NJDEP data recorded in the 2019 State Plan, there are a total of 51 dams in Atlantic County. Of these, one is classified as High Hazard Potential (failure of the dam may result in loss of life and/or extensive property damage); seven are classified as Significant Hazard Potential (failure of the dam may result in significant property damage; however, loss of life is not envisioned); 31 are classified as Low Hazard Potential (failure of the dam is not expected to result in loss of life and or significant property damage); and 12 other dams (small dams with low hazard potential). [3] • The Lake Lenape Dam (Hamilton), is the only Major High Hazard Dam in the County. Its inundation area covers roughly a 5 mile reach of the Great Egg Harbor River from Mays Landing (Hamilton) to Steelman Landing (Estell Manor); including residential areas in Mays Landing (Hamilton) and Belcoville (Weymouth); and bordering residential areas in Clarkstown, Thompsontown, Catawba, and Harding Lakes (all in Hamilton). The County is in possession of EAPs for the Lake Lenape Dam, the Bargaintown Mill Pond Dam, and the Pleasant Mills Dam.

[3] While NJDEP data lists seven significant hazard dams in Atlantic County, USACE NID and the Stanford NPDP list eight and nine respectively.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Drought	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.**	• **NJ State Hazard Mitigation Plan (2019)** • **NJDEP Drought Information web site** • **National Drought Mitigation Center web site and Palmer Drought Severity Index** • **NOAA NCEI database** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **Drought is identified in the State Plan as a hazard of concern state-wide.** • **Drought is also identified in the Atlantic County 4 Plan as a hazard of concern.** • **The State Plan records drought incidents affecting Atlantic County approximately 20 times between May 1929 and May 2012, including one event that received a FEMA Disaster Declaration (1965) and another receiving an Emergency Declaration (1980).** • **The NOAA NCEI database reports 38 drought days in Atlantic County between June 1997 and January 2021, the last of which occurred in October 2010. No deaths, injuries, property damages, or crop damages are recorded for these events.** • **The Atlantic County Plan reports one additional event in 2012 for which the USDA issued a drought-related disaster declaration for New Jersey (S3487) that included Atlantic County.** • **For the purposes of this plan the primary impacts of drought fall on agriculture, which is economically significant in the northern and western portions of Atlantic County.**

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Flood	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.**	• **NJ State Hazard Mitigation Plan (2019)** • **NOAA NCEI Storm Events Database** • **FEMA's NFIP Community Status Book and Community Rating System (CRS)** • **FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, preliminary FIRM data 2014 for areas currently not included in 2021 DFIRMs** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **Flooding is identified in the State Plan as a hazard of concern; it goes on to recognize flooding as the major disaster threat facing the State.** • **Flooding is also identified as a hazard of concern in the current Atlantic County Plan.** • **Atlantic County has an extensive history of flood-related disaster declarations.** • **NCEI reports that Atlantic County has been affected by flood conditions (coastal flood, flash flood and flood event types) on 122 days from January 1996 to January 2021. These event records have a total of $351 million recorded in property damages.** • **The remnants of Hurricane Sandy in October 2012 caused catastrophic flood damage in Atlantic County.** • **All of Atlantic County's municipalities participate in FEMA's National Flood Insurance Program; and 11 participate in the NFIP's Community Rating System (of these, 1 entered the CRS program since the last version of the plan was prepared).**

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Ice Jams	⊘	Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2014) • FEMA's Multi-Hazard Identification and Risk Assessment • USACE Cold Regions Research and Engineering Laboratory (CRREL) Database • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• The State Plan identifies ice jams as a potential cause of flooding (flooding is identified as a hazard of concern). • CRREL records current as of 2021 include 109 reported ice jams occurring in New Jersey between 1780 and 2021. The CRREL database lists one ice jam event occurring in Atlantic County which occurred on the Great Egg Harbor River at Folsom in 1959. No specific impacts are recorded for this event, for which a gage height of 4.72 feet was recorded, as compared to bank-full stage of five feet. • The current Atlantic County Plan does not identify ice jams as a hazard of concern.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Storm Surge	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.** **To better align with the state plan, this hazard will be addressed in the flood hazard risk assessment.**	• **NJ State Hazard Mitigation Plan (2019)** • **FEMA's Multi-Hazard Identification and Risk Assessment** • **NOAA NCEI Storm Events Database** • **USACE SLOSH model data** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **The State Plan identifies hurricanes and tropical storms as a hazard of concern, and storm surge is discussed in that context.** • **The Atlantic County 4 Plan also discusses storm surge in the context of an identified hurricane and tropical storm hazard.** • **SLOSH model data shows a large portion of Atlantic County's land area at risk to storm surge, and particularly those areas located within three to five miles of the shore. Categories 2 through 4 surge zones are not mapped substantially further inland than the Category 1 zone.** • **The NCEI reports 29 days with storm surge events between December 2002 and January 2021, causing $1.25 million in property damages. * the bulk of the damages from storm surge appear to be recorded under coastal flooding in this database *** • **The remnants of Hurricane Sandy in October 2012 caused catastrophic damage in Atlantic County; in part, due to storm surge impacts.**

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Wave Action	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.** **To better align with the state plan, wave action will be addressed under the flood hazard risk assessment**	• **NJ State Hazard Mitigation Plan (2019)** • **FEMA's Multi-Hazard Identification and Risk Assessment** • **NOAA NCEI Storm Events Database** • **FEMA FIRMs for Atlantic County (effective August 2018)** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **The State Plan identifies coastal erosion as a hazard of concern, and wave action is discussed in that context.** • **The current Atlantic County Plan also discusses wave action in the context of an identified coastal erosion hazard.** • **NCEI reports that Atlantic County has had 93 days with coastal flooding and heavy surf events between January 1996 and January 2021. These incidents resulted in a reported total of 2 deaths, 1 injury, and $314 million in property damages ($290 million of which is attributed to Hurricane Sandy).** • **The remnants of Hurricane Sandy in October 2012 caused catastrophic damage in Atlantic County; in part, due to wave impacts.** • **According to FEMA's Preliminary flood maps, 13 municipalities in Atlantic County include coastal flood hazard areas with storm-induced velocity wave action.**

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
GEOLOGIC HAZARDS					
Earthquake	✓	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment • USGS Earthquake Hazards Program web site • New Jersey Geological Survey website • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Earthquakes are identified as a hazard of concern in the State Plan. • Earthquakes have occurred in and around the State of New Jersey in the past; however, historical records show no major earthquakes occurring in the state. • NJGS records 185 earthquakes epicentered in New Jersey, but only one in Atlantic County: near Pleasantville in 1912 for which no magnitude was recorded. • According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years for Atlantic County ranges between 2%g and 3%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more. • Historical earthquake events have caused documented damages in Atlantic County (though all reported damages to date have been minor). • The NJGS web site suggests that New Jersey is overdue for a moderate, damaging earthquake.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Expansive Soils	⊘	Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment • USDA Soil Conservation Service's Soil Survey for Atlantic County (1989) • USDA Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• The 2019 State Plan does not identify expansive soils as a hazard of concern for New Jersey. • The Atlantic County Plan does not identify expansive soils as a hazard of concern for its planning area. • MHIRA places Atlantic County in an area with little or no potential for swelling of clay soils. • Report FHWA-76-82 places Atlantic County in an area designated non-expansive: where high volume change soils do not occur or are extremely limited. • New Jersey has adopted the International Building Code, of which Chapter 18 includes mitigation measures for building on expansive soils through design, removal, or stabilization.
Landslide	⊘	Identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment • USGS Landslide Incidence and Susceptibility Hazard Map • New Jersey Geological Survey GIS database of historic landslides in New Jersey • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• The State Plan identifies landslides as a hazard of concern for the State as a whole. The plan reports that landslides are not particularly common in New Jersey, and tend to occur in the northern portion of the state. The plan documents no record of any significant landslides in Atlantic County and shows no landslide susceptible areas in the County. • MHIRA places Atlantic County in an area of low potential for landslides and debris flows. • USGS mapping shows Atlantic County in an area of low incidence and low susceptibility to landslides. • The general topography of Atlantic County does not feature hilly terrain to any significant degree – the highest natural elevation in the county is approximately 150 feet above sea level. • The current Atlantic County Plan does not identify landslides as a hazard of concern.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Land Subsidence / Sinkholes / Abandoned Mines and Quarries	⊘	Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan (2019) • FEMA's Multi-Hazard Identification and Risk Assessment (MHIRA • New Jersey Geological and Water Survey (NJGWS) digital GIS layers of Bedrock Geology and Abandoned Mines of New Jersey • NJ GWS website maps • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• The State Plan indicates that land subsidence is a hazard in New Jersey. However, it documents no sinkhole/subsidence hazard areas for Atlantic County. Recorded sinkholes in New Jersey have been primarily located in the northern and northeastern part of the state, and there is essentially no history of underground mining in Atlantic County. • MHIRA mapping shows New Jersey as having a historical record of very little or zero cumulative damages from subsidence caused by mining or sinkholes. • The County does not have a history of underground mining. While NJGWS mapping shows 45 existing/historic quarries for the extraction of sand, gravel and fill dirt, these are mostly located away from developed areas and there is no readily available information to suggest that they should be considered a significant hazard of concern warranting further analysis. • NJGS mapping does not indicate the presence in Atlantic County of any rock types which have the potential for the formation of sinkholes. • The USGS has identified the City of Atlantic City as a location where land subsidence has been attributed to the compaction of aquifer systems following groundwater extraction. However, the observed rates of subsidence are very small (0.035 to 0.15 inches per year) and exhibit no wild variations across the studied area. Also, USGS records no significant engineering or structural issues due to subsidence in the Atlantic Coastal Plain (which includes Atlantic County).

Tsunami		Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update. To align with the state plan, tsunami will be considered under the flood hazard.	• NJ State Hazard Mitigation Plan (2019) • National Tsunami Hazard Mitigation Program (NTHMP) website • FEMA's Multi-Hazard Identification and Risk Assessment (MHIRA) • FEMA "How-to" mitigation planning guidance (Publication 386-2, "Understanding Your Risks – Identifying Hazards and Estimating Losses). • NOAA NCEI Storm Events Database • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Tsunamis are discussed in the state plan. The plan states that the return period for a mid-Atlantic tsunami is 1 in every 36 years; however, this includes small scale events with waves of less than 0.5 meters. No record exists of a catastrophic Atlantic basin tsunami impacting the mid-Atlantic coast of the United States. The plan estimates that there is a probability of 0.3% in any given year for a tsunami of greater than one meter to occur. • The NTHMP considers the Atlantic coast to be at "Very low to low" risk of being impacted by tsunamis, and reports eight events over the whole coast since 1886. • Tsunami inundation zone maps are not available for communities located along the U.S. East Coast. • FEMA mitigation planning guidance suggests that locations along the U.S. East Coast have a relatively low tsunami risk. NCEI reports one tsunami event affecting Atlantic County between 1950 and January 2021, in June 2013. While no resulting injuries or damages were reported in Atlantic County, two people in Ocean County were injured by it. This event, however, was a "meteotsunami", in which tsunami-like conditions are generated by atmospheric rather than seismic/geological events. • The State Plan records two additional events impacting Atlantic County that are considered potential tsunamis, because their cause has not been confirmed: One caused significant damage in Longport in 1913, the other was observed in Atlantic City in 1931. While tsunamis are considered rare events in Atlantic County, their potential impacts are significant. Hence this plan update will include tsunamis as a hazard for further analysis within the wider context of coastal flooding, in line with the current State Plan.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
Volcano	⊘	Not identified as a significant hazard to be addressed in the plan at that time.	Considered again and the earlier assessment was determined to still be applicable for the plan update.	• NJ State Hazard Mitigation Plan • USGS Volcano Hazards Program web site • Atlantic County Hazard Mitigation Plan (2016) • Input from CPG	• Volcanoes are not located anywhere remotely near Atlantic County. • Neither the State Plan nor the current Atlantic County Plan identifies volcanos as a hazard of concern for the State of New Jersey or its counties and jurisdictions.

Table 2.2 Documentation of the Hazard Evaluation Process					
Natural Hazards Considered	**Significant Hazard Meriting Risk Assessment**	**2016 Plan Assessment**	**Current Update Assessment**	**Sources of Hazard Information**	**Why was this determination made?**
OTHER HAZARDS					
Wildfire	✓	**Identified as a significant hazard to be addressed in the plan at that time.**	**Considered again and the earlier assessment was determined to still be applicable for the plan update.**	• **NJ State Hazard Mitigation Plan (2019)** • **NOAA NCEI Storm Events Database** • **New Jersey Forest Fire Service web site** • **Atlantic County Hazard Mitigation Plan (2016)** • **Input from CPG**	• **Wildfires are identified in the State Plan as a significant hazard of concern, particularly with regard to the Pine Barrens in south and central portions of the state.** • **The State Plan records 218 wildfires in Atlantic County burning 228,667 acres between 1924 and 2007. Of these, 10 were major wildfires (burning over 100 acres) between 1977 and 2007. An 11th major wildfire was recorded in 2009.** • **NCEI records that Atlantic County has had 9 days with wildfire events between January 1996 and January 2021. These incidents resulted in a reported total of 6 injuries.** • **The New Jersey Pine Barrens area, which lies partially within Atlantic County, is widely recognized as highly prone to forest fires, and the whole ecosystem is in some ways dependent on fire for its continued existence. Within these areas are a large number of homes and small communities, which were developed before the current regulations restricting development within the Pine Barrens.** • **NJFFS mapping shows that there are significant areas in Atlantic County considered by NJFFS to be High and Extreme hazard areas for fire risk.**

SECTION 3A - HAZARD PROFILES

Overview

This section includes detailed profiles for each of the hazards identified in the previous section and described in **Appendix 2.1**. Each hazard profile includes a general description of the location of each hazard, its extent (magnitude or severity), notable historical occurrences and the probability of future occurrences. Profiles also include specific items noted by members of the Planning Committee as it relates to unique historical or anecdotal hazard information for Atlantic County or a particular municipal jurisdiction.

As part of this plan update, revisions to this section include things such as: summaries of disaster activity since the previous update; updates to hazard area mapping based on new data that has become available since the previous update; incorporation of new hazard information that has become available in recent years; updated assessments of hazard descriptions, frequencies of occurrence, hazard histories; as well as updated information on the FEMA National Flood Insurance Program (NFIP), including Repetitive Loss Property and Severe Repetitive Loss Property information, and the latest flood mapping products and policy and claims data.

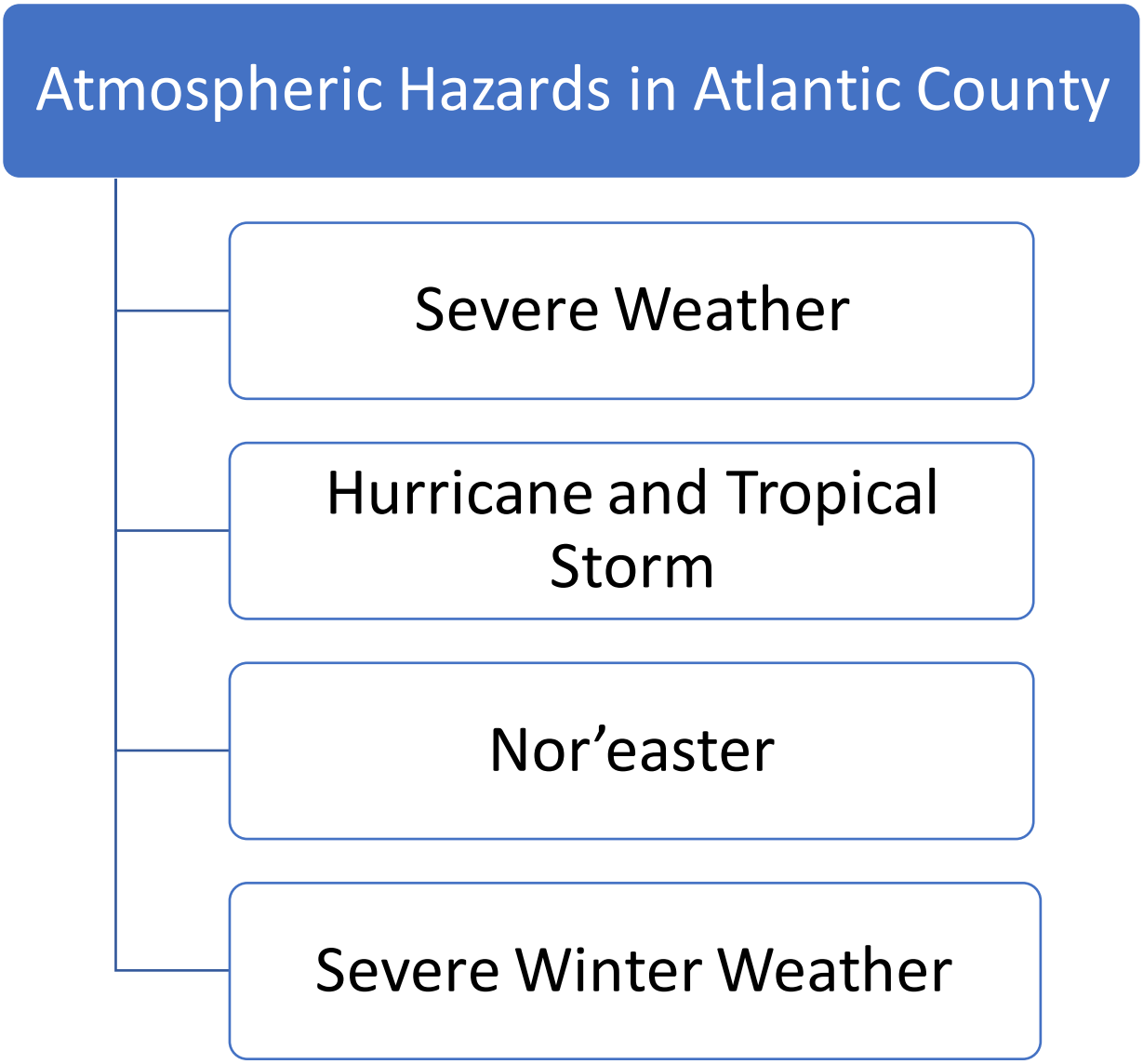
Table 3a.1 lists each significant hazard for Atlantic County and identifies whether or not it has been determined to be a specific hazard of concern for each of the 24 participating jurisdictions (the County and each of its 23 municipalities) based on best available data and local information provided by the Planning Committee (■ = hazard of concern).

The remainder of this section will discuss, for each identified hazard, its:

- location (the geographic areas in the planning region that are affected by the hazard);
- extent (the strength or magnitude of the hazard);
- history of previous occurrences; and
- probability of future occurrences (the likelihood of the hazard occurring, in terms of general descriptors, historical frequencies, or statistical probabilities).

Table 3a.1 Summary of Identified Events in Atlantic County										
Jurisdiction	Atmospheric				Hydrologic				Geologic	Other
	Severe Weather	Hurricane and Tropical Storm	Nor'easter	Severe Winter Weather	Coastal Erosion & Sea Level Rise	Dam and Levee Failure	Drought	Flood	Earthquake	Wildfire
Atlantic County	■	■	■	■	■	■	■	■	■	■
Absecon, City of	■	■	■	■	■	■	■	■	■	■
Atlantic City, City of	■	■	■	■	■		■	■	■	■
Brigantine, City of	■	■	■	■	■		■	■	■	■
Buena Vista, Township of	■	■	■	■		■	■	■	■	■
Buena, Borough of	■	■	■	■			■	■	■	■
Corbin City, City of	■	■	■	■	■		■	■	■	■
Egg Harbor City, City of	■	■	■	■		■	■	■	■	■
Egg Harbor, Township of	■	■	■	■	■	■	■	■	■	■
Estell Manor, City of	■	■	■	■	■	■	■	■	■	■
Folsom, Borough of	■	■	■	■		■	■	■	■	■
Galloway, Township of	■	■	■	■	■	■	■	■	■	■
Hamilton, Township of	■	■	■	■		■	■	■	■	■
Hammonton, Town of	■	■	■	■		■	■	■	■	■
Linwood, City of	■	■	■	■	■	■	■	■	■	■
Longport, Borough of	■	■	■	■	■		■	■	■	■
Margate City, City of	■	■	■	■	■		■	■	■	■
Mullica, Township of	■	■	■	■		■	■	■	■	■
Northfield, City of	■	■	■	■	■		■	■	■	■
Pleasantville, City of	■	■	■	■	■		■	■	■	■
Port Republic, City of	■	■	■	■	■	■	■	■	■	■
Somers Point, City of	■	■	■	■	■		■	■	■	■
Ventnor City, City of	■	■	■	■	■		■	■	■	■
Weymouth, Township of	■	■	■	■		■	■	■	■	■

ATMOSPHERIC HAZARDS



Severe Weather

Severe weather events are common in Atlantic County and can occur at any time. Severe weather events profiled in this section include extreme temperatures, extreme wind, hail storms, lightning, and tornadoes.

Extreme Temperatures

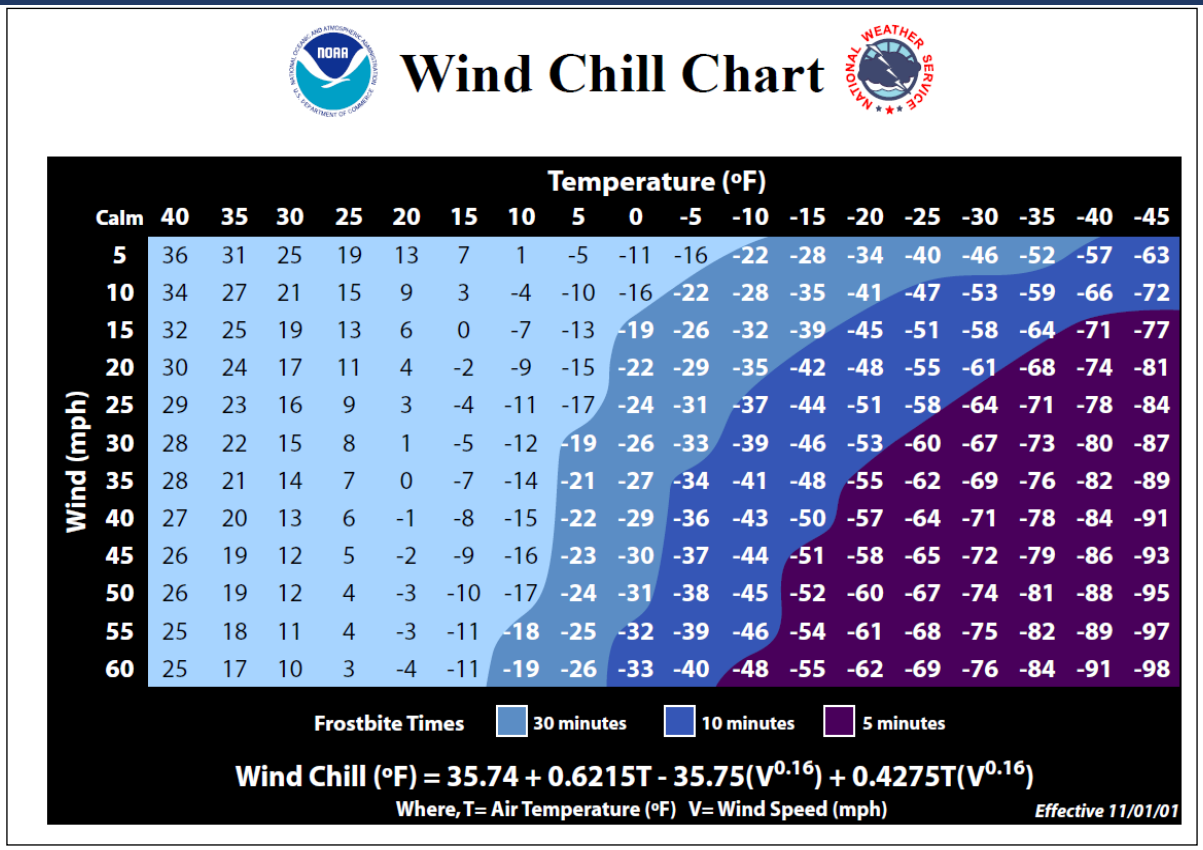
Location – Extreme Temperatures

Atlantic County is located in a region of the country that is susceptible to both extreme heat and extreme cold. During periods of extreme temperature conditions, the effects are felt over a widespread geographic area and it is generally assumed that the entire planning area is uniformly exposed to extreme heat and extreme cold. Areas along the immediate coast might experience minor differences in apparent temperatures due to the combined effects of air temperature, relative humidity, and wind speed.

Extent – Extreme Temperatures

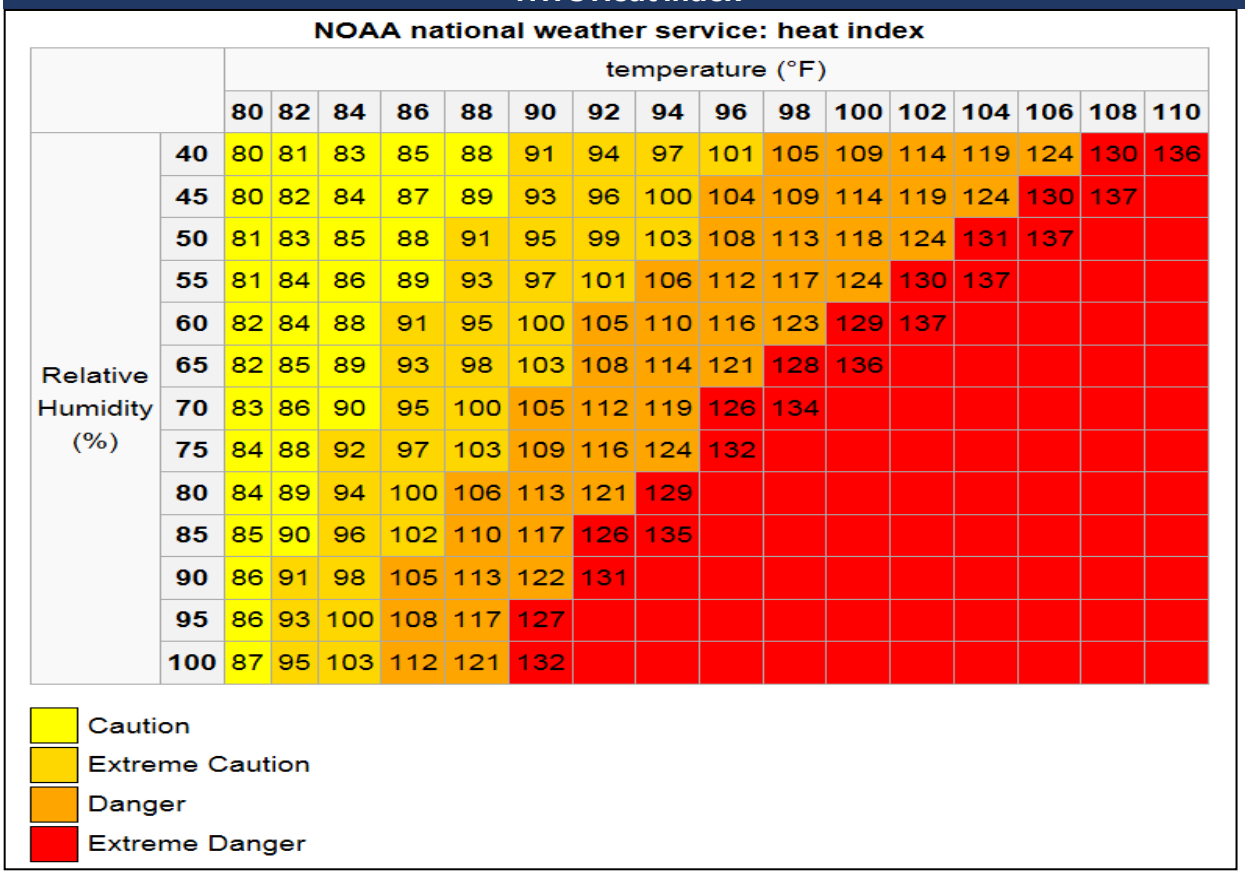
The speed of onset of extreme temperature events typically offers 24 hours of warning time. The duration of historic events in Atlantic County is typically less than one week. The extent of extremely cold temperatures is typically measured through the Wind Chill Temperature (WCT) Index. The WCT Index provides a formula for calculating the dangers from winter winds and freezing temperatures. It is, essentially, a calculation of the temperature that is felt when the effects of wind speed are added to the base air temperature. **Figure 3a.1** shows the NOAA NWS Wind Chill Chart.

Figure 3a.1
NWS Wind Chill Index



The extent of the extremely hot temperatures is typically measured through the Heat Index, which calculates the dangers from high relative humidity and extremely hot temperatures. It is, essentially, a calculation of the temperature that is felt when the effects of relative humidity are added to the base air temperature. **Figure 3a.2** shows the NOAA NWS Heat Index.

Figure 3a.2
NWS Heat Index



Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Historical Occurrences – Extreme Temperatures

According to the National Center for Environmental Information (NCEI) database (formerly the National Climatic Data Center)[1], 87 days of recorded **extreme heat** events have affected Atlantic County between February 1996 and May 2021. Of these events, two have occurred since the last version of the plan was approved in February 2016. Thirty-six injuries have been recorded in Atlantic County as a result of extreme heat, none of which have occurred since February 2016. Some *notable historic events* include the following:

July 14-15, 1995. An oppressive heat wave gripped most of New Jersey, with almost every location reporting record-breaking heat. Dew point temperatures reached into the 80s across southern New Jersey, an almost unheard of phenomenon. This, combined with sweltering temperatures, produced an apparent temperature (Heat Index) of 115 degrees in Pomona (Galloway Township). Statewide, nine people died and more than 100 people were treated for heat exhaustion; though no deaths were reported in Atlantic County.

June 25-26 1997. The first hot spell of 1997 brought the hottest weather in two years to New Jersey. The highest temperatures in the State reached near 100 degrees on the 25th. The highest temperatures recorded in Atlantic County included 98 degrees in Hammonton, 97 degrees in Estell Manor, and 96 degrees in Atlantic City.

[1] Current as of May 2021.

July 4-6, 1999. A very strong and oppressive high pressure system gave New Jersey a brutal heat wave over the Independence Day weekend. There were 17 heat related deaths and around 100 reported heat related injuries state-wide. No deaths were recorded in Atlantic County. The combination of the temperature and humidity produced heat indices of around 110 degrees, leading to record demand for electricity. Over 110,000 homes and businesses lost power state-wide by either intentional or unintentional blackouts. High temperatures included 102 degrees in Margate City.

August 1-3, 2006. Temperatures during this event soared well into the 90s with some areas more than 100 degrees. Atlantic City topped out at 98 degrees on both August 2nd and 3rd. Sporadic power outages affected pockets of people for up to two hours at a time. New Jersey American Water asked customers to immediately begin conserving water on August 2nd in seven Atlantic County towns as the excessive heat and dry weather led to a record high water usage. The conservation request affected 115,096 residents in Absecon, Galloway, Egg Harbor Township, Linwood, Northfield, Pleasantville, and Somers Point.

July 21 2011. This event represented one of the most oppressive heat waves in New Jersey since July 1995. The heat was responsible for two deaths and hundreds of heat related injuries across the state. Many locations recorded high temperatures into the 100s. Heat index values on July 22nd ranged from 110F to 120F. High temperatures in Atlantic County included 105 degrees at the Atlantic City International Airport. The highest hourly heat index at the Atlantic City International Airport was 122 degrees on the 22nd.

June 17-18, 2014. High temperatures were in the lower to mid-90s both days with the hottest weather on the 18th. Afternoon heat index values were in the mid-90s both days. Highest temperatures included 97 degrees in Margate, and 95 degrees at the Atlantic City International Airport.

June 23, 2015. Unseasonably hot and humid weather occurred across southern New Jersey on the 23rd with high temperatures reaching into the lower to mid-90s and afternoon heat indices of around 100F. About 30 people had to be treated for heat exhaustion at the Egg Harbor Township graduation. A high temperature of 94 degrees was recorded at the Atlantic City International Airport.

According to the NCEI database, 30 recorded **extreme cold** events have affected Atlantic County between February 1996 and May 2021, though no such events have occurred since the last version of the plan was approved in 2016. No deaths or property damage was reported but 7 people did suffer injuries. A *sampling of more notable events* includes the following[2]:

February 4-6, 1996. The coldest air mass of the winter season moved in after the snow storm of the 2nd and 3rd. Most locations had low temperatures below zero on the 5th and 6th. In central New Jersey alone, the Automobile Association of America (AAA) responded to over 900 calls of dead batteries the morning of the 5th. Low temperatures the morning of the 5th included 10 degrees below zero in Estell Manor and 8 degrees below zero at Atlantic City International Airport. Low temperatures the morning of the 6th included 3 degrees below zero at Atlantic City International Airport.

January 14-19, 2003. For many locales, these were the coldest days in three years. The coldest mornings were on the 18th and 28th as low temperatures dipped into the single digits or below

[2] All temperatures are reported in degrees Fahrenheit.

zero. There were several cases of either frostbite or hypothermia throughout the state. The extreme cold filled homeless shelters to capacity in many places. Many dead vehicle batteries and frozen brakes were reported. Calls to heating oil firms and utilities rose dramatically. Several water mains broke and pipes burst in both owner occupied homes and in vacant summer homes which were not properly winterized. Lowest temperatures included 2 degrees below zero in Estell Manor and 3 degrees at the Atlantic City International Airport.

January 28, 2005. Low temperatures across the state hovered around zero degrees. The unseasonably cold weather prompted code blue declarations to help the homeless, elderly, homebound and poor; and resulting in a high demand for heating oil, natural gas and electricity. A low temperature of 3 degrees was reported at the Atlantic City International Airport.

January 16-18, 2009. The majority of the state experienced wind chill values between 0 and 10 degrees below zero during early morning hours of the 16th and 17th. The coldest wind chill value was recorded at the Sussex Airport (Sussex County) of 14 degrees below zero. The low temperatures on the 17th were the coldest in some time across the region. As an example, 4 degrees was the morning low at the Atlantic City International Airport, which was the coldest since March 8, 2007, when it was 4 degrees.

January 4-7 and January 22, 2014. A high pressure system coupled with fresh snow cover from the winter storm on the 2nd and 3rd gave the area one of its coldest winter morning in years on January 4th. The low temperature reached a daily record breaking 3 degrees below zero at the Atlantic City International Airport, the coldest of the meteorological winter and the coldest since February 5, 1996 when the low reached 8 degrees below zero. Other low temperatures on the morning of the 4th included 13 degrees above zero in Margate 14 degrees above zero at the Atlantic City Marina. The excessive cold on January 7th caused many schools to either cancel classes or delay openings. AAA Mid-Atlantic reported an 81 percent increase in service calls, mainly for dead batteries. Amtrak reported extensive delays in its rail service. Electricity suppliers struggled to keep up with surging demand; some power plants were forced to shut down. An all-time winter record usage was recorded at 8 a.m. on the 7th. Lowest hourly wind chill factors included 18 degrees below zero at the Atlantic City International Airport. Another arctic air mass dropped low temperatures on the morning of the 22nd. An hourly wind chill of 10 degrees below zero was recorded at the Atlantic City International Airport (corresponding to an actual temperature of 5 degrees above zero at this same location).

February 16, 2015. The arrival of an arctic high pressure system to New Jersey brought some of the lowest wind chills and temperatures of the winter season to New Jersey. Wind chill factors as low as around 20 degrees below zero occurred in most of the state. Actual low temperatures were around zero. Outreach teams were dispatched to get homeless people to shelters. Code Blues remained in effect. The extreme cold weather caused pipes to freeze and AAA Mid-Atlantic responded to more than 1,600 dead battery calls. Plumbers said they had not been this busy with frozen pipes in over 20 years. Lowest hourly wind chill factors included 19 degrees below zero in Atlantic City. Actual low temperatures included 2 degrees above zero at the Atlantic City International Airport. The low temperature of 2 degrees above zero at the Atlantic City International Airport established a new daily record low for February 16th which stood since 1888.

Probability of Occurrence – Extreme Temperatures

Extreme temperature events will continue to have a high probability of occurrence in Atlantic County, and the probability of future occurrences in Atlantic County is certain (higher for extreme heat than extreme cold). While the impact of such occurrences on people and property is

typically minimal, it is anticipated that the threat to human lives and safety is increasing due to growing elderly populations in many of Atlantic County's municipal jurisdictions. The New Jersey State Hazard Mitigation Plan states: "Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013)."

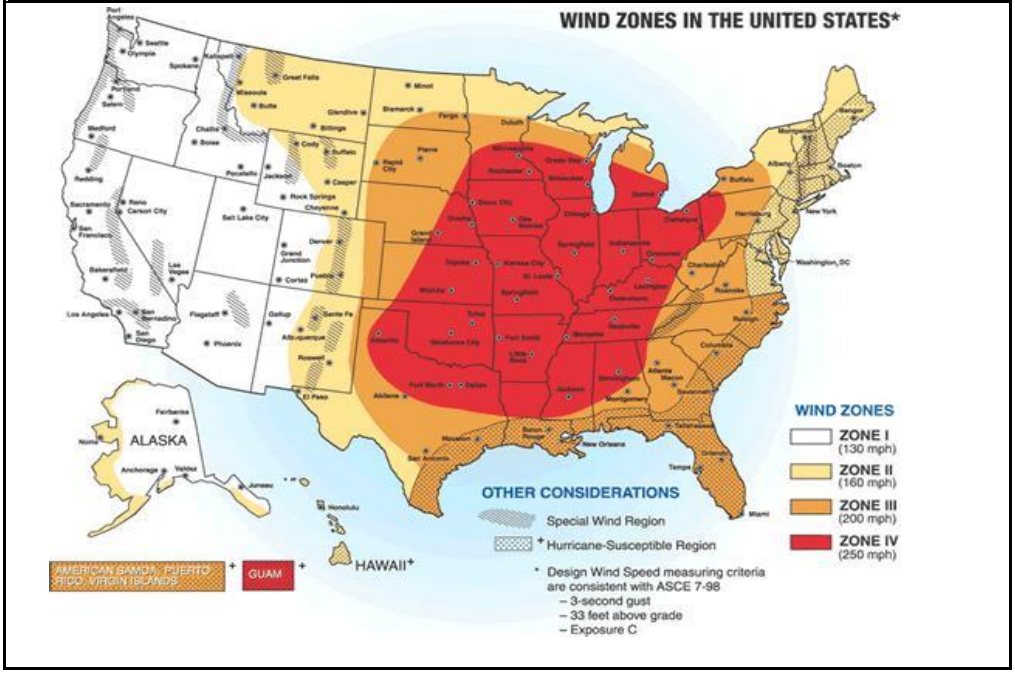
The 2019 New Jersey State Hazard Mitigation Plan states: "Extreme temperatures are predicted to occur more frequently as part of regular seasons. Specifically, extreme heat may continue to impact New Jersey and, based upon data presented, may increase in the next several decades." Many heat records have been set in the last 10 to 15 years while record-setting cold temperatures are decreasing; this trend is likely to continue.

Extreme Wind

Location – Extreme Wind

Extreme wind events are experienced in every region of the United States. The extreme wind hazard area covers the whole of Atlantic County and the entire planning area is uniformly susceptible to the extreme wind hazard. **Figure 3a.3** illustrates various wind zones throughout the country based on design wind speeds established by the American Society of Civil Engineers. It divides the country into four wind zones, geographically representing the frequency and magnitude of potential extreme wind events including severe thunderstorms, tornadoes and hurricanes. The figure shows that all areas of Atlantic County are located within Zone II and are susceptible to hurricanes, with a design wind speed for shelters of 160 mph (3-second gust).

Figure 3a.3
Wind Zones in the United States



Source: Federal Emergency Management Agency

Extent – Extreme Wind

Extreme wind can occur alone, such as during straight-line wind events and derechos, or it can accompany other natural hazards, including hurricanes and severe thunderstorms. Severe wind poses a threat to lives, property, and vital utilities primarily due to the effects of flying debris or downed trees and power lines. Severe wind will typically cause the greatest damage to structures of light construction, particularly manufactured homes. **Table 3a.2** illustrates the severity and typical effects of various sustained wind speeds. These would be reflective of high winds associated with thunderstorms, hurricanes, tropical storms and nor'easters. Typical effects of wind are very different for tornadoes. **Table 3a.3** illustrates the severity and typical effects of wind during tornadoes, as measured by various 3 second gusts. Note that tornadoes are addressed separately later in this plan section.

Table 3a.2
Severity and Typical Effects of Various Sustained Wind Speeds

Sustained Wind Speed* (mph)	Equivalent Saffir-Simpson Scale** (Hurricanes)	Severity of Damage	Typical Effects
0-73 *(V_{3S}=0 to 88)*	N/A	Isolated	Isolated damage for winds below 50 mph. Above 50 mph, expect some minor damage to buildings of light material. Small branches blown from trees.
74-95 *(V_{3S} =89 to 115)*	1	Minor	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, and vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
96-110 *(V_{3S}=116 to 130)*	2	Extensive	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
111-129 *(V_{3S}=131 to 149)*	3	Devastating	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
130-156 *(V_{3S}=150 to 176*	4	Catastrophic	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
157 or higher *(V_{3S}>177)*	5	Catastrophic	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Oceanic and Atmospheric Administration

* *The 2003 International Building Code Table 1609.3.1 was used to convert Saffir-Simpson sustained wind speeds to 3- second gusts (V_{3S}) for the purposes of comparison between hurricane and tornado winds.*

TABLE 1609.3.1
EQUIVALENT BASIC WIND SPEEDS[a,b,c]

V_{3S}	85	90	100	105	110	120	125	130	140	145	150	160	170
V_{fm}	70	75	80	85	90	100	105	110	120	125	130	140	150

For SI: 1 mile per hour = 0.44 m/s.
a. Linear interpolation is permitted.
b. V_{3S} is the 3-second gust wind speed (mph).
c. V_{fm} is the fastest mile wind speed (mph).

** *The Saffir-Simpson Scale is described further in this section under Hurricanes.*

Table 3a.3
Severity and Typical Effects of Various Tornado Wind Speeds (3 second gust)

Maximum Wind Speeds 3 Second Gust (mph)	Equivalent Enhanced Fujita Scale* (Tornadoes)	Severity	Typical Effects
65-85	EF0	Light	Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
86-110	EF1	Moderate	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
111-135	EF2	Significant	Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; high-rise windows broken and blown in; light-object missiles generated.
136-165	EF3	Severe	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
166-200	EF4	Devastating	Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
Over 200	EF5	Incredible	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; steel reinforced concrete structures badly damaged.

Source: National Oceanic and Atmospheric Administration
** The Enhanced Fujita Scale is described further in this section under Tornadoes.*

Historical Occurrences – Extreme Wind

Atlantic County has experienced numerous types of damaging extreme wind events in the past including severe thunderstorms, tornadoes, hurricanes, tropical storms and nor'easters. According to the NCEI database[3], 315 days with recorded high wind events have affected Atlantic County from September 1956 to June 2015 (data excludes tornado events which are addressed separately within this section). These incidents resulted in a reported total of eight injuries, and roughly $424 million in property damages ($400 million of which are related to Superstorm Sandy wind damages alone). Thirty days with high wind events have been recorded after the last version of this plan was approved in February 2016. Extreme wind events occur regularly in Atlantic County. Most events are associated with thunderstorms occurring during the summer months, with relatively low reported property damages per event (in the thousands of dollars). However, stronger weather systems have produced much more extreme and widespread wind-related impacts. A sampling of more *notable extreme, damage-causing events* includes the following:

> **February 17, 2003.** Strong winds during a powerful winter storm caused $300,000 in wind-related property damage in Atlantic County. U.S. Route 30 was closed for three miles between Atlantic City and Absecon on the 17th because 56 light poles were

[3] Data current as of May 2021.

knocked down. Homes and businesses lost power. The strong winds carried sand onto nearby roads, porches and boardwalks. Sand drifts blocked several roadways. Peak wind gusts of 53 mph were recorded at the Atlantic City International Airport.

September 18, 2003. Extreme winds during Tropical Storm Isabel caused $500,000 in damage to property in Atlantic County. Winds gusted up to 53 mph at the Atlantic City Marina and downed trees, tree limbs, and power lines causing one of the worst power outages on record for area utilities.

January 18, 2006. Extreme winds during a winter storm caused damage throughout the state. Strong west winds occurred from late in the morning through most of the afternoon before diminishing at night. Numerous trees and power lines were downed, causing travel delays during the morning rush due to closed roads. Several roofs were torn away. More roofs and homes were damaged by downed trees. Vehicles were also damaged by downed trees. Throughout the state about 150,000 homes and businesses lost power. About $635,000 in wind-related property damage was reported in Atlantic County alone. Downed trees and wires forced traffic to be routed onto the White Horse Pike (U.S. Route 30) and the Atlantic City Expressway. A piece of a large sign at the Trump Plaza Hotel and Casino fell down and caused a road closure. Peak wind gusts included 59 mph in Hammonton and 48 mph at the Atlantic City International Airport.

November 12, 2009. A powerful nor'easter caused more than $500,000 in wind-related property damage in Atlantic County. The highest winds occurred from the afternoon of the 12th into the afternoon of the 13th. Hundreds of people lost power. Peak wind gusts included 59 mph at the Atlantic City Marina and 47 mph at the Atlantic City International Airport.

March 13, 2010. Approximately $6.2 million in wind-related property damage was reported in Atlantic County as a strong winter storm hit the state. Trees, tree limbs, power lines, telephone poles were downed, causing record breaking power outages, damages to homes, and transportation impacts from closed roadways until debris could be removed. In Atlantic City, boom debris from a partially collapsed 780-foot crane at the Revel Entertainment site fell down on a four block area. A police officer was injured from the falling debris. Four stories of glass were also damaged. About 385 people who live near the crane site were evacuated for two days until the crane was lowered. Elsewhere in Atlantic City, the roof of one home was torn away, the front of a building collapsed, the roof above a cleaning establishment was partially torn away and a home under construction collapsed. Peak wind gusts included 73 mph at the Marina in Atlantic City and 67 mph at the Atlantic City International Airport.

June 29, 2012 - Derecho[4]. - The June 2012 North American Derecho took out electrical power to more than 3.7 million customers starting in the Midwestern United

[4] The National Weather Service defines a **derecho** as a widespread, long-lived, straight-line wind storm that is associated with a land-based, fast-moving group or band of severe thunderstorms that have winds of at least 58 miles per hour along the entire span of the storm front, maintained over a time span of at least six hours. They typically possess a high or rapidly increasing forward speed and can cause hurricane force winds, tornadoes, heavy rains, and flash floods. Winds take on a bow echo (backward "C") form of squall line on weather radar. Derechos are a warm-weather phenomenon, usually occurring during the summer months. Winds in a derecho can be enhanced by downburst clusters embedded inside the storm.

States, across the central Appalachians, into the Mid-Atlantic States during a heat wave. In New Jersey, the Derecho produced widespread, significant wind damage from southern New Jersey southward into the Delmarva during the late evening and overnight of the 29th. Salem, Cumberland and Atlantic Counties were the hardest hit counties in the state, with downed trees, power lines and poles, which sparked fires and destroyed some homes. In Atlantic County, one storm related death was reported - a man whose boat capsized in Absecon Bay. A state of emergency was declared in Atlantic County. The National Guard was mobilized to help provide fuel and water. Atlantic City Electric reported that 105,000 homes and businesses in Atlantic County lost power. Destructive wind gusts, measuring around 75 miles per hour, resulted in significant tree and power line damage county-wide. Based on the extensive damage, winds were estimated to be as high as 90 miles per hour in areas across the county. There were seven homes that were destroyed, forty-nine that suffered major damage, fifty-two that suffered minor damage and forty-two others that were affected. Extensive damage occurred across Atlantic County as a result of the strong wind gusts associated with the gust front and cluster of severe thunderstorms, and a State of Emergency was declared in the county. An idle 727 aircraft was moved and damaged by the Derecho at the Atlantic City International Airport. Numerous large trees and electric wires were knocked down in many communities, including Estell Manor, Northfield, Mays Landing, Egg Harbor City, Hamilton Township, Galloway Township, Linwood, Margate City, Egg Harbor Township, Ventnor City, Longport, and Atlantic City. As a result, much of the county was affected by long-term power outages, and numerous roads were impassable. In addition to the widespread tree and power line damage, structural damage was also significant across the county, with trees blown down onto houses in Buena and Absecon and shingles blown off of homes in Somers Point. Thousands of customers experienced power outages for about one week. Approximately 1,400 Atlantic City Electric customers that had lost power during the early morning of June 30th did not have their electricity restored until July 8th.

October 29, 2012 – Superstorm Sandy[5]. When Superstorm Sandy made landfall, sustained winds of as high as 60 to 70 miles per hour battered New Jersey, with gusts as high as 80 to 90 miles per hour. Most of the peak wind gusts occurred during the late afternoon and evening hours as Sandy was making landfall. Most of the high winds in the state were over by midnight, and as Sandy rapidly weakened, most of the strong wind gusts were also over by 6 a.m. on the 30th. The most widespread measured hurricane force wind gusts occurred in northern Ocean County and in Monmouth County. In Atlantic County, the northern end of the famed Atlantic City boardwalk was destroyed. The wind damaged boardwalks within the city. Nearly every Atlantic County municipality from Egg Harbor and Galloway Townships eastward suffered widespread wind and/or tide damage. Peak wind gusts included 77 miles per hour at the Atlantic City Marina, 66 miles per hour in Absecon, and 64 miles per hour at the Atlantic City International Airport. Maximum sustained winds of 51 miles per hour were recorded in Atlantic City. Downed trees and power lines damaged homes and vehicles, and blocked roadways throughout the county. Sandy caused $400 million in wind-related property damage in Atlantic County alone.

[5] This section focuses on impacts from the wind hazard of Superstorm Sandy. Other sections of the hazard profile focus on impacts from other hazards during this event, such as flooding, storm surge, wave damage, etc.

Probability of Occurrence – Extreme Wind

Extreme wind events will continue to have a high probability of occurrence in Atlantic County, and the probability of future occurrences in Atlantic County is certain. The entire planning area is susceptible to a wide variety of recurring events that cause extreme wind conditions including severe thunderstorms (most frequent), tornadoes, hurricanes, tropical storms and nor'easters. Based on historic occurrence data, Atlantic County can expect between four and nine extreme wind days per year[6].

Hail Storms

Hail is a form of frozen precipitation, consisting of solid ice that forms inside thunderstorm updrafts.[7]

Location and Extent – Hail Storms

It is generally assumed that the entire planning area is uniformly exposed to hail storm events.

While hail can result from many different types of storms, it typically occurs during thunderstorm events. The extent of a hail storm can be measured by comparing the size of hail to known objects. Various extents of hail are summarized in **Table 3a.4**.

Table 3a.4
Hail Size[8]

Size	Inches in Diameter
Pea	0.25 inch
Marble/mothball	0.50 inch
Dime/Penny	0.75 inch
Nickel	0.875 inch
Quarter	1.0 inch
Ping-Pong Ball	1.5 inches
Golf Ball	1.75 inches
Tennis Ball	2.5 inches
Baseball	2.75 inches
Tea Cup	3.0 inches
Grapefruit	4.0 inches
Softball	4.5 inches

[6] More than four extreme wind days per year is based on the NCEI database period of record of 65.5 years and 285 event days. However, the database is not particularly robust for its initial years of coverage between 1956 and 1996 during which only 54 event days are recorded. When the same calculation of extreme wind days per year is done using only the 25.5 years of robust record keeping and 231 event days during that period, the estimate of extreme wind days per year goes up to 9.
[7] Source: https://www.nssl.noaa.gov/education/svrwx101/hail/
[8] https://www.weather.gov/boi/hailsize

Historical Occurrences – Hail Storms

The NCEI database reports 37 hail days (with 3/4 inch size hail or greater) for Atlantic County between July 1974 and January 2021. For these events there are no recorded deaths or injuries, but $10,000 in property damage and $5.01 million in crop damages. These damages were incurred during only two of the total number of reported events: (a) August 2008, Hammonton, with ping pong ball sized hail causing $5M in crop damages; and (b) $20,000 in damages to vehicles and crops in Buena Vista Township in June 2011..

Probability of Occurrence – Hail Storms

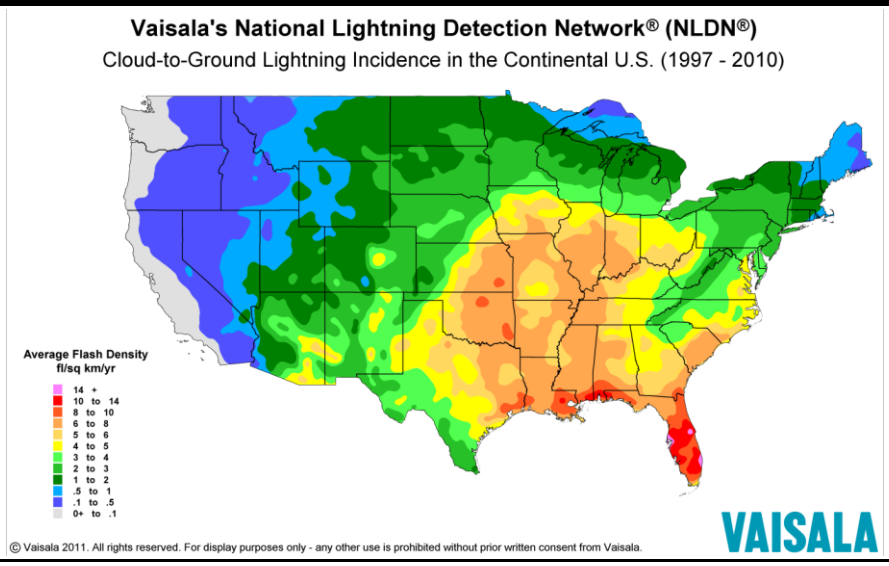
According to the New Jersey State Hazard Mitigation Plan, hail storms occur regularly in New Jersey but not at the frequency or intensity of thunderstorms. Damaging hail storms that occur regularly in other parts of the United States do not occur with significant frequency in New Jersey.

Lightning

Location and Extent – Lightning

Atlantic County is located in a region of the country that is susceptible to lightning strikes, though not as susceptible as southeastern states. **Figure 3a.4** shows a lightning flash density map for the years 1997-2010 based upon data provided by Vaisala's National Lightning Detection Network® (NLDN®)[9].

Figure 3a.4
Lightning Flash Density in the United States



All areas of Atlantic County are equally susceptible to lightning strike. While lightning occurs randomly anywhere and anytime, the most common location for lightning fatalities and injuries to people is in open areas such as parks, beaches, golf courses and other recreational areas.

[9] Source: http://www.vaisala.com/Vaisala%20Documents/Scientific%20papers/2014%20ILDC%20ILMC/ILMC-Thursday/Roeder%20et%20al-Mapping%20Lightning%20Fatality%20Risk-2014-ILDC-ILMC.pdf

Atlantic County remains susceptible to lightning deaths and injuries due to the large number of people who engage in outdoor activities, particularly more so along the shoreline of its coastal jurisdictions.

Historical Occurrences – Lightning

According to the NCEI database[10], 24 lightning days have been recorded in Atlantic County between April 2001 and May 2021. These incidents resulted in a reported total of two deaths and six injuries, and caused more than $1.3 million in property damages. A total of eight events were added to the database since the last version of this plan was approved in 2016. Some *more notable events* include the following:

April 18, 2002. Lightning strikes in Hamilton Township started a couple of small brush fires, struck a senior citizen center and damaged the municipal emergency center's telephone lines and radio communications. A dollar estimate of property damage for this event was not reported in the NCEI database.

June 6, 2002. Lightning struck the parking lot of a closed service station in Somers Point. The lightning traveled to the underground gasoline tank. The subsequent explosion created a crater about 50 feet in diameter and 8 to 10 feet deep. No serious injuries were reported. Lightning also struck the roof of a home in Pleasantville, causing a fire. A dollar estimate of property damage for this event was not reported in the NCEI database.

August 5, 2002. Lightning struck a house under construction in the City of Brigantine. It also struck a construction worker at the site and injured him. Another lightning strike hit a garage, causing a fire which spread to the home. Lightning also struck an antenna on a hotel roof. Guests were evacuated from the hotel. No fire occurred. Brigantine Beach Patrol's radio tower was also struck by lightning as were two radio stations' antennas. About 1,200 Conectiv customers lost power in Brigantine, Northfield and Egg Harbor Township. Property damage was reported as $30,000.

July 18, 2005. Atlantic City Electric reported about 4,500 homes and businesses lost power in Ocean and Atlantic Counties during a thunderstorm event. Outages in Atlantic County were concentrated in Galloway. A dollar estimate of property damage for this event was not reported in the NCEI database.

June 29, 2008. A lightning strike and ensuing fire destroyed the landmark Sweetwater Casino Restaurant in Mullica Township. Lightning struck the restaurant's electrical system. When firefighters arrived, the building was already engulfed in flames. One million dollars in property damage was reported for this event.

July 3, 2011. A lightning strike to Lucy the Elephant in Margate caused significant damage to the tourist attraction's electrical and climate control system. The computer printers, air conditioning controllers, lighting and fire alarm controllers all suffered electrical damage. Ten thousand dollars in property damage was reported. Lucy was hit by lightning in 2007 as well. That hit caused

[10] Data current as of May 2021.

$162,000 worth of damage to her riding carriage. Lightning rods were installed after that incident; they may have helped limit the damage from the 2011 strike.

June 30, 2012 – Derecho. The June 2012 North American Derecho took out electrical power to more than 3.7 million customers starting in the Midwestern United States, across the central Appalachians, into the Mid-Atlantic State. Salem, Cumberland and Atlantic Counties were the hardest hit NJ counties. During this event, a lightning strike and the ensuing fire gutted the 104-year-old Episcopal Church of the Redeemer in Longport. Firefighters had a difficult time battling the blaze as strong to damaging wind gusts were occurring with the Derecho at the time of the blaze. About $250,000 in property damage was reported.

Probability of Occurrence – Lightning

The probability of occurrence for future lightning events in Atlantic County is certain. Using the NLDN® data from Figure 3a.4, Atlantic County is located in an area of the country that experiences two to three lightning flashes per square kilometer per year (about 3,600 flashes countywide per year). Given this regular frequency of occurrence, it can be expected that future lightning events will continue to threaten life and cause minor property damages throughout Atlantic County.

A lightning strike and ensuing fire destroyed the landmark Sweetwater Casino Restaurant in Mullica Township on June 29, 2008. (photo courtesy of Elwood Fire Rescue)

Lucy the Margate Elephant, a National Historic Landmark built in 1881 by James V. Lafferty, has been struck twice by lightning in recent years, once in 2007 and again in 2011 (photo courtesy Wikipedia)

A lightning strike and ensuing fire during the June 2012 Derecho severely damaged the Episcopal Church of the Redeemer in Longport. (Sarah Watson/Press of Atlantic City)

Tornadoes

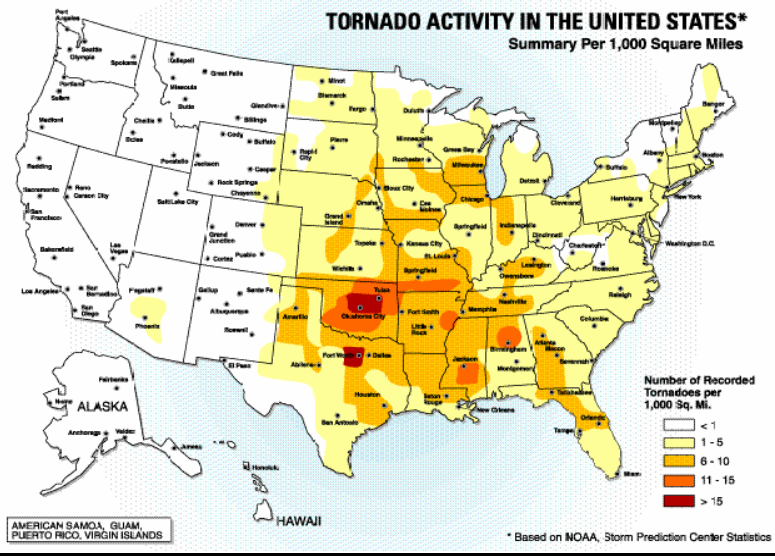
Location – Tornado

Atlantic County is located in an area that is susceptible to tornadoes, though their occurrence is not nearly as frequent or intense as it is in other regions of the country. Of the roughly five tornadoes that touch down in New Jersey each year, most tend to be of low magnitude (from EF0 to EF2) and typically impact only relatively small areas. **Figure 3a.5** shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles. Tornadoes are completely random and it is not possible to predict specific tornado hazard areas. Tornadoes can occur anywhere, and while the susceptibility to tornadoes can vary greatly with location across the United States, all of Atlantic County is uniformly exposed to the same degree.

Extent – Tornado

Table 3a.5 shows the Enhanced Fujita Scale for Tornadoes which was developed to measure tornado strength and associated damages. The tornadoes associated with tropical cyclones are most frequent in September and October when the incidence of tropical storm systems is greatest. This type of tornado usually occurs around the perimeter of the storm, and most often to the right and ahead of the storm path or the storm center as it comes ashore. These tornadoes commonly occur as part of large outbreaks and generally move in an easterly direction.

Figure 3a.5
Tornado Activity in the United States



Source: Federal Emergency Management Agency

Table 3a.5
Enhanced Fujita Scale for Tornadoes

Storm Category	Damage Level	3 Second Gust (mph)	Description of Damages	Photo Example
EF0	LIGHT	65–85	Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.	
EF1	MODERATE	86–110	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.	
EF2	SIGNIFICANT	111–135	Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; highrise windows broken and blown in; light-object missiles generated.	
EF3	SEVERE	136–165	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.	
EF4	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.	
EF5	INCREDIBLE	200+	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 m (109 yd); trees debarked; steel reinforced concrete structures badly damaged.	

Source: National Oceanic and Atmospheric Administration; Federal Emergency Management Agency

Historical Occurrences – Tornado

According to the NCEI database[11], there have been seven recorded tornado days in Atlantic County between November 1970 and August 2021. Intensities ranged from F0 to F2 (note the Fujita Scale has since been superseded by the Enhanced Fujita Scale), as shown in **Table 3a.6**. These events resulted in three injuries and more than $1 million in property damages, approximately half of which are attributable to a tornado that touched down in Hammonton in August 1993. No new tornadoes have been recorded since the last version of the plan was approved in 2016. These are shown graphically in **Figure 3a.6.**

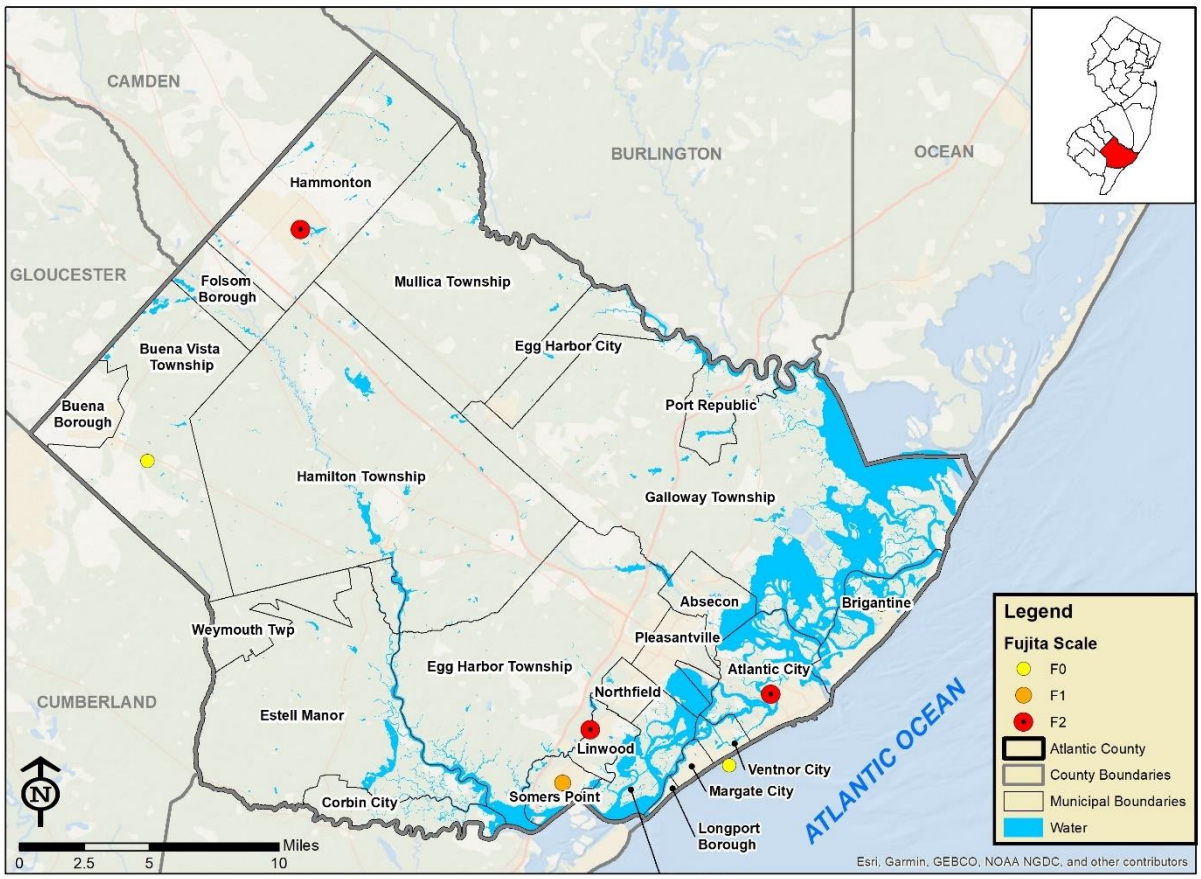
Table 3a.6
Historical Tornadoes in Atlantic County

Location	Date	NCEI Reported Magnitude	Deaths	Injuries	Property Damage
Atlantic City, City of	11/4/1970	F2	0	0	$250,000
Egg Harbor, Township of	7/21/1987	F2	0	3	$2,500
Buena Vista, Township of	8/5/1987	F0	0	0	$2,500
Ventnor City, City of	10/18/1990	F0	0	0	$250,000
Hammonton, Town of	8/21/1993	F2	0	0	$500,000
Brigantine, City of	9/8/1993	F0	0	0	$5,000
Cities of Somers Point and Linwood	7/5/2001	F1	0	0	$15,000
		Total	**0**	**3**	**$1,025,000**

Source: National Center for Environmental Information, 1970 to August 2021

[11] Data current as of August 2021.

Figure 3a.6
Historical Tornado Touchdown Locations, 1970-2021



SOURCE: NOAA National Centers for Environmental Information (NCEI) Storm Events Database, 2021; NJGIN: County Boundary, 2021; Municipal Boundary, 2021.
NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

Since the initial version of the plan was prepared in 2010, it is now customary to categorize tornado using an Enhanced Fujita Scale (EF-scale). The Enhanced F-scale is still a set of wind estimates (no measurements) based on damage. NCEI database records for historic occurrences, however – such as those shown for historic events in Atlantic County in **Table 3a.6** – are still provided in the old Fujita Scale (F-scale). **Table 3a.7** shows how the two scales compare to one another[12].

[12] As per www.spc.noaa.gov/faq/tornado/ef-scale.html

Table 3a.7 Comparison, Fujita Scale (F) versus Enhanced Fujita Scale (EF)			
Fujita Scale		Enhanced Fujita Scale	
F-Number	3 Second Gust (mph)	EF-Number	3 Second Gust (mph)
0	45-78	0	65-85
1	79-117	1	86-110
2	118-161	2	111-135
3	162-209	3	136-165
4	210-261	4	166-200
5	262-317	5	Over 200

Descriptions of the *most recent events* in Atlantic County include the following:

October 19, 1990. An F0 tornado struck Ventnor City on October 19, 1990, causing damage to trees, chimneys, and beachfront structures. Portions of roofs blew off, a shed was destroyed, and trees and utility poles were downed. A large wooden deck was blown off a high-rise building and went through the roof of a house next to the buildings.

August 21, 1993. A tornado touched down just northwest of Hammonton Lake which is oriented east-west in a heavily wooded area. The tornado moved east-southeast across the lake, becoming a waterspout. On the eastern edge of the lake, the tornado apparently lifted off the ground for about 500 feet and then touched down again farther east before dissipating. Tree damage was extensive, with several trees twisted, snapped off and uprooted. Numerous trees were 2 to 3 feet in diameter, with a few of the trees 4 to 5 feet in diameter. The damage suggested that the tornado hugged the northern edge of the lake more closely. One large portion of a tree was sent through the roof of a nearby house. Another house was damaged by a 3-foot diameter trunk falling over on its roof. A wooden boat dock, some 30 feet in length, was completely destroyed and tossed up on the land. A 10- foot by 10-foot wooden shed was demolished and its roof lifted and carried about 200 feet away. Some other observers reported automobiles being moved about by the wind, and large areas of sod being vacuumed off the ground leaving exposed root pits. Fortunately, there were no known injuries from the storm.

September 8, 1993. Four waterspouts were observed off the southern New Jersey coast in the midst of very moist and unstable atmospheric conditions. One waterspout was located 20 miles east of Barnegat, the other three were reported off the barrier island City of Brigantine. One of the three moved inland as a weak tornado at the northern end of the City of Brigantine. Police said the tornado moved southward tearing off roof shingles and tree limbs along its short path. One resident had a 55-pound barbecue grill tossed about 150 feet from its original position and an outdoor table destroyed. The funnel dissipated rapidly after moving inland and was accompanied by small hail and very heavy rain.

Somers Point/Linwood F1 Tornado, July 5, 2001, as seen from the Longport/Somers Point Bridge at mid-span. (Photo courtesy of Ronald Fallon, as posted on www.erh.noaa.gov).

July 5, 2001. An F1 tornado caused wind damage in Somers Point and Linwood. About six homes were damaged by the tornado. More than 30 trees were either uprooted or badly twisted.

Electrical, telephone and cable wires were knocked down. Siding was ripped off several houses and one porch was badly damaged. At least one vehicle was damaged by downed trees. About 400 Conectiv customers lost power. Strongest winds were estimated at about 90 mph in Somers Point. The tornado apparently touched down as a waterspout over Patcong Creek and then moved into Somers Point. It crossed the Garden State Parkway near mile marker 30.4. The first observed wind damage was to trees down on Bala Drive. Wind damage also occurred on Bucknell and Exton Roads. On Bucknell Road, a boat was tossed 90 feet into a neighbor's yard. The tornado traveled east-northeast down Southview Drive across Chapman Boulevard. It was at this location where it reached its maximum intensity, badly damaged a porch and uprooted several large trees. The tornado proceeded to move through Crestview Drive, across U.S. Route 9, Euclid Avenue and Abbey Road before entering Linwood near West Royal Drive. Trash cans were flying in circular motions. The last property damage occurred in Linwood near Candlewood Drive where a couple of bird house poles were bent and twisted. The tornado continued on the ground through the marshes before it dissipated as a waterspout over Scull Bay. The total path length was about 3.6 miles. The tornado was not on the ground for its entire length. Its maximum width was about 100 yards. No injuries were reported.

Probability of Occurrence – Tornado

It is likely that Atlantic County will continue to experience weak to moderate tornado events, though their frequency of occurrence will be fairly low. Probability data made available through NOAA's National Severe Storms Laboratory (NSSL) indicate that Atlantic County is in an area that experiences less than one tornado event per year. Historical storm data made available through the NCEI database confirms this data (seven confirmed events in 44 years, resulting in an estimated annual probability of a tornado event of about 16 percent). In New Jersey, tornadoes are more likely to occur during the months of March through August and tend to form in the late afternoon and early evening.

Hurricane and Tropical Storm

Location– Hurricane and Tropical Storm

Hurricanes and tropical storms threaten the entire Atlantic and Gulf seaboard of the United States, and while coastal areas are most directly exposed to the brunt of landfalling storms their impact is often felt hundreds of miles inland. Atlantic County is located in a region of the country that is susceptible to all of the hazards wrought by hurricanes and tropical storms. In the strictest sense, hurricanes and tropical storms are not hazards in their own right but, rather, events where the primary damaging hazards are high-level sustained winds, heavy precipitation that causes inland flooding and tornadoes (coastal areas are also susceptible to the additional forces of storm surge, wind-driven waves and tidal flooding, which can be more destructive than cyclonic wind). The entire planning area is located within a geographic area that is affected by hurricanes and tropical storms. The hazard areas for the accompanying extreme wind, storm surge, coastal erosion, riverine flooding, tornadoes, and wave action hazards do, however, vary across the county. While mentioned here, each of these individual forces are more thoroughly addressed as separate hazards within this section (i.e., extreme wind, coastal erosion, flood, tornado, storm surge, and wave action).

Extent – Hurricane and Tropical Storm

As a hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 mph, the system is designated a tropical storm, given a name and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach 74 mph the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale (**Table 3a.8**), which rates hurricane intensity in categories on a scale of 1 to 5, with Category 5 being the most intense. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure and storm surge potential, which are combined to estimate potential damage. Categories 3, 4 and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. Tropical storms and hurricanes that parallel the Atlantic County coastline many dozens of miles away without ever making direct landfall can still cause significant damage.

Table 3a.8
Saffir-Simpson Scale for Hurricanes

Category	Maximum Sustained Wind Speed (mph)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74–95	Greater than 980	3–5
2	96–110	979–965	6–8
3	111–129	964–945	9–12
4	130–156	944–920	13–18
5	157 +	Less than 920	19+

Source: National Oceanic and Atmospheric Administration

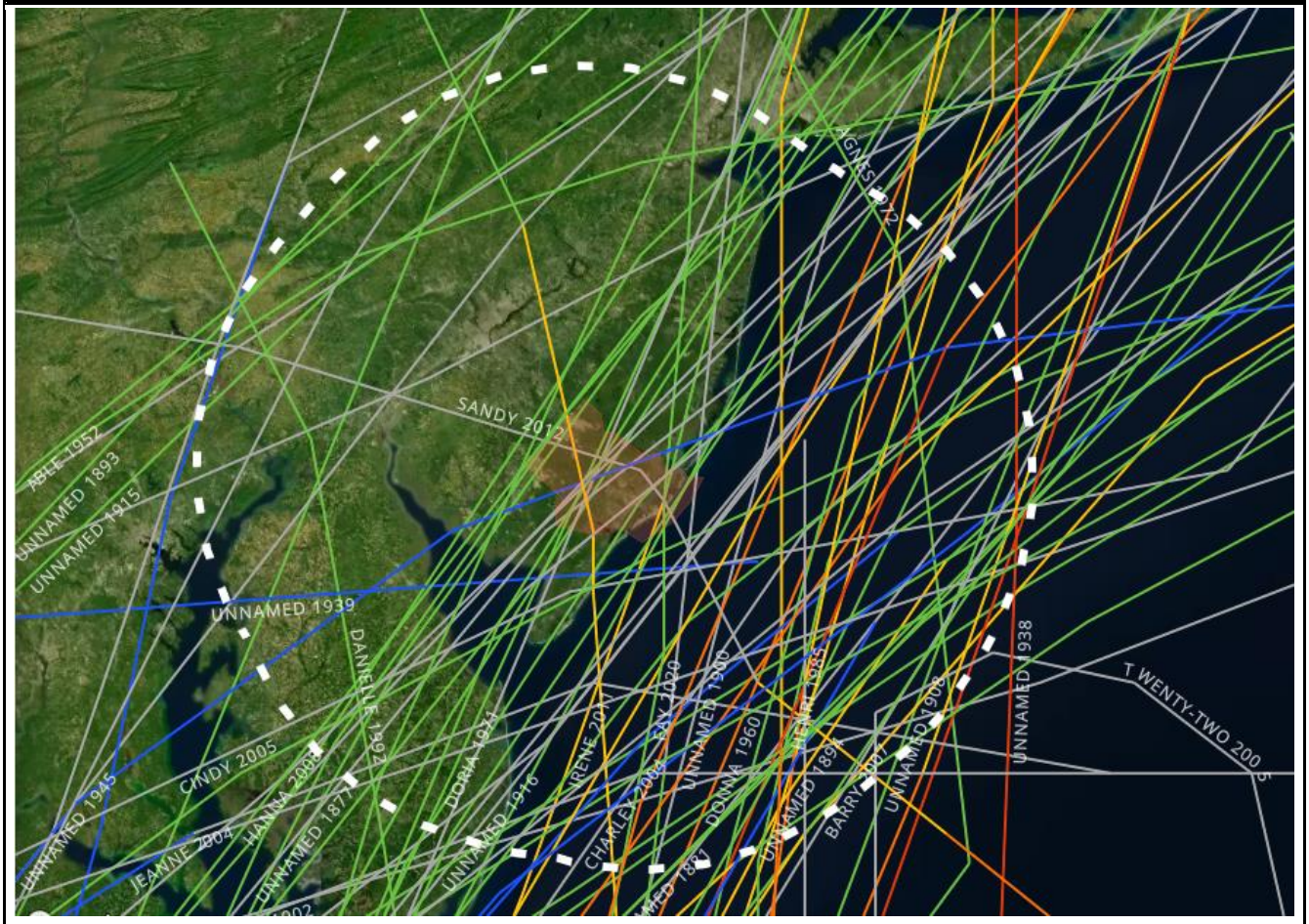
Historical Occurrences – Hurricane and Tropical Storm

Atlantic County has an active history of hurricanes and tropical storms. According to NOAA historical records[13], 43[14] hurricane and tropical storm tracks have passed within 75 nautical miles of Atlantic County since 1856. **Figure 3a.7** shows the track of each recorded historical storm in relation to the Atlantic County area. As can be seen in the figure, almost all hurricane and tropical storm tracks traverse northward through the area. For each event, **Table 3a.9** provides the date of occurrence, storm name (if applicable), maximum wind speed (as recorded within 75 miles of Atlantic County) and category of the storm based on the Saffir-Simpson Scale. This includes seven Category 2 hurricanes; six Category 1 hurricanes; and 30 tropical storms. Of the 43 recorded storm events, the center tracks of 12 storms traversed directly through Atlantic County (marked with * in Table 3a.9). Of these 12 storms, two were Category 1 hurricanes and 10 were tropical storms.

[13] NOAA Historical Hurricane Tracks, database filtered exclusively for hurricane Categories 1 through 5 and tropical storms within 75 nautical miles of Atlantic City (with tropical depressions and extratropical systems excluded from the search results), online at http://coast.noaa.gov/hurricanes/. This is a new version of the NOAA database, which has been improved upon including various data corrections since the 2016 Plan was prepared.

[14] Superstorm Sandy, which was extratropical at its landfall, is included.

Figure 3a.7
Historical Hurricane and Tropical Storm Tracks within 75 Nautical Miles of Atlantic County, 1856-2021*



* *NOAA 2021 (latest date available from data source, http://coast.noaa.gov/hurricanes/).*

Table 3a.9
Historical Hurricane and Tropical Storm Tracks within 75 Nautical Miles of Atlantic County (1856-2014*)

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
8/20/1856	Not Named	50	Tropical Storm
9/17/1859	Not Named	40	Tropical Storm
9/27/1861	Not Named*	60	Tropical Storm
11/3/1861	Not Named	70	Category 1 Hurricane
9/19/1863	Not Named	50	Tropical Storm
10/30/1866	Not Named	60	Tropical Storm
10/26/1872	Not Named*	40	Tropical Storm
9/29/1874	Not Named*	50	Tropical Storm
8/18/1879	Not Named	90	Category 2 Hurricane
9/10/1881	Not Named	50	Tropical Storm

Table 3a.9
Historical Hurricane and Tropical Storm Tracks within 75 Nautical Miles of Atlantic County (1856-2014*)

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
9/23/1882	Not Named*	40	Tropical Storm
9/25/1889	Not Named	40	Tropical Storm
8/24/1893	Not Named	85	Category 2 Hurricane
9/30/1894	Not Named	65	Category 1 Hurricane
10/10/1894	Not Named	65	Category 1 Hurricane
9/24/1897	Not Named	60	Tropical Storm
9/16/1903	Not Named*	70	Category 1 Hurricane
9/15/1904	Not Named*	55	Tropical Storm
9/8/1934	Not Named	70	Category 1 Hurricane
8/3/1944	Not Named	35	Tropical Storm
9/14/1944	Not Named	85	Category 2 Hurricane
8/31/1954	Carol	85	Category 2 Hurricane
7/11/1959	Cindy	40	Tropical Storm
7/30/1960	Brenda*	45	Tropical Storm
9/12/1960	Donna	95	Category 2 Hurricane
9/14/1961	Not Named*	35	Tropical Storm
8/28/1971	Doria*	55	Tropical Storm
6/22/1972	Agnes	60	Tropical Storm
8/9/1976	Belle	90	Category 2 Hurricane
9/27/1985	Gloria	90	Category 2 Hurricane
9/24/1985	Henri	35	Tropical Storm
7/13/1996	Bertha	60	Tropical Storm
9/16/1999	Floyd	60	Tropical Storm
9/18/2003	Isabel**	46	Tropical Storm
8/31/2004	Gaston	35	Tropical Storm
9/7/2008	Hanna	42	Tropical Storm
8/27/2011	Irene*	60	Tropical Storm
10/29/2012	Sandy*	80	Category 1 Hurricane[15]
5/12/2015	Ana	50	Tropical Storm
7/10/2020	Fay*	50	Tropical Storm
8/4/2020	Isaias	50	Tropical Storm

* *NOAA 2021 (latest date available from data source, http://coast.noaa.gov/hurricanes/)*
** *This event record was added as per NCEI query.*

Some more *notable tropical events* include the following:

September 14-15, 1944 – Great Atlantic Hurricane. This unnamed 1944 storm, dubbed the "Great Atlantic

[15] Sandy was a Category 1 Hurricane passing into the 75 nautical mile search area for this database query, but weakened as it passed over the continental shelf, ultimately making landfall as an extratropical system.

Hurricane", impacted the entire coast of New Jersey when it paralleled the coastline as a Category 2 Hurricane. Wind velocities ranged from 90 miles per hour at Atlantic City to over 100 miles per hour at New York City. The peak stage recorded by the Atlantic City tide gage was 8.21 feet NGVD, which held as a stage of record at this location into the late 1990's. The hurricane destroyed the Atlantic City boardwalk and damaged the famous Heinz and Steel Piers in Atlantic City. Only the Steel Pier was rebuilt. The Atlantic City-Brigantine Bridge was destroyed.

August 28, 1971 – Tropical Storm Doria. Doria's path crossed directly over Atlantic County on August 28th. Doria produced wind gusts of up to 54 mile per hour and storm tides of 5.3 feet above normal in Atlantic City. The storm dropped heavy rainfall, leading to record flooding on several small streams across the state. Rainfall totals in Atlantic County were recorded in the range of 5 to 7 inches.

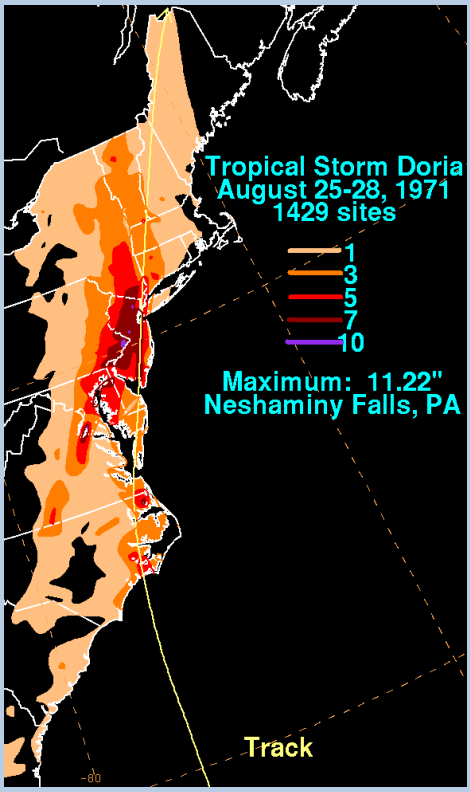
August 9, 1976 – Hurricane Belle. Belle was a tropical storm when it passed off the shore of New Jersey on August 9th. A storm surge of 8.85 feet was measured in Atlantic City. Gusty winds knocked down power lines across the state. Roughly 500 feet of the Atlantic City boardwalk was damaged or destroyed, with repairs estimated to have reached $5 million. On August 21, then-President Gerald Ford issued a major disaster declaration for Atlantic, Cape May, Monmouth, and Ocean counties.

September 16, 1999 – Tropical Storm Floyd. In New Jersey, Floyd was predominantly an inland rain and riverine flooding event. Minor beach erosion and back bay flooding was reported, however, in Atlantic, Cape May and Ocean Counties. The NOAA NCEI database recorded $500,000 in property damage in Atlantic County during this event. Rainfall totals were recorded at 4.41 inches in Estell Manor, 4.37 inches in Folsom, and 4.02 inches at the Atlantic City Marina.

September 18, 2003 – Tropical Storm Isabel. Isabel made landfall as a hurricane near Drum Inlet, North Carolina on the 18th and weakened as it tracked farther inland. Winds gusted up to 62 mph in New Jersey and downed countless numbers of trees, tree limbs and power lines. It was one of the worst power outages on record for area utilities. Jersey Central Power and Light reported that 220,000 of its customers lost power while Conectiv Energy reported about 162,000 of its customers lost power. While tide heights along the ocean side only reached minor, wave action caused considerable beach erosion, especially in Cape May and Atlantic Counties.

Storms have caused significant damage to Atlantic City's iconic boardwalk throughout its existence. Shown here is South Inlet during the Great Atlantic Hurricane of 1944. *(Archive of the Beach Erosion Board stored at the Coastal and Hydraulics Laboratory, Engineer and Research Development Center, Vicksburg, Mississippi, USA)*

Hurricane 1944
Longport



The heaviest rain with tropical systems often falls west of its storm track, thus the Atlantic County area (being on the eastern side of the track) was spared from the heaviest rain. Most places had less than an inch and half of rain. Peak wind gusts included 53 mph at the Atlantic City Marina. The NCEI database reported that property damage was $600,000.

Vehicles go through a partially flooded Bethel Road near New Road in Somers Point about 6:30 a.m. Sunday August 28, 2011 in the wake of Hurricane Irene. (Vernon Ogrodnek).

August 27, 2011 – Tropical Storm Irene. Prior to Irene making landfall, approximately one million people were evacuated from coastal and low lying areas throughout the state of New Jersey (including all of Cape May County). National Guard troops were deployed state-wide to help with evacuations. All Atlantic County shore communities east of U.S. Route 9, including Atlantic City, were placed under a voluntary evacuation on the evening of August 25th; a mandatory evacuation followed at 6 a.m. on the 26th. All Atlantic City casinos were shut down as the city faced its first mandatory evacuation in history. Irene initially made landfall near Cape Lookout, North Carolina on the 27th as a Category 1 hurricane. She later made a second landfall as a tropical storm on Brigantine Island, just north of Atlantic City, on the 28th. Tropical storm force wind gusts overspread New Jersey. The highest wind gusts recorded in Atlantic County were 66 miles per hour at the Atlantic City Marina, and 58 miles per hour in Atlantic City. Event precipitation totals averaged between 5 and 10 inches and caused widespread, record breaking flooding. Irene helped make August 2011 the wettest August on record for the state of New Jersey dating back to 1895. Moderate to severe tidal flooding occurred. Peak storm tides included 6.96 feet above mean lower low water in Atlantic City (moderate tidal flooding starts at 6.0 feet above mean lower low water). The shore took a pounding from the coastal flooding and heavy surf. Waves were estimated to reach as high as 12 feet, as offshore seas reached 25 feet. There were numerous reports of dune fence damage and sand overwash[16] onto streets and boardwalks. In Atlantic County, erosion scarps[17] averaged 1 to 4 feet, but reached 6 feet in Brigantine. All counties in the state were declared disaster areas. Before Superstorm Sandy, Irene stood as one of the costliest natural disasters in the state's history. Preliminary state-wide damage estimates were near one billion dollars in damages to approximately 200,000 homes and

Erosion and damage near Bally's in Atlantic City. Sunday, August 28, 2011. Aftermath of Hurricane Irene. (The Press of Atlantic City/Ben Fogletto)

[16] Overwash is a term used to describe the landward transport of beach sediments across a dune area. Large coastal storms and their associated high winds, waves, and tides can result in overwash of the beach and dune system. During storm conditions, elevated storm tides and high waves may erode beaches and dunes, and the eroded sand can be carried landward by surging water. The sand and water may wash over or break through the dunes, and spill out onto the landward side of the barrier dune. This deposit is usually fan-shaped and therefore is known as an overwash (or washover) fan. Low-lying areas such as a break in the dune system are particularly vulnerable to overwash. Along developed shoreline areas, the breaks in dune systems are typically found at street ends or pedestrian dune cross-over pathways. When large storm waves and high tides breach the dunes, overwash occurs as sand is transported through the open dune area and onto the street.

[17] An erosion scarp is a steep, near-vertical cut in a dune produced by the erosive forces of wave action.

businesses. Around 1.5 million people lost power throughout the state. Power was not fully restored until September 5th. Riverine flooding in many basins reached record or near-record levels (with some locations at levels second only to Tropical Storm Floyd in 1999). The closure of the Atlantic City casinos for three days caused an estimated 45 million dollars in lost revenue. The combination of wind and flooding forced the closure of about 350 main roadways in the state including sections of Interstate 287, the Garden State Parkway and the New Jersey Turnpike. The flooding rains and winds severely damaged crops. New Jersey Transit rail, bus and light rail operations were suspended on the weekend of the 27th and 28th. Numerous homes suffered structural damages from the winds, and limbs impacting their roofs. Widespread wind damage to trees (and damage to homes and vehicles when trees fell on them) occurred in every county. In Atlantic County, a piece of an exterior wall of the Borgata Hotel was blown off. NOAA's NCEI database reports total property damage in Atlantic County as $5.5 million.

A large section of a tree fell on this home on 2nd Avenue in Northfield, causing severe damage during Hurricane Irene. (Anthony Smedile)

October 29, 2012 - Superstorm Sandy. Three days prior to Sandy's landfall, voluntary evacuations of barrier island communities were called for by the Governor on October 26th. On the 27th, a State of Emergency was declared and a mandatory evacuation was ordered for all barrier island communities. More than 2,000 National Guard troops were deployed. Tolls along sections of the Garden State Parkway and all of the Westbound Atlantic City Expressway were suspended. On October 28th, President Obama signed a federal emergency declaration for New Jersey. All State Parks and Historic Sites were closed. Late that afternoon, New Jersey Transit began a gradual, system-wide shut down.

Sandy made landfall at the City of Brigantine on October 29th as a post-tropical storm. Sandy was the costliest natural disaster by far in the State of New Jersey. Record breaking high tides and wave action combined with sustained winds as high as 60 to 70 miles per hour - with gusts as high as 80 to 90 miles per hour - battered the state. Statewide, Sandy caused an estimated $29.4 billion in damage; destroyed or

significantly damaged 30,000 homes and businesses; affected 42,000 additional structures; and was responsible directly or indirectly for 38 deaths. A new temporary inlet formed in Mantoloking (Ocean County) where some homes were swept away. About 2.4 million households in the state lost power and it took weeks for power to be fully restored.

Hardest hit areas in the state were the coastal areas of Ocean and Monmouth counties. However, Atlantic County was not spared. The NCEI database records indicate $690 million in property damage due to high surf, flooding, and extreme wind. The northern end of the famed Atlantic City boardwalk was destroyed. The wind damaged boardwalks within the city. The city was cut off from the mainland by tidal flooding after the morning high tide. Elsewhere in the county, heavy tidal damage was reported in Longport, Margate and Ventnor. Nearly every municipality from Egg Harbor and Galloway Townships eastward suffered widespread wind and or tide damage. Deaths in Atlantic County included a 65-year-old woman who died of a heart attack while on an evacuation bus in Atlantic City, a 73-year-old man who died from hypothermia after failing to evacuate in Brigantine, and a 93-year-old man who fell and struck his head while moving a car in Ventnor. Sandy produced record breaking power outages. Statewide, 2.7 million utility customers lost power, by far surpassing the record from Tropical Storm Irene in 2011. Public Service Electric and Gas alone had power lost to 1.4 million of its customers and reported about 48,000 trees had to be removed or trimmed to restore power and over 2,400 poles had to be replaced. Jersey Central Power and Light estimated that nearly 1.0 million of its customers lost power, about ninety percent of its customer base. This included hardest hit areas of Ocean and Monmouth Counties. Monmouth County had the greatest number of sustained outages of any county in the state. The utility had to cut through approximately 45,000 fallen trees. It was unable to restore power to about 30,000 of its shore and barrier island customers because of massive infrastructure damage to those homes and businesses. Elsewhere in the state, power restoration was hampered by a nor'easter that occurred on November 7th. Public Service Electric and Gas restored all power on November 12th and Jersey Central Power and Light by November 14th.

The unique aspect of Sandy, unlike most tropical systems, was the multi-tide cycle increase of onshore winds prior to landfall. This caused multiple high tide cycles with tidal flooding and also helped produce catastrophic wave action. Record breaking or near record breaking high tides were exacerbated by the high astronomical spring tides associated with the full moon. Sandy's landfall coincided closely with the high tide cycle on the evening of the 29th.

Hurricane Sandy Damage, North End of Brigantine, New Jersey

(Photo Susanne Fluhr)

A section of beach at 24th Street in Longport, where there are no dunes. The borough has already suffered $10 million in public property damage. (TOM GRALISH / Staff Photographer)

Homes are seen on a street covered in beach sand due to flooding from Superstorm Sandy in Longport, New Jersey. (October 29, 2012 – Source: Mario Tama/Getty Images North America)

A Man walks past the remains of a building near a damaged section of boardwalk in the wake of Superstorm Sandy, Wednesday, Oct. 31, 2012, in Atlantic City, N.J. (Matt Slocum / AP)

On the ocean side, Raritan Bay and the lower Delaware Bay, minor tidal flooding started during the high tide cycle on the morning of the 28th with some moderate tidal flooding during the high tide cycle on the evening of the 28th. Widespread major tidal flooding occurred during the morning and evening high tide cycles on the 29th. The highest tide (and surge) along the ocean front and Raritan Bay was with the landfalling high tide cycle on the evening of the 29th. The ocean front and Raritan Bay surge was 5 to 9 feet. A new all-time record tide was set in Sandy Hook. The tide reached 13.31 feet above mean lower low water before the pier collapsed about 45 minutes before high tide. An after the event survey performed by the USGS and Rutgers University determined that an estimated crest of 14.40 feet above mean lower low water will be used as the new record for Sandy Hook. The entrance to New York Harbor Buoy (a relatively new buoy) had record breaking seas of 32.5 feet. The Delaware Bay Buoy (about 19 miles east of Fenwick Island, Delaware) had seas that reached 24.5 feet. Most of the surveyed damage to barrier island homes that were either destroyed or moved indicated that it was the storm surge and wave action that caused most of the damage. Either minor or no tidal flooding occurred with the subsequent high tide cycles the rest of the month. The previous record was 10.1 feet above mean lower low water during Hurricane Donna on September 12, 1960 and the December 11, 1992 nor'easter. In Atlantic City, the highest tide reached 8.9 feet above mean lower low water during the evening high tide on the 29th. This was the second highest tide on record; the highest was 9.0 feet above mean lower low water on December 11, 1992.

Strong winds associated with Sandy began to spread across the state during the morning of the 29th; most of the peak wind gusts (between 70 miles per hour and 90 miles per hour) occurred during the late afternoon and evening hours as Sandy was making landfall. Most of the strong wind gusts were over by the following morning. Peak wind gusts were recorded at 77 miles per hour at the Atlantic City Marina, 66 miles per hour in Absecon, and 64 miles per hour at the Atlantic City International Airport. Maximum sustained winds of 51 miles per hour were reported in Atlantic City.

Heavy rain also occurred with Sandy. This made it easier for shallow rooted and leafed trees to be uprooted, it also complicated the tidal flooding. Event rainfall totals averaged 1 to 3 inches in the northern half of the state and 3 to 7 inches in the southern half of the state, except 6 to 12 inches along the southern tier counties of Salem, Cumberland, Cape May County as well as coastal Atlantic County. The steady rains associated with Sandy were from the 28th to the 30th throughout most of the state.

Approximately 130 miles of the Garden State Parkway was closed from Woodbridge in Middlesex County to its terminus in Cape May County. The New Jersey Turnpike was closed in central New Jersey. Most schools were closed. The nuclear power plants at Oyster Creek (Ocean County) and Salem (Salem County) suspended operations because of tidal flooding. The day after Sandy's landfall, all 580 school districts in the state were closed. All courts and state offices were also closed. Over 200 roadways were closed. Numerous boil water advisories were issued for the northern and coastal parts of the state, some that lasted into November. Governor Christie postponed Halloween in the state until November 5th. On October 31st, Amtrak started limited rail service. State offices were still closed, but some schools reopened. Most major roadways away from the immediate coast including the New Jersey Turnpike were reopened. On November 1st, Governor Christie rescinded evacuation orders for some of the Atlantic County barrier islands. The River Line Transit service between Camden and Trenton resumed. New Jersey Transit bus service resumed as did the Cape May-Lewes Ferry. On November 2nd, the governor lifted the evacuation order for Atlantic City and the casinos opened the next day. Evacuation orders were also lifted for Cape May County. Limited New Jersey Rail Service resumed. Because of power outages, lines for gas reached 100 cars long in the northern part of the state. The governor declared a limited state of emergency and imposed odd-even rationing for gasoline purchases in twelve northern New Jersey counties because of the shortages. They remained in effect through November 12th. The EPA temporarily suspended some Clean Air Act restrictions. The entire state was also under odd-even water restrictions. On November 3rd about 75 major roadways were still closed. On November 4th, rail service between Philadelphia and Atlantic City resumed. It was estimated that the average New Jersey beach became 30 to 40 feet narrower. It was difficult for people whose homes were uninhabitable to find rental properties.

July 10, 2020 – Tropical Storm Fay. Fay made landfall as a tropical storm northeast of Atlantic City with maximum wind speeds of 50 knots. Significant street flooding was reported in Margate City and Somers Point. One person was recorded as drowned and another injured by rough surf conditions while swimming in the ocean off Atlantic City during the storm.

Dann Cuellar/6abc Action News/WPVI-TV, via Associated Press

The Inlet section of Atlantic City, N.J., was flooded.

By THOMAS KAPLAN and N. R. KLEINFIELD
Published: October 29, 2012

Clean-up begins on New Hampshire Avenue in Atlantic City after Sandy. October 30, 2012. (Staff photo by Cindy Hepner/South Jersey Times)

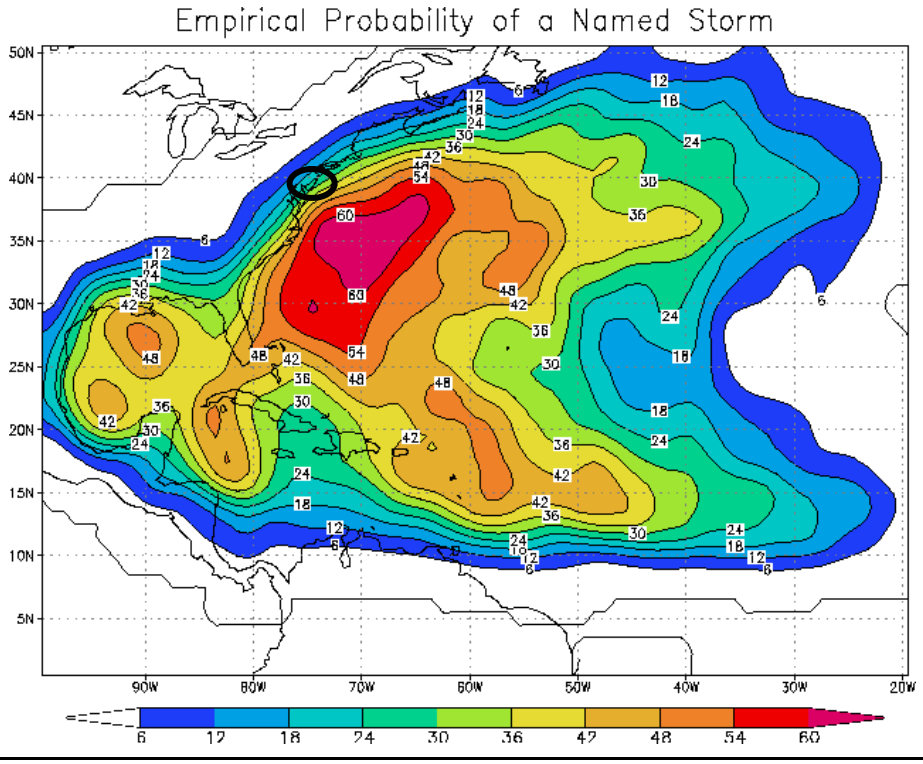
A boardwalk and waterfront property were heavily damaged following Hurricane Sandy in Atlantic City, N.J. One year later, some businesses are still unprepared for disaster, while others have been spurred to make changes. MICHAEL REYNOLDS

U.S. Route 30, the White Horse Pike, one of three major approaches to Atlantic City, New Jersey, is covered with water from Absecon Bay during the approach of Hurricane Sandy

Probability of Occurrence – Hurricane and Tropical Storm

The probability of future hurricane and tropical storm events for Atlantic County is high. According to NOAA statistical data, Atlantic County is located in an area with an annual probability of a named storm between 24 and 30 percent (**Figure 3a.8**). This empirical probability is fairly consistent with other scientific studies and observed historical data made available through various federal, state and local sources. NOAA data on historical storm tracks indicates the annual probability of a hurricane or tropical storm coming within 75 miles of Atlantic County is roughly 25 percent and the annual probability of a hurricane or tropical storm traversing directly through Atlantic County is about 7 percent. Occurrences are most likely during the official Atlantic hurricane season (the months of June through November). The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in this basin is six. The probability of storm occurrences will vary significantly based on the return interval for different categories of magnitude. The probability of less intense storms (lower return periods) is higher than more intense storms (higher return periods). **Table 3a.10** profiles the potential peak wind speeds that can be expected in Atlantic County for the 100-year and 500-year mean return period events.

Figure 3a.8
Empirical Probability of a Named Storm*



Source: NOAA

Table 3a.10
Peak Wind Speeds for 100-year and 500-Year Mean Return Period Events*

Jurisdiction	Peak Wind Speed for a 100-year Mean Return Period Event	Peak Wind Speed for a 500-year Mean Return Period Event
Absecon, City of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Atlantic City, City of	Category 2 (96-110 mph)	Category 3 (111-115 mph)
Brigantine, City of	Category 2 (96-110 mph)	Category 3 (111-115 mph)
Buena, Borough of	Tropical Storm (39-73 mph)	Category 1 (74-95 mph)
Buena Vista, Township of	Tropical Storm (39-73 mph)	Category 2 (96-110 mph)
Corbin City, City of	Category 1 (74-95 mph)	Category 2 (96-110 mph)
Egg Harbor City, City of	Category 1 (74-95 mph)	Category 2 (96-110 mph)
Egg Harbor, Township of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Estell Manor, City of	Category 1 (74-95 mph)	Category 2 (96-110 mph)
Folsom, Borough of	Tropical Storm (39-73 mph)	Category 2 (96-110 mph)
Galloway, Township of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Hamilton, Township of	Between Tropical Storm (39-73 mph) and Category 1 (74-95 mph)	Between Category 2 (96-110 mph) and Category 3 (111-115 mph)
Hammonton, Town of	Tropical Storm (39-73 mph)	Category 2 (96-110 mph)
Linwood, City of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Longport, Borough of	Category 2 (96-110 mph)	Category 3 (111-115 mph)
Margate City, City of	Category 2 (96-110 mph)	Category 3 (111-115 mph)
Mullica, Township of	Tropical Storm (39-73 mph)	Category 2 (96-110 mph)
Northfield, City of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Pleasantville, City of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Port Republic, City of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Somers Point, City of	Category 1 (74-95 mph)	Category 3 (111-115 mph)
Ventnor City, City of	Category 2 (96-110 mph)	Category 3 (111-115 mph)
Weymouth, Township of	Category 1 (74-95 mph)	Category 2 (96-110 mph)

**Source: Atlantic County 4 Hazard Mitigation Plan (2014)*

The frequency and intensity of coastal storms and severe weather events is expected to increase in the future due to climate change. In the years to come, it is anticipated that Atlantic County will observe drastic changes in storm character, intensity, frequency, and storm tracking. Hurricanes are likely to become more intense with rising sea water temperatures. Coastal erosion rates are likely to increase with rising sea-level, to levels higher than those rates that have been observed over the last century. Storm effects will be more extensive in the future. The following types of impacts can be anticipated in Atlantic County's future as a result of climate change and sea level rise: inundation of low-lying areas; increased frequency and extent of storm-related flooding; wetland loss; saltwater intrusion into estuaries and freshwater aquifers; land loss through submergence and erosion of lands in coastal areas; migration of coastal landforms and habitats; increased salinity in estuaries and coastal fresh; impacts to human populations (property losses, more frequent flood damage, more frequent flooding of roadways and urban centers, risks to people as the population of coastal areas increases); more buildings and infrastructure exposed; currently exposed buildings and infrastructure could be subject to potentially greater losses as water levels increase, and continued rapid coastal development exacerbates the impacts of sea level rise; impacts on gravity flow stormwater systems; impacts on non-coastal areas. Impacts of climate change and sea level rise can affect all parts of a community, including: transportation infrastructure (ports, marinas, airports, roads, bridges, railways); public infrastructure (stormwater and wastewater management systems, drinking water supply and distribution systems, power utility systems, communications systems); public facilities (i.e., police, fire, ambulance, hospitals, schools, daycare centers, adult living facilities, historic landmarks,

government buildings, libraries, parks, etc.); economic viability of a community – particularly for communities where tourism tends to drive local economies, as is the case in many of Atlantic County's coastal communities. Climate change and sea level rise could lead to a potential loss of assets that support tourism (i.e., beaches themselves as well beach access points, lodging, restaurants, marinas, fishing habitats, ecotourism, etc.).

Nor'easter

Location – Nor'easter

Nor'easters threaten the entire Atlantic Coast of the United States, and while coastal areas are most directly exposed to the damaging forces of such storm systems their impact is often felt far inland. Atlantic County is located in an area that is extremely susceptible to nor'easters. All areas throughout the County are susceptible to the hazards that can be associated with nor'easters: extreme wind, flooding and heavy snowfall. Atlantic County's coastal jurisdictions are also extremely susceptible to the added effects of storm surge, wave action, coastal erosion and tidal flooding.[18]

Extent – Nor'easter

While there are a variety of indicators for nor'easter intensity, **Table 3a.11** describes the Dolan-Davis Nor'easter Intensity Scale which is based on coastal storm erosion, degradation and property damage.

Table 3a.11
Dolan-Davis Nor'easter Intensity Scale

Storm Class	Beach Erosion	Dune Erosion	Overwash	Property Damage
1 WEAK	Minor changes	None	No	No
2 MODERATE	Modest; mostly to lower beach	Minor	No	Modest
3 SIGNIFICANT	Erosion extends across beach	Can be significant	No	Loss of many structures at local level
4 SEVERE	Severe beach erosion and recession	Severe dune erosion or destruction	On low beaches	Loss of structures at community-scale
5 EXTREME	Extreme beach erosion	Dunes destroyed over extensive areas	Massive in sheets and channels	Extensive at regional-scale; millions of dollars

Historical Occurrences – Nor'easter

Atlantic County has a lengthy history of devastating impacts wrought by nor'easters. This includes damages caused by the effects of extreme wind, heavy rain, snow, wave action, storm surge, coastal flooding and beach erosion (also addressed separately within this section).

[18] Distinct hazard area locations for coastal flooding, wave action and coastal erosion are discussed elsewhere in this section.

According to the State Hazard Mitigation Plan (2014), 17 nor'easters have affected Atlantic County since 1962. Some *notable events* include the following[19]:

March 6-8, 1962 – Ash Wednesday Nor'easter. One of the state's worst nor'easters occurred in 1962 in what became known as the "Ash Wednesday Nor'easter" – a massive storm caused by an unusual combination of three pressure areas and exceptionally high tides associated with the spring equinox stalled in the mid-Atlantic for almost three days, pounding coastal areas with continuous rain, high winds, and tidal surges and dumping large quantities of snow inland for several hundred miles. Gale force winds (sustained at 45 miles per hour with gusts to 70 miles per hour) kept storm surges on shore for five successive high tides. In Atlantic County, the Steel Pier in Atlantic City was partially destroyed. Brigantine, Margate, Ventnor, and Longport also suffered significant damage from wind and flooding. Statewide, the total damage caused by this event was about $85 million (in 1962 dollars).

March 1962 Nor'easter. Men on the roof of the collapsed Boardwalk Pavilion in Margate. (Photo courtesy of the Margate Library).

October 28, 1991 – Halloween Nor'easter. The 1991 Halloween Nor'easter, also referred to as "The Perfect Storm", caused strong waves of up to 30 feet in height. High tides along the shore were only surpassed, at the time, by the 1944 hurricane, while significant bay flooding occurred. Strong waves and persistent intense winds caused extreme beach erosion of millions of cubic feet of sand. In all, damage was estimated about $90 million (1991 dollars).

Boardwalk at Oriental Avenue, Atlantic City, days after the December 1992 Nor'easter (Photo courtesy of Flikr user PentaxTravels).

December 11-12, 1992. An intense, slow-moving nor'easter hit the eastern coast of New Jersey during December 11 and 12, 1992. It occurred while shore residents were still trying to rebuild beaches after the October 1991 and January 1992 storms. This storm produced strong winds and record or near-record flooding along the entire Atlantic Coast of New Jersey. Two deaths were attributed to the storm. Bergen, Essex, Hudson, Somerset, Union, Middlesex, Monmouth, Ocean, Salem, Atlantic, Cumberland, and Cape May Counties were declared disaster areas. The State was granted $46 million in disaster relief funds for public damages and $265 million for insured damage (National Weather Service, 1994) that occurred as a result of this storm.

A home in Brigantine after the March 1962 Nor'easter (from the photo archive of the Atlantic City Press).

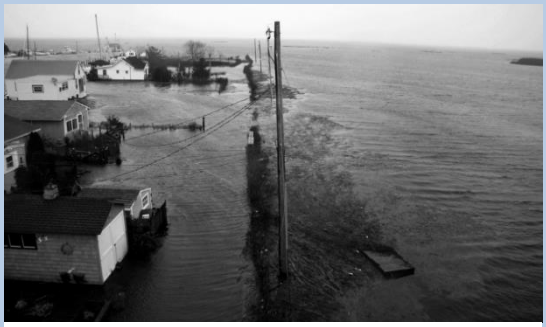
January 28-29, 1998. An intense nor'easter pounded the New Jersey Shore with tidal flooding, beach erosion, strong winds and rain. Conditions were progressively worse farther south. In Atlantic County, both the White

Horse (U.S. Route 30) and Black Horse (U.S. Route 40) Pikes in and out of Atlantic City were closed for more than four hours the morning of the 28th. The Eastbound lanes of the Black Horse Pike were closed again the evening of the 28th. Several other roads were closed due to bayside tidal flooding in Egg Harbor Township, Absecon, Atlantic City and Pleasantville. Sections of U.S. Route 9 in Linwood and County Road 152 in Somers Point and Longport were also closed. Along the ocean side, erosion took a heavy toll. In Margate, 50 to 90 percent of the dunes vanished or suffered damage. In Brigantine, about 1,000 feet of dune fencing was lost. In Ventnor, the ramp to the beach washed away and the ocean carved huge chunks out of the dunes. Atlantic City lost about 3 feet of its beach and vertical drops of 3 to 4 feet were created in Absecon and Brigantine.

February 4-9, 1998. Both Atlantic and Cape May Counties were declared federal disaster areas as a result of this strong nor'easter. Damage statewide was estimated at about 17 million dollars and it was the worst storm to affect the area since December 1992. Atlantic County suffered an estimated 3.9 million dollars in damage. Twenty-two persons from Brigantine and Atlantic City were sheltered. Throughout the county one home and one business suffered major damage, 93 other dwellings and businesses suffered minor damage while tidal flooding affected but caused little damage to 219 others. Brigantine suffered substantial flooding and beach erosion. About 75 percent of its sand was carried away. In Atlantic City, the 84 residents of the Oceanside Nursing Home were removed to 14 other nursing homes on the mainland. The boardwalk was ripped at New Hampshire Avenue. All access roads into the city were closed on the morning of the 5th, except for the Atlantic City Expressway. The worst tidal flooding occurred in the back-bay area with much of Venice Park, the Chelsea Bay Front, and Chelsea Heights inundated. Dozens of cars had water up to their doors. The beach was described as "destroyed" in Margate. In Longport, the ocean met the bay from 11th through 24th Streets. The erosion caused vertical cliffs of 4 to 5 feet and streets had to be cleared of debris. The mainland was not spared in the county as the heavy rain caused basement flooding in the Donald J. Adams School in Northfield and trees were uprooted in Linwood.

Damage in Longport from the March 1962 Nor'easter. Photo courtesy of the Stewart Farrell Collection.

The March 1962 Nor'easter destroyed a section of the Steel Pier in Atlantic City (Photo courtesy of the archives of the Daily Journal).



Flooding in Port Republic during a nor'easter on November 13, 2009 (photo courtesy of Flikr user Steve Maciejewski).

Waves crash along the shore in Atlantic city during the nor'easter of October 2, 2015 (Photo courtesy of Don Woods for NJ.com).

[19] Descriptions extracted from the NJSHMP 2014.

November 11-14, 2009. By several measures this was one of the worst nor'easters to affect New Jersey since 1990. The Dolan Davis Nor'easter power ranking at the Long Island Buoy #44025 ranked it 4th and the strongest since March of 1994. The Miller Storm Erosion Index and the Kraus and Wise Maximum Wave Run-up Index were both ranked second only to December 1992 nor'easter. In Atlantic County, flooding caused the closure of the Black Horse (U.S. Routes 40 and 322) and White Horse (U.S. Route 30) Pikes near Atlantic City on the 12th and 13th. This caused huge traffic delays on the Atlantic City Expressway. Motels were also evacuated along the Black and White Horse Pikes. Dozens of motorists were rescued from flood waters along the White Horse Pike and U.S. Route 9. The surf and tides caused about 10 million dollars in damage to the Atlantic City boardwalk and beach. In Atlantic City and also Ventnor, ramps to the beach and boardwalk were destroyed. Overall county damage was estimated at 16 million dollars.

October 2, 2015. A nor'easter on October 2, 2015 was one of multiple weather systems impacting New Jersey. The impacts of this particular nor'easter were magnified by the presence of Hurricane Joaquin off of the coast. Overall, minor tidal flooding occurred. Roadways, including the Black Horse Pike between Atlantic City and Pleasantville, were shut down due to rising floodwaters. Motorists had to be rescued after becoming trapped in the rising waters.

January 22-24, 2016. A nor'easter struck much of New Jersey from January 22-24, 2016. An impulse from the west coast traversed the midsection of the country, then developed into a low-pressure system as it tracked across the Gulf states before intensifying along the Carolina coast into a major Nor'easter, producing record snowfall in parts of New Jersey on January 23rd. It then moved out to sea after passing by the mid-Atlantic coast early on January 24th.

March 1-3, 2018. A nor'easter struck the entire state of New Jersey from March 1 to March 3, 2018. Sussex County in the northern part of the state reported 10 inches (25 cm) of snow. At the Jersey Shore, the storm caused minor flooding and road closures during the high tide on the morning of March 2. Two local roads in Absecon were closed from flooding and there was flooding on U.S. Route 40 leading into Atlantic City. Flooding also caused lane closures along portions of Route 35 in Brick and Belmar while floodwaters covered roads in Neptune and Highlands. Some flights were cancelled at Newark Liberty International Airport. Atlantic City Electric reported 29,111 customers without power and PSE&G reported tens of thousands of customers without power. New Jersey Transit cancelled some service.[20]

Probability of Occurrence – Nor'easters

Nor'easters will continue to have a high probability of occurrence for Atlantic County, and the probability of future occurrences affecting all of Atlantic County's jurisdictions is certain. The frequency and intensity of coastal storms and severe weather events is expected to increase in the future due to climate change. In the years to come, it is anticipated that Atlantic County will observe drastic changes in storm character, intensity, frequency, and storm tracking. Hurricanes are likely to become more intense with rising sea water temperatures. Coastal erosion rates are likely to increase with rising sea-level, to levels higher than those rates that have been observed over the last century. Storm effects will be more extensive in the future. The following types of impacts can be anticipated in Atlantic County's future as a result of climate change and sea level rise: inundation of low-lying areas; increased frequency and extent of storm-related flooding; wetland loss; saltwater intrusion into estuaries and freshwater aquifers; land loss through submergence and erosion of lands in coastal areas; migration of coastal landforms and habitats; increased salinity in estuaries and coastal fresh; impacts to human populations (property losses, more frequent flood damage, more frequent flooding of roadways and urban centers, risks to

[20]Description extracted from the 2019 New Jersey State Hazard Mitigation Plan.

people as the population of coastal areas increases); more buildings and infrastructure exposed; currently exposed buildings and infrastructure could be subject to potentially greater losses as water levels increase, and continued rapid coastal development exacerbates the impacts of sea level rise; impacts on gravity flow stormwater systems; impacts on non-coastal areas. Impacts of climate change and sea level rise can affect all parts of a community, including: transportation infrastructure (ports, marinas, airports, roads, bridges, railways); public infrastructure (stormwater and wastewater management systems, drinking water supply and distribution systems, power utility systems, communications systems); public facilities (i.e., police, fire, ambulance, hospitals, schools, daycare centers, adult living facilities, historic landmarks, government buildings, libraries, parks, etc.); economic viability of a community – particularly for communities where tourism tends to drive local economies, as is the case in many of Atlantic County's coastal communities. Climate change and sea level rise could lead to a potential loss of assets that support tourism (i.e., beaches themselves as well beach access points, lodging, restaurants, marinas, fishing habitats, ecotourism, etc.).

Severe Winter Weather

Location – Severe Winter Weather

Nearly the entire continental United States is susceptible to winter storms, but the degree of exposure typically depends on the normal expected severity of local winter weather. Atlantic County is accustomed to severe winter weather conditions and is prepared for the potential disruptions they might cause, though intense winter storms might still overwhelm local capabilities. Atlantic County is located south of the typical boundary between freezing and non-freezing precipitation during wintertime. The 2019 State Plan notes that Atlantic County averaged about 16.5 inches of normal seasonal snowfall from 1981 to 2010 (the northernmost corner of the county averaging closer to 18.1 inches per season). All areas throughout the County are susceptible to the hazard effects of winter storms including snow and ice, and Atlantic County's coastal jurisdictions are also extremely susceptible to the added effects of storm surge, wave action, coastal erosion and tidal flooding that might be wrought by nor'easters.[21]

Extent – Severe Winter Weather

The magnitude or severity of a severe winter storm depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (i.e., weekday versus weekend), and time of season.

The extent of a severe winter storm can be classified by meteorological measurements and by evaluating its societal impacts. NOAA's NCEI is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from one to five. It is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2000 Census). The NCEI has analyzed and assigned RSI values to over 500 storms that have occurred since 1900 (NOAA NCEI 2021). **Table 3a.12** presents the five RSI ranking categories.

[21] Nor'easters and their hazard effects are discussed separately within this section.

Table 3a.12 Regional Snowfall Index Ranking Categories		
Category	**Description**	**RSI Value**
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Historical Occurrences – Severe Winter Weather

According to the NCEI database[22], 165 recorded winter storm days (classified as: blizzard, heavy snow, ice storm, sleet, winter storm, winter weather) have affected Atlantic County between January 1996 and May 2021. Of these, 17 days have occurred since data was last compiled for the completion of the last approved plan in 2016. These incidents have resulted in one death and approximately $5.3 million in property damages in Atlantic County[23]. A sampling of some of the more *notable recent events* includes the following:

January 7, 1996. Dubbed the "Blizzard of 1996", this storm system impacted a region from as far south as North Carolina to as far north as Maine from January 6th to January 9th with 10 inches to upwards of 30 inches of snow. Extreme southern New Jersey, including Atlantic County, received 10-20 inches. Nearly one million dollars in property damage was reported in Atlantic County alone.

January 25, 2000. The most intense winter storm since the Blizzard of 1996 buried New Jersey on the 25th with 6 to 15 inches of snow, sleet and freezing rain, wind gusts as strong as 60 miles per hour along the shore, moderate coastal flooding and drifts as high as four feet. For the first time since 1996, county and government offices were closed. Many businesses and all schools were closed. Many malls never opened and all the others closed early. Dozens of public events were postponed. Both the Millville Airport and the Atlantic City International Airport were shut down. In Atlantic County, there was a long list of bayside roads

[22] Data current as of May 2021.

[23] No property damages or crop damages are reported in the NCEI database in Atlantic County for events occurring since the last version of this plan was prepared.

flooded from Brigantine to Somers Point. In Atlantic City, both the Black (U.S. Route 40 and 322) and White (U.S. Route 30) Horse Pikes were closed. Individual accumulations included 10 inches in Pomona (Township of Galloway), 9 inches in the City of Estell Manor and 8.3 inches at the Atlantic City International Airport.

February 16-17, 2003. The most powerful storm to affect New Jersey since the Blizzard of 1996 struck during the President's Day Weekend. Strong winds caused about 11,000 homes and businesses to lose power along coastal New Jersey on the 17th. Power was restored by 6 p.m. EST that evening in Atlantic County. In Atlantic County, the roof parapet of the Egg Harbor Township Middle School collapsed. It caused cracks and strain in the supports of the school's gym and auditorium. Flights at the Atlantic City International Airport resumed on the 18th after being halted on the 16th. Bus transportation in and out of Atlantic City was suspended on the 16th and restored on the 18th. Schools did not reopen until the 20th. Many business awnings collapsed because of the weight of the snow and sleet. In Atlantic County, causeways into the Borough of Longport and Margate City were closed on the 17th. U.S. Route 40 (The Black Horse Pike) was closed due to flooding throughout the 17th. Severe erosion was reported in Ventnor. The beach dropped seven feet in Atlantic City. Peak wind gusts reached 53 miles per hour at the Atlantic City International Airport, Specific snow accumulations included 19.8 inches in Margate City. Approximately $1.5 million in property damage was reported in Atlantic County during this event.

February 9, 2010. For the second time within a week a major winter storm affected New Jersey. Blizzard conditions occurred at times across the extreme southern part of the state during the afternoon and early evening of the 10th. Snowfall averaged 7 to 15 inches across northwest New Jersey, 12 to 20 inches across central New Jersey and 6 to 12 inches across the southern third of New Jersey. Ice accretions were less than one tenth of an inch. Two storm related deaths occurred in Burlington and Middlesex Counties. Winds plus the weight of the snow brought down tree limbs and trees. States of emergencies continued (from the previous winter storm) in Cape May and Atlantic Counties. Many city, federal, social and county offices as well as courthouses were closed on the 10th. Except for court houses, most were reopened on the 11th. Municipal meetings were canceled as were sports games and racing cards. Flights were canceled going in and out of Atlantic City International Airport. State police reported nearly 500 accidents throughout the state. Schools were closed on the 10th and 11th, some even on the 12th. A limited number of businesses were opened on the 10th. New Jersey Transit canceled and or combined bus service on the 10th. Because the heavy snow clung to the trees first and then the winds increased, New Jersey utilities reported about 100,000 new outages, 80,000 in the southern half of the state and 14,000 in Cape May County alone. There was considerable pine tree damage. Several shelters were opened. Many school districts ran out of snow days and had to make up class-time later. Many municipal snow removal budgets were exceeded. Trash collections were postponed. The combination of the two heavy snow events within a week started causing roof collapses in the southern half of the state. Representative snowfall included 10.3 inches in Hammonton, 8.6 inches in Estell Manor, and 7.3 inches at the Atlantic City International Airport. Only 10 days into February and the seasonal total of 50.1 inches of snow to date at the Atlantic City International Airport already made it the snowiest season on record surpassing the previous record of 46.9 inches set in 1966-1967. Peak wind gusts included 41 miles per hour in Atlantic City. The onshore flow preceding the low pressure system helped cause minor tidal flooding with the morning high tide on the 10th along coastal New Jersey. Minor tidal flooding starts at 6.0 feet above mean lower low water[24]. Minor to locally moderate beach erosion also occurred with the winter storm. Vertical cuts averaged 1 to 3 feet along the ocean front with the highest cuts reported in Ocean County. Property damage in Atlantic County was estimated at $1 million dollars.

December 26, 2010. This major blizzard (and, for parts of eastern New Jersey, record-breaking winter storm and blizzard) affected the state on Sunday the 26th and Monday the 27th. Snowfall averaged around two feet for the shore counties as well as Middlesex and Morris Counties in New Jersey with drifts often at

[24] https://www.weather.gov/media/phi/atlant.pdf

least twice that high. Snowfall across southwest New Jersey averaged around one foot and in northwest New Jersey around six inches. A state of emergency was declared in New Jersey. President Barack Obama approved federal disaster reimbursement related to the winter storm and blizzard in Atlantic, Burlington, Cape May, Cumberland, Mercer, Middlesex, Monmouth, Morris, Ocean and Somerset Counties. Senate President Steven Sweeney declared a State of Emergency for New Jersey on the evening of the 26th. Several county and local municipalities also declared states of emergencies or snow emergencies. A total travel ban was in effect in Atlantic County. In Atlantic County, all departures from Atlantic City International Airport were cancelled on the 26th. The Route 52 Bridge between Somers Point and Ocean City in Cape May County was closed for about 24 hours until 11 a.m. EST on the 27th. The Garden State Parkway was closed in Egg Harbor Township because of a jack-knifed tractor-trailer. The snowfall at Atlantic City International Airport was a record breaking 20.1 inches. This was a new single snowstorm record surpassing the previous record of 20.0 inches during the President's Day II snowstorm of February 16 to 17 in 2003. Other representative snowfall included 20.0 inches in Absecon, 16.5 inches in Estell Manor and 16.3 inches in Folsom; The onshore flow preceding the passage of the low pressure system caused minor tidal flooding around the time of overnight high tide. At Atlantic City, the high tide reached 6.55 feet above mean lower low water. Minor tidal flooding starts at 6.0 feet above mean lower low water.

Events, 2011-2015. While several events have occurred per year in 2011-2015, most could be characterized as fairly typical of winter weather events in this part of the country, with relatively minor impacts and insignificant snow accumulations. A notable event occurring prior to the completion of the 2016 Update was on **March 20, 2015**. This winter storm on the first day of astronomical spring dropped snow across most of New Jersey on the 20th. Snowfall averaged 3 to 7 inches from Gloucester and inland Atlantic Counties northward and two inches or less elsewhere in southern New Jersey. It was a heavy, wet snow that did knock down some weak trees and tree limbs and caused isolated power outages in central New Jersey, primarily in Burlington County. The snow also caused travel difficulties and accidents during the afternoon and evening. Speed restrictions were in place on major roadways. Some schools dismissed children early. The snow caused more than 1,150 flights to be cancelled on the 20th in the northeastern United States. One of the worst reported vehicle accidents occurred in Hamilton Township when a driver traveling westbound on the Atlantic City Expressway lost control of his vehicle and subsequently crashed into another vehicle that was stopped on the right shoulder, where the driver was out of the vehicle checking a flat tire. He was struck and thrown by the other vehicle, but survived. Representative snowfall included 3.8 inches in Hammonton, 1.6 inches in Estelle Manor, and 0.3 inches at the Atlantic City International Airport. Minor tidal flooding occurred with the high tide cycle on the evening of the 20th.

November 20, 2016. An area of low pressure near James Bay Canada led to a strong cold frontal passage across the middle Atlantic Saturday evening November 19. Northwesterly winds increased substantially immediately following the cold frontal passage, with several reports of gusts generally in the 45 to 55 mph range over New Jersey.[25]

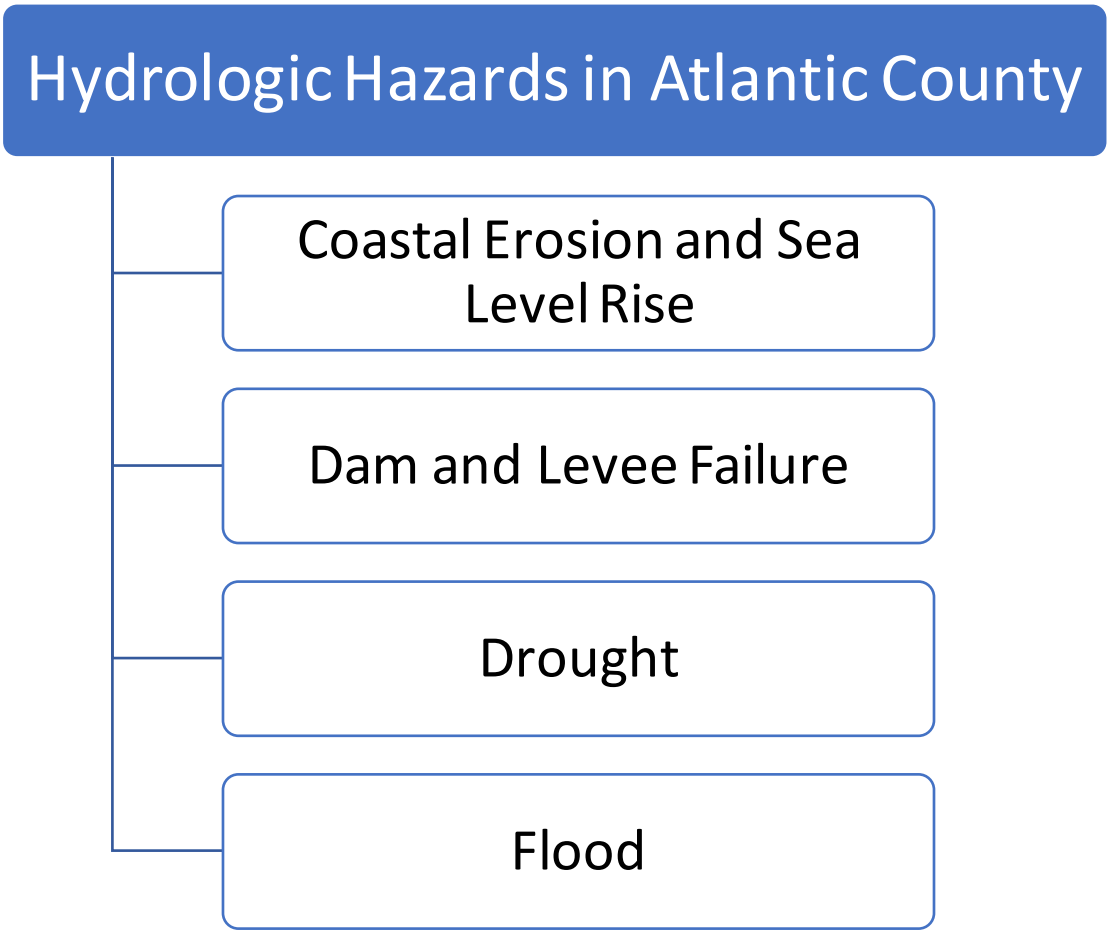
[25] Descriptions extracted from the 2019 New Jersey State Hazard Mitigation Plan.

Probability of Occurrence – Severe Winter Weather

Winter storm events will continue to have a high probability of occurrence in Atlantic County, and the probability of future occurrences in Atlantic County is certain. While the impact of snow and ice storms will cause major disruptions to transportation, commerce and electrical power as well as significant overtime work for government employees, large scale property damages and/or threats to human life and safety are not expected. Nor'easters occur less frequently but represent a much greater hazard of concern as it relates to the impacts of winter storm events (addressed separately within this section). Winter storms typically occur in New Jersey from late November through mid-April, with peak months being December through March. Nor'easters are one type of severe winter storm that typically bring high winds, coastal surge and tidal flooding along with heavy precipitation, which are addressed separately within this section.

The 2019 State Plan indicates that there is a lack of quantitative data to predict how future climate change will affect this hazard, saying, "It is likely that the number of winter weather events may decrease, and the winter weather season may shorten; however, it is also possible that the intensity of winter storms may increase. The exact effect on winter weather is still highly uncertain (Sustainable Jersey Climate Change Adaptation Task Force 2013)."

HYDROLOGIC HAZARDS



Coastal Erosion and Sea Level Rise

Location – Coastal Erosion and Sea Level Rise

All of Atlantic County's coastal jurisdictions are susceptible to the hazards of coastal erosion hazard and sea level rise. Following a review of historic shoreline data dating back to 1836 provided by the New Jersey Department of Environmental Protection (NJDEP), it is clear that Atlantic County has experienced significantly changing shorelines (moving landward and seaward) due to the effects of erosion, accretion, beach nourishment and structural shoreline protection measures.

Figure 3a.9 illustrates the type of shorelines in Atlantic County as classified by NJDEP. These include the following types: (1) beach, which includes waterfront areas comprised of 100 percent sand; (2) bulkhead, which includes manmade structures at the water's edge, after the rip-rap, which were designed to hold back water and protect the adjacent areas from erosion; (3) marsh, which is classified areas of natural marsh edge; (4) earthen dike, classified as structures which

serve as natural barriers between the land and the water; and (5) erodible, which includes any soft shoreline other than beach, rock, marsh or earthen dike, which are vulnerable at the water's edge. As can be seen in the figure, most of Atlantic County's shoreline is classified as susceptible to coastal erosion (including "beach" and "erodible" classifications). Coastal erosion in these areas, where coupled with densely developed or significant recreational shorelines, are routinely addressed through beach nourishment programs.

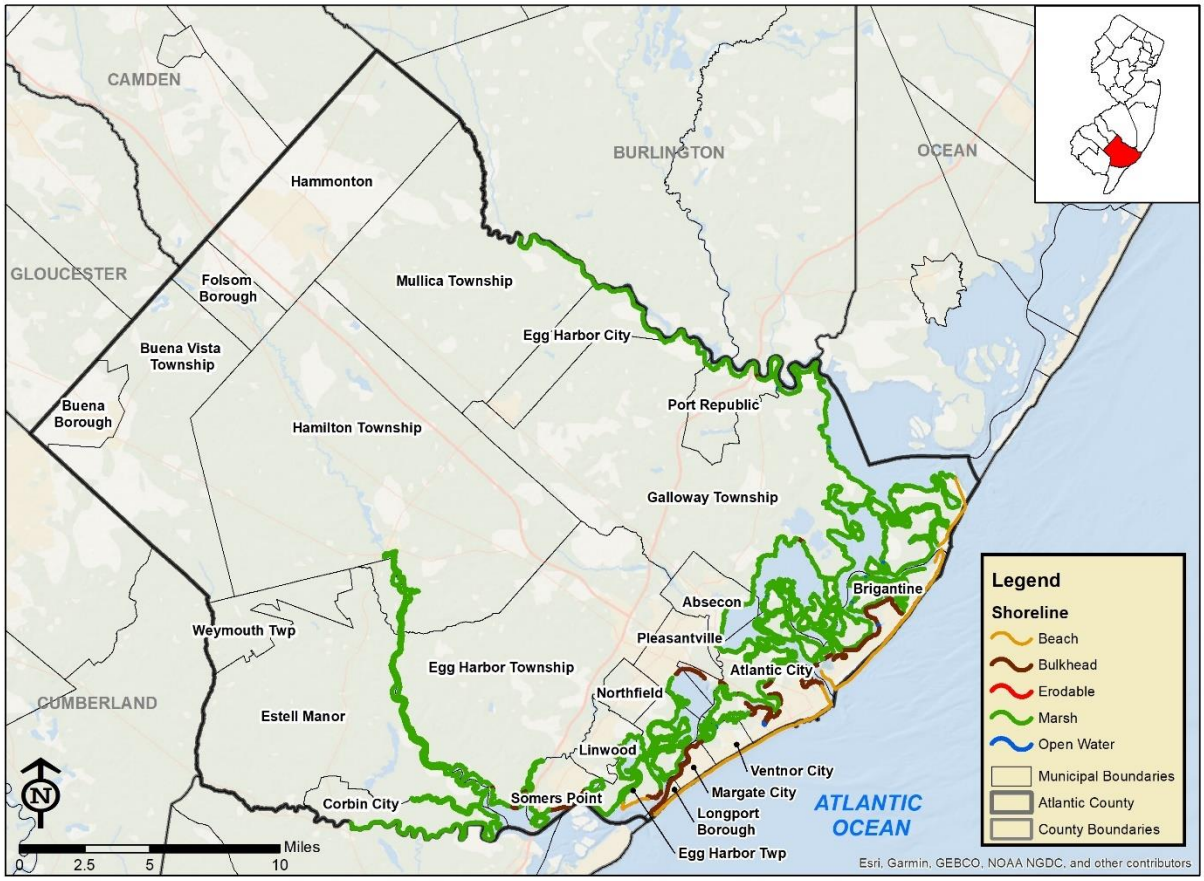
Although not shown on the countywide map figure, there are also many shoreline protection features located along the Atlantic County shore that are designed to reduce coastal storm and erosion hazards. These include hard structures such as jetties, groins, revetments, sea walls and breakwaters. Jetties and groins are protective structures (usually built from rock, wood or concrete) which extend outward from the shoreline. They look alike and provide similar function, but the difference between the two is that jetties are located at inlets, while groins are located along beaches. Sea walls are similar to bulkheads in function, but unlike bulkheads, they are located along the high beach line adjacent to the ocean, protecting property from ocean forces. Revetments are sea walls, which are surrounded on either side by rock or earth fill. A breakwater structure is a protective barrier placed in the water, out in front of a harbor. The 2019 New Jersey State Hazard Mitigation Plan summarizes the number and type of NJDEP shoreline structures off the coastline of New Jersey along the Atlantic Ocean and Inland Bays (current as of 1993). Atlantic County is reported to have 0 breakwaters, 30 groins, 3 jetties, 0 revetments, and 0 seawalls.

In addition to hard structures, some areas also feature coastal protection systems incorporating engineered dunes and beaches, which are maintained through regular scheduled maintenance and renourishment. Failure to continue these activities would result in an increased risk of damage in many areas during coastal storm events, as the levels of protection are degraded. However, local government entities within Atlantic County and the State of New Jersey have been very active in cooperating with Federal government agencies to ensure that these activities continue to be implemented and adequately maintained. These practices are encouraged and expected to continue. The State of New Jersey has completed several moderately sized shoreline restoration projects and is concentrating on cooperative projects with the ACOE to maximize utilization of its shore protection funding. The City of Brigantine received fill during April of 1997. Brigantine completed a 638,000 cubic yard maintenance of its 1997 project during the spring of 2001, assisted by FEMA disaster assistance funds from 1998, and NJ State co-sponsorship. The Absecon Island joint ACOE and NJ State project was completed during the fall of 2003, but limited thus far to the beaches of Atlantic City and Ventnor City. Margate City and Longport declined to participate in the initial project which the ACOE has named Phase I. The City of Brigantine is the location of a federally matched project originally formulated at the "Brigantine Inlet to Great Egg Harbor Inlet Shore Protection Project" to reduce the risk of damages from coastal storms. Initially constructed by ACOE in 2006, the project has received periodic renourishment in 2013 and 2018, with further renourishment scheduled for 2023, depending on the availability of funding.[26] The Brigantine portion was separated from the effort on Absecon Island to create two projects. The Brigantine project plan focuses on adding sand to the northern third of the municipal shoreline.[27]

[26] https://www.nap.usace.army.mil/Missions/Factsheets/Fact-Sheet-Article-View/Article/490777/new-jersey-shore-protection-brigantine-inlet-to-great-egg-harbor-inlet-briganti/

[27] Stockton University, http://intraweb.stockton.edu/eyos/page.cfm?siteID=149&pageID=3

Figure 3a.9
NJDEP Shoreline Classifications for Atlantic County



SOURCE: NJDEP: Shoreline Type, 1993 (with modifications by AECOM to reflect current oceanfront shoreline conditions, 2021) NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

The extent of sea level rise is measured by change in mean sea levels at fixed tide stations of the National Water Level Observation Network.

Extent – Coastal Erosion and Sea Level Rise

Coastal erosion is measured as the rate of change in the position or displacement of a riverbank or shoreline over a period of time. Short-term erosion typically results from periodic natural events, such as flooding, hurricanes, storm surge, and windstorms, but may be intensified by human activities. Long-term erosion is a result of multi-year impacts such as repetitive flooding, wave action, sea level rise, sediment loss, subsidence, and climate change. The severity of coastal erosion is typically measured through a quantitative assessment of annual shoreline change for a given beach cross-section of profile (feet or meters per year) over a long period of

time.[28] Erosion rates vary as a function of shoreline type and are influenced primarily by episodic events, but can be used in land use and hazard management to define areas of critical concern. Unfortunately, there is no uniform erosion rate database or GIS data layer that defines erosion rates or such areas of critical concern for Atlantic County's shoreline. However, NJOEM indicates that the New Jersey coast is characterized by episodic change resulting from severe but episodic storm events with a recurrence interval of 25 years or greater. Areas of natural erosion and accretion show erratic and almost cyclical patterns in response to storm events. The recovery process, although long, results in a stable beach with a slight recession of approximately one foot per year, half of which can be attributed to relative sea level rise. Erosion rates experienced along the New Jersey shore may vary significantly from location to location. According to a study prepared by the Heinz Center[29], much of the coastline of New Jersey, including Atlantic County, experiences an average of three feet of erosion per year. In addition, the 2019 State Plan states that Atlantic County experiences a maximum long-term erosion rate of -14.1 feet per year, and a maximum short-term rate of -63.3 feet per year (based on USGS data, 2011).

Recent scientific studies have shown that the tidal inlets have much greater impact on beach erosion or accretion on individual barrier islands than the steady flow of littoral currents to the south. If the sand moved south from Monmouth County toward Cape May Point in a never-ceasing stream, then Cape May Point and Cape May City would, theoretically, be buried in beach sand. The fact is, however, that both of New Jersey's southern-most communities were sand starved as major man-made structures and indirect, development-caused changes contributed to shoreline instability. In Atlantic County: Absecon Inlet is presently confined between rock jetties and cannot shift position as it once did; and Great Egg Inlet has one jetty or one shoreline armored with rocks to prevent inlet channel migration from taking more of the municipal lands adjacent to the inlet. Brigantine Inlet, however, is still in its natural state with no structures to modify the natural equilibrium.[30]

Historical Occurrences – Coastal Erosion and Sea Level Rise

The State of New Jersey has experienced eight FEMA coastal erosion related disaster declarations between 1954 and 2012[31]. Atlantic County was declared during six of these events: the December 1992, March 1998, and April 2007 coastal storms; severe storms and flooding associated with Tropical Depression Ida and a nor'easter in December 2009; Hurricane Irene in August 2011; and Superstorm Sandy in October 2012. No other county in the state has received more federal disaster declarations for coastal erosion events (though Cape May County also has been declared six times). The NJ State Plan reports 20 instances of coastal erosion affecting Atlantic County from 1936 to 2017 (see **Table 3a.14**). Six of these historic events are new as of this update.

[28] Seasonal fluctuations in beach width is common along the New Jersey shore, but is not considered erosion as the sand removed is typically re-deposited at other times of the year.
[29] "*Evaluation of Erosion Hazards*" prepared by The H. John Heinz III Center for Science, Economics and the Environment, April 2000
[30] Stockton University, http://intraweb.stockton.edu/eyos/page.cfm?siteID=149&pageID=3
[31] Source: NJSHMP (2019), Table 5.2-5

Table 3a.14
Historical Incidents of Coastal Erosion in Atlantic County[32]

Date	Associated Hazard Event Type	Federal Disaster Declaration Number[33]
March 6-8, 1962	Nor'easter	Not Available
October 28-November 4, 1991	Nor'easter	Not Declared
September 22-26, 1992	Tropical Storm Danielle	Not Declared
December 10-17, 1992	Coastal Storm	DR-973
August 8-25, 1994	Hurricane Felix	Not Declared
December 22-26, 1994	Storm	Not Declared
January 7-8, 1996	Blizzard	Not Declared
July 13, 1996	Tropical Storm Bertha	Not Declared
February 4-9, 1998	Nor'easter	DR-1206
April 16, 2007	Nor'easter	DR-1694
November 11-15, 2009	Remnants of Tropical Storm Ida (Nor'easter)	DR-1867
August 27-September 5, 2011	Hurricane Irene	DR-4021
October 29, 2011	Nor'easter	Not Declared
October 26-November 8, 2012	Superstorm Sandy	DR-4086
January 23-30, 2015	Winter Storm Juno	Not Declared
October 2, 2015	Nor'Easter	Not Declared
January 22-24, 2016	Blizzard	Not Declared
August 28-September 8, 2016	Remnants of Tropical Storm Hermine	Not Declared
March 14, 2017	Nor'Easter	Not Declared
September 5-26, 2017	Hurricane Jose	Not Declared

Descriptions of some of the *more notable events* from Table 3a.14 identified in the NJSHMP – in addition to some less extreme, more local events - include:

August 20, 1997. Very strong onshore winds coupled with torrential rain, that nearly coincided with high tide along the back bays caused moderate tidal flooding along the barrier islands of Atlantic County. Some significant erosion was observed in Atlantic City.

January 28, 1998. An intense nor'easter pounded the New Jersey Shore with tidal flooding, beach erosion, strong winds and rain. Along the ocean side, erosion took a heavy toll. In Margate 50 to 90 percent of the dunes vanished or suffered damage. In the City of Brigantine about 1,000 feet of dune fencing was lost. In the City of Ventnor City, the ramp to the beach washed away and the ocean carved huge chunks out of the dunes. Atlantic City lost about 3 feet of its beach and vertical drops of 3 to 4 feet were created in the Cities of Absecon and Brigantine.

February 4-9, 1998. The strongest nor'easter of the winter battered Coastal New Jersey, especially from Ocean County southward, with damaging winds, moderate to severe coastal flooding, extensive beach erosion, several dune breaches and heavy rain. A state of emergency was declared for all the coastal counties and both Atlantic and Cape May Counties were declared federal disaster areas. Damage statewide was estimated at about 17 million dollars and it was determined to be the worst storm to affect the area since December 1992.

[32] Source: NJSHMP (2014), Table 5.2-5 and NJSHMP (2019), Table 5.2-4
[33] Source: NJSHMP (2014) Table 5.2-6

Atlantic County suffered an estimated 3.9 million dollars in damage. Twenty-two persons from the Cities of Brigantine and Atlantic City were sheltered. Throughout the county one home and one business suffered major damage, 93 other dwellings and businesses suffered minor damage while tidal flooding affected but caused little damage to 219 others. The City of Brigantine suffered substantial flooding and beach erosion, especially at the north end of the island. About 75 percent of its sand was carried away. The boardwalk was ripped up at New Hampshire Avenue. All access roads into the city were closed on the morning of the 5th, except for the Atlantic City Expressway. The beach was described as "destroyed" in Margate City. In the Borough of Longport, the ocean met the bay from 11th through 24th Streets. The erosion caused vertical cliffs of 4 to 5 feet and streets had to be cleared of debris.

September 29, 2001. The onshore flow around a nor'easter brought minor to locally moderate tidal flooding along the New Jersey coast from the 29th through October 1st. Some beach erosion occurred. In the City of Brigantine, heavy beach erosion along the north end of the island produced cliffs that were four feet high.

September 18-19, 2003. Tropical Storm Isabel passed some way to the southeast of Atlantic County, but caused winds gusting up to 62 miles per hour in New Jersey and considerable beach erosion in Atlantic County.

October 21-25, 2004. The combination of a nearly stationary high pressure system over nearby Canada and low pressure systems over the western Atlantic produced six consecutive days of rough surf along the New Jersey shore from the 20th through the 25th Waves as large as six to eight feet were reported breaking on the shore. This produced moderate beach erosion along the coast with areas of severe erosion on Long Beach Island in Ocean County. In Atlantic County, erosion averaged between 3 and 5 feet vertically and sloped up to 100 feet wide. The worst reported damage was in the Cities of Brigantine and Atlantic City. In the City of Brigantine, an 8 foot vertical cut to the dune system occurred between Promenade and Vernon Place. In Atlantic City, damage occurred to the dune system north of Rhode Island Avenue with loss of sand fencing. Groins were exposed in the City of Margate City.

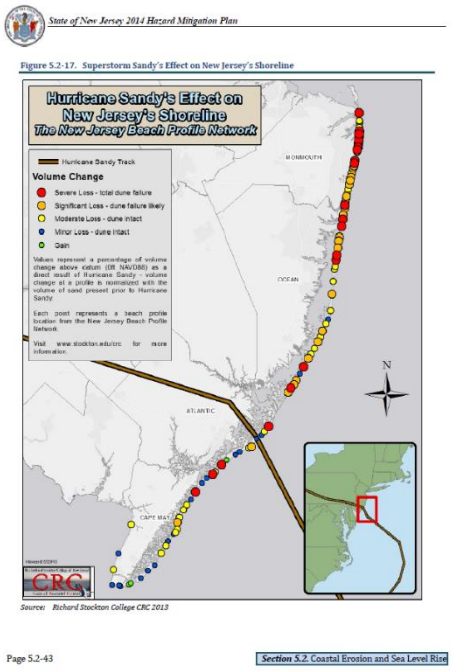
November 11-15, 2009. From November 11th through November 15th, 2009 coastal areas of New Jersey were impacted by severe storms and flooding associated with the remnants of **Tropical Storm Ida** and a Nor'easter. On December 22, 2009 a Presidentially-declared Disaster was declared for the three coastal Counties in New Jersey (FEMA DR-1867). The hardest hit counties included Atlantic, Cape May, and Ocean Counties. Only Public Assistance was made available.

August 27-September 5, 2011. Hurricane Irene produced torrential downpour rains that resulted in major flooding and a number of record breaking crests on area rivers, tropical storm force wind gusts with record breaking outages for New Jersey utilities, one confirmed tornado and a three to five foot storm surge that caused moderate to severe tidal flooding with extensive beach erosion. The average sand loss was about four to five feet high and one hundred fifty feet wide. Waves were estimated to reach as high as 12 feet as offshore seas reached 25 feet. There were numerous reports of dune fence damage and sand overwashes onto streets and boardwalks. In Atlantic County, vertical cuts averaged 1 to 4 feet, but reached 6 feet in Brigantine.

October 29, 2011. A nor'easter on October 29, 2011, caused strong winds and moderate tidal flooding. Atlantic County received less than one inch of snow during this event. However, wind gusts of 56 miles per hour were observed at the Atlantic City Marina with highest tides at 7.29 feet above mean lower low water at Atlantic City. Moderate tidal flooding starts at 7.0 feet

above mean lower low water at Atlantic City. In addition to impacts from wind and tidal flooding, this nor'easter was also a coastal erosion event in Atlantic County.

October 29, 2012. Like much of coastal New Jersey, Atlantic County's coastal communities were severely impacted by coastal erosion during Superstorm Sandy. The Richard Stockton College Coastal Research Center (CRC) researchers monitor shoreline change at 105 beach sites in Atlantic, Cape May, Monmouth, and Ocean Counties. A 25-year shoreline change analysis of each of the 105 monitoring sites was conducted to present the overall trend for each county. Richard Stockton College CRC also conducts post-storm survey and assessment of the New Jersey shoreline in response to severe beach erosion resulting from the impact of storm events. Nearly all of the 105 NJBPN sites were surveyed immediately after Superstorm Sandy to provide accurate assessments of sand volume losses to New Jersey's beaches. Figure 5.2-17 of the NYSHMP (reproduced here) illustrates the percent volume change above datum (0 feet NAVD88) as a direct result of Superstorm Sandy at each beach profile site. The volume change at each site is normalized with the volume of sand present prior to Superstorm Sandy. As this figure depicts, nearly all of these sites in Atlantic, Cape May, Monmouth, and Ocean Counties showed evidence of sand volume losses as a result of Superstorm Sandy in 2012 (Richard Stockton College CRC 2013). Dune breaches, loss and scarping of dunes, and decreased beach width and elevation occurred from southern Absecon Island's oceanfront north into Brigantine. The CRC reports[34] a total sand loss volume for Atlantic County of 845,132 cubic yards. Impacts of Sandy cited in the CRC report[35] include:



- **Green Acres Area, Brigantine**. The northern-most profile site on the Island of Brigantine is located on the undeveloped northern end of the island now in the possession of the State of New Jersey. This location was overwashed by waves from the ocean to the bay marshes by Sandy.

- **Brigantine**: Where development begins, the beach has been erosional due to the orientation difference between the physical infrastructure and the long-term changes in the shoreline. The Federal project includes a part of the natural shoreline where sand is placed to act as a feeder beach to the worst of the erosional segment. Prior to Sandy, the beach was wet to the toe of the rock revetment, so it provided little protection. During Sandy, waves crashed over the promenade and flooded Brigantine Boulevard. Dunes and a dry beach begin near the southern end of the promenade where steep scarps were in evidence going south to approximately 25th Street South. The dune-defended section did much better in stopping the storm waves except at 15th Street South where a large, multi-story building occupies the footprint of the dune. Both the 15th and 14th Street ends and the building's parking lot were overrun by waves and sand was transported into Brigantine Blvd. However, south of 15th Street South, the ever-widening beach absorbed the storm surge and the wave energy with no ill effects on any public or private property. Further south, extending to the Absecon Inlet jetty the

[34] http://intraweb.stockton.edu/eyos/coastal/content/docs/sandy/Atlantic.pdf
[35] New Jersey Beach Profile Network Report, Atlantic County, 2014. Richard Stockton College.

berm was eroded and sand pushed landward into the seaward-most part of the dune area.

- **Atlantic City**: Atlantic City has participated with a Federal beach nourishment project since 2003. The dunes were constructed to an elevation of 14.5 feet NAVD88 and were just high enough to withstand the wave run-up during Sandy. The oceanfront beach lost width and elevation, but the dunes prevented damage to the City's famous boardwalk.

- **Ventnor**: Ventnor City chose to participate in the 2002-2003 Federal beach restoration project. The Dorset Avenue site saw no serious impact from Sandy other than beach elevation loss and a narrower berm width. Further south toward Margate, the end-effect losses to the Federal project allowed waves to reach the timber bulkhead protecting the upland development and water came over the bulkhead at a variety of locations. The end effect sand losses were significant and a significant reason to complete the project as designed.

  Margate: Margate City had significant amounts of water wash over the timber in sufficient force and water volume to move sand into homes, businesses and the general infrastructure all along Atlantic Avenue. At the Benson Avenue site, a lack of consistent dunes, but a very wide beach permitted wave energy to deposit sand to the very top of the bulkhead, over it and into the street. Some spots did have "island" dunes that acted to protect from the overwash process, but in many cases the water came into the City. Sand recovered from inland was hauled back to the beach, but since the federal project has yet to start there has been no organized dune building in Margate City. The Margate City council has so far not sought inclusion in the Federal beach nourishment project because multiple oceanfront owners are strongly opposed to any dune as part of the project.

NJBPN 127 – Benson Avenue, Margate City

The photographs above were taken on April 13, 2012 (left) and November 6, 2012 (right). The relatively robust berm was cut down and pushed landward as a substantial deposit that included Benson Avenue and environs. The work was underway to excavate the sand at the sea-side of the bulkhead to keep water from simply running over it.

Photo courtesy of Richard Stockton College Coastal Research Center, Beach-Dune Performance Assessment of New Jersey Beach Profile Network (NJBPN) Sites at Atlantic County, New Jersey, After Hurricane Sandy Related to FEMA Disaster DR-NJ-4086.

- **Longport**: The damage incurred in Longport during Superstorm Sandy has convinced the community to seek inclusion in the Federal beach nourishment project to continue the work south from Ventnor. The southern community has an old concrete seawall protecting some of the development with a narrow, low elevation beach seaward. Waves crashed into the wall and poured over it down most of the Borough streets into Atlantic Avenue. Since the homes are very close to the wall, house damage was evident as well.

Sea level rise is a continuous event that does not have discrete occurrences. According to the 2019 New Jersey State Hazard Mitigation Plan, the sea level rose on average 4.1 millimeters annually between 1911 and 2016 in Atlantic City, a trend of 1.3 feet per century.[36]

Probability of Occurrence – Coastal Erosion and Sea Level Rise

Coastal erosion remains a natural, dynamic and continuous process for Atlantic County's coastal jurisdictions and its probability of occurrence is certain. The damaging impacts of coastal erosion are lessened through continuous (and costly) beach nourishment and structural shoreline protection measures; however, it is likely that the impacts of coastal erosion will increase in severity due to future episodic storm events as well as the anticipated slow onset, long-term effects of climate change and sea level rise. The frequency and intensity of coastal storms and severe weather events is expected to increase in the future due to climate change. In the years to come, it is anticipated that Atlantic County will observe drastic changes in storm character, intensity, frequency, and storm tracking. Hurricanes are likely to become more intense with rising sea water temperatures. Coastal erosion rates are likely to increase with rising sea-level, to levels higher than those rates that have been observed over the last century. Storm effects will be more extensive in the future. The following types of impacts can be anticipated in Atlantic County's future as a result of climate change and sea level rise: inundation of low-lying areas; increased frequency and extent of storm-related flooding; wetland loss; saltwater intrusion into estuaries and freshwater aquifers; land loss through submergence and erosion of lands in coastal areas; migration of coastal landforms and habitats; increased salinity in estuaries and coastal fresh; impacts to human populations (property losses, more frequent flood damage, more frequent flooding of roadways and urban centers, risks to people as the population of coastal areas increases); more buildings and infrastructure exposed; currently exposed buildings and infrastructure could be subject to potentially greater losses as water levels increase, and continued rapid coastal development exacerbates the impacts of sea level rise; impacts on gravity flow stormwater systems; impacts on non-coastal areas. Impacts of climate change and sea level rise can affect all parts of a community, including: transportation infrastructure (ports, marinas, airports, roads, bridges, railways); public infrastructure (stormwater and wastewater management systems, drinking water supply and distribution systems, power utility systems, communications systems); public facilities (i.e., police, fire, ambulance, hospitals, schools, daycare centers, adult living facilities, historic landmarks, government buildings, libraries, parks, etc.); economic viability of a community – particularly for communities where tourism tends to drive local economies, as is the case in many of Atlantic County's coastal communities. Climate change and sea level rise could lead to a potential loss of assets that support tourism (i.e., beaches themselves as well beach access points, lodging, restaurants, marinas, fishing habitats, ecotourism, etc.).

Sea level rise is a continuous event that does not have discrete occurrences. The 2019 New Jersey State Hazard Mitigation Plan references the Rutgers University report titled Assessing New Jersey's Exposure to Sea-Level Rise and Coastal Storms: Report of the New Jersey Climate Adaptation Alliance Science and Technical Advisory Panel (STAP), 2016, to project and local and regional sea level rise in New Jersey. Local and regional sea level rise projections in New Jersey,

[36] Table 5.2-3 Mean Sea Level Rise Trends, 2019 SHMCAP

as identified in the 2019 SHMCAP are provided in **Table 3a.13**. It should be noted that many future sea level rise projections are not linear; that is they do not follow a trajectory with a constant gradient, but instead show the rate of sea level rise increasing over time.

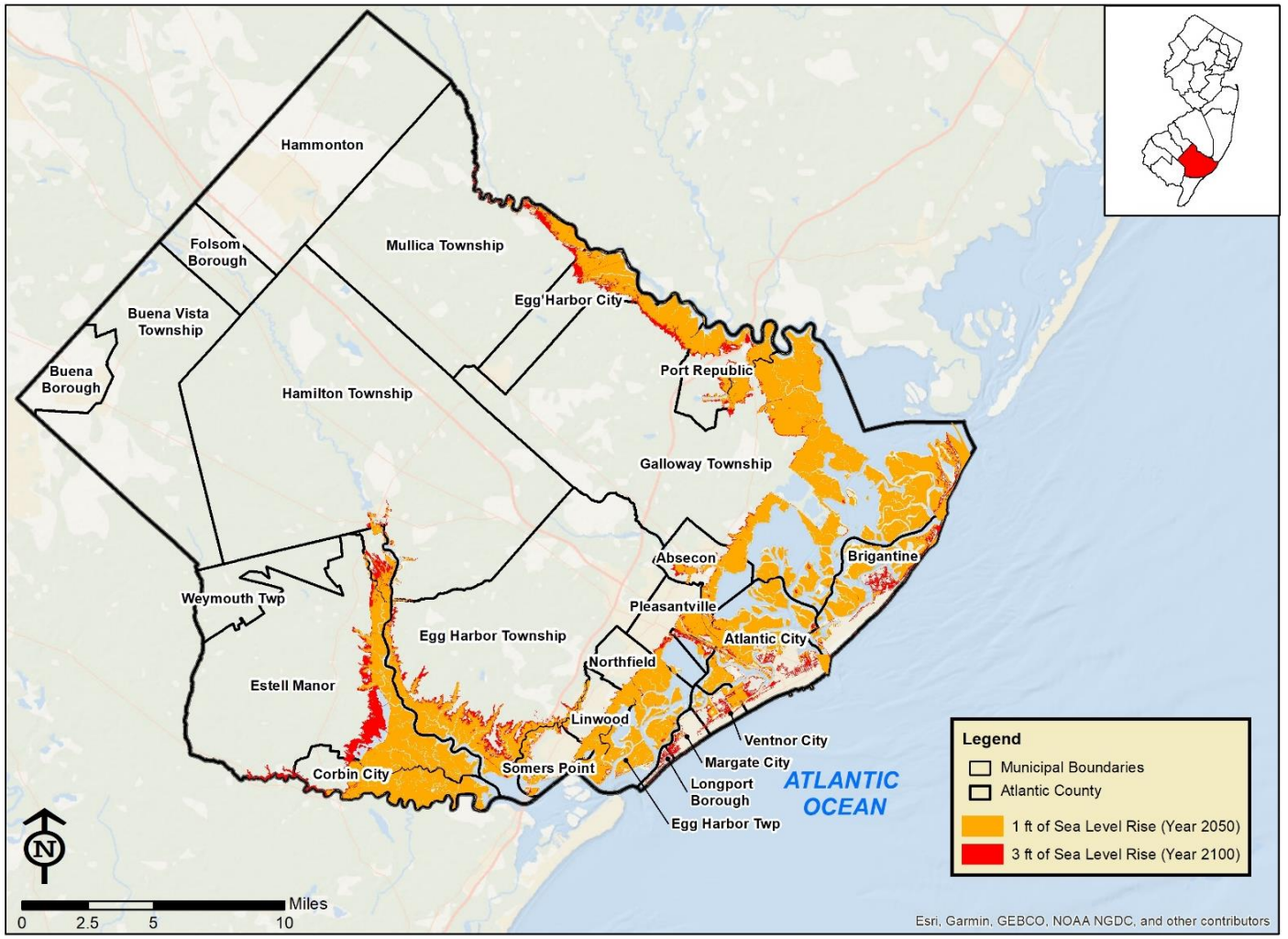
Table 3a.13
Projected Sea Level Rise for New Jersey

Year	Central Estimate	Likely Range	1-in-20 Change	1-in-200 Chance	1-in-1,000 Change
	50% probability SLR meets or exceeds	67% probability SLR is between	5% probability SLR meets or exceeds	0.5% probability SLR meets or exceeds	0.1% probability SLR meets or exceeds
2030	0.8 ft	0.6-1.0 ft	1.1 ft	1.3 ft	1.5 ft
2050	1.4 ft	1.0-1.8 ft	2.0 ft	2.4 ft	2.8 ft
2100 Low Emissions	2.3 ft	1.7-3.1 ft	3.8 ft	5.9 ft	8.3 ft
2100 High Emissions	3.4 ft	2.4-4.5 ft	5.3 ft	7.2 ft	10.0 ft

While the obvious impact of sea level rise is the permanent loss of land for human habitation, economic activity, and ecosystem conservation, even small amounts of sea level rise may significantly increase the annual probability that periodic coastal flooding events reach damaging or critical elevations.

Figure 3a.10 shows the areas potentially inundated by two future seal level rise scenarios taken from the Rutgers STAP Report and recommended by the 2019 State Plan for the assessment of future vulnerability to sea level rise: These two scenarios project one foot of sea level rise occurring by 2050 and three feet of sea level rise by 2100.

Figure 3a.10
Inundation from Projected Sea Level Rise



SOURCE: 1 ft (2050) and 3 ft (2100) Sea Level Rise Mapping provided by NOAA Sea Level Rise Viewer, https://coast.noaa.gov/digitalcoast/tools/slr.html and Kopp, R.E, et al, 2016.
NJGIN: County Boundary, 2021; Municipal Boundary, 2021.
Basemap: ESRI Ocean/World Ocean Basemap

Dam and Levee Failure

Location – Dam and Levee Failure

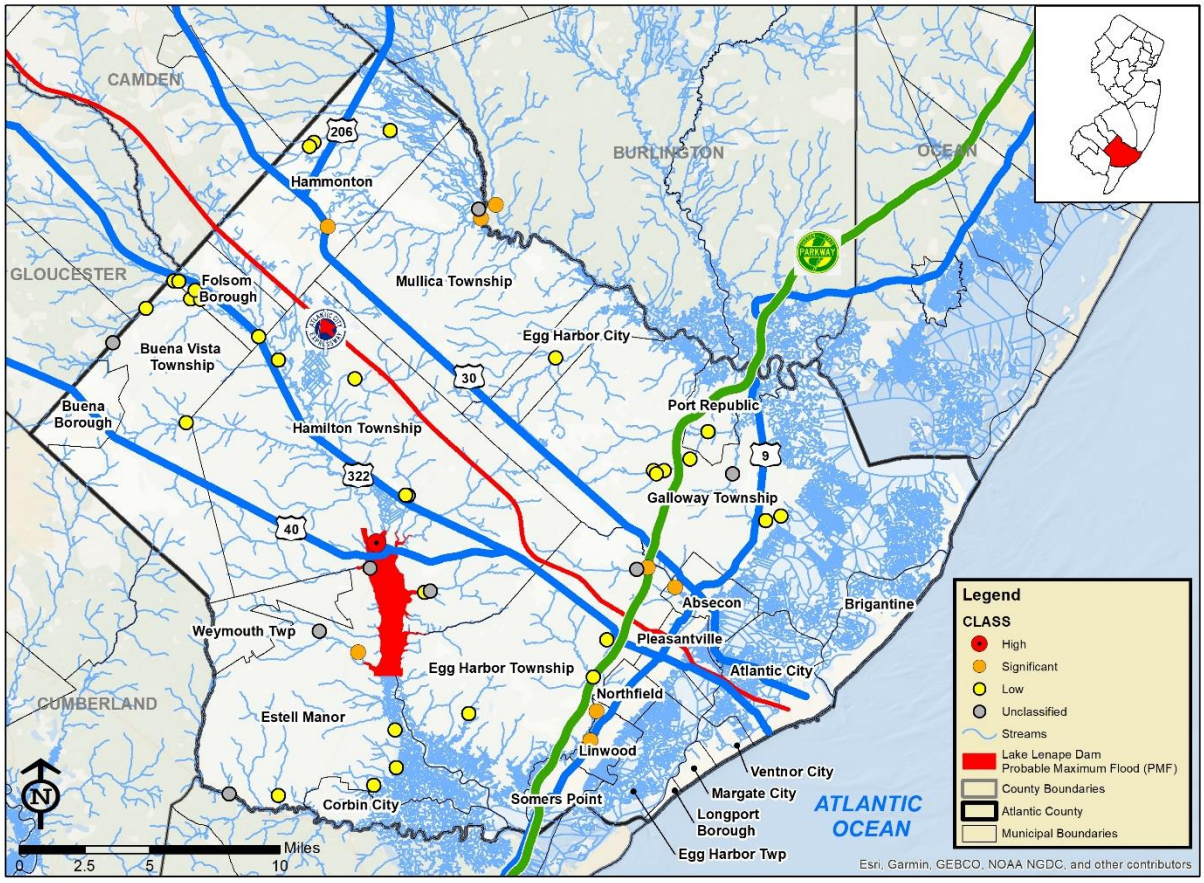
A dam is an artificial barrier that has the ability to store water or wastewater for many reasons, including flood control, water supply, irrigation, and energy generation. The New Jersey Department of Environmental Protection has identified and classified 48 dams[37] in Atlantic County. Of these, one dam has been classified as having "high hazard potential," meaning that its failure may cause the probable loss of life or extensive property damage. Another seven dams have been classified as having "significant hazard potential," meaning their failure may cause significant damage to property and project operation, but loss of human life is not envisioned. This classification applies to predominantly rural, agricultural areas, where dam failure may damage isolated homes, major highways or railroads or cause interruption of service of relatively important public utilities. Thirty dams are classified as "low hazard potential" meaning their failure would cause loss of the dam itself but little or no additional damage to other property. The remaining ten dams are unclassified. It is important to note that dam hazard classifications are based on the consequences of dam failure—not the condition, probability or risk of failure itself. Specific locations for all state-regulated dams that have been geo-referenced for mapping purposes are illustrated in **Figure 3a.11**. This figure also shows the Probable Maximum Flood delineation for the Lake Lenape Dam. Of the eight "high" or "significant" hazard dams in Atlantic County, only one has been classified by USGS as a "major" dam and represents the most significant hazard risk based on the potential consequences of a dam failure. Major dams are described as 50 feet or more in height, or with a normal storage capacity of 5,000 acre-feet or more, or with a maximum storage capacity of 25,000 acre-feet or more. In Atlantic County, this includes the Lake Lenape Dam along the Great Egg Harbor River (located in, and owned by, Hamilton Township).

Levees are human-made structures designed to contain, control, or divert the flow of water in order to provide protection from temporary flooding.[38] There are no significant levees recorded in Atlantic County.

[37] As defined in NJAC 7:20 (Dam Safety Standards), "Dam" means any artificial dike, levee or other barrier, together with appurtenant works, which is constructed for the purpose of impounding water on a permanent or temporary basis, that raises the water level five feet or more above the usual, mean, low water height when measured from the downstream toe-of-dam to the emergency spillway crest or, in the absence of an emergency spillway, the top-of dam.

[38] State of New Jersey Office of Emergency Management, New Jersey State Hazard Mitigation Plan, 2019.

Figure 3a.11
State-Regulated Dams in Atlantic County



SOURCE: US Army Corps of Engineers National Inventory of Dams (NID), 2021; Stanford University National Performance of Dams Database (NPDP), 2021; NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

Extent – Dam and Levee Failure

The extent or magnitude of a dam failure event can be measured in terms of the classification of the dam.

The NJDEP assigns one of four hazard classifications to state-regulated dams in New Jersey. The classifications relate to the potential for property damage and/or loss of life in the event of a dam failure:

- Class I (High-Hazard Potential) - Failure of the dam may result in probable loss of life and/or extensive property damage.
- Class II (Significant-Hazard Potential) - Failure of the dam may result in significant property damage; however, loss of life is not envisioned.
- Class III (Low-Hazard Potential) - Failure of the dam is not expected to result in loss of life and/or significant property damage.
- Class IV (Small-Dam Low-Hazard Potential) - Failure of the dam is not expected to result in loss of life or significant property damage.

Table 3a.15 lists information for all state-regulated dams in Atlantic County reported as having high (H) hazard potential or significant (S) hazard potential (a total of 8 dams, 1 being classified as high hazard potential and 7 being classified as significant hazard potential). The County's high hazard dam – Lake Lenape Dam – is also listed as a "major" dam in the USGS National Inventory of Dams (NID).

Table 3a.15
State-Regulated Dams with High or Significant Hazard Potential

Dam Name	Hazard Potential	Jurisdiction	River/Stream	Dam Storage (acre-feet)	Owner(s)
Lake Lenape Dam*	H	Hamilton Township	Great Egg Harbor River	6610	Hamilton Township
Doughty Pond Dam	S	Absecon City	Absecon Creek	2400	Atlantic City M.U.A.
Bargaintown Mill Pond Dam	S	Egg Harbor Township	Patcong Creek	123	Atlantic County
Kuehnle Pond Dam	S	Egg Harbor Township	South Branch Absecon Creek	2100	Atlantic City M.U.A.
Stephen Lake Dam	S	Estell Manor City	Stephen Creek	130	Lenape Game Preserve & Breeding Assoc.
Hammonton Lake Dam	S	Hammonton Town	Hammonton Creek	426	NJDOT
Off's Pond Dam	S	Linwood City	Patcong Creek tributary	N/A	Brighton Farms Corp.
Pleasant Mills Dam	S	Mullica Township	Hammonton Creek	160	Nescochague Lake Assoc. Inc.

Source: New Jersey Department of Environmental Protection, Bureau of Dam Safety and Flood Control
* Dam also listed as a "major" dam in the USGS National Inventory of Dams (NID). Major dams are described as 50 feet or more in height, or with a normal storage capacity of 5,000 acre-feet or more, or with a maximum storage capacity of 25,000 acre-feet or more.

Historical Occurrences – Dam and Levee Failure

According to NJDEP's Bureau of Dam Safety and Flood Control, New Jersey has not experienced any historic major dam failures but there have been an increasing number of small dam failures. This is largely attributed to the lack of maintenance and inspection of the small dams, as well as the fact that many of the dams in the state are nearing the end of their design life. At the time the initial plan was prepared, local sources on the CPG reported concerns regarding a series of lakes and dams on the campus of the Richard Stockton College of New Jersey, in the Township of Galloway. The lower dam (Lake Fred Dam) forms the main impoundment of the lakes. Constructed in the 1930's, the Lake Fred Dam is an earth fill embankment approximately 850 feet long, 12-feet wide and 10 feet high. On August 20, 1997, the entire length of the earth fill dam was overtopped from a 100-year storm due to the apparent failure of the main spillway to control the volume of water. At that time a hole was scoured under the bottom of the main spillway, water overtopped the majority of the dam's crest causing erosion along the dam's downstream slope of the embankment, and sections of the earth fill dam along the spillway were undermined causing subsidence (sinkholes) in the dam's crest. Downstream areas of concern for the flooding were the Evergreen Woods Lakefront Resort Campground and the Garden State Parkway. After the incident, the rehabilitation of the Lake Fred Dam was managed by the State of New Jersey, Division of Property Management and Construction in coordination with the requirements of the

New Jersey Department of Environmental Protection, Bureau of Dam Safety & Flood Control. Rehabilitation included: a new spillway, with sluice gate, designed to manage the additional volume of water generated by a 100-year storm and prevent overtopping of the dam, and articulated concrete block on the downstream slope of the embankment designed to prevent erosion if overtopping should occur. These design elements of the rehabilitation effort have minimized concerns associated with the Lake Fred Dam, which is currently classified by the Bureau of Dam Safety & Flood Control as a Class III structure (Low Hazard Potential – those dams the failure of which will cause loss of the dam itself but little or no additional damage to other property. Failure may result in the damage of farm buildings, agricultural lands and non-major roads). There have not been any dam failures in Atlantic County since the 2016 Update.

There are no levees recorded in Atlantic County, and subsequently there are no recorded instances of historic levee failures.

Probability of Occurrence – Dam and Levee Failure

The probability of a dam failure occurrence in Atlantic County is relatively low due to routine inspection, repair and maintenance programs, though the possibility of a future failure event is likely increasing due to aging dam structures that may be in need of repair or reconstruction. The NJDEP's Dam Safety program serves to ensure the safety and integrity of dams in New Jersey and, thereby, protect people and property from the consequences of dam failures.

Drought

Location – Drought

Droughts occur in all parts of the country and at any time of year, depending on temperature and precipitation over time. Similarly, droughts can occur in all parts of Atlantic County at any time of year, depending on temperature and precipitation over time. While arid regions of the United States are more susceptible to long-term or extreme drought conditions, other areas such as Atlantic County tend to be more susceptible to short-term, less severe droughts. It is impossible to delineate a drought hazard area for the County, per se, but it is generally assumed that drought is a county-wide hazard, with drought conditions being possible in all geographic areas.

Extent – Drought

The extent (i.e., magnitude or severity) of drought can depend on the duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. The intensity of the impact from drought could be minor to extreme damage in a localized area or regional damage affecting human health and the economy. Generally, impacts of drought evolve gradually, and regions of maximum intensity change with time. The severity of a drought is determined by areal extent as well as intensity and duration. The frequency of a drought is determined by analyzing the intensity for a given duration, which allows determination of the probability or percent chance of a more severe event occurring in a given mean return period.

The Palmer Drought Severity Index (PDSI) is one of many available drought indices used to assess the extent of a drought event. It was developed by Wayne Palmer in 1965 and indicates prolonged and abnormal moisture deficiency or excess. The PDSI tends to be used more commonly than other available indices, and is an important tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. PDSI drought classifications are based on observed drought conditions and will range from -0.5 (incipient dry spell) to -4.0 (extreme drought). The PDSI also reflects excess precipitation using positive numbers. The PDSI is the most effective in determining long-term droughts; but has limitations in terms of use for short-term forecasts. To improve monitoring and measurement of drought severity from region to region within the State of New Jersey, NJDEP implemented a unique set of indices in January 2001 specifically designed for the particular characteristics and needs of the State. This new set of statewide indicators supplements the Palmer Drought Severity Index (PDSI) with the measurement of regional precipitation, streamflow, reservoir levels, and groundwater levels. New Jersey currently measures the status of each indicator as near or above normal, moderately dry, severely dry, or extremely dry. The status is based on a statistical analysis of historical values with generally the driest 10 percent being classified as extremely dry, from 10 percent to 30 percent as severely dry, and 30 percent to 50 percent as moderately dry.

Historical Occurrences – Drought

Drought is continuous event that does not always have a discrete start and end time. According to NCEI database[39], drought conditions have affected Atlantic County for 38 months between June 1997 and May 2021, occurring in eight years. No deaths, injuries, property, or crop damages are recorded in the NCEI database. No events have been recorded since the last version of the plan was prepared in 2016. A sampling of *more notable* historical events includes:

> **July 1998 – December 1998**. July 1998 started a run of drier than normal weather across New Jersey. The unseasonably dry weather forced the NJDEP to issue a severe forest fire warning for southern New Jersey, and on December 14th the NJDEP declared a drought warning for the entire state. Agriculture was significantly affected, with grain farmers in particular suffering serious losses of corn and late season crops. For most of the state the precipitation was around 2.5 inches below normal. July through December 1998 was the second driest six-month period ever in the state of New Jersey: the average statewide precipitation total of 12.04 inches was only 52 percent of normal. The only drier six-month period previously recorded was November 1984 through April 1985 when a statewide average of 11.92 inches of precipitation fell. Statewide precipitation records have been kept in New Jersey since 1895.
>
> **June 1999 – September 1999**. Unseasonably dry weather that had begun in May 1999 intensified, and on July 19th the Governor declared a water shortage alert and called for residents to voluntarily conserve water by not watering lawns or washing cars. On August 5th this was raised to a drought emergency, with mandatory water restrictions. Farmers in New Jersey felt a double pinch: irrigation, if possible, was driving up the costs of farming. Meanwhile, ideal growing conditions elsewhere in the country kept crop prices low. If possible, irrigation was occurring everywhere. Irrigation ponds were drying out and well permits were being issued. Irrigated corn fields were in fair condition, most corn was in poor condition. Low yields and nutrient content were expected with many fields already lost. Livestock feed crops were at a near-total loss and many farmers had to borrow money to buy food for their cattle into 2000. Soybean crops (normally not irrigated) were in fair to poor condition. The second hay

[39] Data current as of May 2021.

cutting was poor at best. No third cutting of alfalfa was possible. Pasture conditions were in poor condition. Supplemental feeding, some that is normally saved for the winter, was occurring. The hot weather also cut back milk production by about 20 percent. Sun damage was reported to pepper and tomato crops. Overall crop losses in the State of New Jersey were estimated at exceeding $80 million dollars. On August 10th, the Secretary of Agriculture declared 19 counties in New Jersey a drought disaster. This made farmers in those counties and adjacent ones eligible for low interest loans of up to $500,000. Farmers eligible for help must have lost at least 30 percent of their crops, have adequate security, been turned down by two banks, and be able to repay the loan. The Agriculture Department also provided $20 million in grants to provide emergency services to low income migrant and seasonal farm workers in declared areas.

October 2001 – September 2002. October 2001 was an unseasonably dry month across the state of New Jersey. The ongoing dry weather prompted the state Environmental Protection Commissioner to issue a drought watch for the entire state on October 30th. The declaration called on residents to voluntarily conserve water. The NJDEP upgraded the drought watch to a drought warning for counties in southern New Jersey on November 21st. It was also the driest meteorological winter on record at the Atlantic City International Airport as only 4.66 inches of precipitation fell. By the time near-normal precipitation returned in September 2002, it was estimated that the drought will cost farmers about $125 million in revenue. The corn harvest was expected to be down 25 percent and the soybean harvest down 30 percent. Revenue drops in some areas were over 50 percent. Field crops such as hay, wheat, sorghum, soybeans and corn for animal feed were hardest hit because they are not irrigated. *USA Today* reported that in New Jersey "crop damage is widespread, varying from a total loss to expected drops in yield of 20 to 50 percent depending on the crop, when it was planted and farm location."

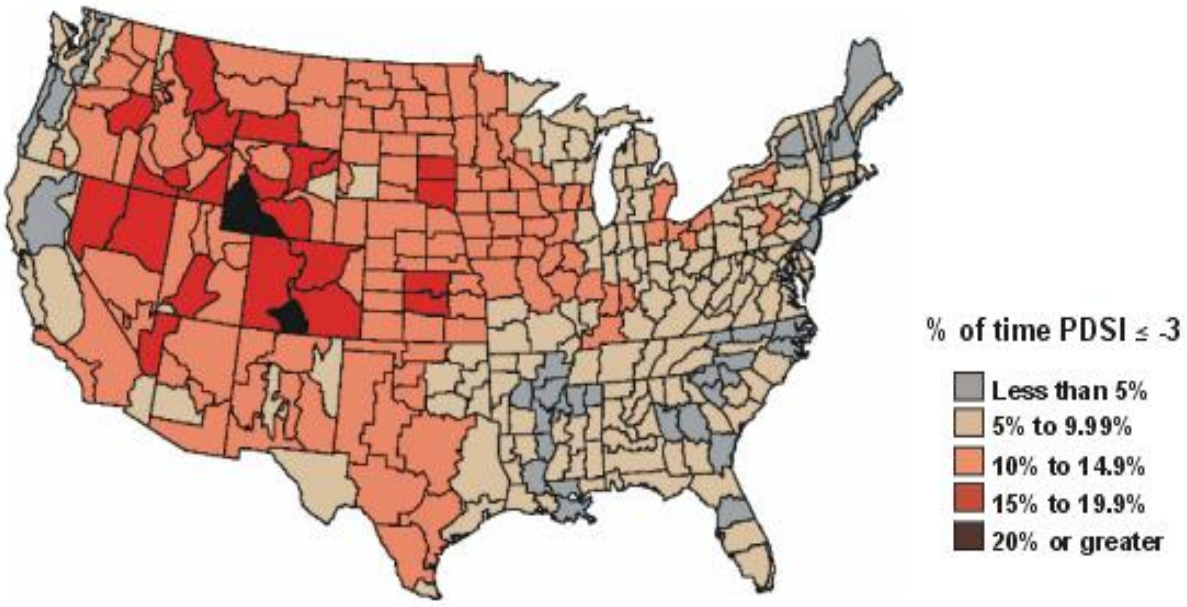
September 2010 – October 2010. The hot and dry summer taxed reservoir stream and groundwater levels. Shallow groundwater (private) wells were also starting to show stress. The NJDEP issued a state-wide drought watch on September 8th. All residents were asked to voluntarily conserve water. September was another unseasonably warm month in New Jersey. Statewide it was the 4th warmest September on record since 1895 with an average temperature of 69.2 degrees. Because of the heavy rain on the last day of the month, September averaged closer to normal rainfall. It was the 7th warmest (71.0 degrees) September on record at the Atlantic City International Airport and the warm season as a whole established a new record for the number of days that the maximum temperature reached or exceeded 90 degrees (46 days). The wet weather on September 30th and October 1st started to recharge water supplies in the State of New Jersey. On October 26th, the New Jersey Department of Environmental Protection cancelled the drought watch for most of the state, except for Monmouth and Ocean Counties. Despite improvements elsewhere, conditions in those counties showed that the combination of reservoir storage remained below the long-term average and severely dry and shallow ground water levels were still occurring. The summer drought took its toll on New Jersey farmers and the United States Secretary of Agriculture declared all counties in southern, central and northwest New Jersey natural disaster areas in November. The declaration made farm operators eligible for assistance from the Farm Service Agency. The assistance included low interest loans which could cover up to 100 percent of the dollar value of the crop losses. The statewide October monthly precipitation average for New Jersey was 4.88 inches, about one hundred forty percent of normal and 1.37 inches wetter than average.

New Jersey has not experienced significant drought events since the February 2016 Update.

Probability of Occurrence – Drought

Atlantic County faces a low to moderate probability of severe drought conditions, though short-term instances of drought will be a more frequent occurrence. **Figure 3a.12** shows the PDSI Summary Map for the United States from 1895 to 1995. According to the PDSI map, Atlantic County is in a zone that experienced severe drought conditions less than 5 percent of the time between 1895 and 1995, but short-term, less severe drought conditions are more common and may occur several times in a decade.

Figure 3a.12
Palmer Drought Severity Index Summary Map for the United States



Source: National Drought Mitigation Center, 1895-1995

Flood

Flood hazards profiled in this section include the following:

- Riverine Flooding
- Coastal Flooding and Storm Surge
- Tsunami
- Wave Action

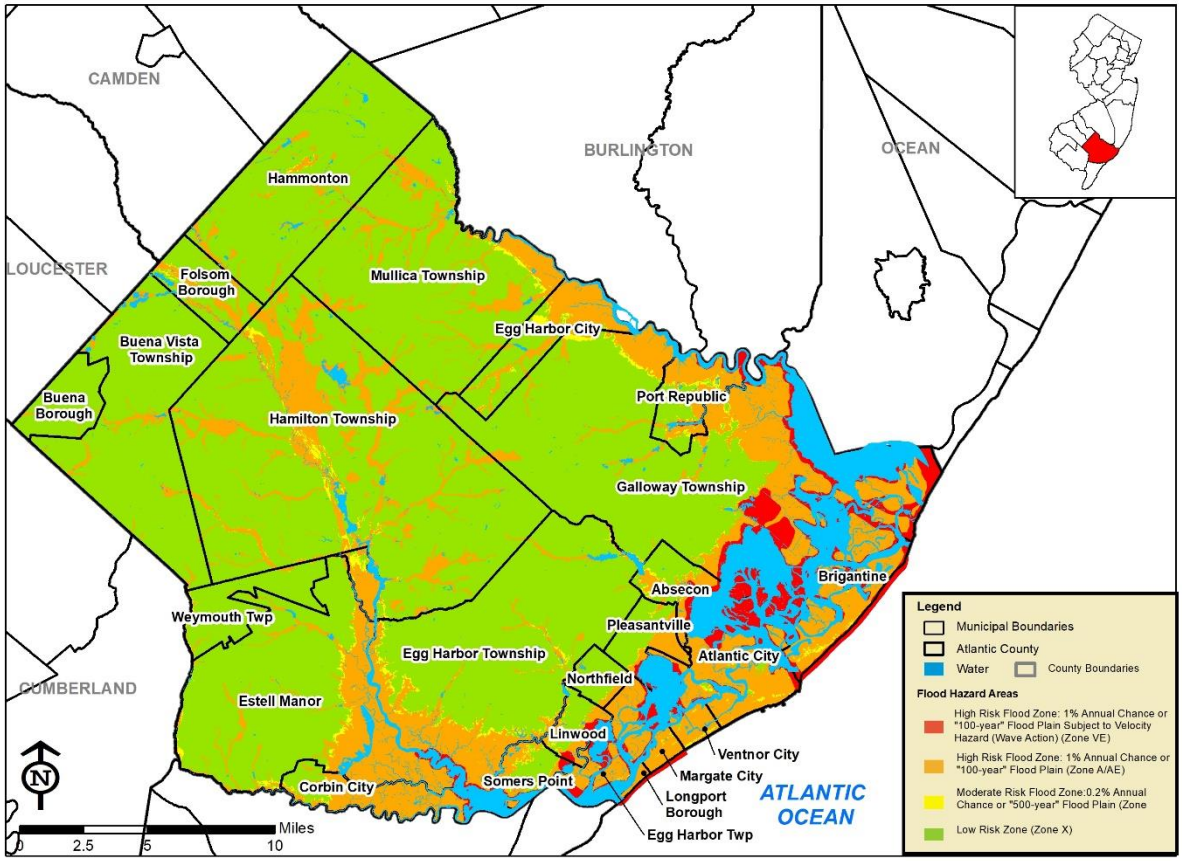
Location – Riverine Flooding

Riverine flooding occurs along inland channels such as rivers, creeks, streams. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas. Many areas of Atlantic County are susceptible to riverine and urban (stormwater) flooding, and its coastal jurisdictions are also very susceptible to tidal and coastal flooding due to coastal storm events including storm surge.[40] It is estimated that nearly 27 percent of lands within Atlantic County are located in the 100-year floodplain. **Figure 3a.13** illustrates the location and extent of currently mapped special flood hazard areas for Atlantic County based on FEMA's 2021 Digital Flood Insurance Rate Maps (DFIRMs) where available, and Preliminary FIRM data in the remaining areas. This includes Zones A/AE (100-year floodplain), Zone VE (100-year coastal flood zones, associated with wave action) and Zone X500 (500-year floodplain). It is important to note that while FEMA digital flood data is recognized as best available data for planning purposes, it does not always reflect the most accurate and up-to-date flood risk. Flooding and flood-related losses often do occur outside of delineated special flood hazard areas – particularly in areas that were not included in detailed study areas.

The FEMA Flood Insurance Study (FIS)[41] notes that along the Atlantic Ocean, most of the shoreline is sandy with a variable height sand dune and characterized by high-density residential areas. The bay sides of the barrier islands are a mix of low-lying marsh, armored shoreline and residential areas. For example, bulkheads have been constructed along mainland shorelines in Egg Harbor Township, Somers Point, Pleasantville, Galloway, and Port Republic; and along barrier island back-bay areas in Longport, Margate, Ventnor, Atlantic City, and Brigantine.[42] The inland shoreline is primarily low-lying with a mix of residential areas and marsh.

[40] Storm surge is addressed as a separate hazard within this section.
[41] FEMA FIS for Atlantic County, NJ. August 2018.
[42] Source: NJDEP Shoreline Type, 1993. See Figure 3a.9.

Figure 3a.13
Special Flood Hazard Areas in Atlantic County



SOURCE: FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, where available; Preliminary FIRM Data 2014 for areas not currently included in 2021 DFIRM: Atlantic City, Corbin City, Egg Harbor City, Estell Manor, Galloway Township, Northfield, Pleasantville, Port Republic, Somers Point, Ventnor City. NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

The flooding portion of this hazard mitigation plan was revised during the first update to reflect changes between the Q3 mapping and 2014 Preliminary DFIRMs.[43] As part of the 2014 update, the FIS notes that updated coastal storm surge and wave height analyses were performed for the entirety of the shoreline within Atlantic County. In addition, floodplains for all riverine flooding sources studied by detailed methods in the county were redelineated using updated topographic data provided to FEMA by USGS and NJDEP. Flood hazard areas previously assessed by approximate methods were reanalyzed throughout the county, with results mapped using the updated topographic data mentioned above. Base map information for the 2014 Preliminary FIRMs was developed from high-resolution orthophotography provided by the State of New Jersey.[44] As noted in the footnote to Figure 3a.13, this plan update made use of the latest Digital Flood Insurance Rate Map (DFIRM) data where available, and the 2014 Preliminary FIRM data in remaining parts of the County.

[43] The projection used for the production of this FIRM is New Jersey State Plane (FIPS 2900) zone. The horizontal datum was NAD 83, GRS80 spheroid. Differences in the datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM.

[44] This information was derived from digital orthophotos produced at a scale of 1:2,400 with a 1-foot pixel resolution from photography dated 2012.

Extent – Flooding

In the case of riverine flood hazard, once a river reaches flood stage, the flood extent or severity categories used by the NWS include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat:

- Minor Flooding - minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding - some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations. (NWS 2011)

The extent of flooding associated with a 1 percent annual probability of occurrence (the base flood or 100-year flood, **Figure 3a.13** for Atlantic County) is used as the regulatory boundary by many agencies. Also referred to as the SFHA, this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water-surface elevations describe the water elevation resulting from a given discharge level, which is one of the most important factors used in estimating flood damage.

Historical Occurrences – Flood

Flooding is the most common major natural hazard in New Jersey. The FIS notes that most serious tidal flooding problems are attributed to hurricanes, which occur during the late summer and early autumn. In addition to heavy precipitation, hurricanes produce high tides and strong waves, which can result in severe damage to coastal areas. Although extratropical cyclones, referred to as northeasters, can develop at almost any time of the year, they are more likely to occur during the winter and spring. Thunderstorms are a common occurrence during the summer months.

According to the NCEI database, 127 recorded flood days (coastal flood, flash flood, and flood) have occurred in Atlantic County between January 1996 and May 2021. These events have resulted in more than $357 million in property damages ($250 million of this is recorded from Superstorm Sandy alone). A sampling of *more recent, notable events* includes the following:

> **August 20, 1997.** A series of thunderstorms moved across eastern parts of Atlantic County causing torrential rain over several hours. Atlantic County bore the brunt of the storm and the flooding with storm totals in excess of 8 inches from Estell Manor through Galloway Township. The storm total at the Atlantic City International Airport of 13.52 inches represented by far a greater than 100-year storm for the area. A 100-year-storm for this area is 7.25 inches. Several major roadways and bridges collapsed or were completely washed out. The governor declared a state of emergency for the county on the 21st and the county was eventually declared a federal disaster area. In Galloway Township, the hardest hit area, about 1,100 homes suffered damage. This represented about 10 percent of all the township housing. The most damage occurred in the Pomona Oaks Development as 75 homes were badly flooded when a drainage pond filled and backed up. The Osprey Court Development was also badly flooded. The Atlantic City Medical Center was closed to emergencies when its first floor and basement were

flooded. Emergency personnel pumped out 1.8 million gallons of water from the center. The adjacent Bacharach Rehabilitation Center was also flooded. Flooding also damaged the Absegami High School and several facilities at the Richard Stockton College. The Atlantic City International Airport was closed at 1230 a.m. on the 21st when power was knocked out to the runways and street flooding closed access to the airport. The airport reopened at 1130 a.m. on the 21st, but had to shut down again at sunset as the runway lights were still not working. The FAA Technical Center was also closed. In Hamilton Township, three major bridges were closed: the Sugar Hill Bridge on County Road 559, the Gravelly Run Bridge (County Road 559 also) on Ocean Heights Avenue and the bridge between the Lake Lenape Dam and the Great Harbor River. Persons in homes near these bridges were evacuated to a senior citizen center. Working around the clock, the Sugar Hill Bridge was repaired in time for the Labor Day Weekend. The two other bridges were repaired by late September. Two New Jersey Transit buses and 40 passengers became stuck in the flood waters near the Hamilton Mall and had to be rescued. Five thousand books in the Atlantic Community College were damaged by the flooding. Parts of the Black Horse Pike (U.S. Route 40) were closed because the road washed out. Sections of U.S. Route 40 were also closed in Egg Harbor Township. In Absecon, a 180 foot section of the New Jersey Transit train track was closed after the gravel bed was washed away. In Pleasantville, the motels around U.S. Routes 30 and 40 were evacuated because of the heavy rain and back-bay flooding. Several people had to be rescued from their vehicles. At the water treatment plant pumping station, the sediment rate was above acceptable standards. Even though Atlantic City proper escaped the heavy rain, residents had to boil their tap water for several days to make it potable because the city's reservoir in Egg Harbor Township flooded. The United States Geological Survey Gage on the Tuckahoe River at Head of River reached a new record crest of 9.1 feet. This represented a greater than 100 year recurrence interval. To put the storm total of 13.52 inches at the Atlantic City International Airport in perspective, the all-time certified 24 hour rainfall record for the state of New Jersey is 14.81 inches in Tuckerton (Ocean County) on August 19, 1939. The 11.12 inches of rain that fell through midnight EST on the 20th, was a new all-time daily record. The previous 24 hour record was 6.46 inches set on July 10, 1949. The 13.52 inches also broke the previous all-time monthly record of 13.09 inches set in July of 1959. August 1997 would have a new rainfall record of 16.12 inches at the airport. Other storm totals from Atlantic County included 12.7 inches in Mays Landing, 12.6 inches in Estell Manor, and 10.21 inches in Pleasantville. Flood damages in Atlantic County alone were estimated to be $54 million.

February 4-9, 1998. This strong nor'easter battered the state with damaging winds, moderate to severe coastal flooding, extensive beach erosion, several dune breaches, and heavy rain. At the time, it was one of the worst storms to impact the study area since the December 1992 nor'easter. The heaviest rain occurred along the immediate shore and exceeded two inches. Tidal departures averaged around 4 feet above normal. Fortunately this storm did not coincide with the spring tide cycle. Nevertheless, for most other locations, this was the highest tide since the December 1992 nor'easter. Atlantic County suffered an estimated $3.9 million in flood related property damage. Twenty-two people from Brigantine and Atlantic City were sheltered. Throughout the county one home and one business suffered major damage, 93 other dwellings and businesses suffered minor damage while tidal flooding affected but caused little damage to 219 others. Brigantine suffered substantial flooding and beach erosion, especially at the north end of the island. About 75 percent of its sand was carried away. Within Atlantic City, the 84 residents of the Oceanside Nursing Home were removed to 14 other nursing homes on the mainland. The boardwalk was ripped at New Hampshire Avenue. All access roads into the city were closed on the morning of the 5th, except for the Atlantic City Expressway. The worst tidal flooding occurred in the back-bay with much of Venice Park, the Chelsea Bay Front and Chelsea Heights inundated. Dozens of parked cars had water up to their doors. The beach was described as "destroyed" in Margate. In Longport, the ocean met

the bay from 11th through 24th Streets. The erosion caused vertical cliffs of 4 to 5 feet and streets had to be cleared of debris. The mainland was not spared in the county as the heavy rain caused basement flooding in the Donald J. Adams School in Northfield and trees were uprooted in Linwood. The high tide on the 5th contained the highest tides including (all above mean lower low water): 9.0 feet in Absecon, 8.5 feet in Longport, 8.0 feet in Ventnor, and 7.8 feet in Atlantic City (3.9 feet above normal).

August 27-28, 2011. Tropical Storm Irene produced torrential downpour rains that helped make August 2011 the wettest August on record for the State of New Jersey dating back to 1895, and resulted in major flooding and a number of record breaking crests on area rivers and a three to five foot storm surge that caused moderate to severe tidal flooding with extensive beach erosion. Event precipitation totals from Irene averaged 5 to 10 inches and caused widespread, record breaking flooding. Irene made her initial landfall near Cape Lookout, North Carolina on the 27th as a Category 1 hurricane; and then proceeded to make her second landfall as a tropical storm on Brigantine Island, just north of Atlantic City, New Jersey at 5:35 a.m. on the 28th. All Atlantic County shore communities east of U.S. Route 9 including Atlantic City were placed under a voluntary evacuation at 8 p.m. on August 25th and a mandatory evacuation effective starting 6 a.m. on the 26th. To relieve evacuation traffic, toll operations were temporarily suspended on the Garden State Parkway south of the Raritan River and on the Atlantic City Expressway. The southbound lanes on the Garden State Parkway south of exit 98 were closed at 8 p.m. on August 26th. Peak storm tides were 6.96 feet above mean lower low water in Atlantic City; moderate tidal flooding starts at 7.0 feet above mean lower low water. Flooding along the Mullica and Great Egg Rivers threatened about 100,000 county residents. Flooding forced the evacuation of 102 residents of a senior mobile home development in Buena Vista Township. The English Creek flooded in Egg Harbor Township. Two bridges (one was the Somers Point-Mays Landing Bridge) were damaged by flooding in the county. Eight roadways were closed due to flooding. For the second time within the same month, the Great Egg Harbor River at Folsom had record breaking major flooding. It was above its 6 foot flood stage from 10:05 a.m. on the 28th through 4:15 a.m. on September 1st. It crested at 8.27 feet at 11:15 p.m. on the 29th. Event rainfall totals included 8.76 inches in Estell Manor, 7.75 inches in Egg Harbor Township, 7.53 inches in Buena Vista Township, 7.49 inches in Hammonton, 7.40 inches in Linwood and 7.06 inches in Hamilton Township and 5.88 inches at the Atlantic City International Airport. Roughly $30 million in flood-related property damage was reported in Atlantic County alone and the closure of the Atlantic City casinos (only the third time in history) for three days caused an estimated 45 million dollars in lost revenue.

August 11, 2012. Thunderstorms with torrential downpours caused flash flooding on Absecon Island in both Atlantic City and Margate City. Numerous streets were flooded in Atlantic City and vehicles were getting stuck in the high water. In Margate, flooding spread into some buildings. Doppler Radar storm total estimates reached 2.0 to 2.5 inches on the island. The Marina within Atlantic City measured 1.60 inches of rain.

August 14, 2012. Thunderstorms which back built over Galloway Township caused flash flooding during the late afternoon of the 14th. Doppler Radar storm total estimates reached 3 to 5 inches in the township. The Garden State Parkway was flooded in the township as were numerous other smaller roadways including Kensington Drive. Vehicles were partially submerged and flood waters reached up to the entrances of homes.

October 29, 2012. Superstorm Sandy made landfall in Atlantic County as a post tropical storm in Brigantine City just north of Atlantic City at 730 p.m. EDT on the 29th. Sandy was the costliest natural disaster by far in the state of New Jersey. The unique aspect of Sandy was its multi-tide cycle increase of onshore winds prior to landfall. This caused multiple high tide cycles with

tidal flooding and also helped produce catastrophic wave action and tidal flooding. Record breaking high tides and wave action combined with extreme winds and heavy rainfall to batter the state. Statewide, Sandy caused an estimated 29.4 billion dollars in damage, with an estimated $250 million in Atlantic County flood damages alone. Heavy rain caused urban and poor drainage flooding and exacerbated the tidal flooding along the ocean in Atlantic County. Flooding was reported along the Atlantic City Expressway near U.S. Route 9 in Pleasantville. Event precipitation totals included 7.06 inches in Estell Manor, 6.83 inches in Egg Harbor Township, 5.80 inches at the Atlantic City International Airport, 5.74 inches in Folsom and 5.46 inches in Hammonton. The northern end of the famed Atlantic City boardwalk was destroyed and the city was cut off from the mainland by tidal flooding after the morning high tide. Elsewhere in the county, heavy tidal damage was reported in Longport, Margate and Ventnor. Nearly every municipality from Egg Harbor and Galloway Townships eastward suffered widespread wind and or tide damage. In Atlantic City (Atlantic County), the highest tide reached 8.9 feet above mean lower low water during the evening high tide on the 29th. This was the second highest tide on record; the highest was 9.0 feet above mean lower low water on December 11, 1992.

March 7, 2013. An intense nor'easter brought minor to moderate tidal flooding along the ocean side. The coastal flooding was exacerbated by wave action. At least minor tidal flooding persisted into the morning high tide cycle on the 10th. The highest tide at Atlantic City (Atlantic County) reached 6.95 feet above mean lower low water. Moderate tidal flooding starts at 7.0 feet above mean lower low water. In Atlantic County, tidal flooding damaged 500 homes along the bay side in Atlantic City. The Black Horse Pike (U.S. Routes 40 and 322) were reduced to just one lane in both directions between Atlantic City and Pleasantville. Exit 2 off of the Atlantic City Expressway was closed because of this flooding. In Absecon, flooding affected the White Horse Pike (U.S. Route 30) and the southbound lanes of U.S. Route 9. Tidal flooding closed Ohio Avenue and Shore Road. Roughly $510,000 in property damages were reported in the NCEI database as a result of this event.

August 2014. Thunderstorms with torrential downpours caused flash flooding in Egg Harbor Township. Franklin Avenue near the headwaters of the Cedar Branch was flooded and closed. Event precipitation totals in Atlantic County included 6.79 inches in Buena Vista Township, 6.17 inches in Estell Manor, 5.58 inches at the Atlantic City International Airport, 5.55 inches in Egg Harbor City, 4.78 inches in Mays Landing, 4.14 inches in Mullica Township, 3.89 inches in Egg Harbor Township, 3.47 inches in Hammonton and 2.54 inches in Margate City.

June 1, 2015. Thunderstorms with very heavy rain caused flash flooding in Buena Vista Township and Folsom Borough in Atlantic County. While flash flooding started with the first wave of thunderstorms during the late afternoon, a second wave of thunderstorms continued flooding into the evening. In the Collings Lake area of Buena Vista Township as well as in Folsom, several roadways were flooded and closed. The fire department rescued some stranded motorists in Collings Lake. Event precipitation totals included 6.37 inches in Folsom, 4.60 inches in Hammonton, 4.40 inches in Mullica Township, 4.24 inches in Buena Vista Township, 3.20 inches in Estell Manor and 2.99 inches in Mays Landing.

Vernon Ogrodnek

The Brigantine brance of the Atlantic County Library is closed as a result of flooding, Wednesday Aug. 13, 2014.

June 27, 2015. Thunderstorms with very heavy rain caused flash flooding of smaller streams as well as poor drainage flooding in northern Atlantic County, mainly in and around Hammonton and Folsom. In Hammonton Township, Packard Street and Bellevue Avenue were closed due to flash flooding. In Buena Borough, U.S. Route 40 was closed near the Deep Run due to flash flooding. Flooding was also reported along New Jersey State Route 54. Event precipitation totals included 3.49 inches in Hammonton, 3.27 inches in Buena Vista Township, 3.22 inches in Folsom, and 2.69 inches at the Atlantic City International Airport.

July 28, 2016. A cold frontal boundary moved southward into the region, leading to the development of afternoon showers and thunderstorms. Some thunderstorms became severe with locally heavy rainfall, many locations saw between 2 and 3 inches of heavy rainfall.[45]

August 7, 2017. Thunderstorms developed along and ahead of a warm front. With a humid airmass in place, the storms produced heavy rain that led to flooding.[46]

Historical Summary of Insured Flood Losses

According to the latest FEMA flood insurance records[47], there are a total of 26,347 active flood insurance policies in Atlantic County and there have been 21,018 flood losses reported in Atlantic County through the National Flood Insurance Program (NFIP) since 1972[48], totaling $490.6 million in claims payments. Every municipal jurisdiction in Atlantic County is listed by FEMA as being an active participant in the NFIP[49]. The name of the Floodplain Administrator (the person responsible for ensuring that development activities comply with floodplain management ordinances and NFIP regulations) for each jurisdiction is included on Worksheet 2 in jurisdictional annexes of Appendix 1.2.

In addition to NFIP participation, the 11communities of Absecon, Atlantic City, Brigantine, Egg Harbor Township, Linwood, Longport, Margate, Mullica, Pleasantville, and, Somers Point Ventnor are listed by FEMA as Community Rating System (CRS) eligible communities[50]. Under the CRS, communities which implement floodplain management actions that go beyond the minimum requirements of the NFIP are eligible for discounts on flood insurance premiums for properties within that community.

ACOEP will continue to work with all jurisdictions in the County, encouraging them all to maintain full participation in the NFIP, and to take full advantage of additional FEMA programs such as the Community Rating System (CRS). Jurisdictions already eligible for the CRS will be encouraged to upgrade their CRS status, while non-eligible jurisdictions will be encouraged to work towards eligibility. The County may also support local jurisdiction participation in the Cooperating Technical Partners Program (CTP), of which the main objective is to increase local involvement in the floodplain mapping process.

[45] Data extracted from the 2019 New Jersey State Hazard Mitigation Plan.
[46] Data extracted from the 2019 New Jersey State Hazard Mitigation Plan.
[47] Policy data current as of June 3, 2021.
[48] Loss data current as of June 3, 2021.
[49] As per FEMA's Community Status Book of participating communities (June 3, 2021).
[50] As per the FEMA's list of Community Rating System Eligible Communities effective June 3, 2021, which was still the most recent available status book posted online by FEMA.

Table 3a.16 lists the total number of losses and total claims payments under the NFIP, by municipal jurisdiction. It should be emphasized that this listing includes only those losses to structures that were insured through the NFIP policies. Total number of losses includes some losses in which claims were sought but not received. It is likely that many additional instances of flood losses in Atlantic County were either uninsured or not reported.

The total value of all claims paid under the NFIP had increased from more than $58 million in 2008, to $490.6 million by 2021. This represents seven-fold increase over 2008 values that were presented in the initial version of this hazard mitigation plan. Much of this tremendous increase is attributed to Superstorm Sandy.

Table 3a.16
National Flood Insurance Program Loss Statistics[51]

Jurisdiction	Date Entered NFIP	Current Effective Map Date	CRS Class	Total Number of Policies 2015	Total Number of Losses 2015	Total Claims Payments to 2015 (in millions)	Municipal Claims as % of Countywide Total to 2015	Total Number of Policies 2021	Total Number of Losses to 2021	Total Claims Payments to 2021 (in millions)	Municipal Claims as % of Countywide Total to 2021
Absecon, City of	03/05/76	08/28/18	7	157	153	$4.1	1%	146	166	$4.7	1%
Atlantic City, City of	06/03/70	02/01/85	6	8,978	5,902	$111.3	25%	6,690	6,094	$121.5	25%
Brigantine, City of	05/15/70	08/28/18	5	7,385	4,180	$92.3	20%	6,638	4,216	$99.7	20%
Buena Vista, Township of	06/22/79	08/28/18	N/A	33	11	$0.1	0%	16	14	$0.1	0%
Buena, Borough of	03/04/83	08/28/18(M)	N/A	4	6	$0.1	0%	1	6	$0.1	0%
Corbin City, City of	09/30/81	09/30/81	N/A	29	8	$0.2	0%	24	8	$0.2	0%
Egg Harbor City, City of	08/02/82	08/02/82	N/A	21	17	$0.4	0%	13	17	$0.3	0%
Egg Harbor, Township of	02/16/83	08/28/18	5	861	771	$27.2	6%	699	891	$33.0	7%
Estell Manor, City of	11/03/78	07/02/03	N/A	7	3	$0.0	0%	3	3	$0.0	0%
Folsom, Borough of	01/06/82	08/28/18	N/A	17	4	$0.0	0%	23	4	$0.0	0%
Galloway, Township of	05/02/83	06/30/99	N/A	161	98	$1.3	0%	132	101	$1.4	0%
Hamilton, Township of	03/15/77	08/28/18	N/A	205	118	$2.4	1%	187	123	$2.5	1%
Hammonton, Town of	01/06/82	08/28/18	N/A	67	15	$0.0	0%	32	15	$0.0	0%
Linwood, City of	01/19/83	08/28/18	5	294	81	$1.5	0%	259	83	$1.5	0%
Longport, Borough of	06/18/71	08/28/18	5	1,466	1,263	$36.5	8%	1,326	1,276	$38.0	8%
Margate City, City of	06/19/71	08/28/18	5	5,791	3,109	$72.5	16%	5,023	3,163	$76.3	16%
Mullica, Township of	03/01/82	08/28/18	10	137	162	$5.3	1%	14	169	$5.6	1%
Northfield, City of	11/02/79	01/19/83(M)	N/A	100	34	$0.4	0%	86	36	$0.4	0%
Pleasantville, City of	01/19/83	01/19/83	5	174	251	$5.6	1%	85	255	$5.6	1%
Port Republic, City of	07/15/83	07/15/92	N/A	40	73	$1.7	0%	33	74	$1.8	0%
Somers Point, City of	11/17/82	11/17/82	5	1,042	338	$6.3	1%	859	344	$6.5	1%
Ventnor City, City of	06/18/71	09/15/83	5	5,056	3,848	$82.5	18%	4,232	3,938	$90.6	18%
Weymouth, Township of	08/10/79	08/28/18	N/A	20	22	$0.5	0%	26	22	$0.6	0%
			Total	**32,045**	**20,467**	**$452.1**	**100%**	**26,347**	**21,018**	**$490.6**	**100%**

[51] Policy data and loss data is current as of June 3, 2021. CRS Class as per the FEMA's list of Community Rating System Eligible Communities effective April 1, 2021, which was still the most recent available status book posted online by FEMA as of July 2021 when this section was written. *N/A= was Not Participating in the CRS Program in 2021

Repetitive Loss Properties

FEMA defines a Repetitive Loss (RL) property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP. According to FEMA RL property records[52] there are 1,099 RL properties located in Atlantic County of which 877 are recorded as not yet having been mitigated. These non-mitigated RL properties are associated with a total of 3,249 losses and more than $79 million in claims payments under the NFIP since February 1979 (the earliest recorded date of loss), as shown in **Table 3a.17**.

Table 3a.17
NFIP RL Property Statistics for Non-mitigated RL Properties[53]

Jurisdiction	Totals for Non-mitigated RL Properties				
	Non-Mitigated RLP Properties	Total Losses	Total Payments	Average Payments per Non-mitigated RL Property Loss	Average Payments per Non-mitigated RL Property
Absecon, City of	6	48	$2,364,000	$394,000	$49,000
Atlantic City, City of	312	1,121	$17,789,000	$57,000	$16,000
Brigantine, City of	114	371	$8,235,000	$72,000	$22,000
Buena Vista, Township of	1	2	$11,000	$11,000	$6,000
Buena, Borough of	0	0	$0	$0	$0
Corbin City, City of	0	0	$0	$0	$0
Egg Harbor City, City of	0	0	$0	$0	$0
Egg Harbor, Township of	56	306	$15,207,000	$272,000	$50,000
Estell Manor, City of	0	0	$0	$0	$0
Folsom, Borough of	0	0	$0	$0	$0
Galloway, Township of	8	26	$374,000	$47,000	$14,000
Hamilton, Township of	15	40	$993,000	$66,000	$25,000
Hammonton, Town of	1	2	$11,000	$11,000	$5,000
Linwood, City of	1	2	$58,000	$58,000	$29,000
Longport, Borough of	48	165	$5,655,000	$118,000	$34,000
Margate City, City of	71	219	$5,406,000	$76,000	$25,000
Mullica, Township of	14	40	$1,776,000	$127,000	$44,000
Northfield, City of	3	17	$353,000	$118,000	$21,000
Pleasantville, City of	16	66	$1,556,000	$97,000	$24,000
Port Republic, City of	6	25	$1,239,000	$207,000	$50,000
Somers Point, City of	18	46	$818,000	$45,000	$18,000
Ventnor City, City of	187	753	$17,292,000	$92,000	$23,000
Weymouth, Township of	0	0	$0	$0	$0
Total	**877**	**3,249**	**$79,137,000**	**$90,000**	**$24,000**

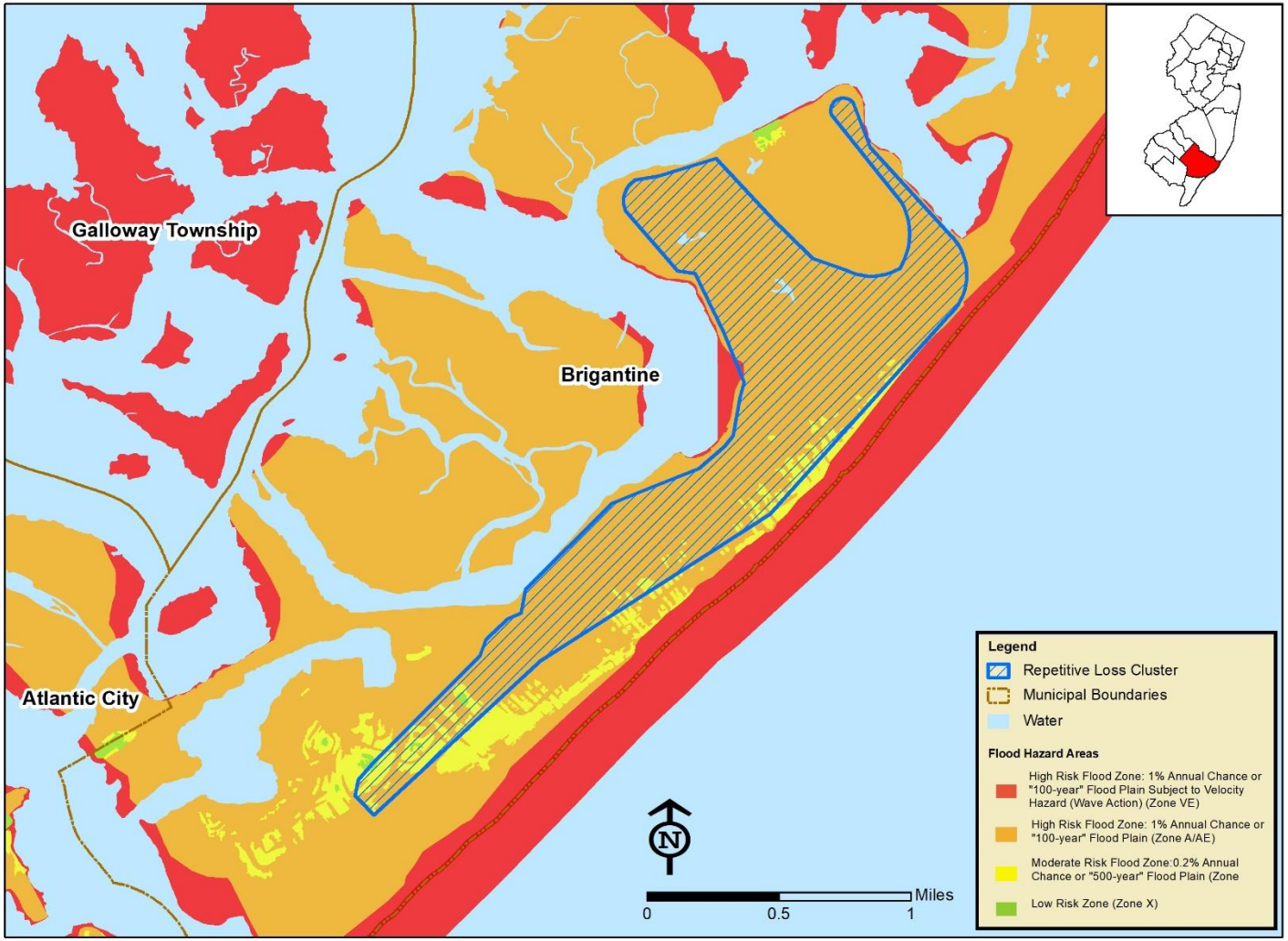
Seventeen of Atlantic County's municipal jurisdictions (roughly three fourths) are identified as having one or more RL properties. Atlantic City, Brigantine, and Ventnor have the most RL properties (312, 114, and 187, respectively; 70 percent of all the RL properties in the County).

[52] Repetitive loss data as provided to AECOM on July 15, 2021 and dated July 13, 2021.
[53] Repetitive loss data as provided to AECOM on July 15, 2021 and dated July 13, 2021.

Atlantic City, Brigantine, and Ventnor also have the top three most recorded losses (1,121, 371, and 753, respectively) – accounting for 69 percent of all RL losses in the County. Total payments are the highest, however, in four communities: Atlantic City ($17.8 million from 312 Atlantic City properties, as compared to $7.2 million from 272 properties in 2008); Brigantine ($8.2 million from 114 properties, as compared to $3.2 million from 146 properties in 2008); Egg Harbor Township ($15.2 million from 56 properties, as compared to $5 million from 37 properties in 2008); and Ventnor ($17.3 million from 187 properties; as compared to $5 million from 159 properties in 2008). Average payments per non-mitigated RL property are highest in Absecon where only six properties have been paid more than $2.3 million, with an average of $390,000 per loss. Mitigating RL properties is one of the goals of the State Hazard Mitigation Plan and jurisdictions with RL properties in their communities should aim toward this same goal wherever possible.

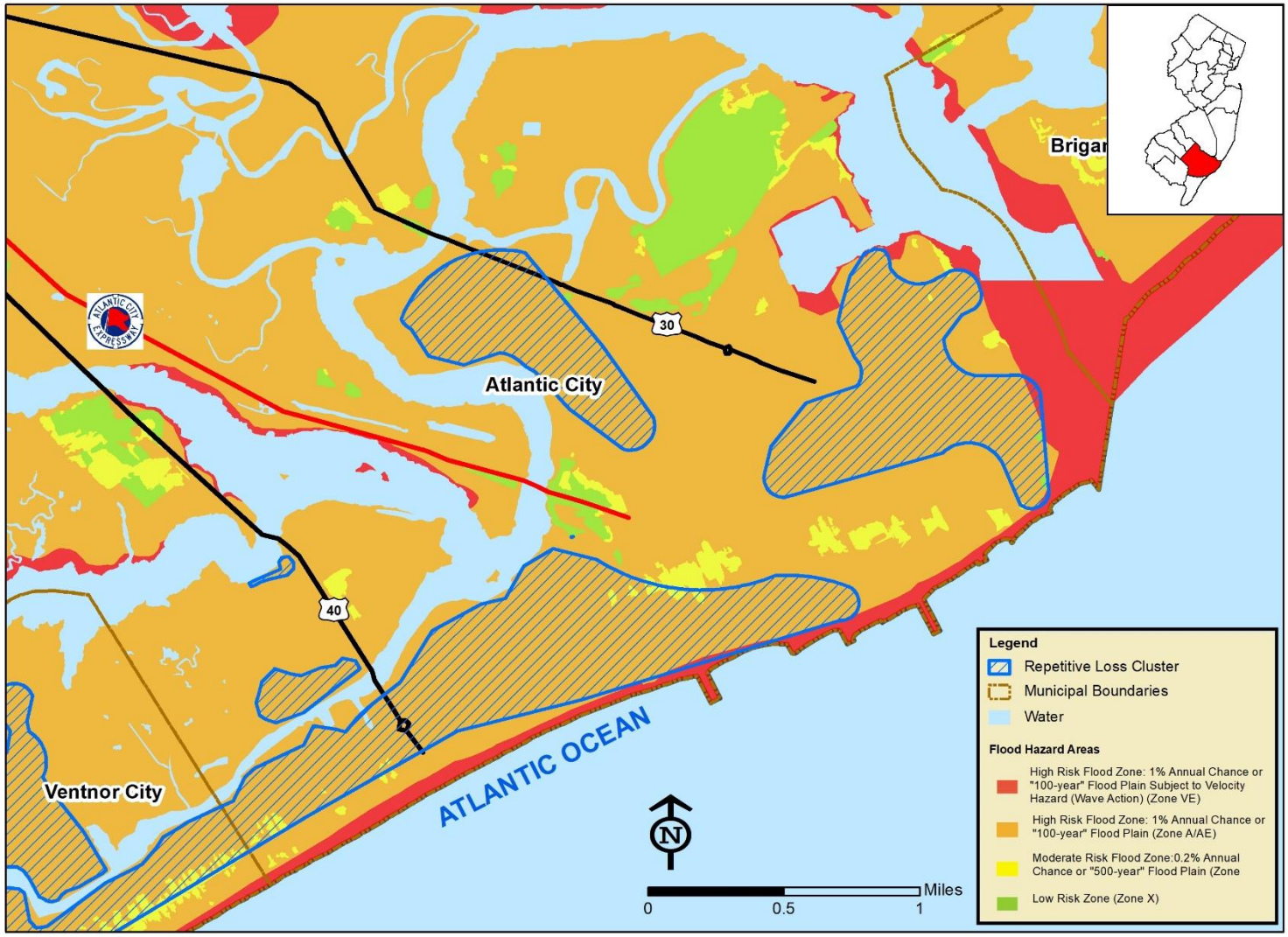
The approximate areas where RL properties are clustered are plotted in **Figure 3a.14 through Figure 3a.17** in comparison with the extent of the mapped FEMA Preliminary DFIRMs (the base/100-year floodplain). This figure does not show areas of the County where occasional isolated RL properties are located; rather, it depicts only the approximate areas covering clusters of RL properties, since the component data is subject to the 1974 Privacy Act which prohibits the public release of any information regarding individual NFIP claims or information which may lead to the identification of associated individual addresses and property owners. While detailed address information is not provided in this public document, local officials in the NFIP participating communities do have access to comprehensive RL property data from FEMA for the purposes of targeted mitigation of RL areas or individual RL structures.

Figure 3a.14
Repetitive Loss Property Cluster Area 1



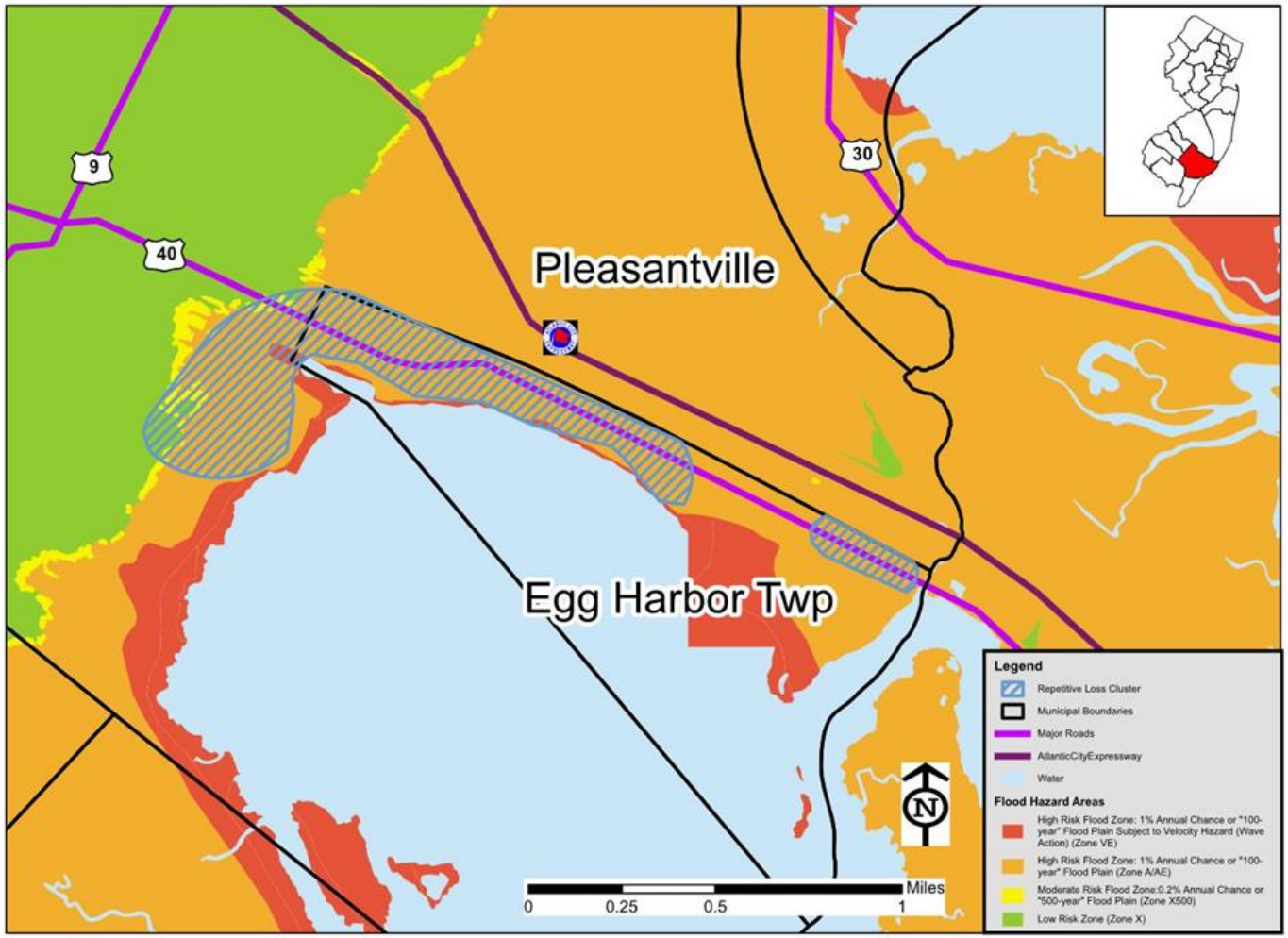
SOURCE: FEMA Repetitive Loss Data, 2021; FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, where available; Preliminary FIRM Data 2014 for areas not currently included in 2021 DFIRM: Atlantic City, Corbin City, Egg Harbor City, Estell Manor, Galloway Township, Northfield, Pleasantville, Port Republic, Somers Point, Ventnor City. NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002.

Figure 3a.15
Repetitive Loss Property Cluster Area 2



SOURCE: FEMA Repetitive Loss Data, 2021; FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, where available; Preliminary FIRM Data 2014 for areas not currently included in 2021 DFIRM: Atlantic City, Corbin City, Egg Harbor City, Estell Manor, Galloway Township, Northfield, Pleasantville, Port Republic, Somers Point, Ventnor City. NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002.

Figure 3a.16
Repetitive Loss Property Cluster Area 3



SOURCE: FEMA: Preliminary FIRM Data, 2014; Repetitive Loss Data, 2014. NJGIN: County Boundary, 2012; Municipal Boundary, 2014. NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Atlantic County Office of GIS: US Highway, Atlantic City Expressway, and Garden State Pkwy, 2003.

Figure 3a.17
Repetitive Loss Property Cluster Area 4

SOURCE: FEMA Repetitive Loss Data, 2021; FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, where available; Preliminary FIRM Data 2014 for areas not currently included in 2021 DFIRM: Atlantic City, Corbin City, Egg Harbor City, Estell Manor, Galloway Township, Northfield, Pleasantville, Port Republic, Somers Point, Ventnor City. NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002.

Since this plan was initially prepared in 2010, the number of listed RL properties has increased dramatically, with 775 RL properties in 2008 as compared to 877 in 2021. FEMA has indicated that their systems depend heavily on programmed address matching to identify repetitive losses and, while the software makes some allowances for misspellings and incomplete addresses, it is not perfect and sometimes legitimate address matches are missed. Sometimes repetitive loss properties go undetected for years because of address anomalies. FEMA actively works on updating the repetitive loss data system which allows them to link addresses that they have found should be linked. As these improvements and corrections are made on an ongoing basis, new RL properties can be created even though the loss dates may have been older. Sometimes RL properties can be combined as well and may create severe loss properties. For communities that participate in CRS, correction of this data is a required activity.

The average non-mitigated RL property in Atlantic County has experienced between three and four losses. At the extreme end, two properties in Egg Harbor Township and Absecon are recorded as having experienced 40 and 36 losses respectively, with a combined $4.4 million in paid claims. All told, there are 26 non-mitigated RL properties in the County that have had 10 or more losses. They are located one in Absecon, five in Atlantic City, 10 in Egg Harbor Township, one in Pleasantville, and nine in Ventnor. These 26 properties have had a total of 368 losses and $13.5 million in paid claims. The following six communities have no RL properties within their borders: Buena Borough, Corbin City, Egg Harbor City, Estell Manor, Folsom, and Weymouth. The majority of all RL properties are located in the 100-year floodplain, and leaving aside scattered individual RL properties, the RL clusters are almost entirely within the 100-year floodplain.

Severe Repetitive Loss Properties

FEMA defines a severe repetitive loss (SRL) property as a residential property that is covered under an NFIP flood insurance policy and: (a) that has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or (b) for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building; and (c) for both (a) and (b), at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart. According to FEMA repetitive loss property records[54] there are a total of 140 SRL properties located in 12 Atlantic County communities; all of which are identified as "non-mitigated". These 140 SRL properties are associated with a total of 1,010 losses more than $29.9 million in payments under the NFIP since January 1987 (the earliest recorded date of loss for this subset of properties), as shown in **Table 3a.18**. Mitigation of SRL properties should be pursued. There are an average of seven losses per property and an average payment of $29,600 per paid loss. Seventy percent of the County's SRL properties are located in Atlantic City, Brigantine, Egg Harbor Township, and Ventnor. Average payments per non-mitigated SRL property are highest in Absecon, where historically only two SRL properties have been paid more than $1.9 million (at present, there is one remaining non-mitigated SRL property in Absecon). Total payments to non-mitigated SRL properties are highest in Egg Harbor Township.

[54] Repetitive loss data as provided to AECOM on July 15, 2021 and dated July 13, 2021.

It should be noted that failure to mitigate SRL properties could eventually lead to significant increases in flood insurance premiums.

Table 3a.18
NFIP SRL Property Statistics for Non-mitigated SRL Properties[55]

Jurisdiction	Totals for Non-mitigated SRL Properties				
	Non-Mitigated SRL Properties	Total Losses	Total Payments	Average Payments per Non-mitigated SRL Property Loss	Average Payments per Non-mitigated SRL Property
Absecon, City of	1	36	$2,141,000	$2,141,000	$59,000
Atlantic City, City of	46	292	$5,269,000	$115,000	$18,000
Brigantine, City of	9	46	$1,099,000	$122,000	$24,000
Buena Vista, Township of	0	0	$0	$0	$0
Buena, Borough of	0	0	$0	$0	$0
Corbin City, City of	0	0	$0	$0	$0
Egg Harbor City, City of	0	0	$0	$0	$0
Egg Harbor, Township of	19	204	$12,113,000	$638,000	$59,000
Estell Manor, City of	0	0	$0	$0	$0
Folsom, Borough of	0	0	$0	$0	$0
Galloway, Township of	1	4	$120,000	$120,000	$30,000
Hamilton, Township of	1	4	$209,000	$209,000	$52,000
Hammonton, Town of	0	0	$0	$0	$0
Linwood, City of	0	0	$0	$0	$0
Longport, Borough of	7	33	$1,236,000	$177,000	$37,000
Margate City, City of	6	31	$733,000	$122,000	$24,000
Mullica, Township of	1	4	$121,000	$121,000	$30,000
Northfield, City of	1	9	$81,000	$81,000	$9,000
Pleasantville, City of	6	39	$923,000	$154,000	$24,000
Port Republic, City of	2	8	$687,000	$343,000	$86,000
Somers Point, City of	1	5	$134,000	$134,000	$27,000
Ventnor City, City of	39	295	$5,052,000	$130,000	$17,000
Weymouth, Township of	0	0	$0	$0	$0
Total:	**140**	**1,010**	**$29,919,000**	**$214,000**	**$30,000**

Probability of Occurrence – Flood

Flooding will continue to have a high probability of occurrence in Atlantic County, and the probability of future occurrences in Atlantic County is certain. The probability of future flood events based on magnitude and according to best available data is illustrated in **Figure 3a.12**, which indicates those areas susceptible to the 1 percent annual chance flood (100-year floodplain); the 1 percent annual chance flood with wave action (100-year coastal floodplain); and the 0.2 percent annual chance flood (500-year floodplain). The frequency of intense precipitation events in Atlantic County is expected to increase in the future with climate change;

[55] Repetitive loss data as provided to AECOM on July 15, 2021 and dated July 13, 2021.

this is likely to result in more riverine and flash flooding events.

Flooding in Atlantic County is attributed mainly to tropical storms, nor'easters, and - to a lesser extent - severe thunderstorms. Usually occurring during late summer and early autumn, these storms can result in severe damage to coastal areas. Although extratropical cyclones can develop at almost any time of the year, they are more likely to occur during winter and spring. Thunderstorms are a common occurrence during the warm summer months.

It should also be noted that anticipated sea level rise will increase the risk of damages/losses due to future coastal flooding events. Rising sea level over time will shorten the return period (increasing the frequency) of significant flood events. For example; sea level rise of 1 foot over a typical project analysis period (50 years) may cause a flood event currently of annual probability 2 percent (50-year flood) to become an event of 10 percent annual probability (10-year flood). This increased probability obviously has an effect on the estimation of annualized loss/damage, but one that is typically only analyzed during detailed feasibility studies for projects proposed by the US Army Corps of Engineers.

Storm Surge

Location – Storm Surge and Coastal Flooding

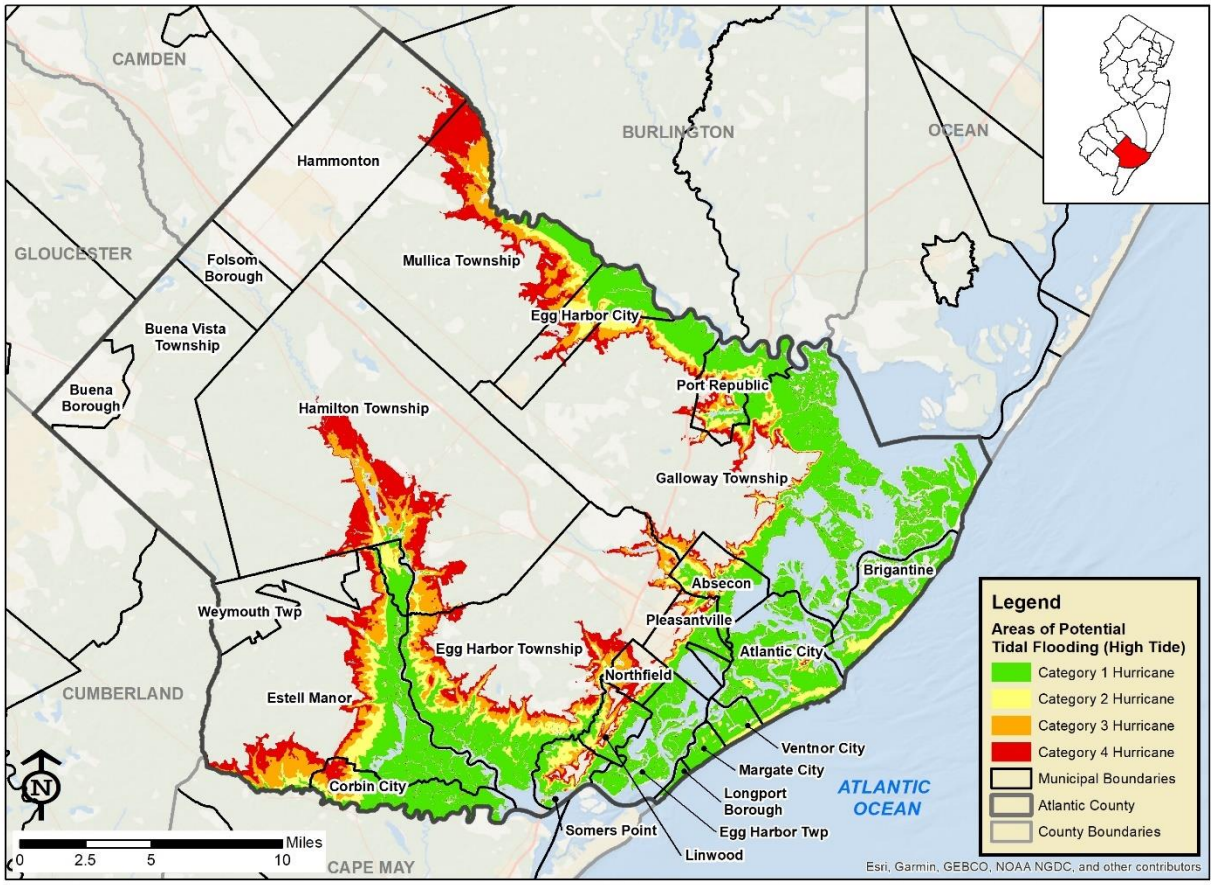
Storm Surge and Coastal flooding occurs when local sea levels temporarily rise during meteorological events to inundate areas along the coasts of oceans, bays, estuaries, coastal rivers, and large lakes. Hurricanes and tropical storms, severe storms, and nor'easters cause most of the coastal flooding in New Jersey.

There are many areas in Atlantic County subject to potential storm surge inundation as modeled and mapped by the U.S. Army Corps of Engineers (USACE). **Figure 3a.18** illustrates inundation zones from storm surges associated with hurricanes of Category 1 to 4 for Atlantic County derived from georeferenced SLOSH (Sea, Lake and Overland Surge from Hurricanes) data produced by the USACE in coordination with NOAA[56]. SLOSH is a modeling tool used to estimate storm surge for coastal areas resulting from historical, hypothetical or predicted hurricanes taking into account maximum expected levels for pressure, size, forward speed, track and winds. Therefore, the SLOSH data is best used for defining the potential maximum surge associated with various storm intensities for any particular location. Storm surge arrives prior to a hurricane's landfall, and the greater the hurricane's intensity, the sooner the surge arrives. As shown in the figure, all of Atlantic County's coastal jurisdictions are at high risk to storm surge inundation. While non-coastal areas may not be directly impacted by storm surge inundation, they might experience flooding caused by storm surge and extremely high tides that can affect the drainage of areas further inland. Twenty of the County's 23 municipal jurisdictions (87 percent) have been identified as being at risk to the storm surge hazard[57]. Only Buena Borough, Buena Vista Township, and the Borough of Folsom have no land in mapped surge areas.

[56] This data represents a polygon feature set in Atlantic County showing the limits of potential flooding from Category 1-4 hurricanes. The data was compiled by the U.S. Army Corps of Engineers as part of its calculations in using the National Weather Service- National Hurricane Center's SLOSH model (Sea, Lake and Overland Surges from Hurricanes).

[57] By virtue of having some portion of their land area in a Category 1, 2, 3, or 4 mapped surge zone.

Figure 3a.18
Hurricane Storm Surge Inundation Zones in Atlantic County



SOURCE: NOAA: Sea, Lake, and Overland Surges from Hurricane (SLOSH), High Tide Conditions, 2018. NJGIN: County Boundary, 2021; Municipal Boundary, 2021.
NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

Extent – Storm Surge

The magnitude or severity of the storm surge hazard is generally related to the category of storm making landfall, where Category 1 potential storm surge inundation areas are smaller than Category 4 potential inundation areas. The Saffir-Simpson is one scale used to classify storms according to their magnitude or severity. **Table 3a.19** shows the relationship between storm category and surge, as well as typical types of damages.

Table 3a.19
Saffir-Simpson Scale for Hurricanes

Storm Category	Maximum Sustained Wind Speed (mph)	Minimum Surface Pressure (Millibars)	Storm Surge (feet)	Damage Level	Description of Damages
1	74–95	Greater than 980	3–5	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery and trees. Also, some coastal flooding and minor pier damage.
2	96–110	979–965	6–8	MODERATE	Some roofing material, door and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings might break their moorings.
3	111–129	964–945	9–12	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain might be flooded well inland.
4	130–156	944–920	13–18	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain might be flooded well inland.
5	157 +	Less than 920	19+	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas might be required.

Source: National Oceanic and Atmospheric Administration

Historical Occurrences – Storm Surge

Before Superstorm Sandy, there was fairly limited data available for historical weather events that have caused storm surge inundation in Atlantic County. According to the NCEI database[58], Atlantic County experienced storm surge during 34 events between December 2002 and June 2015 that accounted for an estimated $281.2 million in property damages, as described below. Storm surge has been a major factor associated with various weather events affecting Atlantic County, particularly hurricanes, tropical storms, and nor'easters (as described separately within this section).

Some more *notable storm surge events* include the following:

> **September 14-15, 1944 – Great Atlantic Hurricane.** This unnamed hurricane impacted the entire coast of New Jersey when it paralleled the coastline as a Category 2 hurricane. The peak stage recorded by the Atlantic City tide gage was 8.21 feet NGVD, which held as a stage of record at this location into the late 1990's. The Atlantic City boardwalk was destroyed and the famous Heinz and Steel Piers were damaged. The Atlantic City-Brigantine Bridge was also destroyed.

[58] Current as of May 2021.

March 6-8, 1962 – Ash Wednesday Nor'easter. This massive nor'easter stalled in the mid-Atlantic for almost three days, pounding coastal areas with continuous rain, high winds, and tidal surges and dumping large quantities of snow inland for several hundred miles. Gale force winds kept storm surges on shore for five successive high tides. In Atlantic County, the Steel Pier in Atlantic City was partially destroyed. Brigantine, Margate, Ventnor, and Longport also suffered significant damage.

August 9, 1976 – Hurricane Belle. Belle was a tropical storm when it passed off the shore of New Jersey on August 9th. A storm surge of 8.85 feet was measured in Atlantic City. Roughly 500 feet of the Atlantic City boardwalk was damaged or destroyed, with repairs estimated to reach $5 million.

October 28, 1991 – Halloween Nor'easter. The 1991 Halloween nor'easter, also referred to as "The Perfect Storm", caused strong waves of up to 30 feet in height. High tides along the shore were only surpassed, at the time, by the 1944 hurricane.

December 11-12, 1992. An intense, slow-moving nor'easter hit the eastern coast of New Jersey during December 11 and 12, 1992. It occurred while shore residents were still trying to rebuild beaches after the October 1991 and January 1992 storms. This storm produced record or near-record flooding along the entire Atlantic Coast of New Jersey.

January 28-29, 1998. An intense nor'easter caused significant tidal flooding along the New Jersey Shore. In Atlantic County, both the White Horse (U.S. Route 30) and Black Horse (U.S. Route 40) Pikes in and out of Atlantic City were closed for more than four hours the morning of the 28th. The Eastbound lanes of the Black Horse Pike were closed again the evening of the 28th. Several other roads were closed due to bayside tidal flooding in Egg Harbor Township, Absecon, Atlantic City and Pleasantville. Sections of U.S. Route 9 in Linwood and County Road 152 in Somers Point and Longport were also closed.

February 4-9, 1998. This strong nor'easter was the worst storm to affect the area since December 1992. Atlantic County suffered an estimated 3.9 million dollars in damage. Tidal flooding was extensive. Brigantine suffered substantial flooding and beach erosion. In Atlantic City, the 84 residents of the Oceanside Nursing Home were removed to 14 other nursing homes on the mainland. The boardwalk was ripped at New Hampshire Avenue. All access roads into the city were closed on the morning of the 5th, except for the Atlantic City Expressway. The worst tidal flooding occurred in the back-bay area with much of Venice Park, the Chelsea Bay Front, and Chelsea Heights inundated. Dozens of cars had water up to their doors. The beach was described as "destroyed" in Margate. In Longport, the ocean met the bay from 11th through 24th Streets.

August 28, 2011 – Tropical Storm Irene. Irene initially made landfall near Cape Lookout, North Carolina on the 27th as a Category 1 Hurricane and then proceeded to the north northeast where she slowly weakened before making a second landfall as a tropical storm on Brigantine Island, just north of Atlantic City on the 28th. Moderate to severe tidal flooding occurred along the coast. Peak storm tides included 6.96 feet above mean lower low water in Atlantic City (moderate tidal flooding starts at 7.0 feet above mean lower low water). There were numerous reports of dune fence damage and sand overwashes onto streets and boardwalks.

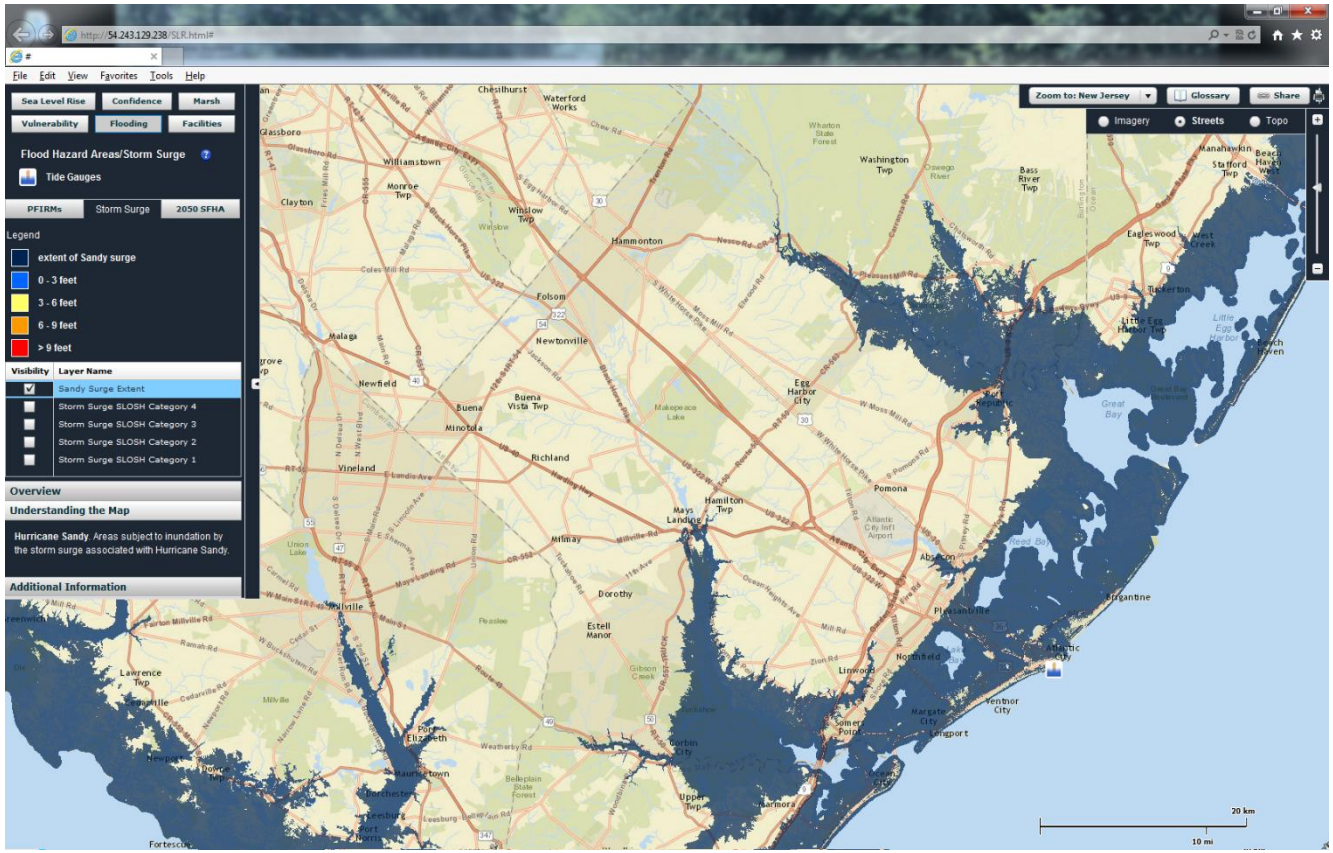
October 29, 2012 (Superstorm Sandy). Sandy made landfall at the City of Brigantine on October 29th as a post-tropical storm. Sandy was the costliest natural disaster by far in the

State of New Jersey. Record breaking high tides and wave action combined with sustained winds as high as 60 to 70 miles per hour - with gusts as high as 80 to 90 miles per hour - battered the state. The northern end of the famed Atlantic City boardwalk was destroyed. The city was cut off from the mainland by tidal flooding after the morning high tide. Elsewhere in the county, heavy tidal damage was reported in Longport, Margate and Ventnor. Nearly every municipality from Egg Harbor and Galloway Townships eastward suffered widespread wind and or tide damage. The unique aspect of Sandy and unlike most tropical systems was the multi-tide cycle increase of onshore winds prior to landfall. This caused multiple high tide cycles with tidal flooding and also helped produce catastrophic wave action. Record breaking or near record breaking high tides were exacerbated by the high astronomical spring tides associated with the full moon. Widespread major tidal flooding occurred during the morning and evening high tide cycles on the 29th. Most of the surveyed damage to barrier island homes that were either destroyed or moved indicated that it was the storm surge and wave action that caused most of the damage. In Atlantic City, the highest tide reached 8.9 feet above mean lower low water during the evening high tide on the 29th. This was the second highest tide on record; the highest was 9.0 feet above mean lower low water on December 11, 1992. Moderate tidal flooding starts at 7.0 feet above mean lower low water. **Figure 3a.19** shows the areas subject to inundation by the storm surge associated with Sandy in Atlantic County and immediately surrounding areas.

October 2, 2015. A nor'easter on October 2, 2015 was one of multiple weather systems impacting New Jersey. The impacts of this particular nor'easter were magnified by the presence of Hurricane Joaquin off of the coast. Overall, minor tidal flooding occurred. Roadways, including the Black Horse Pike between Atlantic City and Pleasantville, were shut down due to rising floodwaters. Motorists had to be rescued after becoming trapped in the rising waters.

According to the NCEI database, there have not been significant storm surge events affecting Atlantic County since the 2016 Update.

Figure 3a.19
Sandy Surge Extent[59]



Courtesy of *NJ Flood Mapper*.

[59] Courtesy of *NJ Flood* Mapper, produced in collaboration with the NOAA Coastal Services Center (CSC) through a partnership with the Jacques Cousteau National Estuarine Research Reserve (JCNERR) and the Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA), Rutgers University. This interactive mapping website was designed and created to provide a user-friendly visualization tool that will help get information into the hands of local communities who need to make decisions concerning flooding hazards and sea level rise. This website should be used to promote enhanced preparedness and land use planning decisions with considerations for possible future conditions. The *NJFloodMapper* uses high resolution mapping of the land surface elevation to model areas vulnerable to sea level rise. FEMA Preliminary Flood Insurance Rate Maps (FIRMs), coastal evacuation routes, state/municipal level infrastructure and socio-demographic information are included to provide a fuller picture of vulnerability to flooding hazards.

Probability of Occurrence – Storm Surge and Coastal Flooding

Atlantic County faces a relatively low probability of major storm surge inundation as derived from current SLOSH data for major hurricanes (Category 3-4). As described elsewhere in this section, the probability of a named storm making landfall in the vicinity of Atlantic County is 24 to 30 percent but is less for events that cause significant storm surge (dependent on storm speed, direction, tides, etc.). However, less severe to moderate storm surge events typically associated with nor'easters and less intense coastal storms are more likely to occur, and in the case of nor'easters will last longer and possibly cause more damage than fast-moving hurricanes. Additionally, the long-term rise in sea level can be expected to impact the occurrence of significant storm surges and hence future damages from coastal flooding in Atlantic County. Rising sea levels over time will shorten the return period (or exceedance interval) and hence increase the frequency of significant storm surge events. To take a hypothetical example, a one foot rise in sea level over 50 years could result in a storm surge event with a current annual occurrence probability of 2 percent (a "50-year" event) becoming an event of 10 percent annual probability (a "10-year" event).

The frequency and intensity of coastal storms and severe weather events is expected to increase in the future due to climate change. In the years to come, it is anticipated that Atlantic County will observe drastic changes in storm character, intensity, frequency, and storm tracking. Hurricanes are likely to become more intense with rising sea water temperatures. Coastal erosion rates are likely to increase with rising sea-level, to levels higher than those rates that have been observed over the last century. Storm effects will be more extensive in the future. The following types of impacts can be anticipated in Atlantic County's future as a result of climate change and sea level rise: inundation of low-lying areas; increased frequency and extent of storm-related flooding; wetland loss; saltwater intrusion into estuaries and freshwater aquifers; land loss through submergence and erosion of lands in coastal areas; migration of coastal landforms and habitats; increased salinity in estuaries and coastal fresh; impacts to human populations (property losses, more frequent flood damage, more frequent flooding of roadways and urban centers, risks to people as the population of coastal areas increases); more buildings and infrastructure exposed; currently exposed buildings and infrastructure could be subject to potentially greater losses as water levels increase, and continued rapid coastal development exacerbates the impacts of sea level rise; impacts on gravity flow stormwater systems; impacts on non-coastal areas. Impacts of climate change and sea level rise can affect all parts of a community, including: transportation infrastructure (ports, marinas, airports, roads, bridges, railways); public infrastructure (stormwater and wastewater management systems, drinking water supply and distribution systems, power utility systems, communications systems); public facilities (i.e., police, fire, ambulance, hospitals, schools, daycare centers, adult living facilities, historic landmarks, government buildings, libraries, parks, etc.); economic viability of a community – particularly for communities where tourism tends to drive local economies, as is the case in many of Atlantic County's coastal communities. Climate change and sea level rise could lead to a potential loss of assets that support tourism (i.e., beaches themselves as well beach access points, lodging, restaurants, marinas, fishing habitats, ecotourism, etc.).

Location and Extent – Tsunami

According to the New Jersey State Hazard Mitigation Plan, few tsunami events have occurred in the Gulf and East Coast states in the last 200 years, indicating no portions of Atlantic County are likely to experience a tsunami. As stated in the Maine State Hazard Mitigation Plan, all areas with an elevation of less than 100 feet and within a mile of the coast could be impacted by a tsunami, the chances of a catastrophic event are minimal.[60] There is no tsunami monitoring program on the East Coast of the United States.[61] The extent of a tsunami could be measured by land inundated and depth of inundation.

Probability of Occurrence and Previous Occurrences – Tsunami

The lack of significant tsunami events affecting the East Coast of the United States, combined with the lack of a tsunami monitoring program, suggest a low probability of a tsunami impacting New Jersey.

The New Jersey State Hazard Mitigation Plan identified potential tsunami events in New Jersey between 1821 and 2017. While the New Jersey State Hazard Mitigation Plan acknowledges that very few tsunami events have impacted the Gulf and East Coast states, potential tsunami events identified have damaged the Longport Thoroughfare (June 9, 1913) and the parts of Atlantic City (August 19, 1931). However, there were no reports of storms or earthquakes on June 9, 1913 and the weather bureau attributed the August 19, 1931 event affecting Atlantic City to a tropical storm north of Puerto Rico.

Wave Action

Location – Wave Action

The areas most susceptible to wave action in Atlantic County are predominantly located along the immediate coastal and shoreline areas of the Atlantic Ocean and along the back bays and inlet areas. Additional areas may occasionally experience wave action during extremely large storm events that cause storm surge (addressed separately within this section). **Figure 3a.20** illustrates the wave action hazard zones for Atlantic County based on FEMA 2014 Preliminary FIRMs. This includes areas mapped as Zone VE according to the most recent Flood Insurance Study (FIS) completed by FEMA. Zone VE refers to coastal areas with a 1 percent or greater chance of flooding and an additional hazard associated with storm-driven velocity waves of three feet or more.

Extent – Wave Action

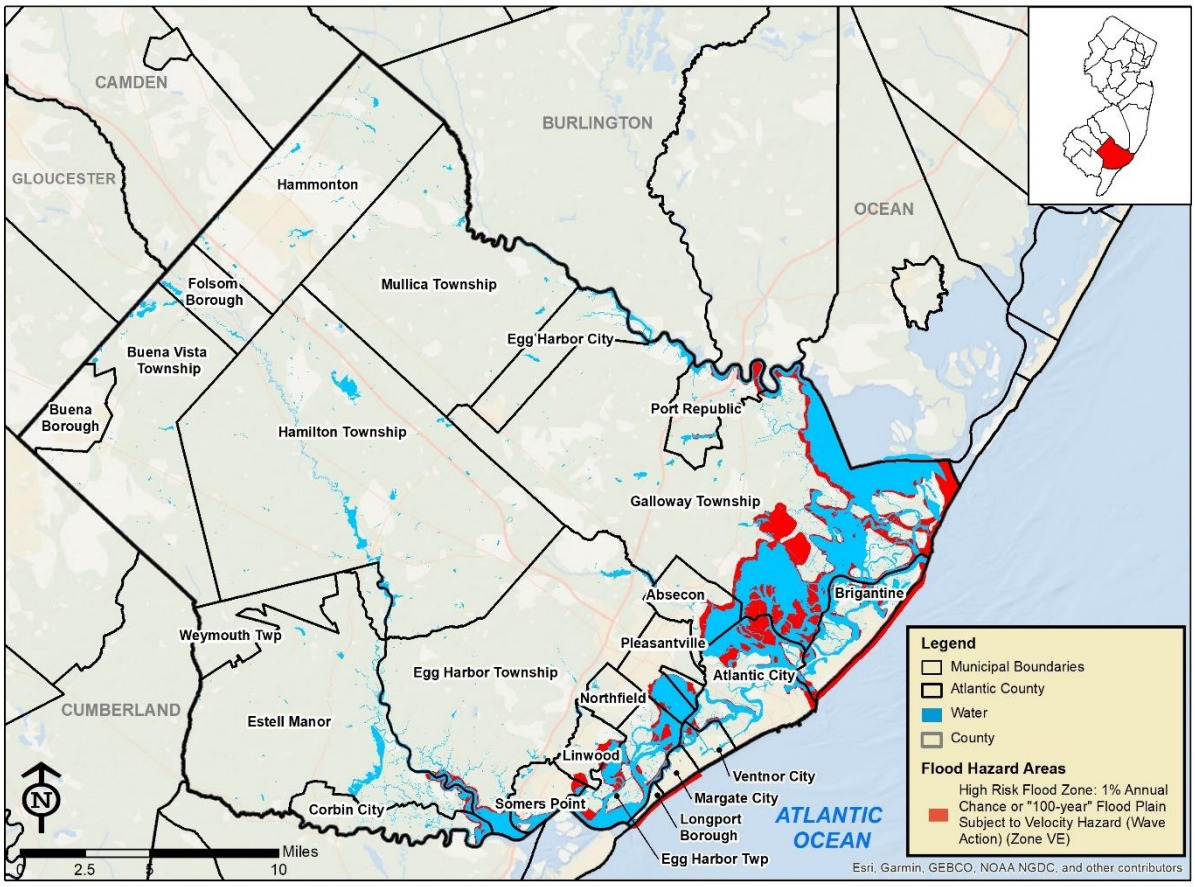
There is no particular scale that classified the magnitude or severity of different wave events for different category storms. The extent of flooding associated with a one percent annual

[60] Maine Emergency Management Agency, Maine State Hazard Mitigation Plan, 2019. Retrieved https://www.maine.gov/mema/sites/maine.gov.mema/files/inline-files/State%20Hazard%20Mitigation%20Plan%202019%20Update_10.8.2019.pdf

[61] State of New Jersey Office of Emergency Management, New Jersey State Hazard Mitigation Plan, 2019.

probability of occurrence (the base flood or 100-year flood) is used as the regulatory boundary by many agencies and this mapping does include mapping of the VE-zone, or the lands that can support breaking waves of three feet or more. This boundary is therefore a convenient tool for assessing the extent of the wave action hazard and risk in flood-prone communities. Higher category storms on the Saffir-Simpson scale would, however, typically have more destructive waves breaking into the built environment at the coastline causing more extensive damages to those susceptible structures with increasing storm category.

Figure 3a.20
Wave Action Hazard Zones in Atlantic County



SOURCE: FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, where available; Preliminary FIRM Data 2014 for areas not currently included in 2021 DFIRM: Atlantic City, Corbin City, Egg Harbor City, Estell Manor, Galloway Township, Northfield, Pleasantville, Port Republic, Somers Point, Ventnor City. NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

Historical Occurrences – Wave Action

According to the NCEI database,[62] 27 recorded wave action events ("high surf") have affected Atlantic County from August 1996 to May 2021. These incidents resulted in a reported total of two deaths and two injuries in Atlantic County, and caused an estimated $48 million[63] in property

[62] Current as of May 2021.
[63] $40 million of which are attributed to Superstorm Sandy.

damages. This includes one death, one injury, and $6 million in property damages since data was collected for the February 2016 Plan Update. A sampling of *notable events* includes the following:

August 29 – September 1, 1996. Rough surf associated with Hurricane Edouard affected the New Jersey Coast around the Labor Day Weekend and caused one drowning in Atlantic County when a boat capsized in the Great Egg Harbor Inlet off of Longport. The hurricane passed about 250 miles east of Atlantic City the evening of Sunday September 1st. But, the roughest surf generally occurred on the 30th with slow improvement over the rest of the Labor Day Weekend. Most beaches were either closed or had bathing restrictions throughout the weekend. Beach patrols reported that the busiest day for rescues was Friday the 30th.

September 18-20, 2003. Tropical Storm Isabel produced strong winds, moderate tidal flooding, erosion and rough surf along the New Jersey shore. While tide heights along the oceanside only reached minor, wave action caused considerable beach erosion, especially in Cape May and Atlantic Counties. NOAA reports $2 million in wave damage in Atlantic County as a result of Isabel.

December 5-6, 2003. A northeaster caused wave action, minor tidal flooding and dune damage along coastal New Jersey on the 5th and 6th. Waves caused considerable erosion along the coast. About a foot of beach was eroded from most of the Atlantic County beaches.

October 21-25, 2004. Waves battered the coast in Atlantic County; erosion averaged between 3 and 5 feet vertically and sloped up to 100 feet wide. The worst reported damage was in Brigantine and Atlantic City. In Brigantine, an 8-foot vertical cut to the dune system occurred between Promenade and Vernon Place. In Atlantic City, damage occurred to the dune system north of Rhode Island Avenue with loss of sand fencing. Groins were exposed in Margate.

February 28, 2005. Waves battered the Atlantic County coastline during an intense nor'easter. In Atlantic County, two to four-foot vertical cuts occurred, except in Ventnor where the vertical cut reached five feet at the south end of the city. Walkways and fences were also damaged. Some walkways now ended at the water's edge. The Ventnor Beach had just been rebuilt in 2004.

September 10-11, 2009. A low pressure system moving on shore brought with it strong northeast winds, high tides and rough surf. The largest effect along the shore was the wave action and the ensuing erosion from the pounding surf. In Atlantic County, vertical cuts averaged 1 to 2 feet, but reached up to 6 feet in Ventnor from Richards to Newport Avenue.

November 11-14, 2009. Strong winds, high tides, heavy surf and severe beach erosion occurred along the New Jersey coast during this powerful nor'easter. The surf and tides caused about 10 million dollars in damage to the Atlantic City boardwalk and beach. In Atlantic City and also Ventnor, ramps to the beach and boardwalk were destroyed. Overall county damage was estimated at 16 million dollars.

October 28-30, 2012. Superstorm Sandy was the costliest natural disaster by far in the state of New Jersey. Record-breaking high tides, catastrophic wave action, and damaging winds battered that State. In Atlantic City, the highest tide reached 8.9 feet above mean lower low water during the evening high tide on the 29th. This was the second highest tide on record (the highest was 9.0 feet above mean lower low water on December 11, 1992). Wave action was so severe that the Ocean City-Longport Bridge was closed because boulders were pushed onto it. The northern end of the Atlantic City boardwalk was destroyed. The impact of wave action alone to property in Atlantic County communities was estimated at $40 million.

Waves crashing through Atlantic City during Superstorm Sandy. (Photo courtesy of The Business Insider, Dina Spector, via @AccuWeather)

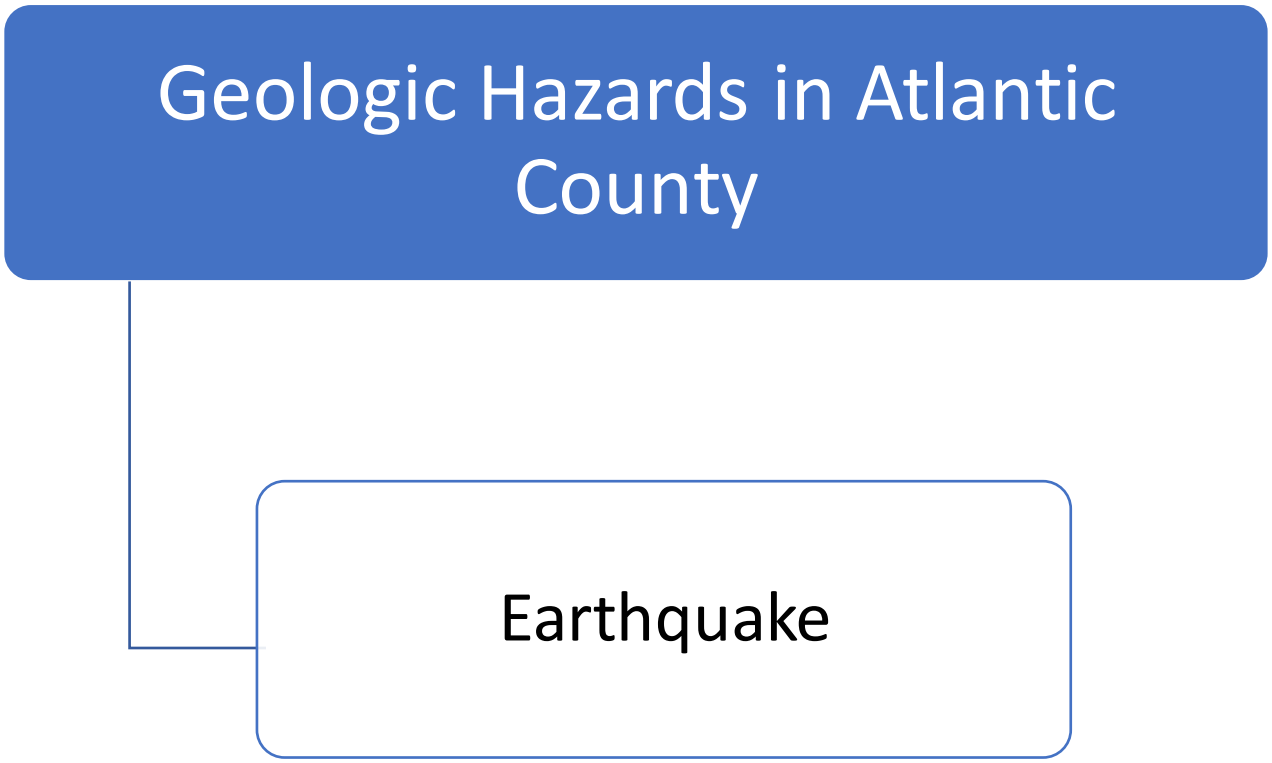
Probability of Occurrence – Wave Action

Wave action will continue to have a high probability of occurrence for the coastal flood hazard zones of Atlantic County, and the probability of future occurrences is certain. The most probably but least severe types of wave action events will be more frequent but are likely have fairly low impacts (i.e., minor damages, coastal erosion, etc.), while more severe waves associated with less frequent and lower probability coastal storm events such as hurricanes and nor'easters will cause much higher impacts (including property damages) along Atlantic County's shoreline.

The frequency and intensity of coastal storms and severe weather events is expected to increase in the future due to climate change. In the years to come, it is anticipated that Atlantic County will observe drastic changes in storm character, intensity, frequency, and storm tracking. Hurricanes are likely to become more intense with rising sea water temperatures. Coastal erosion rates are likely to increase with rising sea-level, to levels higher than those rates that have been observed over the last century. Storm effects will be more extensive in the future. The following types of impacts can be anticipated in Atlantic County's future as a result of climate change and sea level rise: inundation of low-lying areas; increased frequency and extent of storm-related flooding; wetland loss; saltwater intrusion into estuaries and freshwater aquifers; land loss through submergence and erosion of lands in coastal areas; migration of coastal landforms and habitats; increased salinity in estuaries and coastal fresh; impacts to human populations (property losses, more frequent flood damage, more frequent flooding of roadways and urban centers, risks to people as the population of coastal areas increases); more buildings and infrastructure exposed; currently exposed buildings and infrastructure could be subject to potentially greater losses as water levels increase, and continued rapid coastal development exacerbates the impacts of sea level rise; impacts on gravity flow stormwater systems; impacts on non-coastal areas. Impacts of climate change and sea level rise can affect all parts of a community, including: transportation infrastructure (ports, marinas, airports, roads,

bridges, railways); public infrastructure (stormwater and wastewater management systems, drinking water supply and distribution systems, power utility systems, communications systems); public facilities (i.e., police, fire, ambulance, hospitals, schools, daycare centers, adult living facilities, historic landmarks, government buildings, libraries, parks, etc.); economic viability of a community – particularly for communities where tourism tends to drive local economies, as is the case in many of Atlantic County's coastal communities. Climate change and sea level rise could lead to a potential loss of assets that support tourism (i.e., beaches themselves as well beach access points, lodging, restaurants, marinas, fishing habitats, ecotourism, etc.).

GEOLOGIC HAZARDS

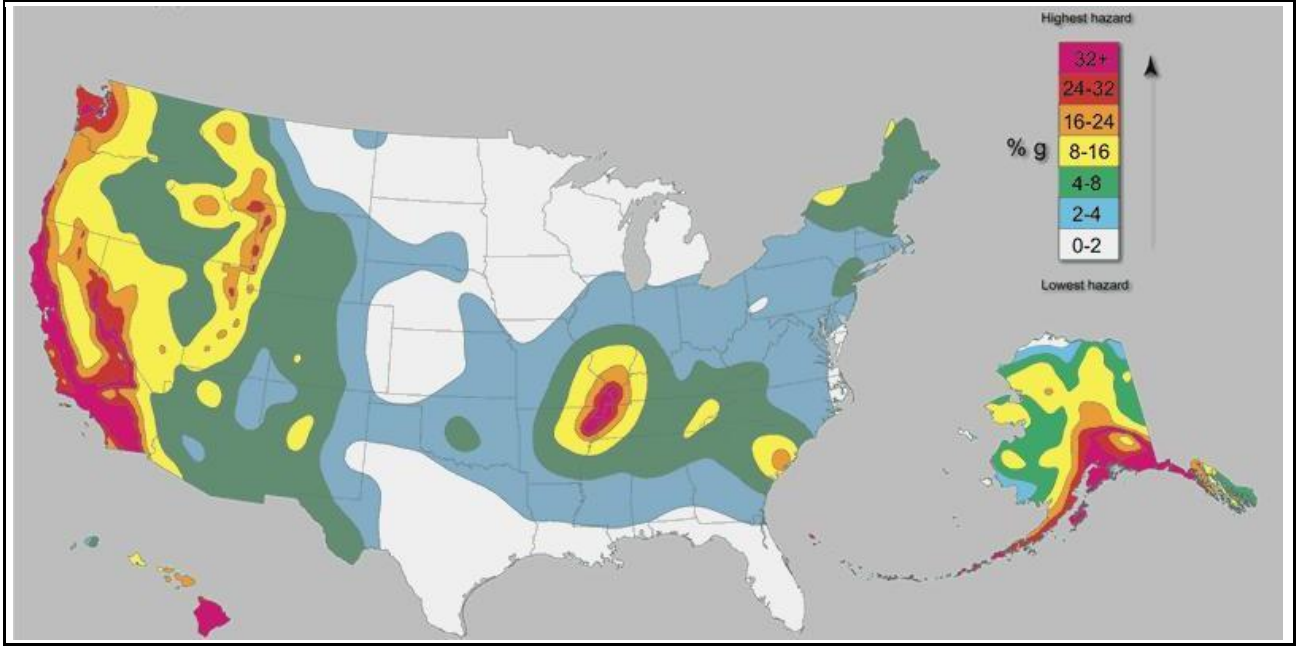


Earthquake

Location – Earthquake

The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines located in the central and western states; however, the East Coast does face moderate risk to less frequent, less intense earthquake events. **Figure 3a.21** shows relative seismic risk for the United States.

Figure 3a.21
United States Earthquake Hazard Map



Source: United States Geological Survey

Figure 3a.17 shows the probability that ground motion will reach a certain level during an earthquake in Atlantic County and the surrounding region. The data shows peak horizontal ground acceleration (the fastest measured change in speed for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. Atlantic County is located in an area with peak ground acceleration (PGA) values between 2%g and 3%g, which is a relatively low seismic risk but still enough to suggest that Atlantic County is susceptible to moderate, damaging earthquakes over time.

Extent – Earthquake

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy.

Table 3a.20
Magnitude/Intensity Comparison for Earthquakes

Magnitude	Typical Maximum Modified Mercalli Intensity	Abbreviated Modified Mercalli Intensity Scale
1.0 - 3.0	**I**	**I**. Not felt except by a very few under especially favorable conditions.
3.0 - 3.9	**II - III**	**II**. Felt only by a few persons at rest, especially on upper floors of buildings.
		III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 - 4.9	**IV - V**	**IV**. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
		V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 - 5.9	**VI - VII**	**VI**. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
		VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 - 6.9	**VII - IX**	**VII**. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
		VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
		IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	**VIII** or higher	**VIII**. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
		IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
		X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
		XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
		XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: US Geological Survey (http://earthquake.usgs.gov/learn/topics/mag_vs_int.php, page last modified September 29, 2014)

Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, with a I corresponding to imperceptible (instrumental) events, IV

corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in **Table 3a.20**.

Historical Occurrences – Earthquake

Earthquakes do occur on a fairly regular basis in New Jersey, though most are of very low magnitude (MMI intensity of less than II) and often not felt by people or capable of causing property damage. According to the New Jersey Geological Survey, there have been 150 recorded earthquakes in New Jersey since 1783, including one with an epicenter located in Atlantic County. This event occurred on November 6, 1912. Its epicenter was located in the City of Pleasantville. The depth and magnitude for this event are both listed as zero in both the NJGS data and the National Earthquake Information Center. Additional information on this event is not available.

New Jersey's susceptibility to earthquakes extends to events located beyond state borders, and some of the most damaging earthquakes were associated with larger, more significant events occurring elsewhere along the East Coast. Most past earthquake damage in New Jersey has been to building contents and architectural damage, such as fallen chimneys, cracked plaster and masonry, and items falling off shelves. Some of the more notable earthquake events for the New Jersey region are identified in **Table 3a.21**.

Table 3a.21
Damaging Earthquakes Felt in the New Jersey Region[64]

Date	Location	Richter Magnitude	Description
12/19/1737	Greater NYC Area	5.2	Chimneys down in New York City. Felt from Boston, MA to Philadelphia, PA.
11/30/1783	North-Central New Jersey	5.3	Felt from New Hampshire to Pennsylvania. Two foreshocks (11/24 and 11/30) and one aftershock (11/30); threw down chimneys.
08/10/1884	Greater NYC Area	5.2	Threw down chimneys; felt from Virginia to Maine
09/01/1895	Near High Bridge, NJ	7.7	Felt over a considerable area to the northeast and southwest. The total felt area covered points from Maine to Virginia in a long, narrow elliptical zone of about 92,000 square kilometers. Articles fell from shelves and buildings rocked (intensity VI) in several Hunterdon County towns. The shock was fairly sharp at Camden and Burlington. At Philadelphia, Pennsylvania, broken windows and overturned crockery were reported.
06/01/1927	Near Asbury Park, NJ	3.9	Occurred in the Asbury Park area. Three shocks were felt along the coast from Sandy Hook to Toms River. Maximum intensities of VII were observed at Asbury Park and Long Branch. Several chimneys fell, plaster cracked, and articles were thrown from shelves. The felt area extended over approximately 7,800 square kilometers.

[64] *Source: NJ State Hazard Mitigation Plan 2014, excerpts from Table 5.5-6.*

01/25/1933	Near Trenton, NJ	0.0	A sharp jolt was felt over central New Jersey from Lakehurst to Trenton. Although there is some doubt whether the shock was of seismic origin, the event was felt most strongly at Lakehurst, where people reported they were rolled out of bed (intensity V). Other people reported pictures shaken from walls. The shock was also felt at Bordentown, Burlington, Columbus, Englishtown, Freehold, Hightstown, New Egypt, Robbinsville, and White Horse.
08/23/1938	Northeast of New Egypt, NJ	3.8	Caused minor damage at Gloucester City and Hightstown (intensity V). The total felt area was about 13,000 square kilometers, including bordering portions of Delaware and Pennsylvania. Glassware was broken at Gloucester City and Hightstown and some furniture was displaced at Pitman. A few windows and some glassware were reported broken at Ardmore, Pennsylvania. Four smaller shocks occurred on 8/23 and one on 8/26.
11/15/1939	Salem County, NJ	3.4	The disturbance was reportedly felt from Trenton to Baltimore, Maryland, and from Cape May to Philadelphia and its adjoining counties. About 16,000 square kilometers were affected. Small objects were reported to have overturned at Deepwater, but little or no damage was noted.
3/23/1957	Schooley's Mountain, NJ	2.9	A shock affected west-central New Jersey, near the site of the 1895 earthquake. Chimneys cracked (intensity VI), windows and dishes broke, and pictures fell at Lebanon. A cracked chimney was also reported from Hamden. At Long Valley, some walls were cracked and plaster fell. The felt area was small in comparison with the other shocks previously described.
3/10/1979 "Cheesequake Earthquake"	Bernardsville, NJ (epicenter in Morris County)	3.1	Felt by some people in Manhattan
10/19/1985	Ardsley, NY	4	Many people in the NYC area felt this earthquake.
10/23/1990	Hancock's Bridge, NJ	2.9	Felt in New Jersey, Delaware, and Pennsylvania
02/03/2009	3.5km South-Southwest of Rockaway, NJ	3.0	There were reports of people having felt this earthquake throughout New Jersey.
02/14/2009	5 km North-Northeast of Boonton, NJ	2.4	There were reports of people having felt this earthquake throughout New Jersey.
07/01/2009	2.25km East-Southeast of Pennsville, NJ	2.8	There were reports of people having felt this earthquake throughout New Jersey.
02/21/2010	Gladstone, NJ	2.6	This earthquake hit just before 9 a.m. and prompted numerous phone calls to police. No damages were reported. Many people in New Jersey reported having felt this earthquake. A 2.3 occurrence later in the day was also reported as having been felt by numerous people in New Jersey, and was most likely an aftershock.
06/06/2010	6 km Southeast of Sayreville, NJ	2.3	People reported having felt this earthquake throughout New Jersey.

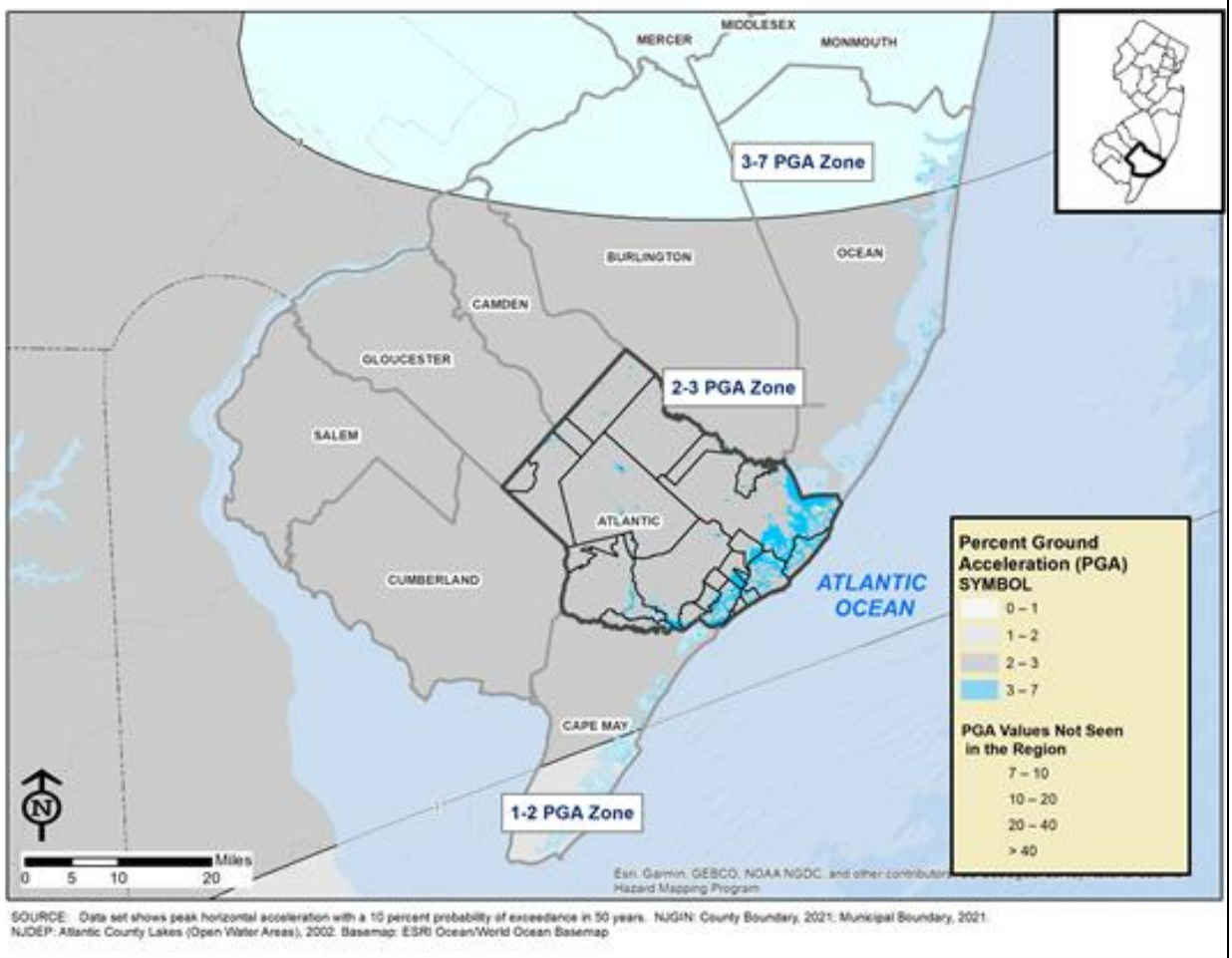
08/23/2011	Central Virginia	5.8	A moderate earthquake occurred in central Virginia and was felt throughout most of the east, from Georgia to southern Canada and from Indiana to coastal Maine. It was followed by four aftershocks. In New Jersey, the intensity ranged from one to four (weak to light). Areas underlain by thick silt and clay felt a stronger ground motion than did those where rock was very close to the surface. The quake was felt in South Brunswick and residents were calling 911 wanting to know what happened; some thought it was an explosion. It was also felt in the offices of Alcatel-Lucent in Murray Hill (Union County). Ceiling tiles fell out at a Sears store in Middletown. In Plainfield (Union County), employees in the Park Madison building were evacuated after the tremor. Union County's administration building in Elizabeth reported continuous shaking. In New Brunswick (Middlesex County), employees were evacuated from the County administration building. Atlantic City (Atlantic County) went into emergency mode with evacuations of high rises, hospitals, schools, casinos, and hotels. The County OEM received reports of a crack in a wall in a house and broken water pipe in a building. There were minor scattered power outages reported throughout the state.
11/05/20112	3 km Southwest of Mahwah, NJ	2.0	People reported having felt this earthquake in various parts of New Jersey.
11/23/2012	Greater Philadelphia Area/New Jersey	2.2	Numerous reports of people having felt the earthquake in southwestern New Jersey.

Atlantic County has not experienced earthquakes resulting in significant damages since the 2016 Plan Update.

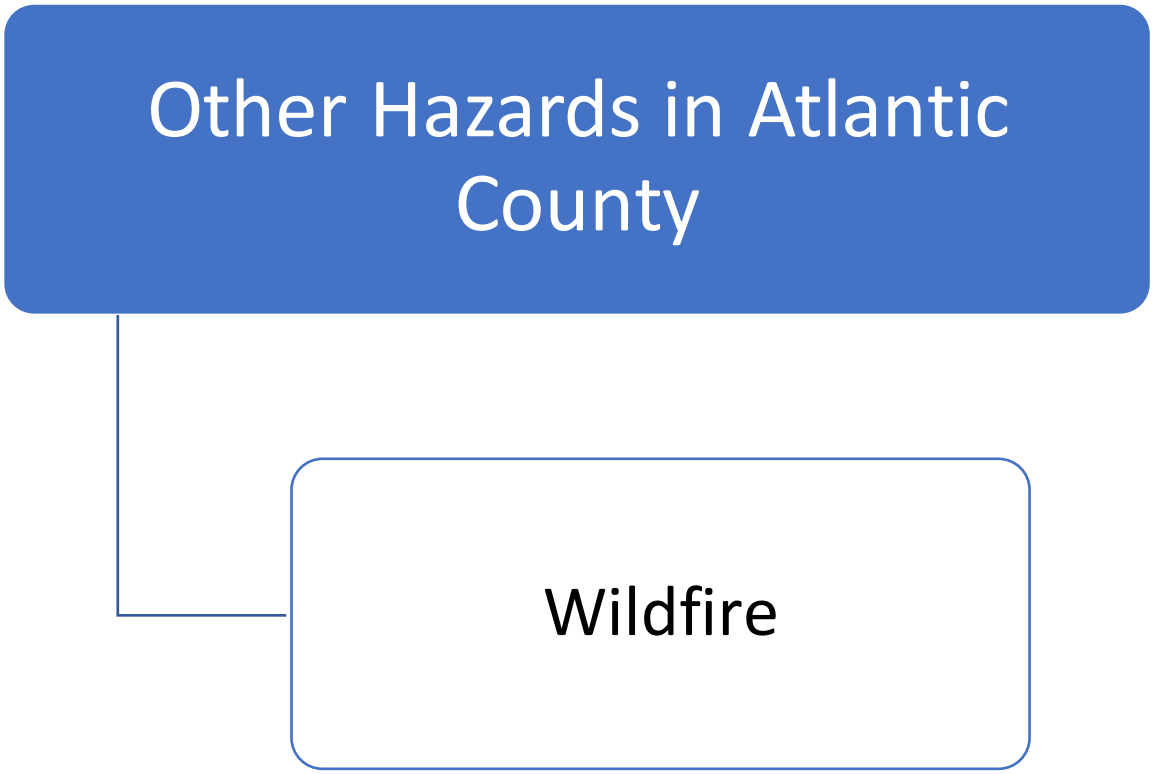
Probability of Occurrence – Earthquake

The probability of significant, damaging earthquake events affecting Atlantic County is low. According to the United States Geological Survey (USGS), an earthquake with a 10 percent probability of exceedance over 50 years would have PGA values between 2%g and 3%g, which would result in light to moderate perceived shaking and damages ranging from none to very light. More destructive earthquakes are very rare, low probability events for Atlantic County with highly infrequent recurrence periods. **Figure 3a.22** visualizes earthquake risk in southern New Jersey.

Figure 3a.22
Peak Ground Acceleration with a 10% Probability of Exceedance over 50 years



OTHER HAZARDS

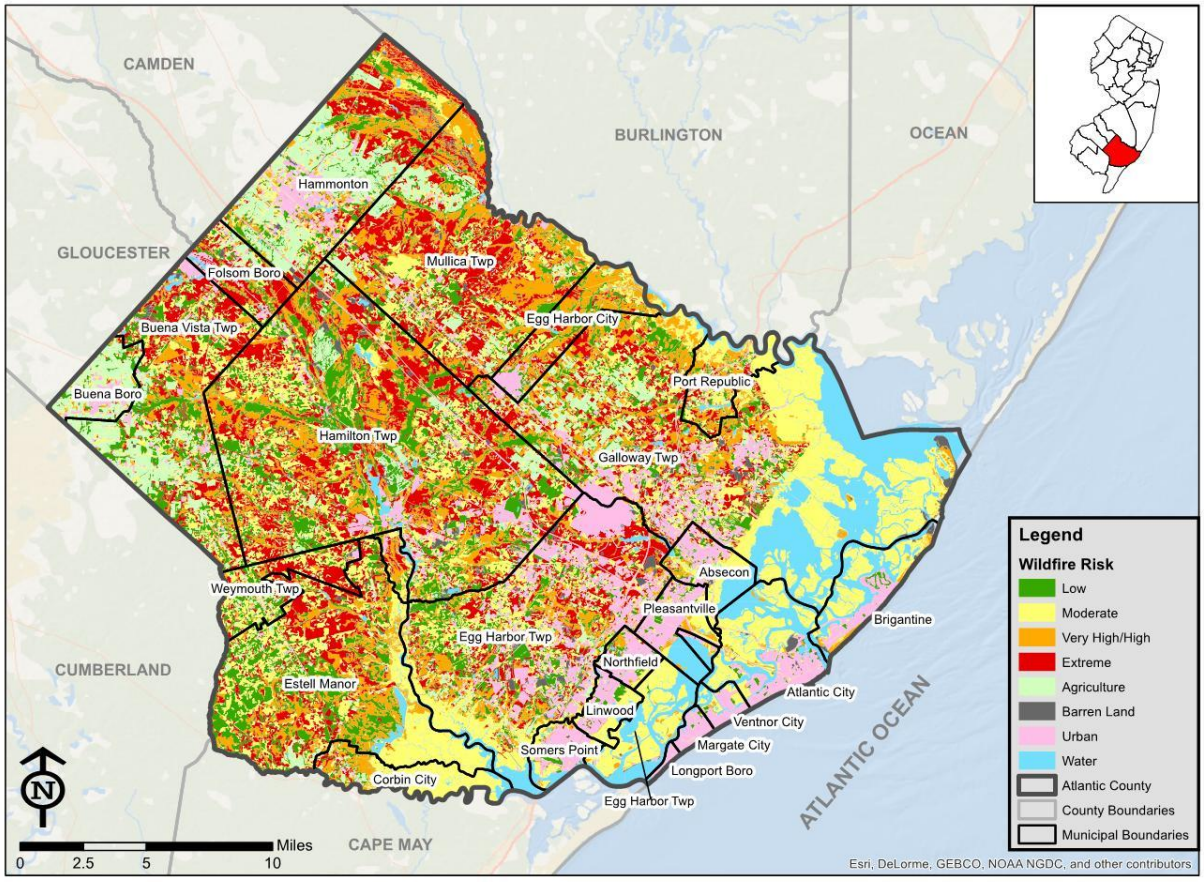


Wildfire

Location – Wildfire

Areas typically prone to wildfire occurrence include large tracts of undeveloped wildlands containing heavier fuels with high continuity, steep slopes and far away from firefighting apparatus that would suppress the spread of wildfires once reported. The New Jersey Forest Fire Service (NJFFS) recently conducted a wildfire hazard assessment[65] for much of the state and has published a map of wildfire hazard areas in Atlantic County. **Figure 3a.23** illustrates this information and shows that the most significant wildfire hazard areas are located predominantly in the western portions of the county.

Figure 3a.23
Wildfire Hazard Areas for Atlantic County



SOURCE: NJDEP and NJFFS: Atlantic County Wildfire Fuel Hazard, 2009. NJGIN: County Boundary, 2012; Municipal Boundary, 2014.

[65] The methodological basis for the NJFFS wildfire risk assessment in Atlantic County was based on a correlation of fire risk to vegetation type as recorded in 1996 data for Land Use / Land Cover data.

Extent – Wildfire

The extent (that is, magnitude or severity) of wildfires depends on weather and human activity. NJFFS uses two indices to measure and monitor dryness of forest fuels and the possibility of fire ignitions becoming wildfires. The State Plan notes that these indices include the National Fire Danger Rating System's Buildup Index, and the Keetch-Byram Drought Index. Both are used for fire preparedness planning, which includes the following: campfire and burning restrictions, fire patrol assignments, staffing of fire lookout towers, and readiness status for both observation and firefighting aircraft.

- The **Buildup Index (BUI)** is a number that reflects the combined cumulative effects of daily drying and precipitation in fuels with a 10-day time lag constant. The BUI can represent three to four inches of compacted litter or can represent up to six inches or more of loose litter (North Carolina Forest Service 2009).
- The **Keetch-Byram Drought Index (KBDI)** is a drought index designed for fire potential assessment as defined by the United States Department of Agriculture Forest Service. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. The index increases each day without rain and decreases when it rains. The scale ranges from zero (no moisture deficit) to 800 (maximum drought possible). The Florida Forest Service states that the range of the index is determined by assuming that 8 inches of moisture in a saturated soil is readily available to the vegetation. For different soil types, the depth of soil required to hold eight inches of moisture varies. A prolonged drought influences fire intensity, largely because more fuel is available for combustion. The drying of organic material in the soil can lead to increased difficulty in fire suppression.

There are also many other scales and fire weather indices that evaluate wildfire *potential* on any given day taking into account factors such as daily weather and vegetation condition information, fuel moisture, fuel hazard, moisture content in the lower atmosphere, etc.

Historical Occurrences – Wildfire

According to the New Jersey State Hazard Mitigation Plan (2014)[66], Atlantic County experienced 218 wildfire events from 1924 to 2007, more than any other county in the State with the exception of neighboring Ocean County (with 692 recorded events) and Burlington County (with 924 recorded events). A total of 228,667 acres was burned during these events. The State Plan records 11 wildfires that were considered to be major events (burning more than 100 acres) or otherwise significant[67]. Specific historical occurrences of wildfires in Atlantic County are also recorded in the NCEI database, which records details for nine wildfire events in Atlantic County between July 1997 and June 2015. The most recent occurrence included in the NCEI database was in April 2009. No events occurred during the last plan maintenance phase (2016-2021).

Further details on a sampling of prior events are provided here:

[66] Table 5.12-5 Number of Wildfire Events by County from 1924 to 2007
[67] Table 5.12-2 Wildland Fire Incidents (1905-2015)

March 31, 1977. A total of 15,000 acres of land was burned in Atlantic, Burlington, and Ocean Counties. A 15,000-acre fire on March 31 burned six homes and caused extensive damage in Burlington, Ocean, and Atlantic Counties.

July 29, 1997. In all 381 wildfires blackened 3,095 acres of forest throughout New Jersey during the month of July. The largest forest fire of the month blackened about 1,920 acres of the Wharton State Forest in the Township of Mullica and Town of Hammonton. One fire fighter suffered heat exhaustion. The fire started about 2.5 miles from the Totem Village in the Township of Mullica. About 100 persons (75 homes) were evacuated for about a day from that development and placed in the Mullica Township firehouse. The fire was declared contained at 6 p.m. EDT on the 30th. The unseasonably hot and dry weather contributed to a larger than normal number of wild and forest fires in the State of New Jersey.

April 30, 1999. A five acre marsh fire caused by a welder's torch was exacerbated by the unseasonably dry weather during the second half of April and very strong and gusty northeast winds. The fire started around 1120 a.m. EDT behind Harrah's within Atlantic City. Workers were building a walkway from a parking lot into the casino. The strong winds coupled with flames stretching into the marsh beyond the hoses' reach made it a difficult fire to control. Nevertheless, it was contained by 1 p.m. EDT. No injuries, property damage or evacuations occurred. The peak wind gust at the Marina within Atlantic City was 29 mph.

March 5, 2000. A fast moving brush fire, exacerbated by strong gusty northwest winds, forced the evacuation of an apartment complex in the City of Somers Point and the closure of the Garden State Parkway for 80 minutes. The fire started as a grass fire on Hoter Avenue in Somers Point shortly before 1 p.m. EST. It spread into the meadow grass and the strong gusty northwest winds extended it beyond the Garden State Parkway. The fire came dangerously close to three buildings in the Somers Point Village Apartments before it was extinguished at 247 p.m. EST. About 15 acres were burned. It was extinguished in 15 minutes. The peak wind gust at the Atlantic City International Airport was 33 mph.

April 18, 2002. An active thunderstorm caused a couple of lightning strike damage in Hamilton Township during the late afternoon of the 18th. Lightning strikes started a couple of small brush fires, struck a senior citizen center and damaged the township's emergency center telephone lines and radio communications.

March 5, 2007. A grass fire in the Township of Egg Harbor closed the northbound and southbound lanes of the Garden State Parkway near the intersection with the Atlantic City Expressway. Heavy smoke sharply reduced visibility. Later that afternoon, one lane in each direction on the Garden State Parkway was reopened. Traffic was also diverted on the Atlantic City Expressway. The spread of the brush fire was assisted by the gusty northwest winds. The peak wind gust at the Atlantic City International Airport on the 5th was 46 mph.

June 1, 2007. A wildfire in the Wharton State Forest near Atsion in Hammonton Township burned for several days and forced the closing of State Route 206. A total of 3,500 acres was burned.

October 21-27, 2008. The Sauder Ditch Wildfire consumed about 1950 acres of forest before it was contained. The fire began in a secluded section of Wharton State Forest in Waterford Township (Camden County) close to 3 p.m. EDT on the 21st. This location is west of U.S. Route 206 and south of the Atsion Recreational Area. It spread into parts of the Town of Hammonton (Atlantic County). Gusty northwest winds along with recent dry weather helped spread the fire

quickly and hampered firefighting efforts on the 21st and 22nd. About four homes and two businesses on U.S. Route 206 in the Town of Hammonton were evacuated because of fear of smoke and the fire itself on the 21st. They were allowed to return at noon EDT on the 22nd. The fire reached up to 100 feet in the air and was visible from Atlantic City. The heavily traveled U.S. Route 206 was closed between the White Horse Pike (U.S. Route 30) in the Town of Hammonton and Atsion Lake (Shamong Township, Burlington County) after the fire jumped the roadway on the evening of the 21st. The roadway had sporadic closures, especially at night when the smoke became thicker, through the 25th. About 200 fire fighters battled the blaze and used brush trucks, helicopters, bull dozers and air tankers in their efforts. Water was retrieved from nearby Atsion Lake. The fire was considered twenty percent contained on the 21st, forty percent contained on the 22nd, fifty percent contained on the 23rd, seventy percent contained on the 24th, ninety percent contained on the 26th and fully contained on the morning of the 27th. A firefighter suffered an irregular heartbeat from battling the blaze and one traffic cop was struck by a vehicle. On the morning of the 24th an atmospheric inversion caused by a nearby high pressure system trapped the smoke near the ground. This caused thick smoke with near zero visibilities to affect the Town of Hammonton and surrounding area. All Hammonton schools were closed and the White Horse Pike (U.S. Route 30) in Hammonton and Winslow was closed. Heavy rain on the 25th helped firefighting efforts. The peak wind gusts at Atlantic City International Airport were 37 miles per hour on the 21st and 35 miles per hour on the 22nd.

February 12, 2009. A wind whipped forest fire burned about 40 acres in Galloway Township during the afternoon and evening on the 12th before it was contained. The fire was believed to be caused by arcing downed wires. The fire occurred in the area bounded by Leipzig Avenue and Liebig and Herschel Streets. No homes were damaged or threatened and no injuries were reported.

April 18, 2009. The fire started near the former Jersey Devil cabin off of Bremen Avenue in Egg Harbor City within the Pinelands National Reserve. The fire briefly caused some evacuations including one woman with respiratory problems. The fire consumed about 315 acres of white cedar swamp within the Pinelands.

In addition, information from local sources on the CPG reported that a large wildfire in the 1960s threatened Weymouth Township, causing large scale evacuations and the loss of several homes. No further information was readily available. Based on a review of NCEI data and the 2019 New Jersey State Hazard Mitigation Plan, no significant wildfire events have occurred in Atlantic County since the 2016 Update.

Probability of Occurrence – Wildfire

Wildfire probability depends on local weather conditions; outdoor activities such as camping, debris burning, and construction; and the degree of public cooperation with fire prevention measures. Wildfire events will continue to have a high probability of occurrence in Atlantic County, and the probability of future occurrences in Atlantic County is certain. However, these events are typically contained and extinguished rather quickly and those events causing major property damage or life/safety threats are much less likely to occur.

Sections 3B and 3C - VULNERABILITY ASSESSMENT

Overview

As described in Section 2, as part of this first plan update, the planning team reassessed a full range of natural hazards and determined that no hazards should be added to or omitted from the 2010 list of identified hazards. Section 3A profiled each identified hazard.

Sections 3B and 3C build upon the information provided in the *Hazard Profiles* (Section 3A) by identifying and characterizing an inventory of assets in Atlantic County, and then assessing the potential impact and amount of damages that can be expected to be caused by each identified hazard event. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard, by jurisdiction. In so doing, Atlantic County and each of its municipalities may better understand their own unique risks to identified hazards and be better prepared to evaluate and prioritize unique hazard mitigation actions for their communities.

This section begins with a summary description of the asset inventory as compiled for Atlantic County through coordination with the Atlantic County Office of GIS, as well as an explanation of the methodology applied to complete the multi-jurisdictional vulnerability assessment. The remainder of this section focuses on the results of the vulnerability assessment and is organized by hazard in similar format to the *Hazard Profiles* section, and as listed below.

- **Atmospheric Hazards**
  - Severe Weather
    - Extreme Temperatures
    - Extreme Wind
    - Hail Storm
    - Lightning
    - Tornado
  - Hurricane and Tropical Storm
  - Nor'easter
  - Severe Winter Weather

- **Hydrologic Hazards**
  - Coastal Erosion and Sea Level Rise
  - Dam and Levee Failure
  - Drought
  - Flood
  - Storm Surge
  - Wave Action
  - Tsunami

- **Geologic Hazards**
  - Earthquake

- **Other Hazards**
  - Wildfire

3B - Identification and Characterization of Assets in Hazard Areas

An inventory of Atlantic County's georeferenced assets[1] was created in order to identify and characterize property and persons potentially at risk to the identified hazards. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Under this assessment, six categories of assets were created and then further assessed through geographic information systems (GIS) analysis. The six categories of assets include:

1. Improved property: This category was identified using Geographic Information System (GIS) parcel data downloaded from New Jersey Geographic Information Network (NJGIN) as part of the current MOD-IV dataset, which provides parcel boundaries for the State of New Jersey. The parcel data file for Atlantic County in the MOD-IV dataset was last updated by the County in 2012. Attribute information including property usage category and improvement values were obtained from the 2021 Atlantic County tax list dataset and then joined to the 2012 parcel records for the county, using unique parcel identification numbers. Due to the differences in the data structure and parcel naming between the GIS data and the tax list and the age of the parcel data, not every parcel can be matched with the corresponding tax information (including property usage category and improvement value). Those parcels that were matched with attribute information and having an improvement value greater than 0 were categorized as "Improved Property".

   Hence for some detailed analyses of delineable hazards in Section 3C, the total value of improvements shown in the tables ($19.65 billion) differs from the total value of improved property in Atlantic County as provided by the Atlantic County tax list ($23.2 billion).

2. Emergency facilities: This category covers all facilities dedicated to the management and response of emergency or disaster situations, and includes emergency operations centers (EOCs), fire stations, police stations, ambulance stations, and hospitals. Data sets for fire stations, police stations, and hospitals were provided by Atlantic County Office of GIS. EOC data was obtained from HAZUS-MH®. HAZUS defines EOCs as municipal government disaster operation and communication centers deemed (for design) to be vital in emergencies; they are dedicated facilities used for emergency operations, separately and distinctly from hospitals, fire stations, police stations, etc.

3. Critical infrastructure and utilities: This category covers facilities and structures vital to the maintenance of basic living conditions in the county, and includes electrical power facilities, communications facilities, potable water supply facilities, wastewater treatment facilities, significant public works buildings, airports, and passenger railroad stations. HAZUS was the main data source, supplemented with public works facilities data from Atlantic County Office of GIS[2].

[1] While potentially not all-inclusive for Atlantic County, "georeferenced" assets include those assets for which specific location data is readily available for connecting the asset to a specific geographic location for purposes of GIS analysis.
[2] The significant public works facilities GIS layer that was provided also included facility types such as municipal buildings.

4. Other key facilities: This category covers facilities which may be capable of providing refuge and limited medical care and hence may be utilized as emergency shelters, and those which routinely house more vulnerable sectors of the county population, making them potentially especially vulnerable to identified hazards. Included in this category are schools, senior care facilities, and emergency shelters. Atlantic County Office of GIS provided school data and nursing home data was downloaded from NJGIN. ACOEP provided data for the emergency shelters.
5. Historic and cultural resources: This category includes those historic structures, landmarks and sites that are included in the New Jersey State or National Register of Historic Places.
6. Population: This category covers the number of people residing in the 23 municipalities in the County as measured by the U.S. Census Bureau, 5-Year American Community Survey (2015-2019).

The remainder of this subsection provides a more detailed breakdown, by jurisdiction, of georeferenced assets that have been identified for inclusion in the multi-jurisdictional vulnerability assessment.

Improved Property

The total value of improved property value in Atlantic County is nearly $23.2 billion, based on parcel data as of 2021 downloaded from NJGIN. **Table 3b.1** lists the total number and percentage of improved parcels as well the total value of their improvements by jurisdiction. The data may not include some public buildings and other tax-exempt structures.

Table 3b.1
Improved Property by Jurisdiction

Jurisdiction	Total Number of Parcels	Number of Improved Parcels	Percent of Improved Parcels	Total Value of Improvements (in millions)
Absecon, City of	4,187	3,524	84%	$441.9
Atlantic City, City of	16,769	13,165	79%	$4,819.2
Brigantine, City of	9,407	8,811	94%	$1,324.8
Buena, Borough of	1,940	1,545	80%	$232.7
Buena Vista, Township of	9,184	2,717	30%	$481.8
Corbin City, City of	380	249	66%	$34.4
Egg Harbor City, City of	4,773	1,516	32%	$244.1
Egg Harbor, Township of	19,960	16,251	81%	$3,314.3
Estell Manor, City of	2,670	800	30%	$113.9
Folsom, Borough of	1,420	750	53%	$114.8
Galloway, Township of	19,674	14,277	73%	$2,609.7
Hamilton, Township of	17,420	9,545	55%	$1,762.8
Hammonton, Town of	6,606	5,365	81%	$1,126.2
Linwood, City of	3,095	2,928	95%	$612.1
Longport, Borough of	1,693	1,611	95%	$540.0
Margate City, City of	7,579	6,901	91%	$1,547.9
Mullica, Township of	5,248	2,417	46%	$329.0
Northfield, City of	3,665	3,414	93%	$621.1
Pleasantville, City of	6,560	5,854	89%	$909.7
Port Republic, City of	658	494	75%	$86.5
Somers Point, City of	4,389	4,140	94%	$857.0
Ventnor City, City of	6,972	6,554	94%	$967.0
Weymouth, Township of	1,115	714	64%	$108.9
Total	**115,364**	**113,542**	**73%**	**$23,199.5**

Source: NJGIN, Atlantic County Parcel data, 2021.

Emergency Facilities

There are 107 georeferenced emergency facilities in Atlantic County, including 62 fire stations, 24 police stations, 10 ambulance stations, 4 hospitals, and 7 EOCs. **Table 3b.2** tabulates these emergency facilities by jurisdiction. Geographic coordinates (latitude and longitude) were used to determine the location of each facility.

Table 3b.2
Emergency Facilities by Jurisdiction

Jurisdiction	Fire Stations	Police Stations	Ambulance Stations	Hospitals	Emergency Operations Centers
Absecon, City of	1	1	1	0	0
Atlantic City, City of	6	3	0	1	1
Brigantine, City of	1	1	0	0	0
Buena, Borough of	2	1	1	0	0
Buena Vista, Township of	5	1	0	0	0
Corbin City, City of	0	0	0	0	0
Egg Harbor City, City of	1	1	1	0	0
Egg Harbor, Township of	12	1	1	0	1
Estell Manor, City of	1	0	0	0	0
Folsom, Borough of	1	0	0	0	0
Galloway, Township of	6	1	1	1	0
Hamilton, Township of	6	4	2	0	1
Hammonton, Town of	2	2	0	1	0
Linwood, City of	1	1	1	0	1
Longport, Borough of	1	1	0	0	0
Margate City, City of	2	1	0	0	0
Mullica, Township of	4	2	0	0	0
Northfield, City of	2	1	0	0	0
Pleasantville, City of	1	1	0	0	1
Port Republic, City of	1	0	0	0	1
Somers Point, City of	2	1	1	1	0
Ventnor City, City of	2	0	0	0	1
Weymouth, Township of	2	0	1	0	0
Total	**62**	**24**	**10**	**4**	**7**

Source: Atlantic County Office of GIS: Fire Stations, Police Stations, and Hospitals, 2021 Ambulance Stations (Rescue Squad). FEMA HAZUS: Emergency Operations Center, 2021

Critical Infrastructure and Utilities

There are 106 identified critical infrastructure and utility elements in Atlantic County, including 36 water supply facilities, 6 wastewater treatment facilities, 4 electrical power facilities, 3 airports, 4 passenger railroad stations, 34 public works facilities, and 18 communications facilities. **Table 3b.3** shows critical infrastructure and utilities by jurisdiction. Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility within each jurisdiction.

Table 3b.3
Critical Infrastructure and Utilities by Jurisdiction

Jurisdiction	Water Supply Facilities	Wastewater Treatment Facilities	Electrical Power Facilities	Airport	Passenger Railroad Stations	Public Works Facilities	Communications Facilities
Absecon, City of	1	0	0	0	1	1	0
Atlantic City, City of	1	2	2	0	1	3	9
Brigantine, City of	0	0	0	0	0	1	0
Buena, Borough of	1	1	0	0	0	1	0
Buena Vista, Township of	0	0	0	0	0	1	0
Corbin City, City of	0	0	0	0	0	1	2
Egg Harbor City, City of	6	1	0	0	1	1	1
Egg Harbor, Township of	0	0	1	1	0	2	0
Estell Manor, City of	0	0	0	0	0	1	0
Folsom, Borough of	0	0	0	0	0	0	0
Galloway, Township of	3	0	0	1	0	2	1
Hamilton, Township of	7	1	0	0	0	3	1
Hammonton, Town of	4	1	0	1	1	3	1
Linwood, City of	0	0	0	0	0	1	0
Longport, Borough of	0	0	0	0	0	1	0
Margate City, City of	6	0	0	0	0	1	0
Mullica, Township of	0	0	0	0	0	1	0
Northfield, City of	0	0	0	0	0	4	0
Pleasantville, City of	0	0	1	0	0	1	3
Port Republic, City of	0	0	0	0	0	2	0
Somers Point, City of	0	0	0	0	0	2	0
Ventnor City, City of	5	0	0	0	0	1	0
Weymouth, Township of	2	0	0	0	0	1	0
Total	**36**	**6**	**4**	**3**	**4**	**35**	**18**

Source: Atlantic County Office of GIS: Public Works Facilities, 2021. FEMA HAZUS: Electrical Power Facilities, Airports, Passenger Rail Stations, Communication Facilities, Wastewater Treatment Facilities, 2021. Atlantic County OEP: Water Treatment Facilities.

Other Critical Facilities

This category covers facilities which may be capable of providing refuge and limited medical care and hence may be utilized as emergency shelters, and those which routinely house more vulnerable sectors of the county population, making them potentially especially vulnerable to identified hazards. There are 159 such facilities in Atlantic County, including 118 schools, 22 senior care facilities, and 19 emergency shelters. **Table 3b.4** shows these facilities by jurisdiction. Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility within each jurisdiction.

Table 3b.4
Other Critical Facilities by Jurisdiction

Jurisdiction	Schools	Senior Care Facilities	Emergency Shelters
Absecon, City of	3	1	0
Atlantic City, City of	13	2	1
Brigantine, City of	3	0	0
Buena, Borough of	4	0	0
Buena Vista, Township of	6	0	3
Corbin City, City of	3	0	0
Egg Harbor City, City of	4	0	0
Egg Harbor, Township of	11	2	2
Estell Manor, City of	1	0	0
Folsom, Borough of	1	0	0
Galloway, Township of	19	7	4
Hamilton, Township of	12	1	5
Hammonton, Town of	5	2	0
Linwood, City of	5	3	0
Longport, Borough of	0	0	0
Margate City, City of	2	0	0
Mullica, Township of	4	0	1
Northfield, City of	5	1	1
Pleasantville, City of	8	3	2
Port Republic, City of	1	0	0
Somers Point, City of	6	0	0
Ventnor City, City of	2	0	0
Weymouth, Township of	1	0	0
Total	**118**	**22**	**19**

Source: Atlantic County Office of GIS: Schools, 2021. NJGIN: HSIP New Jersey Nursing Homes, 2021 Atlantic County OEP: Emergency Shelters

Historic and Cultural Resources

There are 109 georeferenced historic properties and sites/districts in Atlantic County which are included in the New Jersey or National Registers of Historic Places, or that have been determined eligible for inclusion through Federal or state processes as administered by the New Jersey Historic Preservation Office (HPO). These properties are listed in **Table 3b.5**. The data does not preclude the existence of other historic properties or sites not within this category or as yet to be identified.

Table 3b.5
Historic and Cultural Resources by Jurisdiction

Jurisdiction	Name	Location
Absecon	Captain Francis Babcock House	324 South Shore Road
Absecon	Dr. Jonathan Pitney House	57 North Shore Road
Absecon	John Doughty House	40 North Shore Road
Absecon	North Shore Road Historic District	North Shore Road
Absecon	South Shore Road Historic District	South Shore Road
Absecon, Atlantic City, Egg Harbor City, Egg Harbor Township, Galloway, Hammonton, Mullica, Pleasantville	Camden and Atlantic Railroad Historic District	Parallel NJ Transit Atlantic City Line
Atlantic City	1315 Pacific Avenue	1315 Pacific Avenue
Atlantic City	2-6 South Virginia Avenue	2-6 South Virginia Avenue
Atlantic City	Absecon Lighthouse	Pacific and Rhode Island Avenues
Atlantic City	Administration Building for the Board of Education	1809 Pacific Ave
Atlantic City	Atlantic City Armory	Atlantic Boulevard and New York Avenue
Atlantic City	Atlantic City Convention Hall	Boardwalk between Pacific, Mississippi, and Florida Avenues
Atlantic City	Atlantic City Fire Station #4	2700 Atlantic Avenue
Atlantic City	Atlantic City Fire Station #6	4025 Atlantic Avenue
Atlantic City	Atlantic City Post Office	1701 Pacific Avenue
Atlantic City	Barclay Court	9-11 South Pennsylvania Avenue
Atlantic City	Beth Israel Synagogue	34 South Pennsylvania Avenue
Atlantic City	Beth Kehillah Synagogue Building (H.G. Rosin Senior Center)	901 Pacific Avenue
Atlantic City	Chinn & Schull Boathouse	419 Carson Ave
Atlantic City	Church of the Ascension	1601 Pacific Avenue
Atlantic City	Eldredge Chelsea Fireproof Warehouse	3528 Atlantic Avenue
Atlantic City	Equitable Trust Bank Building	2030 Atlantic Avenue
Atlantic City	Fire Station #8	140 North Indiana Avenue
Atlantic City	Fire Station #9	734 North Indiana Avenue
Atlantic City	Madison Hotel	123 South Illinois Avenue
Atlantic City	Neptune Hose Company	519 Atlantic Avenue
Atlantic City	Raphael-Gordon House	118 South Newton Street
Atlantic City	Ritz Carlton Hotel	2715 Boardwalk at Iowa Avenue
Atlantic City	Segal Building	1200 Atlantic Avenue
Atlantic City	Shelburne Hotel	Michigan Avenue and the Boardwalk
Atlantic City	St. Nicholas of Tolentine Church	1409-1421 Pacific Avenue
Atlantic City	The Knife and Fork Restaurant	29 S. Albany Ave.
Atlantic City	The Strand and Marine Apartments	3821-3825 Boardwalk Ave.
Atlantic City	U.S. Route 30 Bridge	U.S. Route 30 (Absecon Boulevard) over Beach Thorofare
Atlantic City	USCG Station Atlantic City	900 Beach Thorofare
Atlantic City	Warner Theatre	Atlantic City Boardwalk between Michigan and Arkansas Avenues
Atlantic City	Westside All Wars Memorial Building	1510 Adriatic Avenue
Atlantic City	World War 1 Memorial	South Albany Avenue, Ventnor Avenue and O'Donnell Parkway

Table 3b.5
Historic and Cultural Resources by Jurisdiction

Jurisdiction	Name	Location
Atlantic City, Egg Harbor Township, Hamilton, Pleasantville	West Jersey and Atlantic Railroad Historic District	Mays Landing, Hamilton Township to Pleasantville City
Brigantine City	Brigantine Lighthouse	Brigantine Boulevard (County Route 638)
Buena	Hebron Button Factory	Weymouth Malaga & Aberdeen Avenue
Buena Vista	Richland Hotel	1302 Harding Way
Buena Vista	Richland Presbyterian Church	Main Ave. at Sewell Ave.
Buena Vista Hamm	Wood Estate	Cedar Ave.
Buena Vista, Corbin City, Estell Manor, Folsom, Hammonton, Weymouth	Atlantic City Railroad Cape May Division Historic District	Railroad right-of-way from Winslow Junction to Cape May Point, Sea Isle City & Ocean City
Corbin City	North and South Tuckahoe Historic District	NJ Route 50/Tuckahoe-Mount Pleasant Road
Corbin City	South Tuckahoe Historic District	1409-1421 Pacific Avenue
Egg Harbor City	Egg Harbor City Fire Station	351 Cincinnati Avenue
Egg Harbor City	Egg Harbor City Historic District	Philadelphia Avenue
Egg Harbor City	Egg Harbor Commercial Bank	134 Philadelphia Avenue
Egg Harbor City	Lower Bank Road Bridge	Lower Bank Road (County Route 542) over Mullica River
Egg Harbor City	Neutral Water Health Resort Sanitarium	Corner of Claudius Street and London Avenue
Egg Harbor Township	Andrew B. Scull House	1647 Mays Landing-Somers Point Road (CR 559)
Egg Harbor Township	Cannon Court Roadside Cabins	6124 Black Horse Pike
Egg Harbor Township	Captain John Jeffries Burial Marker	Palestine Bible Church Cemetery, County Route 559
Egg Harbor Township	Ocean City-Longport Bridge	Ocean Drive over Great Egg Harbor
Egg Harbor Township	Studebaker Showroom	North West Corner Verona and Toulon Avenues
Egg Harbor Township, Galloway, Port Republic, Somers Point	Garden State Parkway Historic District	Entire Garden State Parkway Right-of-Way
Estell Manor	Estellville Glassworks Industrial Historic District	Estell Manor Park, Stevens Creek, Maple Avenue, Walkers Forge Road, and NJ Rt. 50
Estell Manor	Head of the River Church	NJ Route 49 at Aetna Drive
Estell Manor	Risley School	134 Cape May Avenue
Folsom	Eighth Street Bridge	Eighth Street over Hospitality Branch
Folsom	Jacobus Evangelical Lutheran Church	Mays Landing Road
Galloway	Anonymous Roadside Cabins	US Route 30 and Taylor Avenue
Galloway	Conovertown Historic District	Along New York Road between Brook Lane and the border with Absecon City, west on Biscayne Avenue
Galloway	Frankfurt Avenue Bridge	Frankfurt Avenue over New Jersey Transit Atlantic City Line
Galloway	L.N. Renault and Sons Winery	Bremen Avenue and Leibig Street
Galloway	Modern Boat Works	US Route 9 at Nacote Creek
Galloway	Oceanville / Leeds Point / Moss Mill Historic District	Bounded by New York Road, Somers Town Lane, Leeds Point Road, and Moss Mill Road
Galloway	Roadside Cabins	US Route 30 and 5th Avenue

Table 3b.5
Historic and Cultural Resources by Jurisdiction

Jurisdiction	Name	Location
Galloway	Smithville Apothecary	Smithville-Old Towne and Moss Mill Roads
Galloway	The Country Motel Roadside Cabins	201 White Horse Pike
Hamilton	Abbott's Modern Cabins	217 NJ Route 40
Hamilton	Mays Landing Historic District	Main Street and Cape May Avenue
Hamilton	US Route 322 and NJ Route 50 Cloverleaf	US Route 322 and NJ Route 50
Hamilton	Weymouth Road Bridge	Weymouth Road Bridge over Great Egg Harbor River
Hammonton	101 Bellevue Avenue	101 Bellevue Avenue
Hammonton	733 Bellevue Avenue	733 Bellevue Avenue
Hammonton	Arena Auto Dealership	227 South White Horse Pike
Hammonton	Eagle Theatre	208 Vine Street
Hammonton	Former Town Hall	333 Vine Street
Hammonton	Hammonton Commercial Historic District	Third, Washington, Orchard, and Vine Streets
Hammonton	J.S. Thayer Carpenter Shop	220 Vine Street
Hammonton	William L. Black House	458 Bellevue Avenue
Linwood	Linwood Historic District	Maple and Poplar Avenues, and Shore Road
Linwood	Thomas & Mary Ingersall Naylor House	204 West Garfield Avenue
Longport	Church of the Redeemer	20th and Atlantic Avenues
Longport	Great Egg Coast Guard Station Building	31st and Pacific avenues
Margate City	Lucy, The Margate Elephant	Decatur and Atlantic Avenues
Margate City	Marven Gardens Historic District	Between Ventnor, Fredericksburg, Winchester and Brunswick Avenues
Mullica	Batsto Village	31 Batsto Rd
Mullica	Pleasant Mills	Elwood-Pleasant Mills Road
Northfield	1715 Tilton Road	1715 Tilton Road
Northfield	Risley Homestead	8 Virginia Avenue
Pleasantville	213 Verona Avenue	213 Verona Avenue
Port Republic	Amanda Blake Store	104 Main Street
Port Republic	Chestnut Neck Battle Monument	US Route 9 and Old York Road
Port Republic	Gulf Service Station	758 Old New York Road
Port Republic	Port Republic Historic District	Central and Pomona Avenues, Riverside Drive, St. Johns Lane, Chestnut Neck, Clarks Landing, and Port Republic-Smithville Roads
Port Republic	Smithville-Port Republic Road Bridge	Smithville-Port Republic Road over Nacote Creek
Somers Point	World War 1 Memorial Bridge	NJ Route 52 over Ship Channel
Somers Point	Bay Front Historic District	Parts of Anna, Bay, Decatur, Delaware, Gibbs, Higbee, New Jersey, and Somers Avenues
Somers Point	Somers Mansion	Shore Road, adjacent to NJ Route 52 traffic circle
Ventnor City	Dorset Avenue Bridge	N. Dorset Avenue between Ventnor Avenue and N. Derby/Edgewater Avenue

Table 3b.5
Historic and Cultural Resources by Jurisdiction

Jurisdiction	Name	Location
Ventnor City	John Stafford Historic District	Portions of Atlantic, Austen, Baton Rouge, Marion, and Vassar Avenues
Ventnor City	New Haven Firehouse	20 North New Haven Ave
Ventnor City	Saint Leonard's Tract Historic district	Bounded by Ventnor Ave, Fredericksburg Ave, Ventnor Gardens Plaza, and Derby Place
Ventnor City	Ventnor City Hall	6201 Atlantic Avenue
Ventnor City	Ventnor Motor Boat Club	11 North Derby Avenue, Ventnor City
Weymouth	Belcoville Post Office	1201 Madden Avenue

Source: NJDEP GIS website: Historic Districts, Historic Properties, 2021. NJ DEP: Historic Preservation Office New Jersey and National Registers of Historic Places, 2021
Note: Municipalities that have historic districts crossing multiple municipal boundaries are listed alphabetically.

Population

The U.S. Census Bureau[3] estimates that the population of Atlantic County in 2019 was 266,105 persons, comprising 99,850 households. **Table 3b.6** shows population and household counts by jurisdiction.

Table 3b.6
Population and Households by Jurisdiction

Jurisdiction	Population		Households	
	Count	Municipal Population as % of County Total	Count	Municipal Households as % of County Total
Absecon, City of	8,362	3%	3,177	3%
Atlantic City, City of	37,999	14%	15,504	16%
Brigantine, City of	8,832	3%	4,052	4%
Buena, Borough of	4,356	2%	1,750	2%
Buena Vista, Township of	7,295	3%	2,558	3%
Corbin City, City of	537	<1%	182	<1%
Egg Harbor City, City of	4,100	2%	1,454	1%
Egg Harbor, Township of	42,714	16%	14,245	14%
Estell Manor, City of	1,728	1%	587	1%
Folsom, Borough of	1,697	1%	588	1%
Galloway, Township of	36,094	14%	12,840	13%
Hamilton, Township of	25,973	10%	9,776	10%
Hammonton, Town of	14,139	5%	4,992	5%
Linwood, City of	6,742	3%	2,509	3%
Longport, Borough of	869	<1%	420	<1%
Margate City, City of	5,997	2%	2,933	3%
Mullica, Township of	5,925	2%	2,282	2%
Northfield, City of	8,153	3%	2,863	3%
Pleasantville, City of	20,301	8%	6,774	7%
Port Republic, City of	1,121	<1%	413	<1%
Somers Point, City of	10,321	4%	4,371	4%
Ventnor City, City of	10,095	4%	4,366	4%
Weymouth, Township of	2,755	1%	1,214	1%
Total	**266,105**	**100%**	**99,850**	**100%**

Source: U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

Census data indicates that the population is growing and skewing older, with a rise in median age and number of older persons and a decreasing number of young children. The median age in Atlantic County in 2019 was estimated to be 41.7 years (up from 37 years in 2000 and 40.2 years in 2013) and the average household size is 2.6 persons, and the median household income is $62,110. In terms of population segments that may potentially be at higher risk in general in terms of their ability to prepare for, respond to, and recover from natural disasters:

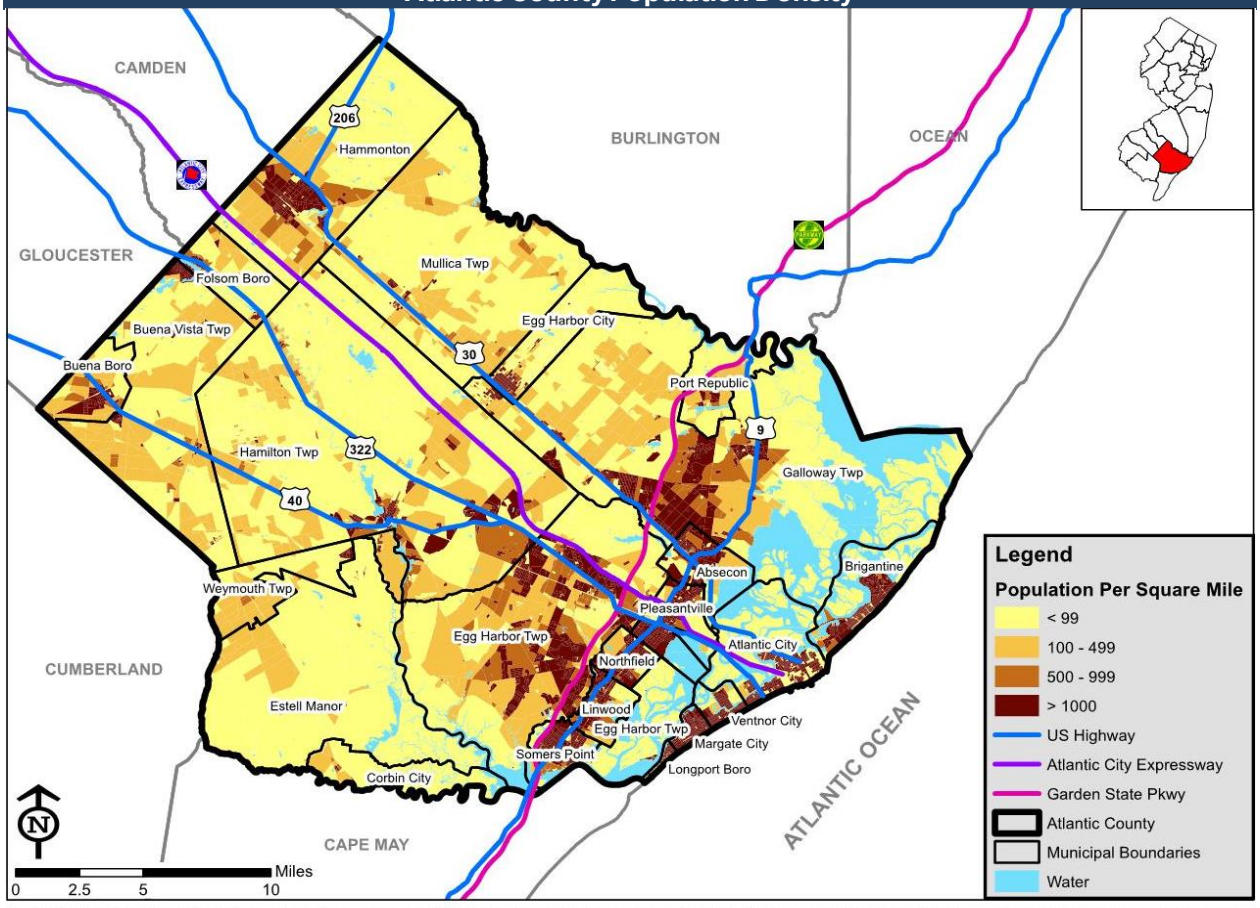
- 5.6 percent of the total population is under the age of five (down from 6.5 percent in 2000 and 6.1 percent in 2013);
- 17.5 percent is over the age of 65 (up from 13.6 percent in 2000 and 14.6 percent in 2013);

[3] U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

- 13.3 percent of the population is living below the poverty level (compared to 10.5 percent in 2000 and 14.4 percent in 2013);
- 9.9 percent of persons between the ages of 5 and 64 years of age holds disability status (compared to 14.0 percent in 2000 and 7.4 percent in 2013).

Figure 3b.1 illustrates the residential population density across Atlantic County. Most of the county's population is located along or near coastal areas. There is also development generally along major thoroughfares including US Routes, 30, 40, 322, 9, and the Garden State Parkway. Development generally decreases as one moves west, and/or away from major thoroughfares. The municipalities with the highest population density are Ventnor City (5,500 people per square mile, Margate City (4,500 per square mile) and Atlantic City (3,680 per square mile). The least densely populated municipality in the county is Estell Manor, with only 32 people per square mile, followed by Corbin City (64 per square mile) and Mullica (109 per square mile).

Figure 3b.1
Atlantic County Population Density



SOURCE: NJGIN: TIGER/Line Shapefile New Jersey Census Block, 2010; County Boundary, 2012; Municipal Boundary, 2014. Atlantic County Office of GIS: US Highway, Atlantic City Expressway, and Garden State Pkwy, 2003. NJDEP: Atlantic County Lakes (Open Water Areas), 2002.

SECTION 3C - Damage Estimates

Methodology

This multi-jurisdictional vulnerability assessment was conducted with two distinct methodologies, utilizing GIS-based analysis and a statistical risk assessment methodology. Each approach provides estimates for the potential **impact** of hazards by using a common, systematic framework for evaluation, including historical occurrence information provided in the *Hazard Profiles* section. The results of the multi-jurisdictional vulnerability assessment are provided for each hazard immediately following the summary of information provided through the hazard identification and analysis, as listed above.

A GIS-based analysis was conducted for the following hazards:

- Hurricane and tropical storm;
- coastal erosion and sea level rise;
- dam failure;
- flood;
- storm surge;
- wave action;
- earthquake; and
- wildfire.

A statistical risk assessment approach was used to analyze the following hazards:

- extreme temperatures;
- extreme wind;
- hail;
- lightning;
- nor'easter;
- tornado;
- tsunami;
- winter storm; and
- drought.

Below is a brief description of these approaches.

GIS-Based Analysis

For GIS-based assessment, digital data was collected from local, state and national sources. ESRI® ArcGIS™ 9.3 was used to assess risk utilizing digital data for individual tax parcels and georeferenced point locations for buildings and critical facilities. Using these data layers, risk was assessed by estimating the value of buildings determined to be located in identified hazard areas. For the plan update, population estimates were refined using most recent Census data (5-Year American Community Survey, 2016-2019) where the population and value of improved property exposed were estimated to be proportional to the area exposed; and the value of exposed property was refined using updated (2021) improvement values. The objective of the GIS-based analysis was to determine the estimated vulnerability of assets to the identified hazards for

Atlantic County using best available geospatial data. In so doing, local databases made available through the County such as local tax records, parcel boundaries, building footprints and critical facilities data, were used in combination with digital hazard data as included and described in the *Hazard Profiles* section. Where only a portion of a parcel was found to lie within a given hazard area, the ratio of area in to area out of the hazard area was applied to the value of improvements on the parcel to estimate the dollars exposed. A similar process was generally undertaken to estimate population exposed, where the percentage of Census block in the hazard area was applied to total census block population to estimate the population exposed to the hazard. Where it was found that this approach tended to overestimate the exposed population, the approach was refined by applying the average household size taken from census data to the number of affected improved parcels with residential use. The results of the analysis provided an estimated number of people, as well as the numbers and values of buildings and critical facilities determined to be potentially at risk to those hazards with delineable geographic hazard boundaries. These hazards included the coastal erosion and sea level rise, dam failure, flood, storm surge, wave action, earthquake, and wildfire hazards. A more specific description of the GIS-based analysis for each particular hazard is provided under the vulnerability assessment section of each respective hazard.

While GIS analysis as described above has been used to analyze the exposure of assets to some hazards, for this plan update the vulnerability analyses for others have been augmented and refined by the use of HAZUS. HAZUS is a nationally standardized risk modeling software tool developed and freely distributed by FEMA that combines data from many disciplines to generate detailed loss estimates for disaster events of a range of annual probabilities. HAZUS is capable of quantifying risk information such as physical damage to structures and their contents, economic losses such as business interruptions, and social impacts including displaced households and shelter requirements. While HAZUS includes statewide baseline default inventories for buildings and infrastructure, this data may be replaced with more detailed locally specific information for future analyses. In accordance with guidance contained in the current New Jersey State Hazard Mitigation Plan, HAZUS has been used to estimate losses for events of a range of probabilities for hurricanes, riverine flooding, coastal flooding (storm surge), and earthquakes.

Statistical Risk Assessment Methodology

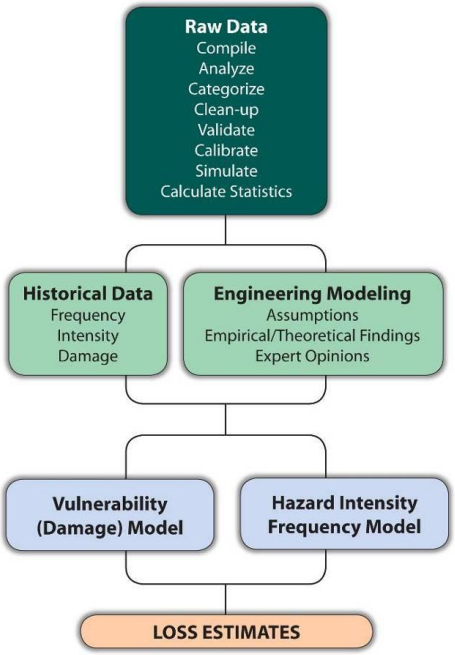
A statistical risk assessment methodology was applied to analyze hazards of concern that were outside the scope of the GIS-based risk assessment. This methodology uses a statistical approach and mathematical modeling of risk to predict a hazard's frequency of occurrence and estimated impacts based on recorded or historic damage information (presented in the *Hazard Profiles* section). This methodology was used to assess risk to the extreme temperatures, extreme wind, lightning, nor'easter, tornado, winter storm, and drought hazards. Historical data for each hazard as described in the *Hazard Profiles* section was used and statistical evaluations were performed using manual calculations. The general steps used in the statistical risk assessment methodology are summarized below:

1. Compile data from local, state and national sources, as well as literature;
2. Clean up data, including removal of duplicate records and update losses to account for inflation;

3. Identify patterns in frequency, intensity, vulnerability and loss
4. Statistically and probabilistically extrapolate the patterns[4]; and
5. Produce meaningful results, including the development of annualized loss estimates.

Figure 3c.1 illustrates a conceptual model of the statistical risk assessment methodology as applied to Atlantic County.

Figure 3c.1
Conceptual Model of the Statistical Risk Assessment Methodology



Risk (vulnerability) is presented in terms of potential annualized losses, whenever possible. In general, presenting results in the annualized form is useful in three ways:

1. This approach accounts for the contribution of potential losses from all future disasters;
2. Annualized results for different hazards are readily comparable, thus easier to rank; and
3. The use of annualized losses is the most objective approach for evaluating mitigation alternatives.

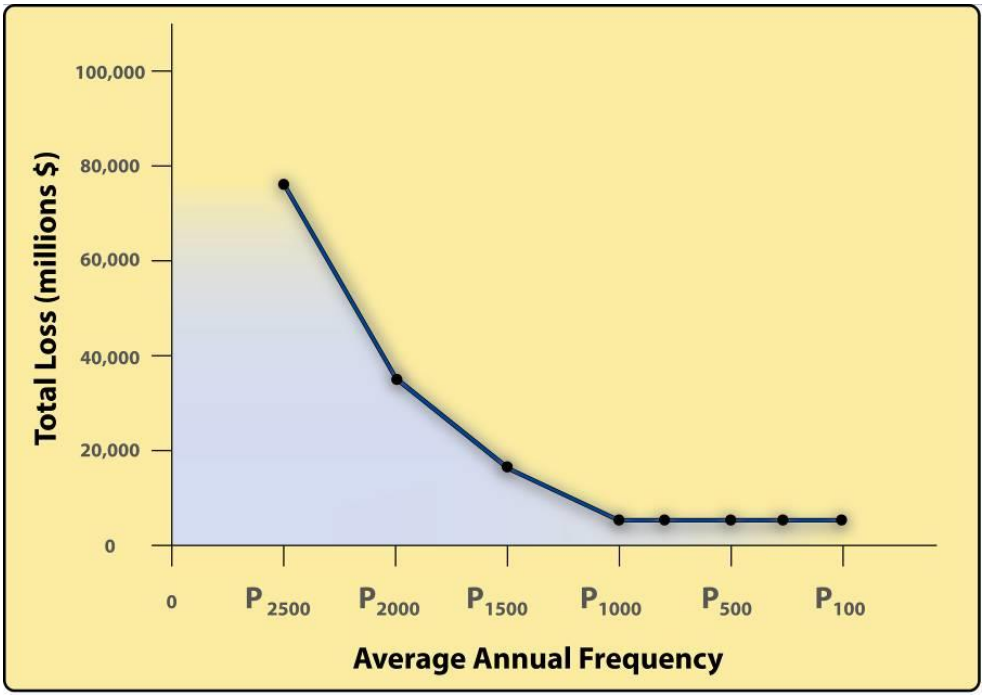
Annualized losses for the hazards where the parametric approach was utilized were computed in a three-step process:

[4] In cases where historical events/losses were recorded for the county as a whole, losses were averaged across all jurisdictions in order to estimate losses by jurisdiction and calculate potential annualized losses by jurisdiction.

1. Compute/estimate losses for a number of scenario events with different return periods (i.e., 10-year, 100-year, 200-year, 500-year, etc.);
2. Approximate the Probability versus Loss Curve through curve fitting; and
3. Calculate the area under the fitted curve to obtain annualized losses.

This approach is illustrated graphically in **Figure 3c.2**. For other hazards where the statistical approach was used, the computations are based primarily on the observed historical losses.

Figure 3c.2
Graphical Representation of the Annualized Loss Methodology



The economic loss results are presented here using two interrelated risk indicators: Annualized Loss and Annualized Loss Ratio. The Annualized Loss is the estimated long-term weighted average value of losses to property in any single year in a specified geographic area (i.e., municipal jurisdiction). The estimated Annualized Loss (AL) addresses the key idea of risk: the probability of the loss occurring in the study area (largely a function of building construction type and quality). By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk. The Annualized Loss Ratio (ALR) represents the AL as a fraction of the assessed value of the local inventory. This ratio is calculated using the following formula:

ALR = Annualized Losses / Total Exposure

Loss estimates provided in this vulnerability assessment are based on best available data, and the methodologies applied result in an approximation of risk. These estimates should be used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (i.e., incomplete inventories, demographics or economic parameters).

All conclusions are presented in "Conclusions on Hazard Risk" at the end of this section. Findings for each hazard are detailed in the hazard-by-hazard vulnerability assessment that follows.

Extreme Temperatures

Impacts - Extreme Temperatures

Extreme temperatures are primarily a threat to human life and health, though they are also hazardous to livestock and agricultural crops and occasionally might threaten property and infrastructure, and disrupt transportation systems. They can also exacerbate the impact of other hazards such as severe weather events that cause widespread power outages. Emergency responders are often called upon to work with public officials/non-profit agencies for heating/cooling venues, and to transport vulnerable sectors of the population to such venues. Extreme temperatures are likely to result in relatively minor impacts in Atlantic County, with very few injuries (if any), minor and sporadic property damage, and minimal disruption on quality of life. Temporary shutdown of critical facilities to reduce energy usage or due to the fact that employees may not be able to get to the facility is possible. Common impacts associated with extreme heat in Atlantic County include: injuries associated with swimming to escape extreme heat, and individuals seeking medical treatment for heat related illness (i.e., for heat stress, exhaustion, heat stroke, etc.), and power outages from an associated strain on electrical networks. Cooling centers are typically opened, and schools altering class schedules and/or activities to ensure student safety. Extreme heat events typically impact the elderly and disadvantaged most heavily. Primary impacts of concern for extreme cold temperatures include the life-threatening effects of overexposure hypothermia on people, particularly the elderly and disadvantaged. Other significant impacts include strains on livestock and agriculture.

Exposure and Damage Estimates – Extreme Temperatures

While all of Atlantic County is exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by extreme heat or cold events. Damages can occur when thermal tolerances of various systems are exceeded. Extreme cold can cause thermal cracking of paved surfaces, and freezing of pipes. Extreme heat can cause softening and traffic-related rutting of paved surfaces; and buckling of railway tracks. Extreme temperatures can place greater demand on utility systems, with possible associated power outages. While losses could be high for particular events, and could result in increased maintenance costs over time with frequent occurrences, average annual property losses associated with extreme temperatures are anticipated to be minimal across the planning area.

Extreme temperatures do however present a significant life and safety threat to Atlantic County's population.

Heat casualties are usually caused by lack of adequate air conditioning or heat exhaustion. The most vulnerable population to heat casualties are the elderly or infirmed, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being. Casualties resulting from extreme **cold** may result from a lack of adequate heat, carbon monoxide poisoning from unsafe heat sources and frostbite. The most vulnerable populations to cold casualties are the elderly or infirmed and low income households, as they may not be able to afford to operate a heat source on a regular basis and may not have immediate family or friends to look out for their well-being.

Given the lack of historical data and limited likelihood for structural losses resulting from extreme heat or cold occurrences in Atlantic County, annualizing potential structural losses over a long period of time would most likely yield a negligible annualized loss estimate for the entire county.

Extreme Wind

Impacts - Extreme Wind

Impacts associated with extreme wind in Atlantic County can be critical. Multiple deaths/injuries are possible, large portions of property in the affected area can be damaged or destroyed (depending on the nature of the event), and a complete shutdown of critical facilities for more than one week could all be possible, depending on the type of wind event and the nature of the event. Some extreme wind events can be forecasted; others are completely unpredictable. Emergency responders are called up for evacuations, road closures, and attending to the injured. Flying debris, in extreme wind events, can cause secondary impacts. Trees can be downed, buildings can be damaged. High winds can directly damage private property as well as roads and bridges, schools, hospitals, and other types of critical facilities and utilities and communications facilities. In addition, impaired access to these facilities during extreme wind events can cause secondary, indirect damages. Extreme winds may stem from other hazards, including hurricanes and tropical storms, nor'easter, and tornadoes; however, only reported extreme wind events not related to other hazards are considered in this analysis. Vulnerability to winds from hurricanes and tropical storms, nor'easter, and tornadoes are addressed individually in other sections.

Exposure and Damage Estimates – Extreme Wind

Because it cannot be predicted where extreme winds may occur, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported extreme wind occurrences have been factored into this vulnerability assessment[5]. For the 2021 plan update, NCEI historical extreme wind loss

[5] It is possible that additional extreme wind events may have occurred since 1950 that were not reported to NCDC and are not accounted for in this analysis.

data current as of May 2021 includes a total of 315 days with high wind, thunderstorm wind, and strong wind events in the 64 years between September 1956 and December 2020. Of these, there are 91 event records in the database through and including the year 1999, and 224 event records from 2000 through 2021. All event records prior to the year 2002 include $0 in damages – presumably due to database limitations as opposed to decades of non-damaging wind events. Extreme wind events totaled approximately $424.0 million in property damage (of which $13.3 million is attributed to damage from the June 2012 Derecho and an additional $400.0 million is attributed to wind damages during Superstorm Sandy, with the balance of $10.7 million reported during the balance of wind events). To estimate jurisdictional losses due to extreme wind, expected annualized losses were calculated for the 64 year period of record:

- NCEI losses for all wind events were obtained for the entire county ($424.0 million total; using a 64 year period of record, this yields expected annualized losses of $6.6 million countywide).
- NCEI event records included specific loss histories in 20 jurisdictions totaling $13,361,000 (with $13,300,000 in damages in Buena Borough during the June 2012 Derecho and the remaining $61,000 and $9,567,000 for all other non-Sandy events countywide).
- The total value of all improvements in the County is estimated to be nearly $23.2 billion for the purposes of this analysis. Thus, based on recent historical data, annual extreme wind damage represents roughly 0.03 percent of the total improved property value in Atlantic County.
- Since the extreme wind hazard is generally uniform across the planning area, this same percentage was applied to each of the County's jurisdictions to generate annualized expected property losses in each community.

Table 3c.1 shows potential annualized property losses and percent loss ratios resulting from the extreme wind hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCEI. For the plan update, population estimates were refined using year 2015-2019 American Community Survey data[6], and annualized expected property losses were based on updated (2021) improvement values[7].

[6] U.S. Census Bureau, 5-Year American Community Survey (2015-2021)

[7] NJGIN, Atlantic County Parcel data, 2021

Table 3c.1 Potential Annualized Losses from Extreme Wind by Jurisdiction				
Jurisdiction	**Estimated Population At Risk***	**Total Value of Improvements (Buildings) At Risk (in millions)***	**Annualized Expected Property Losses**	**Annualized Percent Loss Ratio**
Absecon, City of	8,362	$441.9	$148,000	0.033%
Atlantic City, City of	7,999	$4,819.2	$1,612,000	0.033%
Brigantine, City of	8,832	$1,324.8	$443,000	0.033%
Buena, Borough of	4,356	$232.7	$78,000	0.033%
Buena Vista, Township of	7,295	$481.8	$161,000	0.033%
Corbin City, City of	537	$34.4	$12,000	0.033%
Egg Harbor City, City of	4,100	$244.1	$82,000	0.033%
Egg Harbor, Township of	42,714	$3,314.3	$1,109,000	0.033%
Estell Manor, City of	1,728	$113.9	$38,000	0.033%
Folsom, Borough of	1,697	$114.8	$38,000	0.033%
Galloway, Township of	36,094	$2,609.7	$873,000	0.033%
Hamilton, Township of	25,973	$1,762.8	$590,000	0.033%
Hammonton, Town of	14,139	$1,126.2	$377,000	0.033%
Linwood, City of	6,742	$612.1	$205,000	0.033%
Longport, Borough of	869	$540.0	$181,000	0.033%
Margate City, City of	5,997	$1,547.9	$518,000	0.033%
Mullica, Township of	5,925	$329.0	$110,000	0.033%
Northfield, City of	8,153	$621.1	$208,000	0.033%
Pleasantville, City of	20,301	$909.7	$304,000	0.033%
Port Republic, City of	1,121	$86.5	$29,000	0.033%
Somers Point, City of	10,321	$857.0	$287,000	0.033%
Ventnor City, City of	10,095	$967.0	$323,000	0.033%
Weymouth, Township of	2,755	$108.9	$36,000	0.033%
Total	**266,105**	**$23,199.5**	**$7,762,000**	**0.033%**

* Since the extreme wind hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

Hail Storms

Probability data from the NOAA National Severe Storms Laboratory indicates that Atlantic County is at minimal risk to severe weather threats featuring damaging hail (defined as at least 2 inches in diameter), and that Atlantic County is located in a part of the country with the lowest annual number of days with hail storms of any kind, with less than two days per year on average. While the NCEI and NSSL databases report very occasional hail storm events in Atlantic County that have been recorded as causing measurable damages, notably $5 million in crop damage in 2008 and $10,000 in property damage in 2011, the available data is considered not sufficient to support a detailed estimate of annual damage attributable to hail storms for mitigation planning purposes.

While the possibility that Atlantic County may be affected by isolated hail storm events that cause measurable damage in the future is recognized, the low frequency with which such

events have been recorded up to now suggests that any annual damage estimate on a jurisdiction by jurisdiction basis would likely be negligible. In addition, there are considered to be minimal hazard mitigation techniques available to reduce hailstorm impacts outside of the emergency preparedness procedures and severe weather warning systems already in place or under consideration as current mitigation actions.

Hurricanes and Tropical Storms

Impacts - Hurricanes and Tropical Storms

Hurricanes and tropical storms are capable of producing catastrophic impacts. A high number of deaths and/or injuries are possible, more than 50 percent of property in the affected area could be damaged or destroyed, and a complete shutdown of critical facilities would be possible for 30 days or more, depending on the nature of the event.

Atlantic County has an active history of hurricanes and tropical storms. According to NOAA historical records[8], 43 hurricane and tropical storm tracks have passed within 75 nautical miles of Atlantic County since 1856[9]. Recent events have caused significant wind, flood and coastal erosion related damages in Atlantic County.

Coastal areas of Atlantic County are particularly dynamic environments, and are quite susceptible to hazards associated with hurricanes and tropical storms. These susceptibilities are expected to increase over time due to the effects of sea level rise. Impacts of hurricanes and tropical storms are associated with damages as a result of flooding (riverine and coastal (back bay and oceanfront), as well as storm surge), high winds, damaging waves, and coastal erosion. It is possible for the entire county to be impacted by hurricanes and tropical storms, though in different ways. For example, wind impacts may be widespread but more severe in immediate coastal areas. Structures closest to the Atlantic Coast could suffer catastrophic damages from wind, surge, waves and beach erosion while impacts inland structures would be less substantial due to lower wind speeds and absence of surge impacts. Riverine flooding would be limited to riverine flood zones and being of slower velocities in most cases would cause less severe types of structure damages. Roads and bridges across the county would be susceptible to overtopping and damage from floodwaters. Beach erosion can often be severe during hurricanes and tropical storms; though beach restoration and maintenance activities are undertaken regularly to offset storm impacts (such as the USACE flood risk management projects on Brigantine Island and Absecon Island).

Atlantic County is a tourist destination. With summer being the peak vacation time, coincident with hurricane season, the potential population at risk is at its peak during the time of year when Atlantic County is most likely to be impacted by a hurricane or tropical storm. Impacts to the general public include evacuation and sheltering needs, as well as emergency response for those who shelter in

[8] NOAA Historical Hurricane Tracks, database filtered exclusively for hurricane Categories 1 through 5 and tropical storms within 75 nautical miles of Atlantic City (with tropical depressions and extratropical systems excluded from the search results), online at http://coast.noaa.gov/hurricanes/. This is a new version of the NOAA database, which has been improved upon including various data corrections since the 2016 Plan was prepared.

[9] Superstorm Sandy, which was extratropical at its landfall, is included.

place or are injured during the event. All property types are impacted, with residential and commercial impacts being greatest due to their proximity to the coast. Roads, bridges, schools, hospitals and other types of critical facilities are susceptible to wind and water damage. Secondary impacts would be associated with flying debris, as well as drifting sand from storm surges. Sand covered roads and bridges would be common impacts. Beach erosion can be catastrophic depending on the particular area and the nature of the event. Transportation, communications, and governmental services may be severely impacted. Impacts would be exacerbated when coincident with high tides, or during prolonged types of events that extend across several tidal cycles. Sea level rise will increase impacts over time.

Table 3c.2 describes the damage that could be expected for each category of hurricane. Damage during hurricanes might also result from spawned tornadoes, storm surge and inland flooding associated with heavy rainfall that usually accompanies these storms.

Table 3c.2
Hurricane Damage Classifications

Storm Category	Damage Level	Description of Damages	Photo Example
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings might break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain might be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain might be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas might be required.	

Source: National Oceanic and Atmospheric Administration; Federal Emergency Management Agency

Exposure and Damage Estimates – Hurricanes and Tropical Storms

Hurricanes and tropical storms are complex combinations of discrete component hazards occurring simultaneously. The entirety of the County's built environment and population is potentially exposed to this hazard. Damages during these events result from the cumulative impacts of a wide range of hazards including flooding, storm surge, coastal erosion, wave action, and high winds. No two hurricanes or tropical storms are identical. Even hurricanes of the same

category can bring with them wildly different impacts depending on whether they occur during a time of high tide or low tide. Variations in inland wind affects and precipitation amounts, for example, can vary widely. Vulnerability is being expressed as the number of people and value of property at risk. All of the county's built environment and population could potentially be impacted by the hazards characteristically occurring during a hurricane or tropical storm.

For this plan update HAZUS was used to generate county-wide estimates of damage resulting from two significant potential hurricane/tropical storm events, in accordance with guidance in the current New Jersey State Hazard Mitigation Plan. **Table 3c.3** presents the estimated total losses from all sources for events that have a 1% and a 0.2% annual chance of being equaled or exceeded. **Table 3c.3** also includes annual average losses and annualized loss ratios for all jurisdictions in Atlantic County.

Table 3c.3
Hurricane/Tropical Storm Damages as Estimated by HAZUS ($million)

Jurisdiction	HAZUS Building Replacement Value	Total Losses, 1% ACE Event ("100-Year")	Total Losses, 0.2% ACE Event ("500-Year")	Annual Average Total Losses	Annualized Loss Ratio
Absecon, City of	$1,267	$10.253	$46.984	$0.586	0.05%
Atlantic City, City of	$7,929	$103.936	$633.618	$4.852	0.06%
Brigantine, City of	$2,561	$35.882	$260.997	$1.921	0.08%
Buena, Borough of	$562	$0.477	$1.623	$0.096	0.02%
Buena Vista, Township of	$944	$1.454	$4.870	$0.180	0.02%
Corbin City, City of	$79	$0.224	$0.735	$0.017	0.02%
Egg Harbor City, City of	$665	$2.582	$11.026	$0.155	0.02%
Egg Harbor, Township of	$6,286	$39.507	$173.117	$2.546	0.04%
Estell Manor, City of	$258	$1.469	$4.815	$0.110	0.04%
Folsom, Borough of	$287	$0.423	$1.491	$0.048	0.02%
Galloway, Township of	$5,139	$39.886	$181.110	$1.920	0.04%
Hamilton, Township of	$3,563	$12.914	$43.594	$0.888	0.02%
Hammonton, Town of	$2,080	$3.731	$12.764	$0.377	0.02%
Linwood, City of	$1,235	$7.861	$43.030	$0.576	0.05%
Longport, Borough of	$488	$0.417	$2.868	$0.033	0.01%
Margate City, City of	$2,038	$15.657	$106.837	$1.256	0.06%
Mullica, Township of	$818	$2.802	$8.283	$0.171	0.02%
Northfield, City of	$1,492	$9.226	$55.772	$0.618	0.04%
Pleasantville, City of	$2,166	$16.337	$107.909	$0.987	0.05%
Port Republic, City of	$196	$2.892	$13.370	$0.124	0.06%
Somers Point, City of	$1,781	$8.519	$49.972	$0.726	0.04%
Ventnor City, City of	$2,023	$23.140	$143.048	$1.354	0.07%
Weymouth, Township of	$257	$0.332	$1.087	$0.025	0.01%
Atlantic County Total	**$44,114**	**$339.921**	**$1,908.920**	**$19.564**	**0.04%**

Note that for this and other HAZUS-based damage estimates that follow in this section, the analysis utilized the baseline default inventory for buildings and infrastructure inherent within the HAZUS

model rather than improvement values from local tax records. The baseline default inventory in HAZUS is generated from industry-standard construction cost estimation models for a range of structure types and is stored at the census tract and census bloc level within the model. The use of building replacement values instead of assessed or market values reflects standard practice when quantifying damages from storm events and the subsequent benefits arising from measures to mitigate them in scenarios such as the economic appraisal of federal flood and storm risk reduction projects by the US Army Corps of Engineers. In such studies the damages are based on the cost to replace or repair a lost or damaged structure, which is less susceptible to influences that cause the market value of similar structures to vary with location.[10]

Lightning

Impacts – Lightning

On average, 55 people are killed and hundreds are injured each year by lightning strikes in the United States. Lightning can strike communications equipment (i.e., radio or cell towers, antennae, satellite dishes, electrical transformers, etc.) and hamper communication and emergency response. Lightning strikes can also cause significant damage to buildings, critical facilities, and infrastructure, largely by igniting a fire. In addition, lightning can ignite vegetation to cause a wildfire. Lightning's impacts can typically be characterized as minor in Atlantic County. Events are typically associated with very few injuries (if any), only minor property damage, and minimal disruption on quality of life. The shutdown of critical facilities, if at all, is typically only temporary in nature. Historical impacts in Atlantic County have included direct health impacts to individuals struck by lightning, structure damages from fires caused by lightning, and impacts to emergency communications facilities when towers have been struck by lightning. Lightning occurs frequently in Atlantic County but damaging events are relatively few in number and limited in scope when they do occur. Building codes requiring buildings to be grounded work to decrease damages. Members of the general public who are outdoors are particularly vulnerable during an event. Lightning most typically occurs within 10 miles of a thunderstorm.

Exposure and Damage Estimates – Lightning

Because it cannot be predicted where lightning may strike, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. For the plan update, NCEI historical lightning data current as of May 2021 was queried. The data includes a total of 24 lightning events between April 2001 and May 2021, resulting in nearly $1.3 million in damages, 2 deaths, and 6 injuries. The lack of event records prior to the year 2001 is due to database limitations as opposed to decades without lightning events. To estimate jurisdictional losses due to lightning, expected annualized losses were calculated as follows for the 20 year period of record between April 2001 and May 2021:

- NCEI losses were obtained for the entire county (event records included specific loss histories in 15 jurisdictions totaling $1.3 million total; using a 20 year period of record, this yields expected annualized losses of $67,000 countywide).

[10] Procedural Guidelines for Estimating Residential and Business Structure Value for Use in Flood Damage Estimations. Institute for Water Resources report 95-R-9, April 1995.

- The total value of all improvements in the County is estimated to be nearly $23.2 billion. Thus, based on recent historical data, annual lightning damage represents roughly 0.0003 percent of the total improved property value in Atlantic County.
- Since the lightning hazard is uniform across the planning area, this same percentage was applied to each of the County's jurisdictions to generate annualized expected property losses in each community.

Table 3c.4 shows potential annualized property losses and percent loss ratios resulting from the lightning hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCDC. For the plan update, population estimates were refined using 2015-2019 American Community Survey Data[11], and annualized expected property losses were based on updated (2021) improvement values[12].

Table 3c.4
Potential Annualized Losses from Lightning by Jurisdiction

Jurisdiction	Estimated Population At Risk*	Total Value of Improvements (Buildings) At Risk (in millions)*	Annualized Expected Property Losses	Annualized Percent Loss Ratio
Absecon, City of	8,362	$441.9	$1,300	0.0003%
Atlantic City, City of	37,999	$4,819.2	$13,900	0.0003%
Brigantine, City of	8,832	$1,324.8	$3,800	0.0003%
Buena, Borough of	4,356	$232.7	$700	0.0003%
Buena Vista, Township of	7,295	$481.8	$1,400	0.0003%
Corbin City, City of	537	$34.4	$100	0.0003%
Egg Harbor City, City of	4,100	$244.1	$700	0.0003%
Egg Harbor, Township of	42,714	$3,314.3	$9,600	0.0003%
Estell Manor, City of	1,728	$113.9	$300	0.0003%
Folsom, Borough of	1,697	$114.8	$300	0.0003%
Galloway, Township of	36,094	$2,609.7	$7,500	0.0003%
Hamilton, Township of	25,973	$1,762.8	$5,100	0.0003%
Hammonton, Town of	14,139	$1,126.2	$3,200	0.0003%
Linwood, City of	6,742	$612.1	$1,800	0.0003%
Longport, Borough of	869	$540.0	$1,600	0.0003%
Margate City, City of	5,997	$1,547.9	$4,500	0.0003%
Mullica, Township of	5,925	$329.0	$900	0.0003%
Northfield, City of	8,153	$621.1	$1,800	0.0003%
Pleasantville, City of	20,301	$909.7	$2,600	0.0003%
Port Republic, City of	1,121	$86.5	$200	0.0003%
Somers Point, City of	10,321	$857.0	$2,500	0.0003%
Ventnor City, City of	10,095	$967.0	$2,800	0.0003%
Weymouth, Township of	2,755	$108.9	$300	0.0003%
Total	**266,105**	**$23,199.5**	**$66,900**	**0.0003%**

* Since the lightning hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

[11] U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

[12] NJGIN, Atlantic County Parcel data, 2021

Nor'easters

Impacts - Nor'easters

Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and have the potential for creating dangerously high winds and heavy seas. As the low-pressure system deepens, the intensity of the winds and waves will increase and cause serious damage to coastal areas as the storm moves northeast. Nor'easters can be extremely large (up to 1,000 miles in diameter) and their duration can last for days and multiple tidal cycles, often causing major coastal flooding, erosion and damages that might even exceed the impacts of shorter-term hurricane events.

Impacts from nor'easters are primarily associated with high winds, severe beach erosion and flood hazards (riverine and coastal flooding, storm surge). Their impacts are often quite similar to winter storms with significant snow accumulations, creating hazardous driving conditions, business/government office closures, potential for damage from snow accumulations on structures, etc. Nor'easters tend to have the greatest impacts in coastal communities, though the entire county has some exposure and past effects have been widespread. Atlantic County's shore is vital to the local economy but remains highly susceptible to the effects of major coastal storms, including nor'easters. Similar to hurricanes and tropical storms, nor'easters are capable of producing catastrophic impacts, depending upon the nature of the storm, its intensity, and duration. Possible impacts can include high numbers of deaths/injuries, more than 50 percent of property in the affected area could be damaged or destroyed, and critical facilities could be shut down for 30 days or more. Historical records[13] indicate that 17 nor'easters have impacted Atlantic County since 1991. Recent events have caused significant wind, flood and coastal erosion related damages in Atlantic County. They have also resulted in power outages and hazardous driving conditions.

Coastal areas of Atlantic County are particularly dynamic environments, and are quite susceptible to hazards associated with nor'easters. These susceptibilities are expected to increase over time due to the effects of sea level rise. Impacts of nor'easters are associated with damages as a result of flooding (riverine and coastal (back bay and oceanfront) as well as storm surge), high winds, damaging waves, and coastal erosion. It is possible for the entire county to be impacted by nor'easters, though in different ways. For example, wind impacts may be widespread but more severe in immediate coastal areas. Structures close to the Atlantic Coast could suffer catastrophic damages from wind, surge, waves and beach erosion while impacts to inland structures would be less substantial due to lower wind speeds and absence of surge impacts.

[13] State of New Jersey 2014 Hazard Mitigation Plan

Riverine flooding would be limited to riverine flood zones and being of slower velocities in most cases would cause less severe types of structure damages than in coastal areas but could be more widespread geographically. Roads and bridges across the county would be susceptible to overtopping and damage from floodwaters. Beach erosion can often be severe during nor'easters; though beach restoration and maintenance activities are undertaken regularly to offset storm impacts. As noted earlier, this specifically includes the USACE storm damage reduction projects on Absecon Island and Brigantine Island.

Atlantic County is a tourist destination. With summer being the peak vacation time – opposite the time of the typical nor'easter occurrences in winter, tourists are not generally impacted. Impacts to the general public include evacuation and sheltering needs, as well as emergency response for those who shelter in place or are injured during the event. All property types are impacted, with residential and commercial impacts being greatest due to their proximity to the coast. Roads, bridges, schools, hospitals and other types of critical facilities are susceptible to wind and water damage. Secondary impacts would be associated with flying debris, as well as drifting sand from storm surges. Sand covered roads and bridges would be common impacts. Beach erosion can be catastrophic depending on the particular area and the nature of the event. Transportation, communications, and governmental services may be severely impacted. Impacts would be exacerbated when coincident with high tides, or during prolonged types of events that extend across several tidal cycles. Sea level rise will increase impacts over time.

Exposure and Damage Estimates – Nor'easters

Because nor'easters often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. Similar to hurricanes and tropical storms, nor'easters are complex combinations of discrete component hazards occurring simultaneously. Damages during these events result from the cumulative impacts of component hazards such as flooding, storm surge, coastal erosion, wave action, and high winds. No two nor'easters are identical. Even storms of the same magnitude and intensity can bring with them wildly different impacts depending on whether they occur during a time of high tide or low tide; and, since it is not uncommon for nor'easters to stall off of the coast, damages are often affected by the number of tidal cycles during which they occur. Variations in inland wind affects and precipitation amounts can also vary widely. Thus, it is difficult to estimate total potential losses from these cumulative effects in a manner that would allow for the calculation of a meaningful average annual loss estimate for nor'easters. However, because nor'easters are low pressure systems, the impacts from winds found in a strong nor'easter can be modeled using methodology similar to that used for hurricanes.

Nor'easters are complex combinations of discrete component hazards occurring simultaneously. Damages during these events result from the cumulative impacts of a wide range of hazards including flooding, storm surge, coastal erosion, wave action, and high winds. No two nor'easters are identical. Even similar storm systems can bring with them wildly different impacts depending on whether they occur during a time of high tide or low tide – or over multiple tidal cycles. Variations in inland wind affects and precipitation amounts, for example, can also vary widely. Thus, it is difficult to estimate total potential losses from these cumulative hazard effects in a manner that would allow for the calculation of a meaningful average annual loss estimate for

nor'easters as an event. Vulnerability to the component hazards of nor'easter events such as flooding, storm surge, coastal erosion, wave action, and high winds are addressed separately in this section. Vulnerability is being expressed as the number of people and value of property at risk. All of the county's built environment and population could potentially be impacted by the hazards characteristically occurring during a nor'easter.

Tornado

Impacts - Tornado

Tornados are nature's most violent storms. The most intense tornados can cause fatalities and catastrophic damage to both trees and the built environment in a matter of seconds. The number of deaths, injuries, and dollar amount of damages can fluctuate drastically depending on the severity of the tornado and the degree and type of development in the damage path. Emergency responders are called upon for search and rescue, to tend to the injured, assist in evacuations, and to close roads and direct traffic. Transportation, communications, and the general operation of government could be affected by an incident. Property damage can be significant within the tornado's path. Trees can be damaged or destroyed. Power outages can occur. These impacts tend to be felt in rather limited areas, due to the nature of the tornado hazard itself (tornados with limited widths and path lengths after touchdown). The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings and particularly manufactured homes.

Exposure and Damage Estimates – Tornado

Historical evidence shows that Atlantic County is vulnerable to tornadic activity. This hazard can result from severe thunderstorm activity or may occur during a major tropical storm or hurricane. Because it cannot be predicted where a tornado may touch down, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported tornadoes have been factored into this vulnerability assessment[14].

For the plan update, NCEI historical tornado data current as of May 2021 includes a total of 7 tornado events between November 1970 and May 2021, resulting in just over $1 million in damages. To estimate jurisdictional losses due to tornados, expected annualized losses were calculated as follows for the 51-year period of record:

- NCEI losses were obtained for the entire county ($1,025,000 total; using a 51-year period of record, this yields expected annualized losses of $21,000).
- The total value of all improvements in the County is estimated to be nearly $23.2 billion. Thus, based on recent historical data, annual tornado damage represents 0.0001 percent of the total improved property value in Atlantic County.

[14] It is possible that additional tornado events may have occurred since 1950 that were not reported to NCEI and are not accounted for in this analysis.

- Since the tornado hazard is uniform across the planning area, this same percentage was applied to each of the County's jurisdictions to generate annualized expected property losses in each community.

Table 3c.5 shows potential annualized losses and percent loss ratios resulting from the lightning hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCDC. For the plan update, population estimates were refined using year 2015-2019 American Community Survey Census data[15], and annualized expected losses were based on updated (2021) improvement values[16].

Table 3c.5
Potential Annualized Losses from Tornados by Jurisdiction

Jurisdiction	Estimated Population At Risk*	Total Value of Improvements (Buildings) At Risk*	Annualized Expected Property Losses	Annualized Percent Loss Ratio
Absecon, City of	8,362	$441.9	$400	0.0001%
Atlantic City, City of	37,999	$4,819.2	$4,200	0.0001%
Brigantine, City of	8,832	$1,324.8	$1,100	0.0001%
Buena, Borough of	4,356	$232.7	$200	0.0001%
Buena Vista, Township of	7,295	$481.8	$400	0.0001%
Corbin City, City of	537	$34.4	$0	0.0001%
Egg Harbor City, City of	4,100	$244.1	$200	0.0001%
Egg Harbor, Township of	42,714	$3,314.3	$2,900	0.0001%
Estell Manor, City of	1,728	$113.9	$100	0.0001%
Folsom, Borough of	1,697	$114.8	$100	0.0001%
Galloway, Township of	36,094	$2,609.7	$2,300	0.0001%
Hamilton, Township of	25,973	$1,762.8	$1,500	0.0001%
Hammonton, Town of	14,139	$1,126.2	$1,000	0.0001%
Linwood, City of	6,742	$612.1	$500	0.0001%
Longport, Borough of	869	$540.0	$500	0.0001%
Margate City, City of	5,997	$1,547.9	$1,300	0.0001%
Mullica, Township of	5,925	$329.0	$300	0.0001%
Northfield, City of	8,153	$621.1	$500	0.0001%
Pleasantville, City of	20,301	$909.7	$800	0.0001%
Port Republic, City of	1,121	$86.5	$100	0.0001%
Somers Point, City of	10,321	$857.0	$700	0.0001%
Ventnor City, City of	10,095	$967.0	$800	0.0001%
Weymouth, Township of	2,755	$108.9	$100	0.0001%
Total	**266,105**	**$23,199**	**$20,100**	**0.0001%**

* Since the tornado hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

[15] U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

[16] NJGIN, Atlantic County Parcel data, 2021.

Winter Storms

Impacts – Winter Storms

Winter storms can have tremendous impacts on Atlantic County. Though typically short in duration, winter storms can result in significant snow accumulations, with extensive impacts on local transportation via road, rail, and air. Impacts are exacerbated with storms having an ice component, as snow loads are increased and driving conditions substantially worsen. A severe winter storm can adversely affect roadways, utilities, business activities and can cause loss of life, frostbite, or freezing. The most common effect of winter storms and ice storms are traffic accidents, interruptions in power supply and communications. In addition, heavy snow loads can cause roof collapse in cases of inadequate design and/or maintenance, as the structural integrity of the structure is compromised. Power outages and temperatures below freezing for extended periods of time can cause pipes to freeze and burst. Heavily populated areas tend to be significantly impacted by losses of power and communications systems due to downed lines. Distribution lines can be downed by the weight of snow or ice, or heavy winds – particularly during periods of high winds – which can result in outages when limbs fall on power lines and communication lines. Secondary impacts from downed communication lines can hamper the response and recovery efforts due to lack of communication. When limbs and lines fall on roadways, transportation routes can be adversely affected and buildings and automobiles can be damaged. Secondary impacts from power outages can include frozen pipes, business losses, negative impacts on people associated with trying to heat their homes using portable heat sources (i.e., kerosene) or stoves including carbon monoxide poisoning and fire risks. Severe winter storms can also cause coastal flooding, coastal erosion, and wave action. If significant snowfall amounts melt quickly, inland flooding can occur as bankfull conditions are exceeded or in areas of poor roadway drainage. The impacts of snow and ice storms in the planning area are more likely to be major disruptions to transportation, commerce and electrical power as well as significant overtime work for government employees, rather than large scale property damages and/or threats to human life and safety. The severity of the effects of winter storms and ice storms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for a longer duration and become more severe in their affects. Storms that are in full force during the morning or evening rush hours tend to have their affects magnified because more people are out on the roadways and directly exposed. Atlantic County's more rural jurisdictions could be expected to be impacted more by heavy snow and freezing rain due to access transportation issues and distances from major population centers and additional emergency response resources. The human impact of winter storms tends to be exacerbated in areas of social vulnerability (for example, low income, and a high proportion of the very young and/or very old).

Exposure and Damage Estimates – Winter Storms

Because winter storms often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. For the plan update, NCDC historical winter storm data current as of May 2021 was queried for events categorized as: blizzards, heavy snow, ice storms, sleet,

winter storms, and winter weather. The data includes a total of 121 winter weather days between January 1996[17] and May 2021, resulting in approximately $5.3 million in property damages. No event records are included prior to 1996. To estimate jurisdictional losses due to winter storms, expected annualized losses were calculated as follows for the 25-year period of record:

- NCEI losses were obtained for the entire county ($5.3 million total[18]; using a 25-year period of record, this yields expected annualized losses of $210,000).
- The total value of all improvements in the County is estimated to be nearly $23.2 billion. Thus, based on recent historical data, annual winter storm damage represents 0.001 percent of the total improved property value in Atlantic County.
- Since winter storm hazard is uniform across the planning area, this same percentage was applied to each of the County's jurisdictions to generate annualized expected property losses in each community.

Table 3c.6 shows potential annualized property losses and percent loss ratios resulting from the winter storm hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCDC. For the plan update, population estimates were refined using year 2015-2019 American Community Survey Census data[19], and annualized expected property losses were based on updated (2021) improvement values[20].

Table 3c.6
Potential Annualized Losses from Winter Storms by Jurisdiction

Jurisdiction	Estimated Population At Risk*	Total Value of Improvements (Buildings) At Risk (in millions)*	Annualized Expected Property Losses	Annualized Percent Loss Ratio
Absecon, City of	8,362	$441.9	$4,000	0.001%
Atlantic City, City of	37,999	$4,819.2	$44,000	0.001%
Brigantine, City of	8,832	$1,324.8	$12,100	0.001%
Buena, Borough of	4,356	$232.7	$2,100	0.001%
Buena Vista, Township of	7,295	$481.8	$4,400	0.001%
Corbin City, City of	537	$34.4	$300	0.001%
Egg Harbor City, City of	4,100	$244.1	$2,200	0.001%
Egg Harbor, Township of	42,714	$3,314.3	$30,300	0.001%
Estell Manor, City of	1,728	$113.9	$1,000	0.001%
Folsom, Borough of	1,697	$114.8	$1,000	0.001%
Galloway, Township of	36,094	$2,609.7	$23,800	0.001%
Hamilton, Township of	25,973	$1,762.8	$16,100	0.001%
Hammonton, Town of	14,139	$1,126.2	$10,300	0.001%
Linwood, City of	6,742	$612.1	$5,600	0.001%
Longport, Borough of	869	$540.0	$4,900	0.001%
Margate City, City of	5,997	$1,547.9	$14,100	0.001%

[17] Events between 1950 and 1995 were not included in the NCEI database and, therefore, are not accounted for in this analysis.

[18] It should be noted that the NCEI's estimation of losses to winter storms was limited to documented structural damages and did not include other types of damages or economic impacts such as power outages, infrastructure repair and restoration, loss of business income and snow removal costs. In the absence of detailed historical data, it is difficult to model and quantify these other types of non-structural losses for winter storm at a jurisdictional level in Atlantic County. However, it should be recognized that such losses can indeed be significant and their associated costs are most often borne by local government and the private sector.

[19] U.S. Census Bureau, 5-Year American Community Survey (2019)

[20] NJGIN, Atlantic County Parcel data, 2021.

Table 3c.6 Potential Annualized Losses from Winter Storms by Jurisdiction				
Jurisdiction	**Estimated Population At Risk***	**Total Value of Improvements (Buildings) At Risk (in millions)***	**Annualized Expected Property Losses**	**Annualized Percent Loss Ratio**
Mullica, Township of	5,925	$329.0	$3,000	0.001%
Northfield, City of	8,153	$621.1	$5,700	0.001%
Pleasantville, City of	20,301	$909.7	$8,300	0.001%
Port Republic, City of	1,121	$86.5	$800	0.001%
Somers Point, City of	10,321	$857.0	$7,800	0.001%
Ventnor City, City of	10,095	$967.0	$8,800	0.001%
Weymouth, Township of	2,755	$108.9	$1,000	0.001%
Total	**266,105**	**$23,199**	**$212,000**	**0.001%**

* Since the winter storm hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

Coastal Erosion and Sea Level Rise

Impacts – Coastal Erosion

Death and injury are not typically associated with coastal erosion, as erosive processes along the coast occur over long durations during which people in the affected areas have sufficient times to evacuate; however, it can cause the destruction of buildings and infrastructure as land is eroded away. Coastal erosion can also represent a major threat to the local economies of coastal communities that rely on the financial benefits of their recreational beaches. Natural recovery from erosion can take years to decades. If a beach and dune system does not recover quickly enough naturally, coastal and upland property may be exposed to further damage in subsequent coastal erosion and flooding events. Human actions to supplement natural coastal recovery, such as beach nourishment, dune stabilization and shoreline protection structures (sea walls, groins, jetties, etc.) can mitigate the hazard of coastal erosion, but may exacerbate it under some circumstances.

Exposure and Damage Estimates – Coastal Erosion

Unlike other hazards, the coastal erosion hazard is best described as a relatively slow natural process occurring over the long term, with occasional major impacts wrought by episodic natural events such as hurricanes and nor'easters. Another complicating factor in accurately determining specific coastal erosion hazard areas is the continuous implementation of shoreline reinforcement or nourishment projects completed by federal, state and local government agencies. Typically, areas of high concern with regard to long term coastal erosion are addressed through shoreline hardening or stabilization projects, such as seawalls, breakwaters and beach nourishment. The ability to continue successfully mitigating the effects of coastal erosion hazards throughout Atlantic County will therefore depend on regular shoreline monitoring and the design and implementation of site-specific solutions, as has been done in the past.

The New Jersey Coastal Zone Management Rules (NJAC 7:7E) defines erosion hazard areas as extending inland from the edge of a stabilized upland area to the limit of the area likely to be

eroded in 30 years for one to four unit dwelling structures, and 60 years for all other structures, including developed and undeveloped areas[21]. The extent of an erosion hazard area is calculated by multiplying the projected annual erosion rate at a site by 30 for the development of one to four unit dwelling structures and by 60 for all other developments. According to a study prepared by the Heinz Center[22], much of the coastline of New Jersey, including Atlantic County, experiences an average of three feet of erosion per year.

To estimate exposure to the coastal erosion hazard, data on shoreline type (as classified by the New Jersey Department of Environmental Protection) was used to delineate areas potentially susceptible to the erosion hazard. For purposes of this analysis, these shoreline types were limited to (1) "beach," which includes waterfront areas comprised of 100 percent sand; and (2) "erodible," which includes any soft shoreline other than beach, rock, marsh, sea wall or earthen dike. The determination of value at-risk was calculated through GIS analysis by summing the total improved values for those parcels that were confirmed to have at least one building located within 200 feet of the identified beach or erodible shoreline types. The figure of 200 feet was determined to be a reasonable yet slightly more conservative estimate for defining erosion hazard areas based on the calculations recommended under NJAC 7:7E as described above (annual erosion rate of three feet per year x 60 years = 180 feet). According to the assessment, 30 jurisdictions have improved property within areas potentially susceptible to coastal erosion.

Atlantic County and its jurisdictions have an active history of pursuing and implementing successful shoreline protection strategies, particularly through the nourishment of critically eroding beaches and for areas in which property is threatened by continued erosion. This is demonstrated particularly in Brigantine's commitment to the USACE Brigantine Island storm damage reduction and storm protection project; and Atlantic City and Ventnor's respective commitments to the USACE Absecon Island shore protection project. Due to these aggressively implemented beach nourishment projects and other mitigating factors, it appears likely that buildings in coastal erosion hazard areas in these areas would be protected from the hazard for at least a foreseeable 30-year planning window (through 2045). Average annual building damages directly attributable to the erosion hazard in these areas have thus been considered to be negligible for the purposes of this risk assessment, assuming that these ongoing beach nourishment and shoreline stabilization practices are expected to be maintained aggressively, implemented on an ongoing basis, and encouraged to continue.

Table 3c.7 shows exposure to the coastal erosion hazard by jurisdiction. To estimate exposure to coastal erosion, the determination of value and population at-risk was calculated through GIS analysis by calculating the proportion of a parcel or census block lying within 120 feet of 'beach' or 'erodible' shoreline types, and applying that same ratio to the census block population and parcel value to estimate population at risk and value of improvements at risk. Significant event damages are possible, particularly where no shoreline protection features are present (i.e., USACE projects) or if the shoreline were allowed to revert to historical behavior. Assuming no further protective actions (nothing new, and no further maintenance of existing features), and

[21] This distance is measured from the crest of a bluff for coastal bluff areas, the most seaward established dune crest for unvegetated dune areas, the first vegetation line from the water for established vegetated dune areas, and the landward edge of a beach or the eight foot North American Datum (NAD), 1983, contour line, whichever is farther inland, for non-dune areas.

[22] "*Evaluation of Erosion Hazards*" prepared by The H. John Heinz III Center for Science, Economics and the Environment, April 2000. http://www.fema.gov/pdf/library/erosion.pdf

assuming a uniform historical erosion estimate of 3 feet per year, and that all improvements in the mapped erosion hazard area could be damaged over a 40 year time frame (120 feet / 3 feet per year = 40 years). Therefore, to derive an upper limit of average annualized erosion damage, maximum losses were estimated at 100 percent of the reported value of improvements on affected parcels, and annualized over a 40 year period, with results shown in Table 3c.8. This methodology assumes that once lost to erosion, an area of land is not subsequently restored and returned to developable condition.

The total exposed populations and structures in Table 3c.8 show a significant decrease from the equivalent table in the previous plan update: This reflects a change in the methodology driven by the 2019 New Jersey State Plan, which recommends that structures and populations should be considered at risk if they lie within 120 feet of the beach or erodible shoreline, whereas the corresponding analysis in the previous version of the Atlantic County plan used a setback of 200 feet.

Assumptions inherent to Table 3c.7: (1) Each affected parcel has one household; (2) The average number of persons per household in each jurisdiction from the US Census, 2019 ACS was applied to each affected parcel; (3) Average annual damages are estimated to be negligible/zero in Margate and Longport. These two areas are subject to regular surveys by NJBPN, and results indicate that the likely natural shoreline change regimes in these areas are accreting; (4) Average annual damages are estimated to be negligible in Pleasantville and Egg Harbor Township because the beach/erodible shorelines in these areas are on the bay side and, while erodible, are subject to erosion rates far less than the rates of 2 to 3 feet per year that are observed on the immediate coast. (5) Average annual damages are estimated to be negligible with ongoing renourishment in Atlantic City, Brigantine, and Ventnor based on local commitments to renourishment and demonstrated protection of the built environment observed during Superstorm Sandy. SOURCE: NJDEP: Shoreline Type, 1993, with modifications by AECOM to reflect current oceanfront conditions: Atlantic County Parcel data, 2021

.

Table 3c.7
Potential Annualized Losses from Coastal Erosion by Jurisdiction

Jurisdiction	Estimated Population At Risk (Residing Within 120 Feet of Beach/ Erodible Shoreline Types)	Total Value of Improvements (Buildings)	Total Value of Buildings Located Within 120 Feet of Beach/ Erodible Shoreline Types	Percent of Total Building Value Located Within 120 Feet of Beach/ Erodible Shoreline Types	Average Annual Building Damages Directly Attributable to Coastal Erosion *Absent Beach Nourishment and Shoreline Stabilization Practices*	Average Annual Building Damages Directly Attributable to Coastal Erosion *Assuming Continued Beach Nourishment and Shoreline Stabilization Practices*
Absecon, City of	0	$393,695,000	$0	0%	$0	$0
Atlantic City, City of	48	$3,812,061,000	$23,780,285	0.62%	$594,507	Negligible
Brigantine, City of	293	$1,013,271,000	$6,449,725	0.64%	$161,243	Negligible
Buena, Borough of	0	$223,248,000	$0	0%	$0	$0
Buena Vista, Township of	0	$458,557,000	$0	0%	$0	$0
Corbin City, City of	0	$32,062,000	$0	0%	$0	$0
Egg Harbor City, City of	0	$234,888,000	$0	0%	$0	$0
Egg Harbor, Township of	3	$3,051,660,000	$381,572	0.01%	Negligible	Negligible
Estell Manor, City of	0	$109,654,000	$0	0%	$0	$0
Folsom, Borough of	0	$110,384,000	$0	0%	$0	$0
Galloway, Township of	0	$2,074,304,000	$1,518	0.0001%	Negligible	Negligible
Hamilton, Township of	0	$1,503,610,000	$0	0%	$0	$0
Hammonton, Town of	0	$1,064,061,000	$0	0%	$0	$0
Linwood, City of	0	$525,896,000	$0	0%	$0	$0
Longport, Borough of	0	$415,591,000	$0	0%	$0	$0
Margate City, City of	0	$1,230,983,000	$0	0%	$0	$0
Mullica, Township of	0	$320,889,000	$0	0%	$0	$0
Northfield, City of	0	$548,660,000	$0	0%	$0	$0
Pleasantville, City of	12	$831,985,000	$230,312	0.03%	Negligible	$Negligible
Port Republic, City of	0	$75,041,000	$0	0%	$0	$0
Somers Point, City of	0	$773,084,000	$0	0%	$0	$0
Ventnor City, City of	60	$733,553,000	$4,535	0.001%	Negligible	Negligible
Weymouth, Township of	0	$106,184,000	$0	0%	$0	$0
Total	**415**	**$19,643,321,000**	**$30,847,947**	**0.16%**	**$755,750**	**Negligible**

As mentioned in the Hazard Profiles section, sea level rise will increase the risk of damages/losses due to future coastal erosion and flood events. Rising sea level over time will shorten the return period (increasing the frequency) of episodic coastal erosion. This increased probability clearly will have an effect on the estimation of annualized loss/damage, but one that is typically only analyzed during detailed feasibility studies for projects proposed by the US Army Corps of Engineers.

While there is general agreement that sea levels have been rising for many years and are likely to continue to do so, there is, as the 2019 New Jersey State Hazard Mitigation plan says, no coordinated interagency effort to identify agreed upon estimates for projections of sea level rise. Almost all studies and analyses of sea level rise present a range of projections based on an array of future carbon emissions scenarios. The 2019 New Jersey State Plan recommends quantifying the vulnerability to future sea level rise using two projections taken from the Rutgers Science and Technical Advisory Panel (STAP) Report of 2016. These two scenarios project one foot of sea level rise occurring by 2050 and three feet of sea level rise by 2100.

Table 3c.8 shows estimates of the number of at risk parcels in residential areas and the corresponding estimate of the population affected by jurisdiction, using Atlantic County GIS parcel data and digital sea level rise inundation data from the National Oceanic and Atmospheric Administration's Sea Level Rise Viewer website[23]. During the analysis a horizontal offset of 10 feet was added to the landward extent of the sea level rise inundation layers to capture parcels not directly inundated by the projected sea level rise but which would be rendered uninhabitable by permanent flooding of the surrounding streets.

[23] https://coast.noaa.gov/digitalcoast/tools/slr.html

Table 3c.8
Estimated Parcels and Population at Risk from Sea Level Rise

Municipality	Average Household Size*	1 Foot Sea Level Rise		3 Feet Sea Level Rise	
		At-Risk Parcels in Residential Areas**	Estimated At-Risk Population in Residential Areas**	At-Risk Parcels in Residential Areas**	Estimated At-Risk Population in Residential Areas**
Absecon, City of	2.6	117	304	197	512
Atlantic City, City of	2.4	579	1,390	4,875	11,700
Brigantine, City of	2.2	825	1,815	2,816	6,195
Buena Vista, Township of	n/a	0	0	0	0
Buena, Borough of	n/a	0	0	0	0
Corbin City, City of	2.6	25	65	61	159
Egg Harbor City, City of	2.7	79	213	86	232
Egg Harbor, Township of	3	424	1,272	796	2,388
Estell Manor, City of	2.7	2	5	16	43
Folsom, Borough of	n/a	0	0	0	0
Galloway, Township of	2.6	103	268	124	322
Hamilton, Township of	2.6	207	538	230	598
Hammonton, Town of	n/a	0	0	0	0
Linwood, City of	2.6	93	242	168	437
Longport, Borough of	1.9	121	135	864	1,642
Margate City, City of	2	324	648	1,521	3,042
Mullica, Township of	2.87	236	677	267	766
Northfield, City of	2.68	29	78	39	105
Pleasantville, City of	3	59	177	90	270
Port Republic, City of	2.6	72	187	89	231
Somers Point, City of	2.4	178	427	305	732
Ventnor City, City of	2.3	372	856	2,094	4,816
Weymouth, Township of	2.4	55	132	67	161
Total		**3,900**	**9,429**	**14,705**	**34,351**

**US Census Bureau, ACS 2019*
*** Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021.Parcels that did not have a match in Atlantic County tax data are assumed to be Category 2-Residential*

Dam Failure

Impacts – Dam Failure

Dam failure presents a significant potential for disaster, in that significant loss of life and property would be expected in addition to the possible loss of power and water resources. The most common cause of dam failure is prolonged rainfall that produces flooding. Failures due to other natural events such as hurricanes, earthquakes or landslides are significant because there is generally little or no advance warning. The best way to mitigate dam failure is through the proper construction, inspection, maintenance and operation of dams, as well as maintaining and updating Emergency Action Plans for use in the event of a dam failure.

Exposure and Damage Estimates – Dam Failure

Of the eight "high" or "significant" hazard dams in Atlantic County, only one has been classified by USGS as a "major" dam and represents the most significant hazard risk based on the potential consequences of a dam failure. Major dams are described as 50 feet or more in height, or with a normal storage capacity of 5,000 acre-feet or more, or with a maximum storage capacity of 25,000 acre-feet or more. In Atlantic County, this includes the Lake Lenape Dam along the Great Egg Harbor River (located in, and owned by, Hamilton Township). The most accurate method to estimate exposure and potential losses to the dam failure hazard relies on data produced through detailed dam failure inundation studies, often prepared by the owners of dam facilities as part of their own emergency action plans. Inundation mapping for the Lake Lenape Dam was not readily available at the time of the preparation of the initial hazard mitigation plan. However, during the first plan maintenance cycle, the mapping was located and is now maintained in the Atlantic County Department of Engineering. In July 2002, the County digitized a dam break inundation limits map prepared by O'Brien & Gere Engineers, Inc., dated January 1992; all inundation limit lines were directly from this map and were still current as of the time this section of the plan was being updated in 2021. While the dam itself is in Hamilton Township, the mapped inundation area extends beyond Hamilton Township and into Egg Harbor Township, Weymouth Township, and the City of Estell Manor. The value of improvements and population at risk was estimated based on the proportion of parcel area within estimated inundation areas (for example, if 10 percent of the parcel area was within a mapped area of inundation during a breach of the dam, 10 percent of the value of improvements on that parcel were also assumed to be at risk). The population at risk was estimated assuming that each residential parcel contained one household, with the average number of persons per household applied by municipality (U.S. Census Bureau, American Community Survey, 2019). **Table 3c.9** shows population and building value exposure to dam failure by jurisdiction for the major, high hazard, Lake Lenape Dam.

Table 3c.9 Exposure in Dam Failure Hazard Areas for Lake Lenape Dam		
Jurisdiction	**Population At-Risk**	**Value of Improvements At-Risk**
Egg Harbor, Township of	177	$7,938,900
Estell Manor, City of	8	$167,400
Hamilton, Township of	1,074	$63,920,400
Weymouth, Township of	485	$28,748,300
Total	**1,744**	**$100,775,000**

Source: Atlantic County Department of Engineering: Inundation Area, 2002. NJGIN: Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021.

Protection of human life through administration of proper emergency notification and evacuation planning, and proper implementation of the emergency action plan, is crucial to minimizing social losses due to dam failure. Because the probability of occurrence of any dam failure event cannot be reliably estimated (and would reasonably be expected to be very low), it is assumed that while one major event may result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate for jurisdictions exposed to this hazard.

Drought

Impacts – Drought

Droughts are slow onset hazards, but, over time, they can severely affect crops, municipal water supplies, recreational resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts.

Exposure and Damage Estimates – Drought

Because drought impacts large areas and crosses jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop losses on agricultural lands and have no impact on buildings. To estimate land exposure to drought, agricultural land acreage was acquired from NJDEP land use / land cover classification data (2019). **Table 3c.10** shows agricultural land acreage in Atlantic County by jurisdiction. Agricultural land consists of cropland and pastureland; orchards, vineyards, nurseries, and horticultural areas; and areas of confined feeding operations and other agricultural uses. Approximately 9.2 percent of land in Atlantic County is used for agriculture; located in 17 of the County's 23 jurisdictions.

Table 3c.10
Acreage of Agricultural Land by Jurisdiction

Jurisdiction	Land Area (Acres)	Area of Agricultural Land (Acres)	Percentage of Municipal Land Devoted to Agricultural Uses	Area of Cultivated Cropland[24] (Acres)	Proportion of Cultivated Cropland (as percentage of County total)
Absecon, City of	3,453	4	0.1%	2	0.1%
Atlantic City, City of	6,878	0	0.0%	0	0.0%
Brigantine, City of	4,088	0	0.0%	0	0.0%
Buena, Borough of	4,850	3,732	76.9%	3,583	73.9%
Buena Vista, Township of	26,274	5,434	20.7%	4,818	18.3%
Corbin City, City of	4,906	217	4.4%	175	3.6%
Egg Harbor City, City of	6,997	120	1.7%	104	1.5%
Egg Harbor, Township of	42,623	776	1.8%	501	1.2%
Estell Manor, City of	34,125	659	1.9%	527	1.5%
Folsom, Borough of	5,249	647	12.3%	622	11.9%
Galloway, Township of	57,008	3,110	5.5%	2,466	4.3%
Hamilton, Township of	71,121	3,766	5.3%	2,409	3.4%
Hammonton, Town of	26,168	9,124	34.9%	8,006	30.6%
Linwood, City of	2,474	12	0.5%	12	0.5%
Longport, Borough of	247	0	0.0%	0	0.0%
Margate City, City of	906	0	0.0%	0	0.0%
Mullica, Township of	36,110	4,899	13.6%	4,156	11.5%
Northfield, City of	2,178	8	0.4%	8	0.4%
Pleasantville, City of	3,644	0	0.0%	0	0.0%
Port Republic, City of	4,788	89	1.9%	70	1.5%
Somers Point, City of	2,579	1	0.0%	1	0.0%
Ventnor City, City of	1,249	0	0.0%	0	0.0%
Weymouth, Township of	7,737	236	3.0%	126	1.6%
Total	**355,651**	**32,833**	**9.2%**	**27,585**	**7.8%**

Source: NJDEP GIS: Land Use/Land Cover, 2021; NJGIN: Municipal Boundary, 2014

The USDA 2017 Census of Agriculture County Profile for Atlantic County was used to analyze the exposure of Atlantic County crops to drought. It was assumed that the exposure of crops was equal to the total value of crops sold ($120,673,000). This represents roughly a 2 percent decrease since the last version of the plan was prepared (when the value of crops sold in 2012 was $123,140,000).

For the 2010 Plan, to estimate losses due to drought, the NOAA NCDC database was evaluated for drought events. The database included three drought events in the period from 1995 to 2009 causing crop damages varying from total losses to 30 to 50 percent reductions in yield, depending on the crop. Based on this data, it was projected that significant crop-damaging droughts occur in Atlantic County approximately once every five years, during which the average reduction in crop yield is 25 percent, for a total annualized damage of almost $6,291,000 million county-wide. This total was distributed amongst the county's municipalities according to the

[24] Cropland, pastureland, orchards, vineyards, nurseries and horticultural areas.

total acreage of agricultural land in each, to derive estimated annual losses by jurisdiction. Due to database limitations, it was assumed that crops of different type and sale value were distributed equally across the various municipalities.

For this plan update, NCEI historical drought loss data was once again queried, this time for records current as of May 2021[25]. The data includes a total of 38 periods of drought between June 1997[26] and May 2021, the most recent of which was in October 2010. However, the event records estimated $0 in both property and crop damages for these events. This was presumed to be a function of ongoing changes to the NCDC data set, as opposed to true zero dollar losses, because episode narratives did present descriptions of often significant losses for these same events, but not in a manner that would permit an accurate breakdown of losses by jurisdiction or even by County.

Using the methodology employed previously, and updating with the most recent 2017 Agriculture Census report of crop sales of $120.7 million, results in an estimated $30.2 million reduction in sales (25 percent) once every five years; or an annualized loss estimate for the County of $6.033 million. Distributing across the 17 jurisdictions with land in agriculture based on the proportion of County agricultural land in the community generates derived losses per jurisdiction, shown in **Table 3c.11**.

Table 3c.11
Potential Annualized Losses from Drought by Jurisdiction

Jurisdiction	Estimated Population At Risk*	Area of Cultivated Cropland[27] (Acres)	Proportion of Cultivated Cropland (as percentage of Countywide total)	Annualized Estimated Crop Losses ($)
Absecon, City of	8,362	2	0.0%	$500
Atlantic City, City of	37,999	0	0.0%	$0
Brigantine, City of	8,832	0	0.0%	$0
Buena, Borough of	4,356	3,583	13.0%	$783,600
Buena Vista, Township of	7,295	4,818	17.5%	$1,053,800
Corbin City, City of	537	175	0.6%	$38,300
Egg Harbor City, City of	4,100	104	0.4%	$22,700
Egg Harbor, Township of	42,714	501	1.8%	$109,500
Estell Manor, City of	1,728	527	1.9%	$115,300
Folsom, Borough of	1,697	622	2.3%	$136,100
Galloway, Township of	36,094	2,466	8.9%	$539,400
Hamilton, Township of	25,973	2,409	8.7%	$526,800
Hammonton, Town of	14,139	8,006	29.0%	$1,751,000
Linwood, City of	6,742	12	0.0%	$2,700
Longport, Borough of	869	0	0.0%	$0
Margate City, City of	5,997	0	0.0%	$0
Mullica, Township of	5,925	4,156	15.1%	$909,100
Northfield, City of	8,153	8	0.0%	$1,700
Pleasantville, City of	20,301	0	0.0%	$0
Port Republic, City of	1,121	70	0.3%	$15,400
Somers Point, City of	10,321	1	0.0%	$100

[25] Queried on and still current as of May 2021; with data through May 2021.
[26] Events between 1950 and 1997 were not included in the NCEI database and, therefore, are not accounted for in this analysis.
[27] Cropland, pastureland, orchards, vineyards, nurseries and horticultural areas.

Table 3c.11 Potential Annualized Losses from Drought by Jurisdiction				
Jurisdiction	**Estimated Population At Risk***	**Area of Cultivated Cropland[27] (Acres)**	**Proportion of Cultivated Cropland (as percentage of Countywide total)**	**Annualized Estimated Crop Losses ($)**
Ventnor City, City of	10,095	0	0.0%	$0
Weymouth, Township of	2,755	126	0.5%	$27,600
Total	**266,105**	**27,585**	**100.0%**	**$6,033,700**

* Since the drought hazard area is countywide, 100 percent of the population is exposed and potentially at risk.

Flooding

Impacts – Flooding

Flooding can cause widespread damage throughout rural and urban areas, causing loss of life, injury, and severe structural damage to buildings, damaged or destroyed building contents, loss of function for flooded facilities, flooded roadways causing lengthy detour times and increased emergency response times, deposition of debris in and out of channels; damages to utility and communication networks; and agriculture losses. Flooding can cause damages to property, infrastructure, agriculture, and the environment. Local communities often bear the brunt of costs for emergency responders to provide guidance during the response phase, and lead the community through what is often a long recovery process thereafter. Buildings, roads, and bridges can be damaged or destroyed. Crops can be lost when farm fields are flooded. Functional downtime of businesses and/or damage to merchandise and equipment can have staggering impacts. Flooding can also cause sewage to backup into houses through drainpipes where backflow valves are not present. Unanchored fuel tanks can be easily moved by floodwater, causing environmental damage. When government facilities or critical facilities such as police stations, fire stations, hospitals, etc. are flooded – or where access routes to these structures are impassable due to floodwaters – impacts are even greater, with the community's ability to effectively and efficiently govern, provide emergency services and critical care for the injured. While recovery from these impacts can be quick for small-scale, short-duration events; larger events can cripple a community for weeks, months, and years to follow.

Exposure and Damage Estimates – Flooding

Where available, FEMA's 2021 Digital Flood Insurance Rate Maps (DFIRMs) were overlaid upon the Atlantic County Parcel data (2021) to identify the flood risk areas for all municipalities in Atlantic County. In other areas, the 2014 DFIRM flood mapping was used, and the collated data is presented in **Tables 3c.12 and 3c.13**. All parcels that were intersected at any point by the DFIRM hazard area shape files were counted, and impacted improved property values were calculated by applying a percentage of the parcel area within the hazard area to the total improved value associated with that parcel to account for the uncertainty regarding the location of the structure(s) within each parcel, since without building footprint data it cannot be automatically assumed that all improvements lie exactly at the center of their associated parcels.

In total, 35 percent of the County's land area lies within high or moderate flood risk zones[28], according to the Preliminary DFIRM mapping data. The Borough of Longport has the highest proportion of land area within a high flood risk zone at 100 percent, followed closely by the City of Margate City (96 percent) and City of Brigantine (96 percent) and City of Atlantic City (95 percent), and City of Ventnor City (93 percent). The next highest is the City of Corbin City with 74 percent. For comparison purposes, the average Atlantic County community has 45 percent of its land area in high risk flood zones, ranging from a low of 14. percent in Buena Borough to 100 percent in the Borough of Longport.

The GIS analysis indicates that the Borough of Longport, City of Margate City, City of Brigantine, City of Ventnor City, and City of Atlantic City have the greatest proportions of improved property values in high flood risk zones, with 100, 97, 88, 86 and 79 percent in each municipality, respectively. For every other municipality in the County, the proportion of improved property within the mapped high flood risk zone is less than 27 percent. The average community value of improvements in high risk flood zones in Atlantic County is $296 million; ranging from a minimum of $1.5 million in Buena Borough to a maximum of $3 billion in Atlantic City, followed by Margate with $1.2 billion, and Brigantine with $890 million. The distribution in high risk flood zones is as follows:

- Two communities between $1 billion and $5 billion;
- Two communities between $500 million and $1 billion;
- Three communities between $100 million and $500 million;
- Eight communities between $10 million and $100 million; and
- Eight communities between $1 million and $10 million.

[28] FEMA Flood Zones A, AE, and VE

Table 3c.12
Acres of Land in Flood Hazard Areas by Municipality[29]

Municipality	Total Land Area (Acres)	High Flood Risk (Acres)		Moderate Flood Risk (Acres)	Low Flood Risk (Acres)	Land in High Flood Risk %		Land in Moderate Flood Risk %
		VE	A, AE	X500	X	VE	A, AE	X500
Absecon, City of	3,611	360	1,412	148	1,691	10.0%	39.1%	4.1%
Atlantic City, City of	7,008	1,263	5,376	129	239	18.0%	76.7%	1.8%
Brigantine, City of	4,544	738	3,631	164	10	16.2%	79.9%	3.6%
Buena, Borough of	4,845	0	68	0	4,776	0.0%	1.4%	0.0%
Buena Vista, Township of	26,299	0	1,180	2	25,117	0.0%	4.5%	0.0%
Corbin City, City of	4,941	71	3,571	87	1,212	1.4%	72.3%	1.8%
Egg Harbor City, City of	6,971	0	3,226	312	3,433	0.0%	46.3%	4.5%
Egg Harbor, Township of	42,972	1,088	9,982	728	31,175	2.5%	23.2%	1.7%
Estell Manor, City of	33,658	108	8,671	480	24,399	0.3%	25.8%	1.4%
Folsom, Borough of	5,290	0	1,344	93	3,854	0.0%	25.4%	1.8%
Galloway, Township of	56,746	5,817	15,377	571	34,982	10.3%	27.1%	1.0%
Hamilton, Township of	71.024	0	13,755	671	56,597	0.0%	19.4%	0.9%
Hammonton, Town of	26,099	0	1,544	48	24,504	0.0%	5.9%	0.2%
Linwood, City of	2,448	277	859	95	1,217	11.3%	35.1%	3.9%
Longport, Borough of	260	35	224	0	0	13.5%	86.2%	0.0%
Margate City, City of	915	38	844	30	3	4.2%	92.2%	3.3%
Mullica, Township of	36,028	0	5,687	259	30,083	0.0%	15.8%	0.7%
Northfield, City of	2,292	0	369	29	1,895	0.0%	16.1%	1.3%
Pleasantville, City of	3,663	118	1,229	50	2,266	3.2%	33.6%	1.4%
Port Republic, City of	4,801	231	2,516	262	1,793	4.8%	52.4%	5.5%
Somers Point, City of	2,575	159	1,067	142	1,206	6.2%	41.4%	5.5%
Ventnor City, City of	1,243	71	1,089	73	10	5.7%	87.6%	5.9%
Weymouth, Township of	7,605	0	1,314	191	6,101	0.0%	17.3%	2.5%
Total	**355,838**	**10,373**	**84,332**	**4,565**	**256,565**	**2.9%**	**23.7%**	**1.3%**

Source: FEMA: DFIRM 2021, where available, otherwise Preliminary DFIRM Data, 2014; NJGIN: Municipal Boundary, 2021 and Atlantic County Lakes, Open Water areas.

[29] Zones A/AE (100-year floodplain), Zone VE (100-year coastal flood zones, associated with wave action), Zone X500 (500-year floodplain), and Zone X (areas above the 500-year floodplain)

Table 3c.13
Improved Values in Flood Hazard Areas by Municipality ($million)

Municipality	Total Value of Improvements	Improved Value in High Flood Risk Areas		Improved Value in Moderate Flood Risk Areas	Improved Value in Low Flood Risk Areas	Improved Value in High Flood Risk Areas %		Improved Value in Moderate Flood Risk Areas %
		VE	A, AE	X500	X	VE	A, AE	X500
Absecon, City of	$393.695	$0.094	$35.761	$15.556	$342.283	0.0%	9.1%	4.0%
Atlantic City, City of	$3,812.061	$56.046	$2,948.978	$173.488	$633.549	1.5%	77.4%	4.6%
Brigantine, City of	$1,013.271	$5.325	$884.052	$120.170	$3.724	0.5%	87.2%	11.9%
Buena, Borough of	$223.248	$0	$1.503	$0	$221.745	0.0%	0.7%	0.0%
Buena Vista, Township of	$458.557	$0	$4.502	$0.015	$454.039	0.0%	1.0%	0.0%
Corbin City, City of	$32.062	$0	$8.515	$1.756	$21.790	0.0%	26.6%	5.5%
Egg Harbor City, City of	$234.888	$0	$5.602	$2.197	$227.089	0.0%	2.4%	0.9%
Egg Harbor, Township of	$3,051.660	$6.051	$148.136	$25.502	$2,871.972	0.2%	4.9%	0.8%
Estell Manor, City of	$109.654	$0	$2.824	$0.568	$106.261	0.0%	2.6%	0.5%
Folsom, Borough of	$110.384	$0	$8.405	$3.928	$98.051	0.0%	7.6%	3.6%
Galloway, Township of	$2,074.304	$0.464	$52.520	$4.416	$2,016.905	0.0%	2.5%	0.2%
Hamilton, Township of	$1,503.610	$0	$60.137	$11.274	$1,432.200	0.0%	4.0%	0.7%
Hammonton, Town of	$1,064.061	$0	$25.613	$3.040	$1,035.408	0.0%	2.4%	0.3%
Linwood, City of	$525.896	$1.529	$58.626	$31.346	$434.394	0.3%	11.1%	6.0%
Longport, Borough of	$415.591	$3.065	$412.526	$0	$0.000	0.7%	99.3%	0.0%
Margate City, City of	$1,230.983	$8.974	$1,183.647	$35.864	$2.499	0.7%	96.2%	2.9%
Mullica, Township of	$320.889	$0	$45.404	$2.876	$272.608	0.0%	14.1%	0.9%
Northfield, City of	$548.660	$0	$7.252	$5.767	$535.641	0.0%	1.3%	1.1%
Pleasantville, City of	$831.985	$1.334	$31.974	$8.196	$790.481	0.2%	3.8%	1.0%
Port Republic, City of	$75.041	$1.391	$16.593	$5.291	$51.766	1.9%	22.1%	7.1%
Somers Point, City of	$773.084	$5.767	$128.967	$72.418	$565.932	0.7%	16.7%	9.4%
Ventnor City, City of	$733.553	$0.059	$630.313	$103.182	$0.000	0.0%	85.9%	14.1%
Weymouth, Township of	$106.184	$0	$9.097	$12.585	$84.501	0.0%	8.6%	11.9%
Total	**$19,643.323**	**$90.099**	**$6,710.948**	**$639.436**	**$12,202.839**	**0.5%**	**34.2%**	**3.3%**

Source: FEMA: DFIRM 2021/Preliminary DFIRM Data, 2014, Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021

Damage Estimates – Riverine Flooding

Previous versions of the plan used a variety of methods to estimate annual damages from flooding. The 2010 Update used historic NCEI damage records to estimate annual damages from flooding and the 2016 Update used a combination of historic NCEI damage records and NFIP claims to estimate annual damages from flooding. However, the 2016 Update acknowledged the following limitations with previous methods to estimate annual flood damages:

- NCEI data covers only a relatively short period of record – 25 years. Second, it would therefore appear to be possible that the NCEI data set may not be capturing all losses.
- Of the 127 events identified in the NCEI database to have occurred in Atlantic County, zero dollars in damage are reported for the majority of flood event records (115) despite the fact that many of these events have narratives that qualitatively describe damages occurring in Atlantic County.
- NFIP data does not reflect losses incurred on properties that do not maintain flood insurance. Statistical experience shows that only about 20 percent of properties in the floodplain generally maintain flood insurance[30]. Furthermore, NFIP coverage is capped and therefore claims may not pay for all incurred damages.

For this plan update HAZUS was used to generate county-wide estimates of damage resulting from purely riverine flood events. **Table 3c.14** presents the estimated total losses from all sources for events that have annual probabilities of exceedance of 10%, 2%, 1%, and 0.2% of being equaled or exceeded. **Table 3c.14** also includes annual average losses and annualized loss ratios for all jurisdictions in Atlantic County. As with the analysis of hurricane losses above, this analysis used the baseline default building replacement values within the model, in line with standard practice for the estimation of flood damages for risk reduction planning purposes.

Based on this analysis, a riverine flood event affecting the whole county with an annual chance of exceedance of 1% would be expected to incur $87 million in total losses. Detailed inspection of the HAZUS model output for the 1% annual chance probability event (the "100-year" flood) indicates that 45% of losses in that event are residential in origin, while 33% are of commercial origin, and 5% attributable to industry. The remaining 17% is generated by losses from other sources such as public and government buildings.

HAZUS has the capacity to distinguish between riverine flooding and coastal flooding, and to analyze and output losses from each source separately. Later in this section coastal flooding damages generated using HAZUS are presented in the section on storm surge vulnerability and losses, since coastal flooding is not riverine in origin, rather it is generated by offshore meteorological events and the delineation of flood hazard areas may not distinguish between the two sources.

[30] FEMA HARRP-2000

Table 3c.14
Riverine Flood Damages as Estimated by HAZUS ($million)

Jurisdiction	HAZUS Building Replacement Value	Total Losses, 10% ACE Event ("10-Year")	Total Losses, 2% ACE Event ("50-Year")	Total Losses, 1% ACE Event ("100-Year")	Total Losses, 0.2% ACE Event ("500-Year")	Annual Average Total Losses	Annualized Loss Ratio
City of Absecon	$1,267	$0	$0.183	$0.216	$0.422	$0.006	0.0005%
City of Atlantic City	$7,929	$0	$0	$0	$0	$0	0%
City of Brigantine	$2,561	$0	$0	$0	$0	$0	0%
Borough of Buena	$562	$0	$0	$0	$0	$0	0%
Township of Buena Vista	$944	$0.996	$1.396	$2.166	$5.384	$0.144	0.0153%
City of Corbin City	$79	$2.562	$3.838	$4.530	$7.619	$0.341	0.4307%
City of Egg Harbor City	$665	$3.127	$4.349	$4.881	$6.148	$0.392	0.0590%
Township of Egg Harbor	$6,286	$0	$0	$3.377	$4.513	$0.043	0.0007%
City of Estell Manor	$258	$0.009	$0.030	$0.051	$0.104	$0.001	0.0004%
Borough of Folsom	$287	$4.529	$18.161	$26.214	$45.064	$1.160	0.4048%
Township of Galloway	$5,139	$0	$0	$0	$0.115	$0.000	0.0000%
Township of Hamilton	$3,563	$11.657	$19.069	$33.325	$54.678	$1.767	0.0496%
Town of Hammonton	$2,080	$0.604	$0.729	$0.770	$0.867	$0.068	0.0033%
City of Linwood	$1,235	$0	$0	$0.111	$0.276	$0.001	0.0001%
Borough of Longport	$488	$0	$0	$0	$0	$0	0%
City of Margate City	$2,038	$0	$0	$0	$0	$0	0%
Township of Mullica	$818	$4.694	$7.566	$10.046	$34.170	$0.747	0.0913%
City of Northfield	$1,492	$0.000	$0.000	$1.190	$1.771	$0.015	0.0010%
City of Pleasantville	$2,166	$0	$0	$0	$0	$0	0%
City of Port Republic	$196	$0.003	$0.003	$0.005	$0.008	$0.000	0%
City of Somers Point	$1,781	$0	$0	$0	$0	$0	0%
City of Ventnor City	$2,023	$0	$0	$0	$0	$0	0%
Township of Weymouth	$257	$0	$0.020	$0.025	$0.132	$0.001	0.0004%
Atlantic County Total	**$44,114**	**$28.181**	**$55.344**	**$86.907**	**$161.271**	**$4.686**	**0.011%**

Storm Surge

Impacts – Storm Surge

Storm surge can be devastating to coastal regions causing flooding; wave runup; dune overwash; severe beach erosion. In barrier island systems, backbay areas (both coastal as well as mainland areas) are often spared some of the more severe effects of direct wave action but can still incur significant damages as storm surge piles up along the coast and drives up backbay tide levels. Storm surge impacts often extend beyond the immediate ocean coastline and backbay areas to some areas up to a mile or more inland as riverine regions experience backwater effects from storm surge being driven upriver from coastal estuaries. Water can rise very rapidly due to storm surge, posing a serious threat to people remaining in inundation areas. Depending on the nature of the particular storm system, high water levels can extend over several tidal cycles, often increasing the severity of damages as well as degree of life safety impacts.

Exposure and Damage Estimates – Storm Surge

Storm surge is a unique flood hazard which is associated with storms of tropical origin, which differs from other types of coastal flood events covered within the flood damage estimates. A total of 20 jurisdictions have land exposed to the storm surge hazard. In order to assess storm surge risk, two distinct vulnerability assessment approaches were applied for Atlantic County in order to estimate exposure and potential losses to storm surge events.

Coastal flood inundation zone maps were derived from georeferenced data produced by the National Oceanic and Atmospheric Administration (NOAA). Storm surge data was provided from NAOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) data (2018). SLOSH is a modeling tool used to estimate storm surge resulting from historical, hypothetical or predicted hurricanes. In this analysis, color-coded storm surge inundation areas were created and overlaid with parcel and Census block data, defining the potential maximum surge for coastal locations in Atlantic County and the number of people and value of improved property in these areas.

To estimate exposure to storm surge, the determination of value and population at risk was calculated through GIS analysis by calculating the proportion of a parcel or census block lying within an identified storm surge zone (Category 1-4 storm events), and applying that same ratio to the Census block population and parcel value to estimate population at risk and value of improvements at risk, as presented in **Tables 3c.15, 16 and 17**.

Table 3c.15
Acres of Land in Surge Hazard Areas by Municipality

Municipality	Total Municipal Land Area (Acres)	Area of Municipal Land in Surge Hazard Areas (Acres)				Percent of Municipal Land in Surge Hazard Areas (%)			
		Category 1	Category 2	Category 3	Category 4	Category 1	Category 2	Category 3	Category 4
Absecon, City of	3,611	1,609	2,220	2,573	2,803	44.6%	61.5%	71.3%	77.6%
Atlantic City, City of	7,008	5,487	6,393	6,539	6,625	78.3%	91.2%	93.3%	94.5%
Brigantine, City of	4,544	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Buena, Borough of	4,845	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Buena Vista, Township of	26,299	3,314	4,023	4,060	4,091	12.6%	15.3%	15.4%	15.6%
Corbin City, City of	4,941	3,346	3,869	4,362	4,851	67.7%	78.3%	88.3%	98.2%
Egg Harbor City, City of	6,971	2,332	3,150	3,832	4,315	33.5%	45.2%	55.0%	61.9%
Egg Harbor, Township of	42,972	8,952	11,605	14,477	17,305	20.8%	27.0%	33.7%	40.3%
Estell Manor, City of	33,658	6,657	8,620	11,834	15,003	19.8%	25.6%	35.2%	44.6%
Folsom, Borough of	5,290	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Galloway, Township of	56,746	16,411	18,242	19,957	21,881	28.9%	32.1%	35.2%	38.6%
Hamilton, Township of	71.024	181	779	3,486	8,546	0.3%	1.1%	4.9%	12.0%
Hammonton, Town of	26,099	0	0	26	633	0.0%	0.0%	0.1%	2.4%
Linwood, City of	2,448	1,025	1,458	1,784	2,091	41.9%	59.6%	72.9%	85.4%
Longport, Borough of	260	252	255	256	257	96.9%	98.1%	98.5%	98.8%
Margate City, City of	915	831	901	902	904	90.8%	98.5%	98.6%	98.8%
Mullica, Township of	36,028	1,338	2,280	4,876	9,265	3.7%	6.3%	13.5%	25.7%
Northfield, City of	2,292	311	489	997	1,542	13.6%	21.3%	43.5%	67.3%
Pleasantville, City of	3,663	1,222	1,469	1,772	2,085	33.4%	40.1%	48.4%	56.9%
Port Republic, City of	4,801	2,273	3,112	3,596	4,143	47.3%	64.8%	74.9%	86.3%
Somers Point, City of	2,575	960	1,597	1,891	2,166	37.3%	62.0%	73.4%	84.1%
Ventnor City, City of	1,243	950	1,200	1,204	1,212	76.4%	96.5%	96.9%	97.5%
Weymouth, Township of	7,605	790	1,240	1,313	1,351	10.4%	16.3%	17.3%	17.8%
Total	**355,838**	**58,241**	**72,905**	**89,742**	**111,075**	**16.4%**	**20.5%**	**25.2%**	**31.2%**

Source: NOAA: SLOSH Data, 2018; NJGIN: Municipal Boundary, 2021, 2019 Census ACS

Table 3c.16
Improved Values in Surge Hazard Areas by Municipality[31]

Municipality	Total Municipal Improvement Value ($)	Value of Municipal Improvements Surge Hazard Areas ($)				Percent of Municipal Improvements in Surge Hazard Areas			
		Category 1	Category 2	Category 3	Category 4	Category 1	Category 2	Category 3	Category 4
Absecon, City of	$393,695,263	$25,560,810	$109,867,212	$186,955,649	$238,648,292	6.5%	27.9%	47.5%	60.6%
Atlantic City, City of	$3,812,060,699	$1,904,761,709	$3,314,223,946	$3,529,272,876	$3,694,803,001	50.0%	86.9%	92.6%	96.9%
Brigantine, City of	$1,013,271,279	$674,765,264	$1,000,313,960	$1,002,851,646	$1,006,658,544	66.6%	98.7%	99.0%	99.3%
Buena, Borough of	$223,248,148	$0	$0	$0	$0	0.0%	0.0%	0.0%	0.0%
Buena Vista, Township of	$458,556,770	$0	$0	$0	$0	0.0%	0.0%	0.0%	0.0%
Corbin City, City of	$32,061,701	$4,748,825	$14,032,371	$21,098,668	$31,178,594	14.8%	43.8%	65.8%	97.2%
Egg Harbor City, City of	$234,888,323	$256,054	$434,434	$718,829	$852,289	0.1%	0.2%	0.3%	0.4%
Egg Harbor, Township of	$3,051,660,285	$115,599,574	$234,465,411	$330,925,252	$470,090,900	3.8%	7.7%	10.8%	15.4%
Estell Manor, City of	$109,653,697	$967,092	$3,219,663	$6,821,828	$11,936,068	0.9%	2.9%	6.2%	10.9%
Folsom, Borough of	$110,384,232	$0	$0	$0	$0	0.0%	0.0%	0.0%	0.0%
Galloway, Township of	$2,074,304,491	$8,392,748	$26,292,795	$89,125,589	$135,446,327	0.4%	1.3%	4.3%	6.5%
Hamilton, Township of	$1,503,610,485	$9,581,621	$36,828,176	$178,661,049	$385,247,239	0.6%	2.4%	11.9%	25.6%
Hammonton, Town of	$1,064,061,337	$0	$0	$0	$0	0.0%	0.0%	0.0%	0.0%
Linwood, City of	$525,895,540	$48,827,358	$176,300,627	$290,986,943	$403,632,233	9.3%	33.5%	55.3%	76.8%
Longport, Borough of	$415,591,279	$411,472,292	$412,465,141	$414,327,040	$415,041,908	99.0%	99.2%	99.7%	99.9%
Margate City, City of	$1,230,983,282	$1,142,313,256	$1,216,860,583	$1,218,732,997	$1,221,844,860	92.8%	98.9%	99.0%	99.3%
Mullica, Township of	$320,888,692	$32,542,408	$43,627,351	$59,168,947	$74,841,752	10.1%	13.6%	18.4%	23.3%
Northfield, City of	$548,659,960	$5,109,262	$37,077,481	$126,729,047	$279,637,138	0.9%	6.8%	23.1%	51.0%
Pleasantville, City of	$831,985,384	$26,682,952	$77,421,820	$176,830,953	$292,769,647	3.2%	9.3%	21.3%	35.2%
Port Republic, City of	$75,041,209	$10,084,966	$28,676,546	$49,045,443	$61,894,601	13.4%	38.2%	65.4%	82.5%
Somers Point, City of	$773,083,713	$71,513,017	$343,663,802	$468,012,308	$578,531,598	9.3%	44.5%	60.5%	74.8%
Ventnor City, City of	$733,552,937	$472,174,052	$729,230,095	$730,084,182	$731,157,735	64.4%	99.4%	99.5%	99.7%
Weymouth, Township of	$106,183,795	$3,281,178	$26,584,002	$28,551,192	$28,663,841	3.1%	25.0%	26.9%	27.0%
Total	**$19,643,322,501**	**$4,968,634,438**	**$7,831,585,416**	**$8,908,900,438**	**$10,062,876,567**	**25.3%**	**39.9%**	**45.4%**	**51.2%**

Source: NOAA: SLOSH Data, 2018, Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021

[31] Maximum sustained wind speeds: Category 1 = 74 to 95 miles per hour; Category 2 = 96 to 110 miles per hour; Category 3 = 111 to 129 miles per hour; Category 4 = 130 to 156 miles per hour; Category 5 = 157 miles per hour and greater. Categories 3, 4, and 5 are classified as "major" hurricanes.

Table 3c.17 Exposure in Storm Surge Areas by Jurisdiction				
Jurisdiction	**Estimated Population at Risk**	**Total Value of Improvements (Buildings)**	**Value of Improvements Located in Category 1-4 Storm Surge Areas**	**Percent of Municipal Improvement Value Exposed to Surge**
Absecon, City of	5,417	$393,695,263	$238,648,292	60.6%
Atlantic City, City of	38,497	$3,812,060,699	$3,694,803,001	96.9%
Brigantine, City of	7,716	$1,013,271,279	$1,006,658,544	99.3%
Buena, Borough of	0	$223,248,148	$0	0.0%
Buena Vista, Township of	0	$458,556,770	$0	0.0%
Corbin City, City of	485	$32,061,701	$31,178,594	97.2%
Egg Harbor City, City of	657	$234,888,323	$852,289	0.4%
Egg Harbor, Township of	13,150	$3,051,660,285	$470,090,900	15.4%
Estell Manor, City of	1,419	$109,653,697	$11,936,068	10.9%
Folsom, Borough of	0	$110,384,232	$0	0.0%
Galloway, Township of	6,464	$2,074,304,491	$135,446,327	6.5%
Hamilton, Township of	5,883	$1,503,610,485	$385,247,239	25.6%
Hammonton, Town of	91	$1,064,061,337	$0	0.0%
Linwood, City of	4,951	$525,895,540	$403,632,233	76.8%
Longport, Borough of	761	$415,591,279	$415,041,908	99.9%
Margate City, City of	5,317	$1,230,983,282	$1,221,844,860	99.3%
Mullica, Township of	1,273	$320,888,692	$74,841,752	23.3%
Northfield, City of	3,741	$548,659,960	$279,637,138	51.0%
Pleasantville, City of	10,632	$831,985,384	$292,769,647	35.2%
Port Republic, City of	896	$75,041,209	$61,894,601	82.5%
Somers Point, City of	8,651	$773,083,713	$578,531,598	74.8%
Ventnor City, City of	9,210	$733,552,937	$731,157,735	99.7%
Weymouth, Township of	144	$106,183,795	$28,663,841	27.0%
Total	**125,355**	**$19,643,322,501**	**$10,062,876,567**	**51.2%**

The preceding tables indicate that life and property is at risk from storm surge in all but four of Atlantic County's municipal jurisdictions, and in six of those municipalities (Atlantic City, Brigantine, Corbin City, Longport, Margate City, and Ventnor City) the proportion of life and property at risk is approaching 100%. Approximately half the County's total population and half of the total municipal improvement value are at risk from storm surge.

In previous versions of the plan a methodology was employed to estimate annual losses from storm surge using NFIP loss records and historic events with associated damage listed in the NCEI database. This method may have underestimated storm surge damage due to limitations of these datasets described above in the discussion of other hazards, hence for this plan update losses due to storm surge were estimated using HAZUS. As mentioned above, HAZUS has the capability to distinguish between riverine flooding and coastal flooding, and to analyze and output losses from each source separately. For the purposes of calculating losses in this study, "storm surge" has been taken to cover all coastal flooding events from abnormally high tides which cause backups and nuisance flooding in local drainage systems up to category 4 events in the SLOSH model, since basic riverine flooding is clearly not capturing the majority of flood events observed by the people of Atlantic County or the primary source of flooding used to generate many jurisdictional Flood Insurance Rate Maps.

The coastal flooding module in HAZUS has been used to estimate the storm surge losses presented in **Table 3c.18**, for the same array of event probabilities as for riverine flooding, using the baseline default inventory as before, but also incorporating ocean water surface elevations and associated frequencies taken directly from the County Flood Insurance Study[32]. The analysis was conducted for still water conditions only, i.e., without the wave action component.

As with the analysis of hurricane and riverine flood losses above, this analysis used the baseline default building replacement values within the model, in line with standard practice for the estimation of flood damages for risk reduction planning purposes.

Based on this analysis, a coastal flooding/storm surge event affecting the whole of Atlantic County with an annual chance of exceedance of 1% could be expected to result in more than $6 billion in total losses. Detailed inspection of the HAZUS model output for the 1% annual chance probability event indicates that 54% of losses in that event are residential in origin, while 28% are of commercial origin, and 1% attributable to industry. The remaining 16% is generated by losses from other sources such as public and government buildings.

[32] FEMA Flood Insurance Study for Atlantic County, study number 34001CV000A, effective August 28, 2018.

Table 3c.18
Coastal Flood Damages as Estimated by HAZUS ($million)

Jurisdiction	HAZUS Building Replacement Value	Total Losses, 10% ACE Event ("10-Year")	Total Losses, 2% ACE Event ("50-Year")	Total Losses, 1% ACE Event ("100-Year")	Total Losses, 0.2% ACE Event ("500-Year")	Annual Average Total Losses	Annualized Loss Ratio
City of Absecon	$1,267	$0	$43.205	$78.693	$145.344	$2.108	0.17%
City of Atlantic City	$7,929	$871.539	$2,525.910	$3,192.281	$4,875.117	$156.164	1.97%
City of Brigantine	$2,561	$188.539	$502.510	$698.936	$1,188.515	$33.742	1.32%
Borough of Buena	$562	$0	$0	$0	$0	$0	0.00%
Township of Buena Vista	$944	$0	$0	$0	$0	$0	0.00%
City of Corbin City	$79	$5.281	$12.224	$14.610	$24.760	$0.798	1.01%
City of Egg Harbor City	$665	$0.008	$0.029	$0.047	$0.379	$0.002	0.00%
Township of Egg Harbor	$6,286	$16.773	$182.834	$209.288	$500.575	$8.635	0.14%
City of Estell Manor	$258	$0.598	$1.042	$1.387	$2.383	$0.077	0.03%
Borough of Folsom	$287	$0	$0	$0	$0	$0	0.00%
Township of Galloway	$5,139	$0	$0.625	$29.920	$47.208	$0.546	0.01%
Township of Hamilton	$3,563	$0	$0	$1.072	$56.302	$0.299	0.01%
Town of Hammonton	$2,080	$0	$0	$0	$0	$0	0.00%
City of Linwood	$1,235	$12.492	$22.383	$119.416	$217.402	$3.476	0.28%
Borough of Longport	$488	$55.933	$113.333	$149.772	$258.499	$8.489	1.74%
City of Margate City	$2,038	$236.370	$569.820	$744.300	$1,231.723	$38.957	1.91%
Township of Mullica	$818	$29.513	$50.346	$59.363	$81.642	$3.823	0.47%
City of Northfield	$1,492	$7.823	$14.567	$18.859	$33.758	$1.112	0.07%
City of Pleasantville	$2,166	$11.718	$55.550	$74.084	$128.592	$3.004	0.14%
City of Port Republic	$196	$0.603	$12.003	$19.092	$34.568	$0.570	0.29%
City of Somers Point	$1,781	$110.601	$188.061	$351.313	$600.778	$17.127	0.96%
City of Ventnor City	$2,023	$77.399	$218.353	$316.020	$655.871	$15.129	0.75%
Township of Weymouth	$257	$0	$0	$4.631	$16.872	$0.110	0.04%
Atlantic County Total	**$44,114**	**$1,625.515**	**$4,512.795**	**$6,083.084**	**$10,100.288**	**$294.168**	**0.67%**

Impact of Sea Level Rise on Storm Surge Inundation for Category 1-4 Hurricanes

The impact of long-term sea level rise can be expected to increase the annual occurrence probability of significant storm surge events and hence the future expected annual losses in Atlantic County. Quantifying this increase in damages would require mapping from other sources, or significant amounts of hydrologic data to perform detailed analyses which are typically only undertaken at the feasibility stage during the planning for specific coastal flood and erosion protection projects, and hence is outside the scope of this current plan.

Tsunami

Tsunamis have the potential to cause enormous damage and disruption to the Atlantic coast of the USA, including Atlantic County. Similarly to the impacts and exposure to wave action, assets and populations most at risk from tsunamis are those in the immediate coastal and shorefront areas, although tsunamis carry the possibility that the risk of loss and disruption would extend far inland, significantly beyond the limits of currently mapped V-Zones, and would strike with greater force and speed than inundation from storm surge that is currently mapped using SLOSH Zones. While there is some discussion in the 2019 New Jersey State Hazard Mitigation Plan about future efforts to develop spatial analyses of potential tsunami impact areas, there currently exists little baseline source data from which tsunami exposure, impacts and losses could be quantified for Atlantic County.

The State Plan lists a number of minor events impacting New Jersey which have been attributed to tsunamis (or tsunami-like occurrences), but only one is listed as causing a measurable impact in Atlantic County: Unusual tidal and wave conditions were reported in June of 1913 and damages to wharfs and embankments in the Borough of Longport totaling $10,000 were recorded. While this sum would equal approximately $280,000 in 2021, this single damage estimate in more than 100 years of record does not strongly suggest that annual damages in Atlantic County from tsunami or tsunami-like events would rise above the level of negligible.

In the absence of reliable sources for damage estimates arising from tsunamis in New Jersey and the absence of any analyses of their spatial impacts or probabilities of occurrence, the exposure and losses attributable to tsunamis in Atlantic County are considered currently unquantifiable, and likely negligible. However, the possibility that Atlantic County may be struck by a catastrophic (though statistically extremely rare) tsunami at some point in the future is acknowledged.

Wave Action

Impacts – Wave Action

Wave action is a significant hazard to buildings and infrastructure located in coastal areas. Large, fast moving waves can cause extreme erosion and scour and their impact on buildings can cause severe damage. Storm surge and wind increase the destructiveness of waves and cause them to reach higher elevations and penetrate further inland.

Exposure and Damage Estimates – Wave Action

To estimate exposure to wave action, it is assumed that vulnerable areas are located in the mapped VE flood zone, which experiences coastal flood with velocity hazard (wave action). To estimate exposure to wave action, the determination of value and population at-risk was calculated through GIS analysis by calculating the proportion of a parcel lying within VE zones, and applying that same ratio to parcel value to estimate the value of improvements at risk. The same ratio was applied at the parcel level to multiply the number of affected parcels by the average household size by municipality to estimate the affected population. **Table 3c.19** shows exposure to wave action by jurisdiction. Twelve jurisdictions have developed areas (as represented by improved parcels) that are exposed to wave action, with the most significant areas at risk in Atlantic City, Margate, City, Brigantine, Somers Point, and Longport.

All of the estimates in **Table 3c.19** are observed to have changed fairly significantly from the prior version of the plan, in particular the estimated population at risk is now greatly reduced. While some of this difference may be attributable to changes in the latest DFIRM data, this is principally due to the revised methodology used: In the previous analysis the population at risk was derived from the proportion of each census block overlapping with the VE zone, but it was found that many shorefront census blocks extended far beyond the boundaries of the parcels of improved property that they covered, often into large areas of beach and other undeveloped land. The current methodology reduces this overcount by deriving the population at risk from developed parcels that intersect with the VE zone, which in coastal areas of Atlantic County are more likely to closely correspond to actual human habitation.

For this plan update, given the lack of readily available historical loss data on discrete wave damages in Atlantic County[33], it is assumed that while one major event (i.e., hurricane or nor'easter) may result in significant losses specifically due to wave action, annualizing these structural losses over a long period of time would most likely yield a negligible annualized loss estimate in each jurisdiction exposed to this hazard. However, it should also be noted that over the long term, anticipated sea level rise will increase the risk of damages/losses to future wave action events.

[33] Wave action is not a discrete hazard with specific event records that can be queried in the NOAA NCEI database.

Table 3c.19
Exposure to Wave Action by Jurisdiction

Jurisdiction	Estimated Population at Risk	Total Value of Improvements (Buildings)	Value of Buildings Located in VE Flood Zone*	Percent of Municipal Building Value Exposed to Wave Action
Absecon, City of	5	$393,695,263	$94,198	0.02%
Atlantic City, City of	7	$3,812,060,699	$56,045,760	1.47%
Brigantine, City of	273	$1,013,271,279	$5,325,079	0.53%
Buena, Borough of	0	$223,248,148	0	0%
Buena Vista, Township of	0	$458,556,770	0	0%
Corbin City, City of	0	$32,061,701	0	0%
Egg Harbor City, City of	0	$234,888,323	0	0%
Egg Harbor, Township of	141	$3,051,660,285	$6,050,788	0.20%
Estell Manor, City of	0	$109,653,697	0	0%
Folsom, Borough of	0	$110,384,232	0	0%
Galloway, Township of	8	$2,074,304,491	$464,462	0.02%
Hamilton, Township of	0	$1,503,610,485	0	0%
Hammonton, Town of	0	$1,064,061,337	0	0%
Linwood, City of	44	$525,895,540	$1,528,873	0.29%
Longport, Borough of	47	$415,591,279	$3,065,403	0.74%
Margate City, City of	154	$1,230,983,282	$8,973,568	0.73%
Mullica, Township of	0	$320,888,692	0	0%
Northfield, City of	0	$548,659,960	0	0%
Pleasantville, City of	21	$831,985,384	$1,334,477	0%
Port Republic, City of	130	$75,041,209	$1,391,039	1.85%
Somers Point, City of	97	$773,083,713	$5,767,093	0.75%
Ventnor City, City of	14	$733,552,937	$58,732	0.01%
Weymouth, Township of	0	$106,183,795	0	0%
Total	941	$19,643,322,501	$90,099,472	0.46%

Source: FEMA: DFIRM 2021, where available, otherwise Preliminary DFIRM Data, 2014; Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021, 2019 Census ACS

Earthquake

Impacts – Earthquake

Most earthquake-related property damage and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the extent and duration of the shaking. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (in mountain regions and along hillsides), and liquefaction.

According to USGS data, damage caused by an earthquake will begin at a level of ground shaking (peak ground acceleration, or PGA) of approximately ten percent of the force of gravity (0.1g, or 10%g). Below this level, damages are typically very slight except in unusually vulnerable facilities. An earthquake of this magnitude (10%g) can be expected to occur in New Jersey only once every 2,476 years; while a 100-year return period even would have a PGA of less than 0.17%g[34]. Damages from ground shaking at 10%g to 20%g tend to be minor to moderate, with only unusually poor buildings being subject to potential collapse. Events in the range of 20%g to 50%g may cause significant damage in some modern buildings and very high levels of damage (include collapse) in poorly designed buildings. Events more than 50%g may cause higher levels of damage in many buildings, even those designed to resist seismic forces. The probability of significant, damaging earthquake events affecting Atlantic County is low. According to the United States Geological Survey (USGS), an earthquake with a 10 percent probability of exceedance over 50 years would have PGA values between 2%g and 3%g, which would result in light to moderate perceived shaking and damages ranging from none to very light. More destructive earthquakes are very rare, low probability events for Atlantic County with highly infrequent recurrence periods.

Exposure and Damage Estimates – Earthquake

Because earthquakes often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted.

Seismic hazard maps for New Jersey show because of the low frequency of occurrence and the relatively low levels of ground shaking that would be experienced; the entire State of New Jersey can be expected to have a low-to-moderate risk to earthquake damage as compared to other areas of the country. Historical records indicate the occurrence of approximately one earthquake per year in New Jersey. The most likely earthquake in New Jersey is not likely to be particularly intense, or particularly damaging.

A previous version of the New Jersey State Hazard Mitigation Plan presented the expected peak ground acceleration for earthquake events of various estimated frequencies for Atlantic County. **Table 3c.20** lists the expected peak ground acceleration (PGA) for various return period earthquake events for the whole county as reported in that version of the plan, and there is considered to be no strong reason for any subsequent changes.

[34] NJ State Hazard Mitigation Plan 2014

An event with a PGA of less than 0.17%g would not be felt, and would have a zero damage potential. An event between 0.17%g and 1.4%g would result in weak perceived shaking, but no damage. Events between 1.4%g and 3.9%g would likely result in light perceived shaking, but again, no damage. Damages would be expected in the 3.9%g to 9.2%g range, where perceived shaking would be moderate but would result in very light damages.

Table 3c.20
Peak Ground Acceleration [35]

Jurisdiction	100-year Mean Return Period Event PGA	500-year Mean Return Period Event PGA	1,000-year Mean Return Period Event PGA	2,500-year Mean Return Period Event PGA
Atlantic County	< 0.17%g *No perceived shaking; No potential damage*	1.4%g - 3.9%g *Light perceived shaking; No potential damage*	3.9%g - 9.2%g *Moderate perceived shaking; Very light damage*	9.2%g -18%g *Strong perceived shaking; Light damage*

Source: New Jersey State Hazard Mitigation Plan, 2014

Earthquakes with higher PGAs cause more damage, but have a lower probability of occurrence. Conversely, earthquakes with low PGAs such as those that could potentially impact Atlantic County, have a higher probability of occurrence but would only cause negligible to minor damage due to light shaking. In comparison to PGAs above 0.25g which can cause strong to violent shaking and major damage, expected PGAs for Atlantic County will likely only cause negligible to light shaking and negligible to minor damage. Estimated losses for a 100-year earthquake event in Atlantic County were considered to be negligible. HAZUS

For this plan update HAZUS was used to generate estimates of damage resulting from earthquake events of two different probabilities for all jurisdictions in Atlantic County. **Table 3c.21** presents the estimated total losses for events that have annual probabilities of exceedance of 1%, and 0.2% of being equaled or exceeded, also includes annual average losses generated by HAZUS and annualized loss ratios for all jurisdictions in Atlantic County. In concurrence with the earlier version of the State plan, the analysis indicated that an earthquake event with a 1% chance of being equaled or exceeded in any one year would not result in any measurable losses, while an event an annual chance of 0.2% would likely result in losses totaling $33 million.

Table 3c.21
Earthquake Damages as Estimated by HAZUS

Jurisdiction	HAZUS Building Replacement Value	Total Losses, 1% ACE Event ("100-Year")	Total Losses, 0.2% ACE Event ("500-Year")	Annual Average Total Losses	Annualized Loss Ratio
City of Absecon	$1,267,196,000	$0	$1,014,223	$12,758	0.001%
City of Atlantic City	$7,929,398,000	$0	$6,929,701	$85,591	0.001%
City of Brigantine	$2,561,457,000	$0	$1,572,737	$19,409	0.001%
Borough of Buena	$562,168,000	$0	$654,545	$9,230	0.002%
Township of Buena Vista	$943,547,000	$0	$825,473	$11,446	0.001%
City of Corbin City	$79,168,000	$0	$46,499	$606	0.001%
City of Egg Harbor City	$664,696,000	$0	$613,238	$8,245	0.001%
Township of Egg Harbor	$6,286,181,000	$0	$4,442,717	$57,115	0.001%
City of Estell Manor	$258,137,000	$0	$304,513	$3,968	0.002%
Borough of Folsom	$286,550,000	$0	$218,072	$3,101	0.001%
Township of Galloway	$5,139,040,000	$0	$4,222,039	$54,883	0.001%
Township of Hamilton	$3,562,661,000	$0	$2,792,280	$37,168	0.001%
Town of Hammonton	$2,080,000,000	$0	$2,333,973	$32,499	0.002%
City of Linwood	$1,234,913,000	$0	$614,520	$7,583	0.001%
Borough of Longport	$488,334,000	$0	$15,827	$194	0.000%
City of Margate City	$2,037,682,000	$0	$1,179,967	$14,321	0.001%
Township of Mullica	$817,791,000	$0	$603,679	$8,240	0.001%
City of Northfield	$1,492,484,000	$0	$1,063,959	$13,370	0.001%
City of Pleasantville	$2,165,941,000	$0	$1,743,811	$22,223	0.001%
City of Port Republic	$196,115,000	$0	$142,385	$1,814	0.001%
City of Somers Point	$1,781,072,000	$0	$731,824	$8,348	0.000%
City of Ventnor City	$2,022,669,000	$0	$1,517,371	$18,667	0.001%
Township of Weymouth	$257,200,000	$0	$68,785	$896	0.000%
Atlantic County Total	**$44,114,400,000**	**$0**	**$33,652,136**	**$431,675**	**0.001%**

Wildfire

Impacts – Wildfires

Wildfires have the potential to destroy large portions of a community. Firefighters are at risk during the time that they are trying to contain and control the blaze. Loss of life and injuries are possible for people living, working, or traveling through an impacted area. Beyond the loss of vegetation that wildfires leave in their wake, structures in the wildland/urban interface can be severely damaged or destroyed. Following a large wildfire, the possibility exists for significant increases in stormwater runoff and landslides which can lead to downstream flooding. Depending on the scale of the impacted area and the type and numbers of buildings and infrastructure impacted, secondary effects are possible on local economies and the social fabric of communities following the event.

Exposure and Damage Estimates - Wildfires

To estimate exposure to wildfire, the determination of value and population at-risk was calculated through GIS analysis by calculating the proportion of a parcel or census block located within areas of wildfire susceptibility (low/moderate and high/extreme), and applying that same ratio to the census block population and parcel value to estimate population at risk and value of improvements at risk. Approximately 21 percent of total assessed improvements in the county are located in wildfire hazard areas; however, only about 7 percent is located in high or extreme susceptibility areas.. **Table 3c.23** shows exposure to wildfire by jurisdiction.

Given the lack of historical loss data on significant wildfire occurrences resulting in large-scale structural losses in Atlantic County, it is assumed that while one major event may result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate in each jurisdiction exposed to this hazard.

Table 3c.22
Exposure to Wildfire by Jurisdiction ($million)

Jurisdiction	Estimated Population At Risk in All Wildfire Susceptibility Areas	Total Value of Improvements (Buildings) –**	Total Value of Buildings Located in Low/ Moderate Susceptibility Areas	Total Value of Buildings Located in High/ Extreme Susceptibility Areas	Total Value of Buildings Located in All Wildfire Susceptibility Areas	Percent of Total Building Value Exposed to Wildfire
Absecon, City of	4,005	$441.9	$41.4	$30.4	$71.8	16.2%
Atlantic City, City of	15,541	$4,819.2	$102.8	$0.7	$103.6	2.1%
Brigantine, City of	3,482	$1,324.8	$28.8	$3.8	$32.6	2.5%
Buena, Borough of	1,429	$232.7	$37.2	$7.0	$44.2	19.0%
Buena Vista, Township of	5,646	$481.8	$189.8	$44.7	$234.5	48.7%
Corbin City, City of	371	$34.4	$9.5	$8.8	$18.4	53.4%
Egg Harbor City, City of	344	$244.1	$27.4	$39.1	$66.5	27.2%
Egg Harbor, Township of	291,509	$3,314.3	$830.1	$624.4	$1,454.5	43.9%
Estell Manor, City of	1,621	$113.9	$84.0	$16.4	$100.4	88.1%
Folsom, Borough of	1,393	$114.8	$25.1	$17.8	$42.9	37.4%
Galloway, Township of	23,333	$2,609.7	$676.0	$437.2	$1,113.1	42.7%
Hamilton, Township of	22,811	$1,762.8	$503.7	$231.9	$735.6	41.7%
Hammonton, Town of	8,699	$1,126.2	$209.7	$87.7	$297.4	26.4%
Linwood, City of	2,873	$612.1	$48.8	$5.3	$54.1	8.8%
Longport, Borough of	59	$540.0	$0.7	$0.7	$1.3	0.2%
Margate City, City of	572	$1,547.9	$6.3	$1.5	$7.8	0.5%
Mullica, Township of	5,181	$329.0	$129.9	$68.0	$197.9	60.2%
Northfield, City of	3,248	$621.1	$27.0	$7.6	$34.6	5.6%
Pleasantville, City of	6,916	$909.7	$68.0	$12.1	$80.1	8.8%
Port Republic, City of	1,000	$86.5	$53.6	$16.2	$69.8	80.7%
Somers Point, City of	3,524	$857.0	$13.6	$9.7	$23.3	2.7%
Ventnor City, City of	2,659	$967.0	$9.5	$0.6	$10.1	1.0%
Weymouth, Township of	2,494	$108.9	$59.2	$14.1	$73.2	67.3%
Total	**146,288**	**$23,199**	**$3,102**	**1,686**	**$4,867**	**21%**

** Population in Low, Moderate, High, or Extreme Risk Areas*
*** Exposure calculated by GIS Analysis using local improvement values (2021)*

Vulnerability of Other Assets

The Asset Inventory presented earlier in this document presented six categories of assets, including improved property, emergency facilities, critical infrastructure and utilities, other critical facilities, historic and cultural resources, and population. The preceding sections of this vulnerability assessment have addressed improved property and population for each hazard. This section will specifically address the vulnerability of the other asset categories.

To analyze vulnerability of specific assets located in Atlantic County, facilities were grouped as follows:

- Critical Facilities:
  - Airports
  - Communication Facilities
  - Electrical Power Facilities
  - Emergency Shelters
  - Emergency Operations Centers
  - Fire Stations
  - Hospitals
  - Nursing homes
  - Passenger rail stations
  - Police stations
  - Public works
  - Ambulance/Rescue squads
  - Schools
  - Water supply facilities
  - Wastewater treatment facilities
- Historical and Cultural Resources

All assets throughout Atlantic County are exposed to extreme temperatures, extreme winds, hurricanes and tropical storms, hail, lightning, nor'easters, tornadoes, winter storms, drought and earthquakes. For the hazards with delineable hazard areas (i.e., flood, wave action, storm surge, coastal erosion, sea level rise, dam failure, and wildfire), **Table 3c.23 and Table 3c.24** shows exposure of Atlantic County's critical facilities by jurisdiction. Exposure of these assets was determined through GIS analysis of hazard areas using georeferenced point locations for critical facilities, which were aggregated by facility type. A full list of exposed critical facilities by delineable hazard is provided in **Appendix 3c**. In summary:

- Of the 372 critical facilities identified and georeferenced in Atlantic County's jurisdictions, 197 lie in one or more delineable hazard areas.
- No critical facilities are in areas mapped as susceptible to coastal erosion.[36]
- One facility is susceptible to wave action.[37]
- 88 critical facilities are in the 100-year floodplain.[38]

[36] Within 120 feet of shoreline types classified by NJDEP as "beach" or "erodible".
[37] FEMA V-zones (2021 DFIRM data where available, elsewhere 2014 Preliminary DFIRMs)
[38] FEMA A, AE, and V-zones (as per previous footnote)

- 7 structures are at risk from one foot of sea level rise and 14 are at risk from three feet of sea level rise.[39]
- 23 critical facilities are in mapped areas of high to extreme wildfire hazard.[40]
- 142 critical facilities are in mapped surge hazard areas.[41]
- 6 critical facilities could potentially be impacted by dam failure.[42]

Table 3c.23
Critical Facilities in Hazard Areas by Jurisdiction

Jurisdiction	Number of Critical Facilities	Number of Critical Facilities in At Least One Delineable Hazard Area
Absecon, City of	10	7
Atlantic City, City of	45	45
Brigantine, City of	6	6
Buena Vista, Township of	11	5
Buena, Borough of	16	2
Corbin City, City of	6	6
Egg Harbor City, City of	15	9
Egg Harbor, Township of	34	8
Estell Manor, City of	3	1
Folsom, Borough of	2	0
Galloway, Township of	46	11
Hamilton, Township of	44	25
Hammonton, Town of	23	8
Linwood, City of	13	10
Longport, Borough of	3	3
Margate City, City of	12	12
Mullica, Township of	12	3
Northfield, City of	14	9
Pleasantville, City of	21	8
Port Republic, City of	5	4
Somers Point, City of	13	5
Ventnor City, City of	11	7
Weymouth, Township of	7	3
Atlantic County, Total	372	197

Table 3c.25 shows exposure of historic and cultural resources for delineable hazards (i.e., flood, wave action, storm surge, coastal erosion, one foot of sea level rise, three feet of sea level rise, dam failure, and wildfire). Exposure of historic properties was determined through GIS analysis of hazard areas using georeferenced locations for historic properties provided by the New Jersey Historic Preservation Office. Only those historic property locations which intersect with at least one of the nine delineable hazard categories are included in **Table 3c.25.**

[39] https://coast.noaa.gov/digitalcoast/tools/slr.html
[40] An additional 59 facilities are in mapped areas of low to moderate wildfire hazard, though this is likely to be an overestimate because many of the low to moderate hazard areas are mapped in urban centers near small pockets of vegetation such as local parks or small clusters of trees).
[41] This reflects facilities in mapped SLOSH zones for Category 1 through 4 hurricanes, as per NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) data (2021).
[42] Dam inundation hazard area maps.

Table 3c.24
Exposure of Georeferenced Critical Facility Types by Jurisdiction

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
ABSECON, CITY OF											
	Ambulance	1	0	0	1	0	0	0	0	0	0
	Fire Station	1	0	0	1	0	0	0	0	0	0
	Passenger Rail Station	1	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	1	0	0	0	0	0	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	3	0	0	1	0	0	0	0	0	0
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	Water Supply Facility	1	0	0	1	0	0	0	0	0	0
	TOTAL, ABSECON	**10**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**
ATLANTIC CITY, CITY OF											
	Communication Facility	9	8	0	9	0	3	3	0	6	0
	Electrical Power Facility	2	2	0	2	0	0	0	0	1	0
	Emergency Operations Center	1	1	0	1	0	0	0	0	0	0
	Emergency Shelter	1	1	0	1	0	0	0	0	0	0
	Fire Station	6	0	0	0	0	0	1	0	1	0
	Hospital	1	1	0	1	0	0	0	0	0	0
	Passenger Rail Station	1	0	0	1	0	0	0	0	0	0
	Police Station	3	3	1	3	0	0	0	0	1	0
	Public Works	3	3	0	3	0	0	1	0	1	0
	School	13	12	0	13	0	0	0	0	0	0
	Senior Care Facility	2	2	0	2	0	0	0	0	0	0
	Wastewater Treatment Facility	2	2	0	2	0	0	0	0	0	0
	Water Supply Facility	1	1	0	1	0	0	0	0	1	0
	TOTAL, ATLANTIC CITY	**45**	**42**	**0**	**45**	**0**	**3**	**5**	**0**	**11**	**0**
BRIGANTINE, CITY OF											
	Fire Station	1	1	0	1	0	0	0	0	0	0
	Police Station	1	1	0	1	0	0	0	0	0	0
	Public Works	1	1	0	1	0	0	1	0	0	0
	School	3	2	0	3	0	0	0	0	0	0
	TOTAL, BRIGANTINE	**6**	**5**	**0**	**6**	**0**	**0**	**1**	**0**	**0**	**0**
BUENA, BOROUGH OF											
	Ambulance	1	0	0	0	0	0	0	0	0	1
	Fire Station	2	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	1	0
	Public Works	1	0	0	0	0	0	0	0	0	1

Table 3c.24
Exposure of Georeferenced Critical Facility Types by Jurisdiction

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
	School	4	0	0	0	0	0	0	0	0	0
	Water Supply Facility	1	0	0	0	0	0	0	0	1	0
	WWTP	1	0	0	0	0	0	0	0	1	0
	TOTAL, BUENA	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**
BUENA VISTA, TOWNSHIP OF											
	Emergency Shelter	3	0	0	0	0	0	0	0	1	0
	Fire Station	5	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	6	0	0	0	0	0	0	0	1	0
	TOTAL, BUENA VISTA	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**
CORBIN CITY, CITY OF											
	Communication Facility	2	2	0	2	0	0	0	0	2	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	3	0	0	3	0	0	0	0	0	0
	TOTAL, CORBIN CITY	**6**	**2**	**0**	**6**	**0**	**0**	**0**	**0**	**2**	**0**
EGG HARBOR CITY, CITY OF											
	Ambulance	1	0	0	0	0	0	0	0	0	0
	Communication Facility	1	0	0	0	0	0	0	0	1	1
	Fire Station	1	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	1	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	3	0	0	0	0	0	0	0	0	0
	Water Supply Facility	6	5	0	0	0	0	0	0	1	
	WWTP	1	1	0	0	0	0	0	0	0	1
	TOTAL, EGG HARBOR CITY	**15**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**
EGG HARBOR, TOWNSHIP OF											
	Airport	1	0	0	0	0	0	0	0	0	0
	Ambulance	1	0	0	0	0	0	0	0	0	1
	Electrical Power Facility	1	0	0	0	0	0	0	0	0	0
	Emergency Operations Center	1	0	0	0	0	0	0	0	0	0
	Emergency Shelter	2	0	0	0	0	0	0	0	0	1
	Fire Station	12	2	0	4	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	2	0	0	0	0	0	0	0	0	0
	School	11	0	0	0	0	0	0	0	0	1
	Senior Care Facility	2	0	0	0	0	0	0	0	1	0

Table 3c.24
Exposure of Georeferenced Critical Facility Types by Jurisdiction

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
TOTAL, EGG HARBOR TOWNSHIP		**34**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**
ESTELL MANOR, CITY OF											
	Fire Station	1	0	0	0	0	0	0	0	0	0
	Public Works	1	1	0	0	0	0	0	0	1	0
	School	1	0	0	0	0	0	0	0	0	0
	TOTAL, ESTELL MANOR	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**
FOLSOM, BOROUGH OF											
	Fire Station	1	0	0	0	0	0	0	0	0	0
	School	1	0	0	0	0	0	0	0	0	0
	TOTAL, FOLSOM	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GALLOWAY, TOWNSHIP OF											
	Ambulance	1	0	0	0	0	0	0	0	0	0
	Communication Facility	1	0	0	0	0	0	0	0	0	0
	Emergency Shelter	4	0	0	0	0	0	0	0	1	1
	Fire Station	6	0	0	1	0	0	0	0	0	0
	Hospital	1	0	0	0	0	0	0	0	0	0
	Passenger Rail Station	1	0	0	0	0	0	0	0	1	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	2	0	0	0	0	0	0	0	1	0
	School	19	0	0	0	0	0	0	0	3	0
	Senior Care Facility	7	0	0	0	0	0	0	0	0	1
	Water Supply Facility	3	0	0	0	0	0	0	0	3	0
	TOTAL, GALLOWAY	**46**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**9**	**2**
HAMILTON, TOWNSHIP OF											
	Airport	1	0	0	0	0	0	0	0	0	0
	Ambulance	2	0	0	1	0	0	0	0	0	0
	Communications Facility	1	0	0	0	0	0	0	0	0	1
	Emergency Operations Center	1	0	0	1	0	0	0	0	0	1
	Emergency Shelter	5	0	0	0	0	0	0	0	2	0
	Fire Station	6	0	0	2	0	0	0	1	1	0
	Police Station	4	0	0	2	0	0	0	0	1	0
	Public Works	3	0	0	2	0	0	0	0	0	1
	School	12	1	0	4	0	0	0	2	0	1
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	Wastewater Treatment Facility	1	1	0	1	0	1	1	1	1	2
	Water Supply Facility	7		0	2	0	0	0	0	4	
	TOTAL, HAMILTON	**44**	**2**	**0**	**15**	**0**	**1**	**1**	**4**	**9**	

Table 3c.24
Exposure of Georeferenced Critical Facility Types by Jurisdiction

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
HAMMONTON, TOWN OF											
	Airport	1	0	0	0	0	0	0	0	0	0
	Communication Facility	1	0	0	0	0	0	0	0	1	1
	Fire Station	2	0	0	0	0	0	0	0	0	0
	Hospital	1	0	0	0	0	0	0	0	1	0
	Passenger Rail Station	1	0	0	0	0	0	0	0	0	0
	Police Station	2	0	0	0	0	0	0	0	0	0
	Public Works	3	0	0	0	0	0	0	0	2	1
	School	5	0	0	0	0	0	0	0	0	0
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	Water Treatment Facility	1	0	0	0	0	0	0	0	3	0
	WWTP	4	0	0	0	0	0	0	0	1	0
	TOTAL, HAMMONTON	**23**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**2**
LINWOOD, CITY OF											
	Ambulance	1	1	0	1	0	0	0	0	1	0
	Emergency Operations Center	1	0	0	1	0	0	0	0	0	0
	Fire Station	1	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	1	0	0	0	0	0	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	5	0	0	5	0	0	0	0	1	0
	Senior Care Facility	3	0	0	0	0	0	0	0	0	0
	TOTAL, LINWOOD	**13**	**1**	**0**	**10**	**0**	**0**	**0**	**0**	**2**	**0**
LONGPORT, BOROUGH OF											
	Fire Station	1	1	0	1	0	0	0	0	1	0
	Police Station	1	1	0	1	0	0	0	0	1	0
	Public Works	1	1	0	1	0	0	0	0	1	0
	TOTAL, LONGPORT	**3**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**2**	**0**
MARGATE CITY OF											
	Fire Station	2	2	0	2	0	0	0	0	0	0
	Police Station	1	1	0	1	0	0	0	0	0	0
	Public Works	1	1	0	1	0	0	1	0	0	0
	School	2	2	0	2	0	0	0	0	0	0
	Water Supply Facility	6	6	0	6	0	0	2	0	0	0
	TOTAL, MARGATE	**12**	**12**	**0**	**12**	**0**	**0**	**3**	**0**	**0**	**0**
MULLICA, TOWNSHIP OF											
	Emergency Shelter	1	0	0	0	0	0	0	0	0	0
	Fire Station	4	0	0	2	0	0	0	0	1	1

Table 3c.24
Exposure of Georeferenced Critical Facility Types by Jurisdiction

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
	Police Station	2	0	0	0	0	0	0	0	0	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	4	0	0	0	0	0	0	0	1	0
	TOTAL, MULLICA	**12**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**2**	**1**
NORTHFIELD, CITY OF											
	Emergency Shelter	1	0	0	1	0	0	0	0	0	0
	Fire Station	2	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	4	0	0	0	0	0	0	0	3	0
	School	5	0	0	4	0	0	0	0	0	0
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	TOTAL, NORTHFIELD	**15**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**3**	**0**
PLEASANTVILLE, CITY OF											
	Communication Facility	3	3	0	3	0	0	0	0	0	3
	Electrical Power Facility	1	1	0	1	0	0	0	0	1	1
	Emergency Operations Center	1	0	0	0	0	0	0	0	0	0
	Emergency Shelter	2	0	0	0	0	0	0	0	0	0
	Fire Station	1	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	8	0	0	3	0	0	0	0	0	0
	Senior Care Facility	1	0	0	1	0	0	0	0	0	0
	TOTAL, PLEASANTVILLE	**21**	**4**	**0**	**8**	**0**	**0**	**0**	**0**	**1**	**4**
PORT REPUBLIC, CITY OF											
	Emergency Operations Center	1	1	0	1	0	0	0	0	1	0
	Fire Station	1	0	0	1	0	0	0	0	0	0
	Public Works	2	1	0	1	0	0	0	0	1	0
	School	1	0	0	1	0	0	0	0	0	0
	TOTAL, PORT REPUBLIC	**5**	**2**	**0**	**4**	**0**	**0**	**0**	**0**	**2**	**0**
SOMERS POINT, CITY OF											
	Ambulance	1	0	0	0	0	0	0	0	0	0
	Fire Station	2	0	0	0	0	0	0	0	0	0
	Hospital	1	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	2	0	0	0	0	0	0	0	0	0
	School	6	0	0	4	0	0	0	0	0	0
	TOTAL, SOMERS POINT	**14**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**

Table 3c.24
Exposure of Georeferenced Critical Facility Types by Jurisdiction

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
VENTNOR, TOWNSHIP OF											
	Emergency Operations Center	1	1	0	1	0	0	0	0	0	0
	Fire Station	2	2	0	2	0	0	0	0	0	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	2	2	0	2	0	0	0	0	0	0
	Water Supply Facility	5	1	0	1	0	0	1	0	0	0
	TOTAL, VENTNOR	**11**	**6**	**0**	**7**	**0**	**0**	**1**	**0**	**0**	**0**
WEYMOUTH, TOWNSHIP OF											
	Ambulance	1	0	0	1	0	0	1	0	0	
	Fire Station	2	0	0	1	0	0	1	0	0	0
	Public Works	1	0	0	0	0	0	0	0	1	0
	School	1	0	0	0	0	0	0	0	0	0
	Water Supply Facility	2	0	0	2	0	0	0	0	0	0
	TOTAL, WEYMOUTH	**9**	**1**	**0**	**3**	**0**	**3**	**2**	**0**	**1**	**0**
ATLANTIC, COUNTY OF											
	TOTAL	**372**	**88**	**0**	**142**	**0**	**7**	**14**	**6**	**64**	**23**

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Absecon	Captain Francis Babcock House	324 South Shore Road	1	0	1	0	0	1	0	1	0
Absecon	Dr. Jonathan Pitney House	57 North Shore Road	0	0	1	0	0	0	0	1	0
Absecon	North Shore Road Historic District	North Shore Road	1	0	1	0	0	1	0	1	0
Absecon	South Shore Road Historic District	South Shore Road	1	0	1	0	1	1	0	1	0
Absecon, Atlantic City, Egg Harbor City, Egg Harbor Township, Galloway, Hammonton, Mullica, Pleasantville	Camden and Atlantic Railroad Historic District	Parallel NJ Transit Atlantic City Line	1	0	1	0	1	1	0	0	
Atlantic City	1315 Pacific Avenue	1315 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	2-6 South Virginia Avenue	2-6 South Virginia Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Absecon Lighthouse	Pacific and Rhode Island Avenues	1	0	1	0	0	0	0	1	0
Atlantic City	Administration Building for the Board of Education	1809 Pacific Ave	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Armory	Atlantic Boulevard and New York Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Convention Hall	Boardwalk between Pacific, Mississippi, and Florida Avenues	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Fire Station #4	2700 Atlantic Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Atlantic City Fire Station #6	4025 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Post Office	1701 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Barclay Court	9-11 South Pennsylvania Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Beth Israel Synagogue	34 South Pennsylvania Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Beth Kehillah Synagogue Building (H.G. Rosin Senior Center)	901 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Chinn & Schull Boathouse	419 Carson Ave	1	1	1	0	1	1	0	0	0

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Atlantic City	Church of the Ascension	1601 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Eldredge Chelsea Fireproof Warehouse	3528 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Equitable Trust Bank Building	2030 Atlantic Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Fire Station #8	140 North Indiana Avenue	1	0	1	0	0	1	0	0	0
Atlantic City	Fire Station #9	734 North Indiana Avenue	1	0	1	0	0	1	0	0	0
Atlantic City	Madison Hotel	123 South Illinois Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Neptune Hose Company	519 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Raphael-Gordon House	118 South Newton Street	1	0	1	0	0	0	0	0	0
Atlantic City	Ritz Carlton Hotel	2715 Boardwalk at Iowa Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Segal Building	1200 Atlantic Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Shelburne Hotel	Michigan Avenue and the Boardwalk	1	0	1	0	0	0	0	0	0
Atlantic City	St. Nicholas of Tolentine Church	1409-1421 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	The Knife and Fork Restaurant	29 S. Albany Ave.	1	0	1	0	0	0	0	0	0
Atlantic City	The Strand and Marine Apartments	3821-3825 Boardwalk Ave.	1	0	1	0	0	0	0	0	0
Atlantic City	U.S. Route 30 Bridge	U.S. Route 30 (Absecon Boulevard) over Beach Thorofare	1	0	1	0	1	1	0	1	0
Atlantic City	USCG Station Atlantic City	900 Beach Thorofare	1	1	1	0	1	1	0	1	0
Atlantic City	Warner Theatre	Atlantic City Boardwalk between Michigan and Arkansas Avenues	1	0	1	0	0	0	0	0	0
Atlantic City	Westside All Wars Memorial Building	1510 Adriatic Avenue	1	0	1	0	0	1	0	1	0
Atlantic City	World War 1 Memorial	South Albany Avenue, Ventnor Avenue and O'Donnell Parkway	1	0	1	0	0	0	0	1	0
Atlantic City, Egg Harbor Township,	West Jersey and Atlantic Railroad Historic District	Mays Landing, Hamilton Township to Pleasantville City	1	0	1	0	1	1	1	0	1

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Hamilton, Pleasantville											
Brigantine	Brigantine Lighthouse	Brigantine Boulevard (County Route 638)	1	0	1	0	0	1	0	0	0
Buena Vista Township	Richland Presbyterian Church	Main Ave. at Sewell Ave.	0	0	0	0	0	0	0	1	0
Buena Vista, Corbin City, Estell Manor, Folsom, Hammonton, Weymouth	Atlantic City Railroad Cape May Division Historic District	Railroad right-of-way from Winslow Junction to Cape May Point, Sea Isle City & Ocean City	1	0	1	0	1	1	0	0	1
Corbin City	North and South Tuckahoe Historic District	NJ Route 50/Tuckahoe-Mount Pleasant Road	1	0	1	0	1	1	0	1	0
Corbin City	South Tuckahoe Historic District	1409-1421 Pacific Avenue	1	0	1	0	1	1	0	1	0
Egg Harbor City	Egg Harbor City Fire Station	351 Cincinnati Avenue	0	0	0	0	0	0	0	1	0
Egg Harbor City	Egg Harbor City Historic District	Philadelphia Avenue	0	0	0	0	0	0	0	1	0
Egg Harbor City	Lower Bank Road Bridge	Lower Bank Road (County Route 542) over Mullica River	1	0	1	0	1	1	0	0	1
Egg Harbor City	Neutral Water Health Resort Sanitarium	Corner of Claudius Street and London Avenue	1	0	0	0	0	0	0	0	1
Egg Harbor Township	Andrew B. Scull House	1647 Mays Landing-Somers Point Road (CR 559)	1	0	1	0	1	1	0	1	0
Egg Harbor Township	Captain John Jeffries Burial Marker	Palestine Bible Church Cemetery, County Route 559	0	0	1	0	0	0	0	1	0
Egg Harbor Township	Ocean City-Longport Bridge	Ocean Drive over Great Egg Harbor	1	1	1	1	1	1	0	1	0
Egg Harbor Township	Studebaker Showroom	North West Corner Verona and Toulon Avenues	1	0	1	0	0	0	0	0	0

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Egg Harbor Township, Galloway, Port Republic, Somers Point	Garden State Parkway Historic District	Entire Garden State Parkway Right-of-Way	1	1	1	0	1	1	0	0	1
Estell Manor	Estellville Glassworks Industrial Historic District	Estell Manor Park, Stevens Creek, Maple Avenue, Walkers Forge Road, and NJ Rt. 50	1	0	1	0	0	0	0	0	1
Estell Manor	Head of the River Church	NJ Route 49 at Aetna Drive	1	0	1	0	0	0	0	0	1
Estell Manor	Risley School	134 Cape May Avenue	0	0	0	0	0	0	0	1	0
Folsom	Eighth Street Bridge	Eighth Street over Hospitality Branch	1	0	0	0	0	0	0	0	1
Folsom	Jacobus Evangelical Lutheran Church	Mays Landing Road	0	0	0	0	0	0	0	0	1
Galloway	Anonymous Roadside Cabins	US Route 30 and Taylor Avenue	0	0	0	0	0	0	0	1	0
Galloway	Conovertown Historic District	Along New York Road between Brook Lane and the border with Absecon City, west on Biscayne Avenue	1	0	1	0	0	0	0	0	1
Galloway	Frankfurt Avenue Bridge	Frankfurt Avenue over New Jersey Transit Atlantic City Line	0	0	0	0	0	0	0	0	1
Galloway	L.N. Renault and Sons Winery	Bremen Avenue and Leibig Street	1	0	1	0	0	0	0	0	1
Galloway	Modern Boat Works	US Route 9 at Nacote Creek	1	0	1	0	1	1	0	1	0
Galloway	Oceanville / Leeds Point / Moss Mill Historic District	Bounded by New York Road, Somers Town Lane, Leeds Point Road, and Moss Mill Road	1	0	1	0	0	0	0	1	0
Galloway	Roadside Cabins	US Route 30 and 5th Avenue	0	0	1	0	0	0	0	1	0

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Galloway	Smithville Apothecary	Smithville-Old Towne and Moss Mill Roads	0	0	1	0	0	0	0	0	0
Galloway	The Country Motel Roadside Cabins	201 White Horse Pike	0	0	0	0	0	0	0	1	0
Hamilton	Abbott's Modern Cabins	217 NJ Route 40	0	0	0	0	0	0	0	0	1
Hamilton	Mays Landing Historic District	Main Street and Cape May Avenue	1	0	1	0	1	1	1	0	1
Hamilton	US Route 322 and NJ Route 50 Cloverleaf	US Route 322 and NJ Route 50	1	0	1	0	0	0	0	0	1
Hamilton	Weymouth Road Bridge	Weymouth Road Bridge over Great Egg Harbor River	1	0	1	0	0	0	0	1	0
Hammonton	101 Bellevue Avenue	101 Bellevue Avenue	0	0	0	0	0	0	0	1	0
Hammonton	Hammonton Commercial Historic District	Third, Washington, Orchard, and Vine Streets	0	0	0	0	0	0	0	1	0
Linwood	Linwood Historic District	Maple and Poplar Avenues, and Shore Road	1	0	1	0	0	0	0	0	1
Linwood	Thomas & Mary Ingersall Naylor House	204 West Garfield Avenue	0	0	1	0	0	0	0	0	1
Longport	Church of the Redeemer	20th and Atlantic Avenues	1	0	1	0	0	1	0	0	0
Longport	Great Egg Coast Guard Station Building	31st and Pacific avenues	1	0	1	0	0	1	0	0	0
Margate City	Lucy, The Margate Elephant	Decatur and Atlantic Avenues	1	0	1	0	0	0	0	0	1
Margate City	Marven Gardens Historic District	Between Ventnor, Fredericksburg, Winchester and Brunswick Avenues	1	0	1	0	0	1	0	0	0
Mullica	Batsto Village	31 Batsto Rd	1	0	1	0	1	1	0	0	1
Mullica	Pleasant Mills	Elwood-Pleasant Mills Road	1	0	1	0	0	1	0	1	0
Northfield	1715 Tilton Road	1715 Tilton Road	0	0	0	0	0	0	0	1	0

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Pleasantville	213 Verona Avenue	213 Verona Avenue	1	0	1	0	0	0	0	0	0
Port Republic	Amanda Blake Store	104 Main Street	0	0	1	0	0	0	0	1	0
Port Republic	Chestnut Neck Battle Monument	US Route 9 and Old York Road	1	0	1	0	0	1	0	1	0
Port Republic	Gulf Service Station	758 Old New York Road	1	1	1	0	1	1	0	1	0
Port Republic	Port Republic Historic District	Central and Pomona Avenues, Riverside Drive, St. Johns Lane, Chestnut Neck, Clarks Landing, and Port Republic-Smithville Roads	1	1	1	0	1	1	0	0	1
Port Republic	Smithville-Port Republic Road Bridge	Smithville-Port Republic Road over Nacote Creek	1	1	1	0	1	1	0	1	0
Somers Point	World War 1 Memorial Bridge	NJ Route 52 over Ship Channel	1	1	1	0	1	1	0	1	0
Somers Point	Bay Front Historic District	Parts of Anna, Bay, Decatur, Delaware, Gibbs, Higbee, New Jersey, and Somers Avenues	1	1	1	0	1	1	0	1	0
Somers Point	Somers Mansion	Shore Road, adjacent to NJ Route 52 traffic circle	0	0	1	0	0	0	0	0	0
Ventnor	Dorset Avenue Bridge	N. Dorset Avenue between Ventnor Avenue and N. Derby/Edgewater Avenue	1	0	1	0	1	1	0	0	0
Ventnor City	John Stafford Historic District	Portions of Atlantic, Austen, Baton Rouge, Marion, and Vassar Avenues	1	0	1	0	0	0	0	0	0
Ventnor City	New Haven Firehouse	20 North New Haven Ave	1	0	1	0	0	0	0	0	0
Ventnor City	Saint Leonard's Tract Historic district	Bounded by Ventnor Ave, Fredericksburg Ave, Ventnor Gardens Plaza, and Derby Place	1	0	1	0	1	1	0	0	0

Table 3c.25
Exposure of Historic Properties by Hazard

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Ventnor City	Ventnor City Hall	6201 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Ventnor City	Ventnor Motor Boat Club	11 North Derby Avenue, Ventnor City	1	0	1	0	1	1	0	0	0
Weymouth	Belcoville Post Office	1201 Madden Avenue	0	0	1	0	0	0	1	1	0
Total			**77**	**9**	**83**	**1**	**24**	**35**	**3**	**39**	**21**

Conclusions on Hazard Risk

The results of this vulnerability assessment are useful in at least three ways:

- Improving our understanding of the risk associated with the natural hazards in Atlantic County through better understanding of the complexities and dynamics of risk, how levels of risk can be measured and compared, and the myriad of factors that influence risk. An understanding of these relationships is critical in making balanced and informed decisions on managing the risk.
- Providing a baseline for policy development and comparison of mitigation alternatives. The data used for this analysis presents a current picture of risk in Atlantic County. Updating this risk "snapshot" with future data will enable comparison of the changes in risk with time. Baselines of this type can support the objective analysis of policy and program options for risk reduction in the region.
- Comparing the risk among the natural hazards addressed. The ability to quantify the risk to all these hazards relative to one another helps in a balanced, multi-hazard approach to risk management at each level of governing authority. This ranking provides a systematic framework to compare and prioritize the very disparate natural hazards that are present in Atlantic County. This final step in the risk assessment provides the necessary information for local officials to craft a mitigation strategy to focus resources on only those hazards that pose the most threat to the county.

Exposure to hazards can be an indicator of vulnerability. Economic exposure can be identified through locally assessed values for improvements (buildings), and social exposure can be identified by estimating the population exposed to each hazard. This information is especially important for decision-makers to use in planning for evacuation or other public safety related needs. A summary of the value of buildings at-risk (exposed) to each hazard is presented in **Table 3c.26** and a summary of population exposure is presented in **Table 3c.27**. Using the previously described methodology, economic results were estimated for the different hazards profiled earlier in this section. The economic loss results are summarized in **Table 3c.28** using Annualized Loss (AL), which is the estimated long-term value of losses to the general building stock in any single year in a specified geographic area (i.e., jurisdiction). The estimated AL addresses the two key components of risk: the probability of the hazard occurring in the jurisdiction and the consequences of the hazard, largely a function of building construction type and quality, and of the intensity of the hazard event. By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk.

A summary of the annualized loss ratio (ALR) results is presented in **Table 3c.29**. The ALR represents the AL as a fraction of the local value of improvements (calculated as annualized losses divided by the total exposure at risk). The annualized loss ratio gauges the relationship between average annualized loss and the value of exposed assets.

Table 3c.26
Building Value Exposure by Hazard ($million)

Jurisdiction	Countywide Hazards*	Coastal Erosion**	Dam Failure	Drought** (Value of Crops at Risk)	Flood (A, V Zones)	Storm Surge (Zones 1-4)	Wave Action	Wildfire
Absecon, City of	$441.9	$0	$0	Not Available	$35.86	$238.65	$0.09	$71.8
Atlantic City, City of	$4,819.2	$23.780	$0	$0	$3,005.02	$3,694.80	$56.05	$103.6
Brigantine, City of	$1,324.8	$6.449	$0	$0	$889.38	$1,006.66	$5.33	$32.6
Buena, Borough of	$232.7	$0	$0	Not Available	$1.50	$0.00	$0	$44.2
Buena Vista, Township of	$481.8	$0	$0	Not Available	$4.50	$0.00	$0	$234.5
Corbin City, City of	$34.4	$0	$0	Not Available	$8.52	$31.18	$0	$18.4
Egg Harbor City, City of	$244.1	$0	$0	Not Available	$5.60	$0.85	$0	$66.5
Egg Harbor, Township of	$3,314.3	$0.382	$7.938	Not Available	$154.19	$470.09	$6.05	$1,454.5
Estell Manor, City of	$113.9	$0	$0.167	Not Available	$2.82	$11.94	$0	$100.4
Folsom, Borough of	$114.8	$0	$0	Not Available	$8.41	$0.00	$0	$42.9
Galloway, Township of	$2,609.7	$0.0015	$0	Not Available	$52.98	$135.45	$0.46	$1,113.1
Hamilton, Township of	$1,762.8	$0	$63.920	Not Available	$60.14	$385.25	$0	$735.6
Hammonton, Town of	$1,126.2	$0	$0	Not Available	$25.61	$0.00	$0	$297.4
Linwood, City of	$612.1	$0	$0	Not Available	$60.16	$403.63	$1.53	$54.1
Longport, Borough of	$540.0	$0	$0	$0	$415.59	$415.04	$3.07	$1.3
Margate City, City of	$1,547.9	$0	$0	$0	$1,192.62	$1,221.84	$8.97	$7.8
Mullica, Township of	$329.0	$0	$0	Not Available	$45.40	$74.84	$0	$197.9
Northfield, City of	$621.1	$0	$0	Not Available	$7.25	$279.64	$0	$34.6
Pleasantville, City of	$909.7	$20.30	$0	$0	$33.31	$292.77	$1.33	$80.1
Port Republic, City of	$86.5	$0	$0	Not Available	$17.98	$61.89	$1.39	$69.8
Somers Point, City of	$857.0	$0	$0	Not Available	$134.73	$578.53	$5.77	$23.3
Ventnor City, City of	$967.0	$0.0045	$0	$0	$630.37	$731.16	$0.06	$10.1
Weymouth, Township of	$108.9	$0	$28.748	Not Available	$9.10	$28.66	$0	$73.2
Total	**$23,199.5**	**$30.847**	**$100.775**	**$120.673**	**$6,801.05**	**$10,062.88**	**$90.10**	**$4,867.8**
% Exposure	**100%**	**0.16%**	**0.43%**	**100%**	**35%**	**51.0%**	**0.46%**	**21.0%**

**Extreme wind, winter weather, tornado, lightning, hurricane and tropical storm, tornado, extreme temperatures, earthquake.*
***Assumes absence of current beach nourishment and stabilization actions.*
****All mapped areas of low, moderate and high wildfire risk*

Table 3c.27
Population Exposure by Hazard

Jurisdiction	Countywide Hazards*	Coastal Erosion**	Sea Level Rise 1 Ft	Sea Level Rise 3Ft	Dam Failure	Drought	Flood (A, V Zones)	Storm Surge (Zones 1-4)	Wave Action	Wildfire***
Absecon, City of	8,362	0	197	512	0	8,362	2,243	5,417	5	4,005
Atlantic City, City of	37,999	48	4,875	11,700	0	37,999	33,856	38,497	7	15,541
Brigantine, City of	8,832	293	2,816	6,195	0	8,832	6,094	7,716	273	3,482
Buena, Borough of	4,356	0	0	0	0	4,356	76	0	0	1,429
Buena Vista, Township of	7,295	0	0	0	0	7,295	351	0	0	5,646
Corbin City, City of	537	0	61	159	0	537	886	485	0	371
Egg Harbor City, City of	4,100	0	86	232	0	4,100	4,398	657	0	344
Egg Harbor, Township of	42,714	3	796	2,388	177	42,714	96	13,150	141	291,509
Estell Manor, City of	1,728	0	16	43	8	1,728	797	1,419	0	1,621
Folsom, Borough of	1,697	0	0	0	0	1,697	486	0	0	1,393
Galloway, Township of	36,094	0	124	322	0	36,094	4,025	6,464	8	23,333
Hamilton, Township of	25,973	0	230	598	1,074	25,973	3,838	5,883	0	22,811
Hammonton, Town of	14,139	0	0	0	0	14,139	783	91	0	8,699
Linwood, City of	6,742	0	168	437	0	6,742	1,880	4,951	44	2,873
Longport, Borough of	869	0	864	1,642	0	869	694	761	47	59
Margate City, City of	5,997	0	1,521	3,042	0	5,997	4,915	5,317	154	572
Mullica, Township of	5,925	0	267	766	0	5,925	850	1,273	0	5,181
Northfield, City of	8,153	0	39	105	0	8,153	1,266	3,741	0	3,248
Pleasantville, City of	20,301	12	90	270	0	20,301	4,702	10,632	21	6,916
Port Republic, City of	1,121	0	89	231	0	1,121	526	896	130	1,000
Somers Point, City of	10,321	0	305	732	0	10,321	3,822	8,651	97	3,524
Ventnor City, City of	10,095	60	2,094	4,816	0	10,095	8,224	9,210	14	2,659
Weymouth, Township of	2,755	0	67	161	485	2,755	118	144	0	2,494
Total	**266,105**	**415**	**14,705**	**34,351**	**1,744**	**266,105**	**84,926**	**125,355**	941	**146,288**
% Exposure	**100%**	**0.15%**	**5.5%**	**12.9%**	**0%**	**100%**	**32%**	**47%**	**0.04%**	**55%**

**Extreme wind, winter weather, tornado, lightning, hurricane and tropical storm, tornado, extreme temperatures, earthquake.*
***Assumes absence of current beach nourishment and stabilization actions.*
****All mapped areas of low, moderate and high wildfire risk*

Table 3c.28
Annualized Losses by Hazard
($million)
(Only includes Hazards for which Annual Losses were Quantified)

Jurisdiction	Extreme Wind	Hurricane and Tropical Storm	Lightning	Tornado	Drought*	Winter Storm	Coastal Erosion**	Flooding (Riverine)	Storm Surge (Coastal Flooding)	Earthquake
Absecon, City of	$0.148	$0.586	$0.001	$0.000	$0.001	$0.004	$0	$0.006	$2.108	$0.013
Atlantic City, City of	$1.612	$4.852	$0.014	$0.004	$0.000	$0.044	$0.594	$0.000	$156.164	$0.086
Brigantine, City of	$0.443	$1.921	$0.004	$0.001	$0.000	$0.012	$0.161	$0.000	$33.742	$0.019
Buena, Borough of	$0.078	$0.096	$0.001	$0.000	$0.784	$0.002	$0	$0.000	$0.000	$0.009
Buena Vista, Township of	$0.161	$0.180	$0.001	$0.000	$1.054	$0.004	$0	$0.144	$0.000	$0.011
Corbin City, City of	$0.012	$0.017	$0.000	$0.000	$0.038	$0.000	$0	$0.341	$0.798	$0.001
Egg Harbor City, City of	$0.082	$0.155	$0.001	$0.000	$0.023	$0.002	$0	$0.392	$0.002	$0.008
Egg Harbor, Township of	$1.109	$2.546	$0.010	$0.003	$0.110	$0.030	Negligible	$0.043	$8.635	$0.057
Estell Manor, City of	$0.038	$0.110	$0.000	$0.000	$0.115	$0.001	$0	$0.001	$0.077	$0.004
Folsom, Borough of	$0.038	$0.048	$0.000	$0.000	$0.136	$0.001	$0	$1.160	$0.000	$0.003
Galloway, Township of	$0.873	$1.920	$0.008	$0.002	$0.539	$0.024	Negligible	$0.000	$0.546	$0.055
Hamilton, Township of	$0.590	$0.888	$0.005	$0.002	$0.527	$0.016	$0	$1.767	$0.299	$0.037
Hammonton, Town of	$0.377	$0.377	$0.003	$0.001	$1.751	$0.010	$0	$0.068	$0.000	$0.032
Linwood, City of	$0.205	$0.576	$0.002	$0.001	$0.003	$0.006	$0	$0.001	$3.476	$0.008
Longport, Borough of	$0.181	$0.033	$0.002	$0.001	$0.000	$0.005	$0	$0.000	$8.489	$0.000
Margate City, City of	$0.518	$1.256	$0.005	$0.001	$0.000	$0.014	$0	$0.000	$38.957	$0.014
Mullica, Township of	$0.110	$0.171	$0.001	$0.000	$0.909	$0.003	$0	$0.747	$3.823	$0.008
Northfield, City of	$0.208	$0.618	$0.002	$0.001	$0.002	$0.006	$0	$0.015	$1.112	$0.013
Pleasantville, City of	$0.304	$0.987	$0.003	$0.001	$0.000	$0.008	Negligible	$0.000	$3.004	$0.022
Port Republic, City of	$0.029	$0.124	$0.000	$0.000	$0.015	$0.001	$0	$0.000	$0.570	$0.002
Somers Point, City of	$0.287	$0.726	$0.003	$0.001	$0.000	$0.008	$0	$0.000	$17.127	$0.008
Ventnor City, City of	$0.323	$1.354	$0.003	$0.001	$0.000	$0.009	Negligible	$0.000	$15.129	$0.019
Weymouth, Township of	$0.036	$0.025	$0.000	$0.000	$0.028	$0.001	$0	$0.001	$0.110	$0.001
Total	**$7.762**	**$19.564**	**$0.067**	**$0.020**	**$6.034**	**$0.212**	**$0.755**	**$4.686**	**$294.168**	$0.432

**Potential Crop Losses Only; Data allowed for estimate of a county-wide total but not a jurisdiction specific estimate. Communities with USDA reported 0 acres in agriculture were assigned $0 average annual crop losses for planning purposes. **Assumes absence of current beach nourishment and stabilization actions.*

Table 3c.29
Annual Loss Ratios by Hazard
(Only Hazards for which Annual Losses were Quantified)

Jurisdiction	Extreme Wind	Hurricane and Tropical Storm	Lightning	Tornado	Drought*	Winter Storm	Coastal Erosion**	Flooding (Riverine)	Storm Surge (Coastal Flooding)	Earthquake
Absecon, City of	0.033%	0.05%	0.0003%	0.0001%	5%	0.001%	0	0.0005%	0.17%	0.0010%
Atlantic City, City of	0.033%	0.06%	0.0003%	0.0001%	0%	0.001%	0.02%	0%	1.97%	0.0011%
Brigantine, City of	0.033%	0.08%	0.0003%	0.0001%	0%	0.001%	0.02%	0%	1.32%	0.0008%
Buena, Borough of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0%	0.00%	0.0016%
Buena Vista, Township of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.02%	0.00%	0.0012%
Corbin City, City of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.43%	1.01%	0.0008%
Egg Harbor City, City of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.06%	0.00%	0.0012%
Egg Harbor, Township of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0.001%	0.14%	0.0009%
Estell Manor, City of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0.0004%	0.03%	0.0015%
Folsom, Borough of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.40%	0.00%	0.0011%
Galloway, Township of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0%	0.01%	0.0011%
Hamilton, Township of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.05%	0.01%	0.0010%
Hammonton, Town of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.003%	0.00%	0.0016%
Linwood, City of	0.033%	0.05%	0.0003%	0.0001%	5%	0.001%	0	0.0001%	0.28%	0.0006%
Longport, Borough of	0.033%	0.01%	0.0003%	0.0001%	0%	0.001%	0	0%	1.74%	0.0000%
Margate City, City of	0.033%	0.06%	0.0003%	0.0001%	0%	0.001%	0	0%	1.91%	0.0007%
Mullica, Township of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.09%	0.47%	0.0010%
Northfield, City of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0.001%	0.07%	0.0009%
Pleasantville, City of	0.033%	0.05%	0.0003%	0.0001%	0%	0.001%	0	0%	0.14%	0.0010%
Port Republic, City of	0.033%	0.06%	0.0003%	0.0001%	5%	0.001%	0	0%	0.29%	0.0009%
Somers Point, City of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0%	0.96%	0.0005%
Ventnor City, City of	0.033%	0.07%	0.0003%	0.0001%	0%	0.001%	0	0%	0.75%	0.0009%
Weymouth, Township of	0.033%	0.01%	0.0003%	0.0001%	5%	0.001%	0	0.0004%	0.04%	0.0003%
Total	**0.033%**	**0.04%**	**0.0003%**	**0.0001%**	**5%**	**0.001%**	**0.004%**	**0.011%**	**0.67%**	**0.0010%**

**Drought losses are computed based on the estimated percent of loss of crops per year; all other estimates relate to percentage of improved property or HAZUS building replacement value loss per year.*
***Assumes absence of current beach nourishment and stabilization actions – in actuality losses are assumed to be negligible in all jurisdictions. .*

SECTION 3d - RISK ASSESSMENT: EXISTING LAND USES AND FUTURE DEVELOPMENT TRENDS

Section Overview

Atlantic County has a total land area of 561 square miles, much of which has already been developed. However, a large amount of land remains undeveloped. Future development may affect hazard vulnerability. This section will provide information on current development trends, and how community resiliency can be increased by integrating hazard mitigation practices and principles in local decision making processes regulating land use and new development.

The Atlantic County Master Plan[1] and the Atlantic County Open Space and Recreation Plan[2] work in concert as a guide for the overall future growth and development of Atlantic County in support of local land use planning and decision-making. Guided by these plans, the overall goal of the Department of Regional Planning and Development is to ensure that Atlantic County continues to grow in an orderly and planned way while maintaining the County's unique quality of life.

Historic Context

Prior to the arrival of the first documented European explorers in the late 16th and early 17th centuries, Southern New Jersey was originally the home of the Leni-Lenape Indians. The first survey of the area was made for the Dutch East India Company by Henry Hudson in 1609. However, it was not until 1695 that the first permanent settlement in the County was established at Somers Point. In subsequent years settlements were established at Egg Harbor, Leeds Point, Absecon, Atlantic City, and Mays Landing.

The principal economic activities in the 1700s centered on fishing and shipbuilding, largely for the whaling trade. Mills, ironworks and brickyards were also established in the area at this time, while further settlements took root at Brigantine, Hammonton, Pleasantville, and Egg Harbor City. Until 1837, the area which now forms Atlantic County had been known as Egg Harbor and had been administered as part of Gloucester County. Atlantic County was formally established in February 1837, with the County Seat in Mays Landing and with boundaries that have not been substantially modified since.

Railroads first came to Atlantic County in 1854, with the opening of the line to Atlantic City from the Philadelphia/Camden Area. Several other lines were to follow, spurring the development of the Atlantic County shore as a resort area. In the 20th century, the tourist industry and development along the shore boomed with the construction of several major highways, principally the Garden State Parkway and the Atlantic City Expressway.

[1] Atlantic County Master Plan, 2018, https://www.atlantic-county.org/documents/planning/Master%20Plan_5-1-18.pdf
[2] Atlantic County Open Space and Recreation Plan, 2018, https://www.atlantic-county.org/documents/planning/Open%20Space%20and%20Rec%20Plan_5-1-18.pdf

Atlantic City has always been a major driving force in the overall development of the County. Historically, Atlantic City served as a seaside destination while today it is world renowned as a casino resort.

During the Great Depression and war years, growth slowed to a standstill in Atlantic County. After World War II and into the 1950s, Atlantic City retained its popularity as a resort and remained relatively prosperous. However, its population began to decrease while the rest of the County's population was increasing, reflecting the national trend of suburban growth and urban decline. In marked contrast to Atlantic City, the rest of Atlantic County continued to grow and prosper as its economy diversified and became less dependent on the resort/convention industry of the city.

During the 1970s, suburban growth moved out of the bay communities and into Egg Harbor and Galloway Townships. In November 1976, the New Jersey State Legislature authorized casino gambling in Atlantic City, bringing with it a spike in not only casino development and construction of new hotels but also condominium and housing development. A Casino Control Commission was established to revitalize Atlantic City without using public funds; to reduce unemployment in the area; and to allocate a percentage of the casino revenue for aid to the elderly.

Atlantic County grew substantially during the 1980s, when the County experienced explosive population growth as a direct result of the maturation of the casino industry. Substantial retail, warehousing, office, hotel, and residential development on the mainland bolstered the regional economy.

Within Atlantic County the passage of the Coastal Area Facilities Review Act of 1973 (CAFRA) and the Pinelands Protection Act of 1979 has resulted in significant growth in CAFRA Coastal Centers and Pinelands Regional Growth Areas such as Egg Harbor, Galloway, and Hamilton Townships.

Throughout the 1990's there was generally a moderation in population growth. Many municipalities, such as Somers Point, Absecon, Brigantine, Hammonton, and Hamilton Township expanded through the addition of regional shopping centers. The construction of the Galloway National, Blue Heron Pines, and Harbor Pines Golf Courses has witnessed a surge in the popularity of golf in Atlantic County. In Atlantic City, growth was characterized primarily by casino improvements (addition of hotel rooms, construction improvements/expansions at existing facilities). Also, several new facilities such as the Atlantic City Convention Center, New Jersey Transit Bus Terminal, and the Renaissance Plaza -- a modern shopping center located in the heart of Atlantic City were constructed.

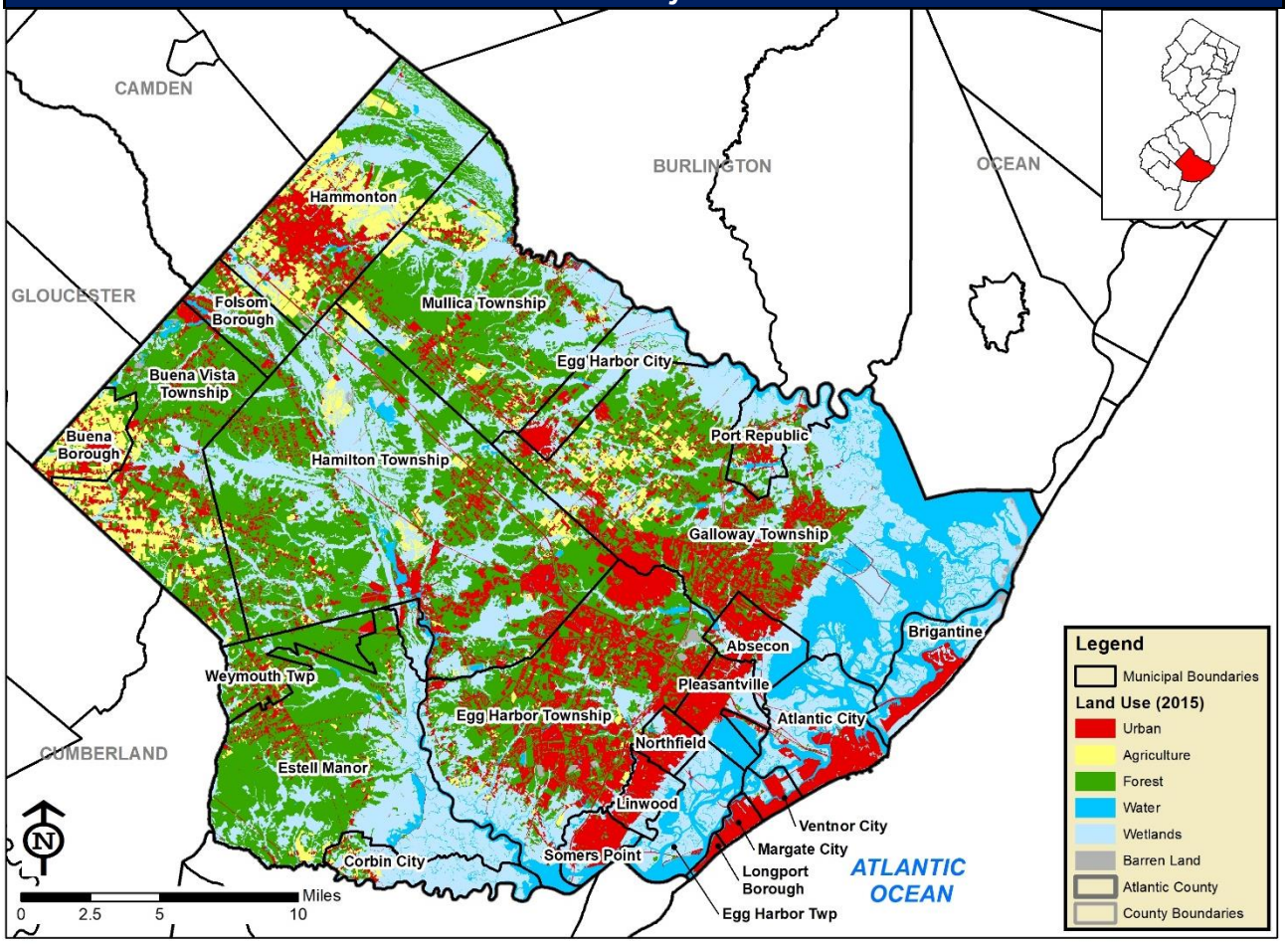
In the early part of this century, Atlantic County was in the midst of what was commonly referred to as the "second wave" of development spurred by a relatively strong economy, low inflation, and unyielding demographic trends. Traditional single-family developments tended to replace the 1980s multi-family development. Age restricted units (those limited to persons age 55 and above for instance) and assisted living facilities for those needing varying degrees of medical assistance have also been on the rise as the nation's population ages. These housing

developments have been predominately located in the Pinelands Regional Growth Areas of the County: Egg Harbor, Galloway, and Hamilton Townships. Over time, it appears residential and commercial growth will continue to move farther west while the Island and Bay communities will demonstrate slower growth because of their already developed condition.

Land Use

Atlantic County is one of the southernmost counties in New Jersey, and is located approximately 40 miles south east Philadelphia, and 100 miles south west of New York City (measured from the Atlantic County Seat at Mays Landing). It is 671 square miles in area (including 110 square miles of open water), making it the fourth largest county in the State by area. The County is bounded to the northwest by Gloucester and Camden Counties, to the northeast by Burlington and Ocean Counties, to the west by Cumberland County, and by Cape May County to the south. To the southeast the county is bounded by the Atlantic Ocean, with which the county has more than 20 miles of oceanfront (not including tidal areas between the barrier islands and the mainland). There are 23 incorporated municipalities in Atlantic County: 13 cities, three boroughs, six townships, and one town. The practice of designating permitted uses of land based on mapped zones which separate one set of land uses from another, or 'zoning' (as per a local government's ordinances or zoning regulations), guides not only the uses that are approved for legal operation on a given parcel today but also sets forth the standards for what will be acceptable - and where - in terms of future development in the community. **Figure 3d.1** presents a graphical depiction of land use / land cover (LULC) in Atlantic County.

Figure 3d.1
Atlantic County Land Use



SOURCE: NJDEP Land Use/Land Cover (HUC8 areas: 02040206, 02040301, 02040302), 2015. NJGIN: County Boundary, 2021; Municipal Boundary, 2021.
NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap.

Changes in Land Use

Table 3d.1 shows changes in land use since the last version of the plan was prepared[3]. Some changes observed in this plan update (which uses NJDEP's most recent Land Use/Land Cover data, circa 2015) are due, in large part, to NJDEP having better imagery available that enabled their delineators to refine polygon classifications and line placements to map the landscape more accurately. Other refinements have included additional water categories (from previous wetland classifications) that have increased the reported water area. These improvements do affect the acreage values of many categories previously reported in the 2016 HMP (which used NJDEP 2007 Land Use/Land Cover data). Despite the impact of various base data adjustments

[3] The initial 2010 HMP was prepared using NJDEP 2002 LU/LC data. Best available data at the time of the first plan update was NJDEP 2007 LU/LC data which was released in July 2010. As was the case in the development of the initial plan, updated NJDEP 2012 LU/LC data was released midway through the HMP update process, after applicable GIS analyses and report figures and table calculations throughout the document were already completed. Therefore, LULC data in the 2015 Plan Update are reflective of NJDEP 2007 LU/LC GIS files. Increases in barren land acreage are also due, in part, to USACE beach nourishment projects in Brigantine, Atlantic City, and Ventnor. This second plan update was prepared using NJDEP's most recent LU/LC data, of which the most recent issue is 2015.

to actual acreages, the percentages shown in the following table seems to affirm general, local observations regarding changes in land use where local agricultural and forested areas continue to be developed.

Table 3d.1
Changes in Land Use

Land Use	2016 Plan Update*		2021 Plan Update**		Change in Land Use 2016 to 2021	
	Acres*		Acres**		Acres	%
Agriculture	23,460	6.0%	22,885	5.9%	-575	-2.5%
Barren Land and Beaches	2,900	0.7%	2,460	0.6%	-440	-15.2%
Forest	138,231	35.4%	137,428	35.1%	-803	-0.6%
Urban	65,553	16.8%	67,416	17.2%	1,863	2.8%
Water	39,079	10.0%	39,152	10.0%	73	0.2%
Wetlands	121,593	31.1%	121,741	31.1%	148	0.1%
Total	*390,816*	*100%*	*391,082*	*100%*		

***** NJDEP 2007 LULC was the most current available at the time of the 2016 HMP update
****** NJDEP 2015 LULC is the most current available at the time of the 2021 HMP update

Changes in Population

As population increases, more residential and commercial buildings, infrastructure, public facilities and other assets will be constructed to support such growth, likely increasing a jurisdiction's overall exposure to natural hazards. Therefore, population growth is considered a general indicator of potential future hazard vulnerability.

Best readily available population data at the time the last version of this Plan was prepared was the US Census 2013 5-year American Community Survey. At that time the estimated County population was 274,960. For the plan update, the Countywide population as determined by the US Census 2019 5-year American Community Survey estimated the population of the County at 266,105 – a 3.2 percent decrease (8,855 people) over the year 2013 data that was reported in the last version of this Plan. Population changes are documented in **Table 3d.2**. The greatest increase in population was in Port Republic, with an increase of 105 persons. The greatest decrease in population was in Atlantic City, with a loss of 1,592 persons. Egg Harbor Township continues to be the most populous jurisdiction in Atlantic County (2013 to 2019).

Table 3d.2
Change in Population Since the Last Version of the Plan was Prepared

Jurisdiction	Population 2013*	Population 2019*	Absolute Change Since Population Reported in Last Version of Plan (2013 to 2019)	Percent Change Since Population Reported in Last Version of Plan (2013 to 2019)
Absecon, City of	8,394	8,362	-32	-0.4%
Atlantic City, City of	39,591	37,999	-1,592	-4.0%
Brigantine, City of	9,480	8,832	-648	-6.8%
Buena, Borough of	4,620	4,356	-264	-5.7%
Buena Vista, Township	7,576	7,295	-281	-3.7%
Corbin City, City of	573	537	-36	-6.3%
Egg Harbor City, City	4,232	4,100	-132	-3.1%
Egg Harbor, Township	43,403	42,714	-689	-1.6%
Estell Manor, City of	1,708	1,728	20	1.2%
Folsom, Borough of	1,813	1,697	-116	-6.4%
Galloway, Township of	37,356	36,094	-1,262	-3.4%
Hamilton, Township of	26,568	25,973	-595	-2.2%
Hammonton, Town of	14,781	14,139	-642	-4.3%
Linwood, City of	7,099	6,742	-357	-5.0%
Longport, Borough of	1,001	869	-132	-13.2%
Margate City, City of	6,385	5,997	-388	-6.1%
Mullica, Township of	6,164	5,925	-239	-3.9%
Northfield, City of	8,608	8,153	-455	-5.3%
Pleasantville, City of	20,391	20,301	-90	-0.4%
Port Republic, City of	1,016	1,121	105	10.3%
Somers Point, City of	10,807	10,321	-486	-4.5%
Ventnor City, City of	10,681	10,095	-586	-5.5%
Weymouth, Township	2,713	2,755	42	1.5%
Atlantic County	**274,960**	**266,105**	**-8,855**	**-3.2%**

* U.S. Census 5-year American Community Survey

While county-wide population has decreased in the 2013 to 2019 window, this is generally uncharacteristic of what has been observed with every decennial Census for Atlantic County. Since 1970, at each Census, overall countywide population has increased. Census 2020 information is not yet available.

Table 3d.3
Population in Atlantic County, 1970 to 2019

Jurisdiction	Population 1970 Census	Population 1980 Census	Population 1990 Census	Population 2000 Census	Population 2013 5-year ACS	Population 2019 5-year ACS
Absecon, City of	6,094	6,859	7,298	7,638	8,394	8,362
Atlantic City, City of	47,859	40,199	37,986	40,517	39,591	37,999
Brigantine, City of	6,741	8,318	11,354	12,594	9,480	8,832
Buena, Borough of	3,283	3,642	4,441	3,873	4,620	4,356
Buena Vista, Township of	4,239	6,959	7,655	7,436	7,576	7,295
Corbin City, City of	258	254	412	468	573	537
Egg Harbor City, City of	4,304	4,618	4,583	4,545	4,232	4,100
Egg Harbor, Township of	9,882	19,381	24,544	30,726	43,403	42,714
Estell Manor, City of	539	848	1,404	1,585	1,708	1,728
Folsom, Borough of	1,767	1,892	2,181	1,972	1,813	1,697
Galloway, Township of	8,276	12,176	23,330	31,209	37,356	36,094
Hamilton, Township of	6,445	9,499	16,012	20,499	26,568	25,973
Hammonton, Town of	11,464	12,298	12,208	12,604	14,781	14,139
Linwood, City of	6,159	6,144	6,866	7,172	7,099	6,742
Longport, Borough of	1,225	1,249	1,224	1,054	1,001	869
Margate City, City of	10,576	9,179	8,431	8,193	6,385	5,997
Mullica, Township of	3,391	5,243	5,896	5,912	6,164	5,925
Northfield, City of	8,646	7,795	7,305	7,725	8,608	8,153
Pleasantville, City of	14,007	13,435	16,027	19,012	20,391	20,301
Port Republic, City of	586	837	992	1,037	1,016	1,121
Somers Point, City of	7,919	10,330	11,216	11,614	10,807	10,321
Ventnor City, City of	10,385	11,704	11,065	12,910	10,681	10,095
Weymouth, Township of	998	1,260	1,957	2,257	2,713	2,755
Atlantic County	**175,043**	**194,119**	**224,387**	**252,552**	**274,960**	**266,105**

The South Jersey Transportation Planning Organization has prepared population projections through 2040 for counties and municipalities in its planning region as part of the 2016 Update to its Regional Transportation Plan[4].

[4] https://www.sjtpo.org/wp-content/uploads/2016/07/Appendix-C-Demographic-Forecast-7-25-2016-Final.pdf

Table 3d.4 Atlantic County Population Projections					
Jurisdiction	**Population 2019 5-year ACS**	**SJTPO Population Projection 2025**	**SJTPO Population Projection 2030**	**SJTPO Population Projection 2035**	**SJTPO Population Projection 2040**
Absecon, City of	8,362	9,000	9,300	9,500	9,700
Atlantic City, City of	37,999	40,900	41,300	41,500	41,400
Brigantine, City of	8,832	9,600	9,600	9,600	9,500
Buena, Borough of	4,356	5,000	5,200	5,300	5,400
Buena Vista, Township of	7,295	8,100	8,300	8,500	8,600
Corbin City, City of	537	500	500	600	600
Egg Harbor City, City of	4,100	4,600	4,700	4,800	4,900
Egg Harbor, Township of	42,714	47,700	49,300	50,700	51,800
Estell Manor, City of	1,728	1,900	1,900	2,000	2,000
Folsom, Borough of	1,697	1,900	1,900	1,900	1,900
Galloway, Township of	36,094	41,800	43,600	45,300	46,800
Hamilton, Township of	25,973	29,700	31,100	32,300	33,400
Hammonton, Town of	14,139	15,900	16,400	16,800	17,100
Linwood, City of	6,742	7,500	7,700	7,900	8,000
Longport, Borough of	869	900	900	1,000	1,000
Margate City, City of	5,997	6,700	6,800	6,900	7,000
Mullica, Township of	5,925	6,600	6,800	6,900	7,000
Northfield, City of	8,153	9,300	9,600	9,800	9,900
Pleasantville, City of	20,301	22,100	22,700	23,300	23,700
Port Republic, City of	1,121	1,200	1,200	1,300	1,300
Somers Point, City of	10,321	11,500	11,700	11,900	12,100
Ventnor City, City of	10,095	11,400	11,700	11,900	12,200
Weymouth, Township of	2,755	2,900	3,000	3,100	3,100
Atlantic County	**266,105**	**296,700**	**305,600**	**312,700**	**318,200**

Based on historic population trends and estimated future projections, Atlantic County's overall pattern of population growth over time represents an overall county-wide increase in exposure and potential vulnerability of people to natural hazards – particularly during the summer months when the County's population swells with visitors.

Changes in Residential Construction

Another general indicator of development since the last version of this Plan was prepared is the quantity of new, privately owned residential housing units that were authorized to be built in that time period. The New Jersey Department of Community Affairs (DCA) Building Permits Yearly Summary Data was queried for Atlantic County, with results shown in **Table 3d.5**. Between the years of 2016 and 2020 a total of 3,868 building permits were approved in Atlantic

County. Forty-seven percent of permits were for 1- or 2-family homes, 53% were for multi-family units, and 0.6% were for mixed uses. While overall exposure has increased over time with more units present, it is not likely that overall vulnerability has increased to the same degree because development in hazard areas would have been built to codes and standards that would offer better protection from hazard events.

Table 3d.5
Annual New Privately-Owned Residential Building Permits

Jurisdiction	2000[5]	2010[2]	2016[2]	2017[2]	2018[2]	2019[2]	2020[2]	Residential Construction In The Last Five Years (2016-2020)
Atlantic County	**1,727**	**444**	**966**	**1,025**	**601**	**810**	**466**	**3,868**
1 and 2 family	NR	366	379	275	378	373	401	1,806
1 and 2 family % of total	*NR*	*82%*	*39%*	*27%*	*63%*	*46%*	*86%*	*47%*
multi-family	NR	76	575	748	221	435	60	2,039
multi-family % of total	*NR*	*17%*	*60%*	*73%*	*37%*	*54%*	*13%*	*53%*
mixed use	NR	2	12	2	2	2	5	23
mixed use % of total	*NR*	*0.5%*	*1.2%*	*0.2%*	*0.3%*	*0.2%*	*1.1%*	*0.6%*

NR = Not Reported
Source: NJ Department of Community Affairs Building Permits Yearly Summary Data, online at: https://nj.gov/dca/divisions/codes/reporter/building_permits.html#3

Protected Open Space

The identification and acquisition of land to be maintained as protected open space presents a significant opportunity for jurisdictions to minimize future hazard exposures and vulnerability. In addition to County, State and Federal protected open spaces, municipal jurisdictions in Atlantic County also safeguard open space through their own local preservation measures (municipal land reserved for open space plus preserved farmland). Though often done for conservation, recreation or other community purposes, protecting lands located in identified natural hazard zones can help jurisdictions meet complementary hazard mitigation objectives and can qualify the communities for additional points under the Community Rating System (CRS). It is often found that those natural areas deemed targets for open space protection are often also identified as potential hazard zones (i.e., environmentally sensitive lands such as wetlands, floodplains, etc.). Approximately 20 percent of the County is parkland. Significant areas of designated protected open space[6] are shown in **Table 3d.6** and **Figure 3d.2.**

[5] Source: NJ Department of Community Affairs, Housing Units Authorized by Building Permits, Annual Reports, https://nj.gov/dca/divisions/codes/reporter/building_permits.html#3

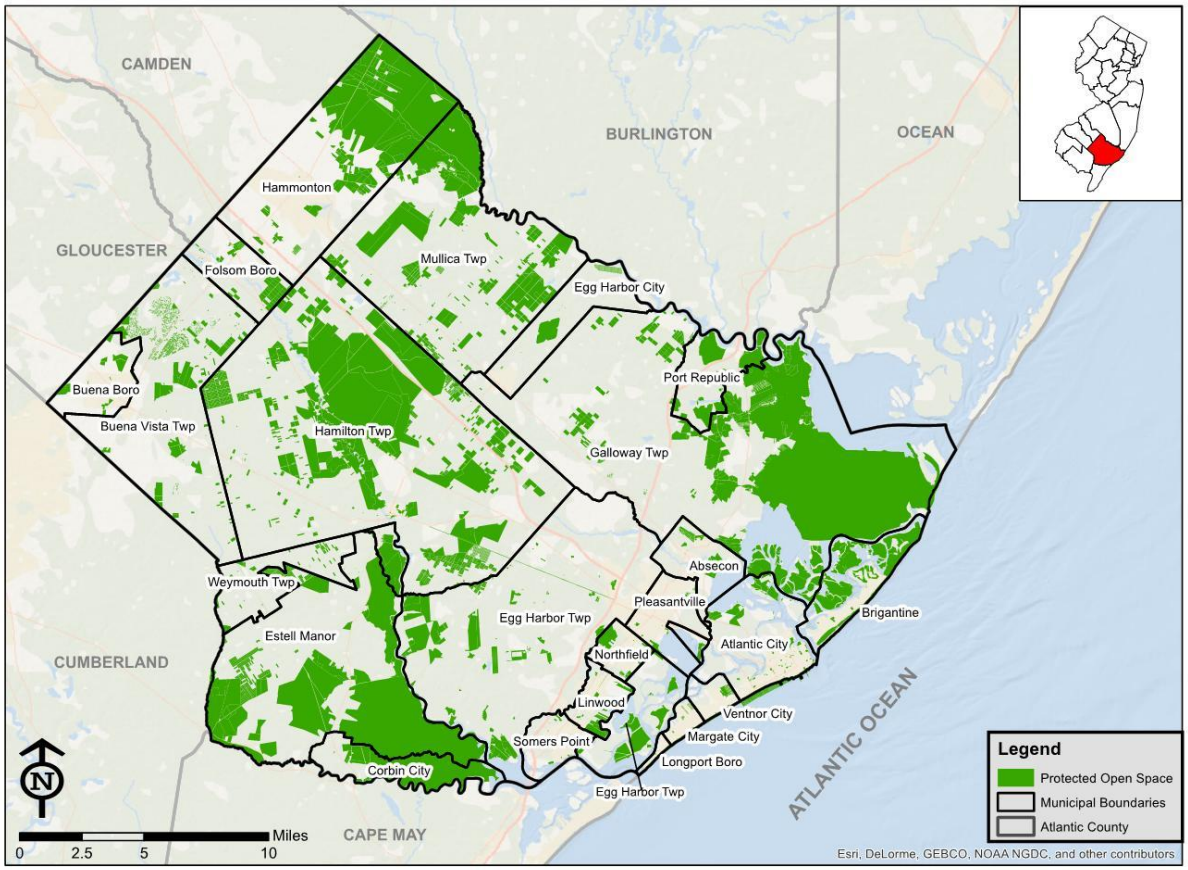
[6] Atlantic County Office of GIS, Preserved Open Space, 2008 (still the most current posted as of 2021 on the Atlantic County Office of GIS website at https://www.atlantic-county.org/gis/data-downloads.asp)

Table 3d.6
Preserved Open Space in Atlantic County

Open Space Classification	Approximate Acres	Percent of Total Land Area
County Farmland Preservation	4,170	1.2%
County Open Space	7,508	2.1%
Municipal Open Space	6,612	1.9%
NJ Natural Lands Trust	5,596	1.6%
NJDEP Fish and Wildlife	46,502	13.1%
NJDEP Parks and Forestry	14,098	4.0%
Non-Profit Open Space	2,600	0.7%
State Farmland PDC Transfer	910	0.3%
State Farmland Preservation	562	0.2%
State Open Space	529	0.1%
US Fish and Wildlife Service	19,522	5.5%
Total Acres of Protected Open Space	**108,610**	**30.5%**

SOURCE: Atlantic County Office of GIS: Preserved Open Space, 2008

Figure 3d.2
Areas of Protected Open Space in Atlantic County



SOURCE: Atlantic County Office of GIS: Preserved Open Space, 2008. NJGIN: County Boundary, 2012; Municipal Boundary, 2014.

Land Use Planning in Atlantic County

Land use planning in the State of New Jersey is primarily a function of local communities, with Atlantic County serving a coordination function for those elements that are best served on a regional level. However, the 1986 State Planning Act also provides guidelines for counties and municipalities to reach agreements with the State Planning Commission on land use and other planning issues through the cross-acceptance process. The Atlantic County Master Plan facilitates the cross-acceptance process by establishing an integrated planning strategy that incorporates State, County, and local objectives.

The Atlantic County Department of Regional Planning and Development is comprised of four major units. The Units and their responsibilities are described below:

- **Office of Policy, Planning and Development (OPPD)** serves to coordinate the various functions of the Department and in large part develops the overall agenda in terms of short- and long-range planning for infrastructure, open space and land development within the County The OPPD also manages projects such as the Strategic Growth Initiative, the Great Egg Harbor Watershed planning effort, and responsibilities include the update of the Atlantic County Master Plan (updated in 2018) and Atlantic County Open Space and Recreation Plan (updated in 2018), and the Atlantic County Land Development Standards adopted in June 2002 and updated in May 2020. These initiatives are implemented with the goal of predicting and identifying future growth issues in order to plan and implement actions commensurate with those issues. Many of these initiatives are referred to as Growth Management. The OPPD administers the review and approval of subdivisions and site plans proposed within Atlantic County. The Atlantic County Land Development Standards provide procedures and standards for review of land development by Atlantic County.

- **The Division of Engineering** ensures that the County's physical infrastructure such as our roads, intersections, and bridges are maintained and enhanced as the population of Atlantic County continues to grow.

- **Office of Land Acquisition** implements the recommendations of the Atlantic County Open Space and Recreation Plan, October 2000 updated May 2018. The Office ensures that sufficient Open Space is set aside for Atlantic County residents to enjoy. Through the establishment of the County/Municipal Open Space Partnership Program, County Government has enabled the County's 23 municipalities to choose the Open Space projects of their choice and to fund those projects utilizing a portion of the Open Space Trust funds. The County also pursues lands for acquisition through the traditional means of identifying and purchasing lands utilizing funds from the County's Open Space Trust.

- **Office of Geographic Information Systems** focuses on the creation of data layers and applications which are used by all of the staff within the Department to further their respective functions.

Influences on Future Development in Atlantic County

Atlantic County's economy and population continue to grow. This growth has resulted in the diversification and strengthening of the County's economy to include a broad array of residential development (single and multifamily, assisted living, and age restricted), retail centers, first class golf courses, and other industries which cater not only to the needs of the casino industry but to all of those people drawn to Atlantic County in search of employment opportunities. While the introduction and then maturation of the casino industry has had a tremendous impact on the development of Atlantic County, the Master Plan points out that regulatory legislation at the State level has also significantly affected County development trends in the past two decades. These regulations are expected to continue to have significant impacts upon future development trends throughout Atlantic County.

Future development in Atlantic County is influenced by guiding principles at the State, County and municipal levels, including:

- **Coastal Area Facilities Review Act of 1973 (CAFRA)**. CAFRA attempts to steer growth to designated Coastal Centers throughout the CAFRA area. Development in CAFRA areas is regulated through permitting from the NJDEP. There are five types of Coastal Planning Areas: Metropolitan, Suburban, Fringe, Rural and Environmentally Sensitive Coastal Planning Areas. Each Coastal Planning Area has associated with it a corresponding, pre-determined impervious cover limit and vegetative cover requirement.[7]

- **Pinelands Protection Act of 1979[8] and the subsequent Pinelands Comprehensive Management Plan[9]**. Pinelands legislation concentrates growth, based on zoning, into regional growth areas.

- **New Jersey State Development and Redevelopment Plan.** The management of New Jersey's lands plays an important role in the state's overall environmental protection strategy. Land use planning in the State of New Jersey is primarily a function of local communities. However, the State (NJDEP) regulates activities proposed in the Highlands, the State's coastal areas (see CAFRA, above), wetlands, floodplains and other environmentally sensitive, "special areas" (such as the Pinelands, see above). The *New Jersey State Development and Redevelopment Plan*[10] (State Plan) provides a vision for the future that will preserve and enhance the quality of life for all residents of New Jersey. The purpose of the State Plan is to coordinate municipal, county, and

[7] N.J.A.C.7:7 establishes the rules of the NJDEP regarding the use and development of New Jersey's coastal resources. A copy of the code can be found online at http://www.nj.gov/dep/rules/rules/njac7_7.pdf. A map of the CAFRA zone can be found online at https://www.google.com/search?q=cafra+zone+image&biw=1484&bih=820&source=lnms&tbm=isch&sa=X&ved=0CAYQ_AUoAWoVChMIhO3J-8HCyAIVQRU-Ch28IASZ#imgrc=5rwV6wSj0NkmLM%3A

[8] The Pinelands Protection Act of 1979 can be found online at: http://www.nj.gov/pinelands/images/pdf%20files/pinelandsprotectionact1.pdf

[9] The Pinelands Comprehensive Management Plan can be found online at: http://www.nj.gov/pinelands/cmp/

[10] http://nj.gov/state/planning/plan.html

regional planning activities through a process known as cross-acceptance[11] to establish Statewide planning objectives in the following areas: land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and intergovernmental coordination (N.J.S.A. 52:18A-200(f)). The last Cross Acceptance Report for Atlantic County was completed in 2005 and is still the current version as of this 2021 plan update. Mapping has been updated since the last version of this plan and is reflected in **Figure 3d.3**. In New Jersey, Smart Growth[12] supports development and redevelopment in recognized Centers—a compact form of development—as outlined in the State Development and Redevelopment Plan, with existing infrastructure that serves the economy, the community and the environment.[13] The State Plan provides a balance between growth and conservation by designating planning areas that share common conditions with regard to development and environmental features:

- *Regional Growth Areas*: Metropolitan planning areas, suburban planning areas, and designated centers

- *Rural Development Aras*: Fringe planning areas, rural planning areas, and environmentally sensitive planning areas. In these planning areas, planning should promote a balance of conservation and limited growth—environmental constraints affect development and preservation is encouraged in large contiguous tracts.

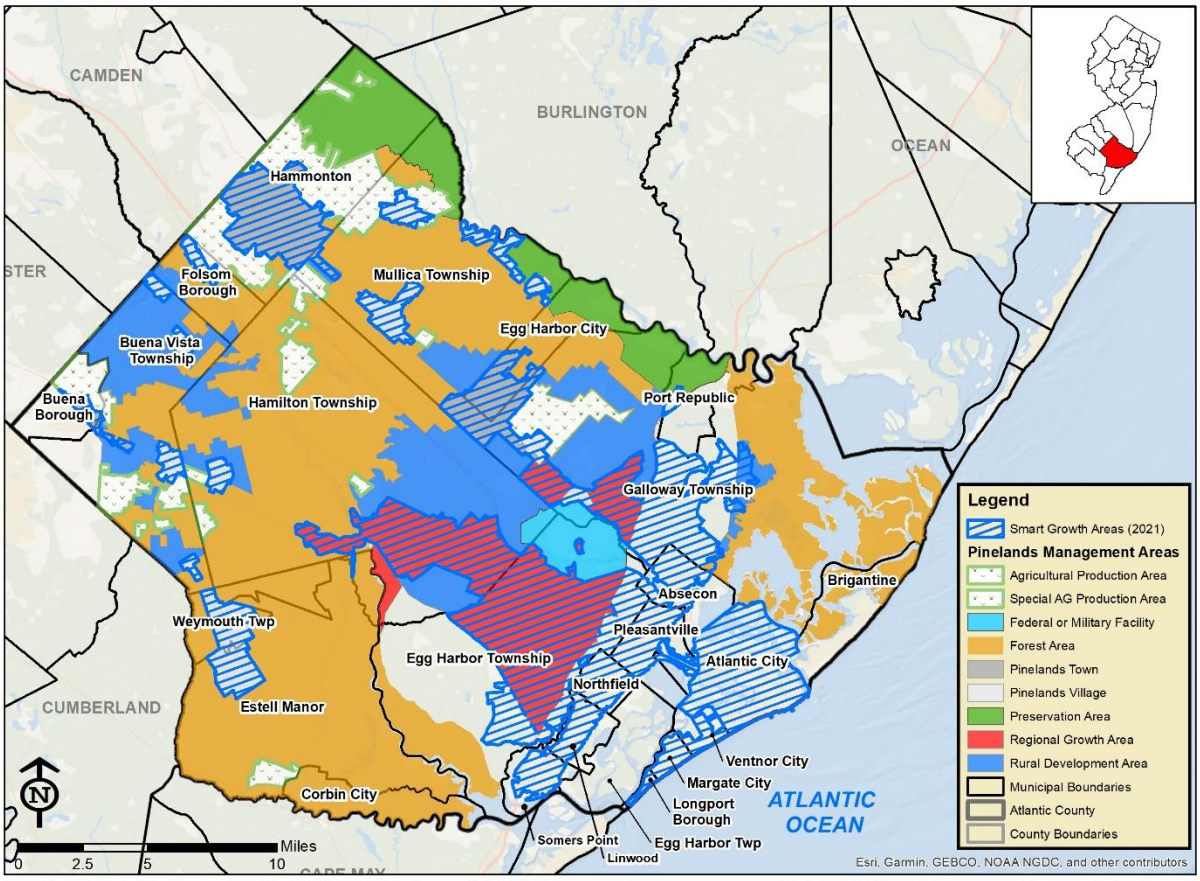
The Smart Growth areas of Atlantic County (2021) are shown in **Figure 3d.3.**

[11] Cross-acceptance is a bottom-up approach to planning, designed to encourage consistency between municipal, county, regional, and state plans to create a meaningful, up-to-date and viable State Development and Redevelopment Plan. The last Cross Acceptance Report for Atlantic County was completed in 2005 and is still the current version as of this 2021 plan update, see https://nj.gov/state/planning/state-plan-cross-acceptance.shtml .

[12] Smart Growth is the term used to describe well-planned, well-managed growth that adds new homes and creates new jobs, while preserving open space, farmland, and environmental resources. Smart Growth supports livable neighborhoods with a variety of housing types, price ranges and multi-modal forms of transportation. Smart Growth is an approach to land-use planning that targets the State's resources and funding in ways that enhance the quality of life for residents in New Jersey. Smart Growth principles include mixed-use development, walkable town centers and neighborhoods, mass transit accessibility, sustainable economic and social development and preserved green space.

[13] http://nj.gov/state/planning/smart.html

Figure 3d.3
Atlantic County Smart Growth Areas



SOURCE: FEMA Digital Flood Insurance Rate Map (DFIRM) data, 2021, where available; Preliminary FIRM Data 2014 for areas not currently included in 2021 DFIRM: Atlantic City, Corbin City, Egg Harbor City, Estell Manor, Galloway Township, Northfield, Pleasantville, Port Republic, Somers Point, Ventnor City. NJGIN: County Boundary, 2021; Municipal Boundary, 2021. NJDEP: Atlantic County Lakes (Open Water Areas), 2002. Basemap: ESRI Ocean/World Ocean Basemap

- **Atlantic County Master Plan (2018)**[14]. Underlying the recommendations of the Atlantic County Master Plan are the following goals which articulate visions for the County's future related to planning, land use, transportation, wastewater management, water supply, natural resources, solid waste management, affordable housing, historic preservation, and farmland preservation. The goals and policies set forth in the Master Plan provide a direction to be considered in formulating future studies and laws. Important decisions will be made in the next decade which will sculpt the landscape of Atlantic County for the future. These goals and policies should guide the choices made to move into the next millennium.

  Overall Planning Goals identified in the 2018 Master Plan are as follows:
  - Incorporate principles of sustainability and resiliency into all aspects of County planning and policy development.
  - Acknowledge the risks associated with climate change, sea level rise, and severe weather events, by applying lessons learned in the aftermath of Hurricane Irene, the Derecho of 2012, and Super Storm Sandy.

[14] https://www.atlantic-county.org/documents/planning/Open%20Space%20and%20Rec%20Plan_5-1-18.pdf

- Promote targeted growth and development in areas served by existing infrastructure outside flood prone areas, and encourage redevelopment of under-utilized urban, suburban, and rural sites.
- Coordinate County planning efforts with other entities including municipalities, improvement authorities, economic development agencies, and state agencies.
- Encourage the diversification of the County's economy and job creation by supporting business attraction and development initiatives.
- Promote the location of research and development businesses for mutual benefit of industry, job searchers and the colleges in Atlantic County.
- Capitalize on the Federal Aviation Administration (FAA) William J. Hughes Technical Center and its continued expansion as an asset for industry and job attraction.
- Support the County's status as a tourist destination with a wide array of natural amenities and communities of interest.
- Promote safe and efficient transportation systems for access to the County and within the County, including air, rail and motor vehicle systems.
- Preserve and make more efficient use of existing roadway capacities by encouraging sound land use planning and highway access control.
- Promote sustainable design, management, and education related to the use of potable water and the treatment of wastewater.
- Preserve and enhance the quality of the natural resources of the County.
- Preserve selected critical natural areas supporting endangered species and wildlife habitat.
- Protect farmland within the County and promote the continued economic viability of farming.
- Preserve the historic and cultural resources in the County.
- Advocate for the preservation and protection of important natural resources while working to reevaluate the capacity of growth areas and the scope of permitted uses and activities within the Pinelands.
- Collaborate with constituent municipalities and outside jurisdictional entities to streamline the development process to make the County a more attractive place for investment.
- Continue to expand the County Park System and the recreation opportunities and facilities available to County residents and visitors.

Land Use Goals identified in the 2018 Master Plan are as follows:

- Influence State and Regional master plans to support the land use goals of Atlantic County, particularly with regard to the Pinelands Comprehensive Management Plan.
- Promote quality growth and development in areas where capital facilities are available
- Support efforts to revitalize neighborhoods and rehabilitate older housing stock
- Discourage growth in areas that require unplanned extension of capital facilities
- Promote lands for a diversity of economic development opportunities within the communities of Atlantic County

- Encourage the repurposing of existing infrastructure and a redefinition of economic activity in Atlantic City and the surrounding communities.
- Promote a mix of housing types to support the demands of a changing population

Transportation Goals identified in the 2018 Master Plan are as follows:

- Maintain and improve a circulation system that provides for the safe and efficient movement of traffic.
- Provide an energy-efficient transportation system that minimizes the negative effects of vehicular emissions on air quality.
- Protect natural and manmade resources from the negative effects of traffic and road improvements.
- Provide transportation choices for work, recreation and other trips for County residents and visitors.
- Promote economic development and tourism in the transportation planning process.

Wastewater Management Infrastructure Recommendations identified in the 2018 Master Plan are as follows:

- Encourage the continued study and development of wastewater management plans as a cooperative effort among municipalities, the County, and other jurisdictional agencies.
- Encourage and assist in the development of standardized methods for the reporting and recording of wastewater flow information.
- Assist in the development of alternative applications of treated wastewater.
- Assist in the development of funding programs for wastewater management.
- Assist and educate residents in best management practices for individual onsite septic systems.
- Recognize that modular treatment technology may be necessary to meet groundwater quality standards.

Sustainability and Resiliency Goals and Objectives identified in the 2018 Master Plan are as follows:

- Consider sustainability principles in all County planning initiatives and capital investments
- Adopt principles of sustainability in County land development standards and review procedures
- Encourage a range of transportation options and compatible land uses within the County
- Promote development that is resistant to natural effects such as storms, flooding, and drought
- Encourage the use of green building techniques and low-impact green alternatives to structured storm water management.
- Consider the impacts of climate change and sea level rise in infrastructure and development planning.
- Preserve open space, habitat, and other valuable natural features.
- Reduce greenhouse gas emissions.

- Promote energy efficiency, alternative energy, and micro-gridding to reduce the County's fossil fuel consumption, save money in the long run, and enhance resiliency in the face of grid disruptions.
- Develop electric charging infrastructure and alternative fueling stations.
- Develop Regional Watershed Management Plans in cooperation with municipal representatives. These plans are a prerequisite for attaining a Class 4 Rating in the CRS Program
- Elevate County roads that provide critical access during emergency situations.
- Acknowledge the Atlantic-Cape May Coastal Coalition" which includes all coastal communities in Atlantic County as well as municipalities in Cape May County. This entity is working with legislators to at all levels of government to make the region more resilient.
- Work to ensure that NFIP flood insurance remains in effect and is affordable to property owners in Atlantic County.
- Promote additional funding for the elevation and relocation of structures within the flood hazard area that have been subject to insurance claims and repetitive losses.
- Coordinate with the Army Corps of Engineers to ensure that recommendations and actions related to the ongoing Back Bay study are consistent with planned regional and County improvements.
- Facilitate connections between institutes of higher learning and employers to provide a well-trained and competitive workforce.
- Promote emerging industries and technologies to diversify the County's economy and attract investment.
- Support municipal and private sector efforts to modernize and retrofit outdated developments and facilities with modern technology and designs that increase market appeal.
- Capitalize on the natural resources present in the County to broaden opportunities for tourism and recreation.
- Encourage the preservation of working farms, promote local agricultural products, and encourage growing of a diverse mix of crops.
- Create a diversified economy that can capitalize on existing strengths and continue to grow and develop in the future.
- Support the growth and development of the Atlantic County Economic Alliance.
- Encourage energy efficiency measures for building and transportation cost savings and economic benefits.
- Guide investment in infrastructure through a holistic alignment of planning efforts and an understanding of sustainability principles.
- Encourage a mix of housing opportunities to meet the needs of the population.
- Provide recreation and cultural amenities to enhance quality of life.
- Capitalize on the agricultural and natural resources in the County to promote healthy active lifestyles.
- Educate County residents about healthy lifestyles that include exercise, recreation, and a balanced diet.
- Promote connections between local agriculture production and end users in the community
- Create quality communities that encourage civic engagement and pride.

- Improve access to healthcare for County residents, particularly those with limited mobility.
- Promote complete streets programs in the County to promote encourage non-motorized transportation options and promote equity.

Water Supply Infrastructure Recommendations identified in the 2018 Master Plan are as follows:

- Recognize that modular treatment technology may be necessary to meet groundwater quality standards.
- Assist in the development of an updated water model, monitoring program, and alternative water use implementation strategies.
- Assist in the promotion and education of water conservation.
- Assist and encourage the development of wastewater recycling
- Assist in the development of land use strategies that mitigate adverse effects to our water resources from non-point source pollution.
- Assist in the development of a regional water supply and quality plan.
- Encourage Flood protection and resiliency measures for all water supply facilities within a Flood Zone.

- **Municipal Regulatory Tools.** Municipalities have various regulatory tools at their disposal to influence land uses and development trends over time. As part of the initial hazard mitigation plan development process, participating jurisdictions were asked to complete a questionnaire in order to provide the consultant with information regarding land use regulatory capabilities in each municipality. As part of the 2015 and 2021 hazard mitigation plan update processes, participating jurisdictions were asked to review and provide updates to the land use regulatory capabilities they reported when the last version of the plan was prepared. All 24 participating jurisdictions (the County plus 23 municipalities) provided feedback as part of this plan update. The County reported subdivision statues and a comprehensive plan at its disposal. All of the 23 municipalities reported having building codes, zoning statutes, subdivision statutes, and comprehensive plans at their disposal. Details are shown in **Table 3d.7** (further information on these and other regulatory tools are discussed in Section 4).

Table 3d.7
Municipal Regulatory Tools

Municipality	Building Code	Zoning Statutes	Subdivision Statutes	Comprehensive Plans
Atlantic, County of			■	■
Absecon, City of	■	■	■	■
Atlantic City, City of	■	■	■	■
Brigantine, City of	■	■	■	■
Buena Vista, Township of	■	■	■	■
Buena, Borough of	■	■	■	■
Corbin City, City of	■	■	■	■
Egg Harbor City, City of	■	■	■	■
Egg Harbor, Township of	■	■	■	■
Estell Manor, City of	■	■	■	■
Folsom, Borough of	■	■	■	■
Galloway, Township of	■	■	■	■
Hamilton, Township of	■	■	■	■
Hammonton, Town of	■	■	■	■
Linwood, City of	■	■	■	■
Longport, Borough of	■	■	■	■
Margate City, City of	■	■	■	■
Mullica, Township of	■	■	■	■
Northfield, City of	■	■	■	■
Pleasantville, City of	■	■	■	■
Port Republic, City of	■	■	■	■
Somers Point, City of	■	■	■	■
Ventnor City, City of	■	■	■	■
Weymouth, Township of	■	■	■	■

■ = yes

Development Trends

Recent changes in Atlantic County's employment and population has resulted in the need for strong regional planning due to the stress placed on the County's physical infrastructure as well as the services of County and municipal governments. Due to Atlantic County's location in the State of New Jersey, it is an area of extreme land use planning conflicts. Casino gaming and secondary impacts fuel an already high demand for residential and commercial growth within the County. In direct conflict with this demand are a wide range of important environmental resources ranging from the oceanfront communities, bayside older suburban communities, Pinelands growth areas, and Pinelands conservation areas. All of these communities are connected by important sensitive wetlands and other undeveloped land.

The following recent development trends are expected to continue in the future, with the focus on accommodating growth while preserving environmentally sensitive lands and open space.

Based on the State Plan Policy Map for Atlantic County, it can be observed that areas targeted for conservation tend to be toward the westernmost regions of the county. New development

is projected to be concentrated in the three Pinelands growth townships of Egg Harbor, Galloway, and Hamilton. The six neighboring cities of Port Republic, Absecon, Pleasantville, Northfield, Linwood, and Somers Point are showing signs of aging commercial and housing stock, increased traffic demands, and other factors typically faced by older suburban communities. The Strategic Growth Management Plan (currently in development) will address both the need for preservation and define areas that can and should be developed or redeveloped. One of the biggest impacts of growth has been the tremendous pressure exerted on the County's transportation infrastructure; this is expected to continue.

Superstorm Sandy's Impact

Superstorm Sandy devastated significant areas of Atlantic County's coastline in 2012. Much of the highly vulnerable bayshore and coastal communities are already developed. While some property acquisitions have occurred on a relatively small scale in certain locations, the observed impact of this disaster on land uses and development trends is generally that communities have tended toward building back damaged and destroyed structures in their previous locations to higher codes and standards, as opposed to precluding new development or substantial improvements in these areas. This more disaster-resistant building stock, along with the many hazard mitigation initiatives being undertaken (i.e., acquisitions, elevations, beach and dune restoration projects, bulkheading, etc.) has the effect of increasing the level of resilience, and decreasing vulnerability for many such communities during future events of this nature.

Re-assessment of Local Land Uses and Development Trends

When the initial 2010 hazard mitigation plan was developed, the Core Planning Group provided feedback on land uses and development trends in their respective jurisdictions by completing a Land Uses and Development Trends Worksheet. The worksheet consisted of the following two questions:

1. Please describe development trends occurring within your jurisdiction, such as the predominant types of development occurring, location, expected intensity, and pace by land use. While details are preferred, it is ok if your feedback is qualitative and quite general, such as "*high-occupancy, high-density residential development is occurring near the waterfront*".

2. Does your jurisdiction enforce regulations/ordinances/codes to protect new development from the effects of natural hazards? (Some examples might be floodplain management ordinances enforcing FEMA's NFIP for new development or substantial improvements in the floodplain; steep slope ordinances for community's which may have landslide hazards; earthquake resistant design criteria and/or high wind design criteria; or buffer zones in wildfire hazard areas.) If so, please describe.

   Local responses were updated as part of the 2016 Plan Update and again as part of the current 2021 Plan Update. The worksheet for the 2021 Update asked jurisdictions to review their community's prior feedback, and to identify any changes that have occurred since that

time so the most current information can be reflected in this 2021 plan update and the responses are summarized in **Table 3d.8**.[15] Some responses have been edited for clarity. Copies of each jurisdiction's original response can be found in Jurisdictional Annexes of **Section 9**.

[15] As part of the 2021 Plan Update, municipalities were asked to review their prior responses (as submitted during the development of the initial plan) and either (a) certify that they still hold true unchanged, or (b) identify any changes that have occurred since that time. Their responses have been incorporated into Table 3d.6.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
Atlantic, County of	Since the 2010 plan was published Atlantic County has been in the midst of severe economic downturn. Four casinos have closed in the last two years resulting in the loss of more than 8,000 jobs. As a result, development in the County as a whole has stalled. It is not anticipated that there will be a notable increase in the near future as foreclosures of residential units and the number of vacant commercial structures is at a very high level.	Since 2016 the Atlantic County Economic Alliance has been working to diversify the County's economy in particular with the creation of the National Aviation Research Technology Park (NARTP). The first of multiple buildings has been constructed and hundreds of new high tech jobs are anticipated over the next several years.	Atlantic County regulates all development along county roads of five residential units or more and all commercial development. The county only reviews for access and drainage issues for those developments. The county drainage standards protect county roads and drainage facilities from flooding from storm events.	County has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current
Absecon, City of	Since the 2010 plan, Absecon has experienced little, if any, increase in population of 8,411 as reported in the 2010 census. Although a substantial increase in senior housing was anticipated, that did not occur. Those projects were essentially converted into all-age units. A 48-unit all-age, owner-occupied complex has been constructed. Two additional projects have received land use approvals, a 442-rental project (including 99 senior units) and 71 additional low- and moderate-income rental units. We have experienced unprecedented	Since the 2016 plan, Absecon has experienced little, if any, increase in population. The estimated population in 2019 was 8,362 according to the Census Bureau. Since the 2016 plan, two new residential developments have been completed; a 442 rental project and 71 additional low and moderate income rental units. Neither of these developments are located within the City's flood hazard zones.	Because of increased property rentals, the City has recently adopted a rental registration ordinance to permit annual inspection of rental properties to assure both zoning and property maintenance compliance. The City continues to strictly enforce its zoning and building codes, including those pertaining to minimum base flood elevation within our flood hazard zones.	The city continues to enforce the rental registration ordinance to permit annual inspection of rental properties to assure both zoning and property maintenance compliance. The city also continues to strictly enforce its zoning and building codes, including those pertaining to minimum base flood elevation within our flood hazard zones.

Table 3d.8 Municipal Development Patterns				
Jurisdiction	**Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan**	**Changes in Development Since the 2016 Plan was Prepared**	**Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan**	**Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)**
	increases in property foreclosures and resulting vacancies, and the net effect is such that the limited new development will not produce an appreciable increase in population. None of the new projects are located within the City's flood hazard zones. The City has experienced very little commercial development since the 2010 Plan, and no development in its industrial zone. Any development is also not within the City's flood hazard zones.	A commercial redevelopment project is currently under construction at the site of a former City recreation field and former firehouse.		
Atlantic City, City of	Revel in Southeast Inlet, and three (3) other casino hotel properties, are currently unoccupied. No new development taking place along waterfront except approximately 40 Sandy damaged homes along bayfront have received approvals to elevate to BFE+2'. New seawall under construction along inlet will protect proposed new boardwalk and public and private properties in the area.	Trump Plaza Hotel/Casino was demolished in 2021. The former Revel Casino is now operational as the Ocean Casino Resort. Former Trump Taj Mahal is now open as the Hard Rock Hotel and Casino. Showboat Casino is now operating as a hotel. The City continues to apply for funding to elevate properties in the SFHA. The Absecon Inlet seawall and boardwalk renovation is complete.	Floodplain management ordinance revised in 2014 to add 2' of freeboard; zoning board of adjustment is appeals board; minimum bulkhead height ordinance is drafted.	Ordinance 46 of 2019 was adopted establishing a minimum bulkhead height of 8.5 feet NAVD 1988.
Brigantine, City of	Development trends remain the same [as in 2016 -	As of 2021 the City has seen a high influx of full time	Adopted ABFE and FIRM elevations. 70% of new or	New codes and ordinances are being

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
	predominantly single-family residential development]. Post Sandy approximately 400 homes were identified as substantially damaged, with approximately 200 being raised.	residents. In post Covid time families are able to work from home via computers. Several homes which in the past were considered weekend rentals are being bought and occupied by full time residents. New homes are being built across the island at a rapid pace.	substantially renovated homes are required to have a finished floor of 12 feet with 3 feet of freeboard, dependent on their ABFE location rating (AE9, AE10 X, etc.)	developed to adjust for new flood regulations. The city also provides NIXLE awareness for pending floods and storms. The PPI committee meets regularly to find ways to reach out to the public. Mainly social media outlets
Buena, Borough of	High-occupancy senior housing in areas that were previously occupied by single family dwellings or farmland. Development of small business or single family dwellings in once wooded areas.	A new 55+ Community is currently being constructed in a formerly undeveloped residential section. The Borough completed a Master Plan Review in 2019 and has a progressive Land Use Board. The Land Use Board looks to supplement the existing small businesses in town through redevelopment of the Borough's Commerce Center. The Pinelands Commission continues to limit development. Active development of small business or single-family dwellings in once wooded and farmland areas. Repaving of Central Ave to help reduce flooding.	Not at this time.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
		Actively working with Atlantic County and the NJ DOT to remediate and mitigate flooding in flood prone areas.		
Buena Vista, Township of	Retirement community located outside the Pinelands. Land that was previously used for farming. To begin in the next year or two. Potential 71 units. Single family homes on individual lots scattered throughout the township inside the Pinelands area. Planned residential single family homes. Major sub-division. 80 units.	These three projects have not been completed and remain valid for the 2021 plan.	None reported in the previous Plan.	Buena Vista Township does enforce applicable laws and regulations affecting new development.
Corbin City, City of	No major changes in land uses and development trends are observed since the last version of the plan was prepared. Development continues to be characterized by single family dwellings and accessories to single family dwellings.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current	June 2014 appointed flood administrator	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current
Egg Harbor City, City of	<u>Recent development:</u> (1) Conifer-Rittenberg Site Senior Housing, Residential, 1 building with 100 apartments; (2) Dollar General, commercial, 9200sf; (3) Renault, Commercial, 50 to 100 room hotel, Bremen Ave. Only location-specific	Residential development in the Egg Harbor North area is still being pursued for Phase II and Phase III, and commercial development is being pursued in the area known as the Tower Site and at the City Lake Park-see	Flood damage prevention ordinance, growth management ordinance, stormwater ordinance	Egg Harbor City is in a Pinelands area, so all development must meet their restrictive requirements.

Table 3d.8 Municipal Development Patterns				
Jurisdiction	**Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan**	**Changes in Development Since the 2016 Plan was Prepared**	**Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan**	**Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)**
	hazard zones or vulnerabilities identified. With the exception of coastal erosion, flood and wildfire, all locations in this planning area are exposed to the natural hazards addressed in this plan. New/potential development: (1) EHC North Cedar Creek Partners, Residential, 280 single family homes, wildfire hazard area; (2) Renaissance Plaza, Residential (senior), 12 apartment units; (3) Landing Creek Estates, Residential, 20 single family, flood hazard area 1%, wildfire hazard area; (4) Station 36 – New Village Green, Residential, 36 multi-family; (5) Gateway Residential Rehabilitation Area, Residential, 84 units, 3 story townhouses; (6) Tower Site, Residential, unknown number of units, research is being done on possible development, wildfire hazard area; (7) Antwerp Ave Homes, residential, 10 to 14 units. Only location-specific hazard zones or vulnerabilities identified. With the exception of coastal erosion, flood and wildfire, all locations in this	updated chart below for status of projects previously identified.		

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
	planning area are exposed to the natural hazards addressed in this plan.			
Egg Harbor, Township of	No changes reported from previous plan..	Egg Harbor Township has experienced Moderate growth in the last 10 years. We are designated a Pinelands Regional Growth Community with the Pinelands Area located west of the Garden State Parkway and North of Ocean Heights Ave. Development trends favor single family homes on lots of 10,000 square feet or larger. The median value of an owner occupied home decreased from $263,100 to $212,000 between 2007 and 2020 according to the latest Census Bureau Statistics. In the same time period median income increased $11,081 to $82,117 for a family. Additional statistics are available through the Census Bureau. The Pinelands Commission mandated growth of over 20,000 housing units for Egg Harbor Township and our zoning has been modified to accommodate this	All state and Federal regulations for building codes are enforced. Floodplain requirements are checked during plan review. The Township has some zones where higher wind restrictions apply and codes are enforced to ensure buildings meet requirements.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
		requirement. With the influx of new residents comes the requirement to educate the children. Currently there are 7,300 students and ten school buildings. The Pinelands Regional Growth Area continues to see new housing.		
Estell Manor, City of	A) Single Family Residential Development is occurring in presently undeveloped woodlands. 1) Low density all Pinelands Approvals and CAFRA approvals needed. A) Entire community Pinelands or CAFRA.	As previously, plus low density all Pinelands & CAFRA approvals were verified. Some redevelopment of old abandoned property as property values rise.	The City enforces all Pinelands and CAFRA regulations and recommendations. All FEMA information is also reviewed.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.
Folsom, Borough of	The expansion of the FC district has made a positive impact on Development on Rt. 322.	No significant construction has taken place within the 322 corridor. Three other residential structures have been approved. One project contains approval for 5 dwellings, two other projects have been approved with three dwellings each. They will be built over the next 12-18 months.	The Borough's design and development standards are consistent with those contained within the Pinelands Comprehensive Management Plan (CMP)	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.
Galloway, Township of	Community has reviewed their feedback from the 2010 Land Uses and Development Trends	Commercial development is occurring along the main roadways, including the	Community has reviewed their feedback from the 2010 Land Uses and	The Township continues to be in compliance with the Pinelands Comprehensive

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
	assessment and has certified that all information previously provided is still current.	Jimmie Leeds Road and Route 9. Many sites are being developed under redevelopment plans. Single-family residential is occurring in the Pinehurst area as infill development.	Development Trends assessment and has certified that all information previously provided is still current.	Management Plan (CMP). Recently, the Township amended the stormwater management ordinance to comply with the new NJDEP regulations for stormwater and green infrastructure.
Hamilton, Township of	Many of the residential developments reported in 2009 have been completed, however there are several developments that have not been constructed. Walmart has competed its expansion and phase 1 of the Hamilton Mall expansion is complete. Harrison Beverage was approved to develop a warehouse/distribution facility in the Business Park but has not started construction. Fire damaged buildings in the Mill Complex Redevelopment Area (aka Cotton Mill) situated in the Flood Hazard area have been demolished.	Residential development is occurring in designated residential growth areas. Hamilton Green is expanding its existing facility by35 apartment buildings. Commercial development mainly along the Harding Highway and Black Horse Pike corridors. The commercial development is comprised mainly of retail uses such as CarMax, Dollar General, and Lomax Carpet. There is some development within the industrial park. The John Brooks Recovery Center was constructed and is open within the area of the park. Construction on previously-approved single-family residential development is continuing throughout the municipality.	Hamilton Township has been and remains in conformance with the environmental requirements of the Pinelands CMP. The Township has amended its Flood Damage Prevention ordinance to be consistent with changes recommended by NJDEP following Superstorm Sandy. The Township follows State Uniform Construction Code which was amended (July 2014) to include standards for Flood-resistant construction.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
Hammonton, Town of	Community has reviewed their feedback from the 2010 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.	The Town of Hammonton uses a zone map to determine construction and development of all building within the Town. The map contains info from New Jersey Pinelands and Wetlands to determine building feasibility on said locations. Hammonton also works closely with Adams Rehman & Hegan for all stormwater, flood water run off during pre and post construction projects to ensure proper planning of said construction. Hammonton Planning Board follows all State and Federal mandates prior to and during construction approvals.	Community has reviewed their feedback from the 2010 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.	The Town of Hammonton follows the Comprehensive Code Management Plan to ensure all new construction within the Town is built to up to date codes for all fire, flood, hurricane and any natural hazards that exist. Hammonton further enforces all uniform building code with a full time code enforcement officer appointed by City officials. Any non-compliant persons are cited and brought to municipal court to face hearing and possible fine until such time that owner remedies issue at hand. The Town follows a uniform construction code that is very comprehensive in scope and gets updated annually for currency.
Linwood, City of	Two lots along Route 9 designated as areas in need of redevelopment. One lot developed in 2003. Now beginning discussion on phase 2 of development. Second	City is almost fully developed, largely residential. Most commercial along Route 9 (New Road). Only several lots left to develop.	Currently NJDEP/CAFRA rules obtain. City continues to acquire open space. Adopted preliminary working map. Review of regulations,	City continues to acquire open space. Recently acquired more than 30 acres of open space, mostly bordering the Patcong Creek and the

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
	undeveloped "redevelopment area" lot in negotiations with office/retail development approved. New residential properties only result of subdivisions or tear downs.		codes, and ordinances are ongoing.	bay. Continued to review regulations, codes, and ordinances and update them accordingly.
Longport, Borough of	Since the last version of the plan was prepared, 113 new homes have been constructed.	Longport's year-round population has been declining over the past 10 years. Longport has become a seasonal destination. The development trend has been for developers and persons wanting to live in Longport to purchase an older home, demolish and reconstruct so-called "McMansions'. McMansions defined as constructing a new home, maximizing every zoning aspect to the letter of the law. Longport has approximately 1,200 buildings within the Special Flood Hazard Area (SFHA). Since the inception of our Hazard Mitigation Plan and updated Flood Damage Prevention Ordinance in 2008, 312 new homes have been constructed and 36 elevated, all to a higher	In 2013, Chapter 99, Flood Damage Prevention, was revised and the ABFE was adopted.	Longport enforces those requirements as outlined within the Flood Damage Prevention Ordinance Chapter 99. Within that ordinance are higher regulatory standards for freeboard, substantially damaged/substantially improved structures, and requirements for submitting non-conversion agreements and subsequent enforcement procedures. Additionally under the Zoning Ordinance (specifically 167-32dD) fill exceeding 1' is prohibited. Longport's Floodplain Administrator is currently working with NJDEP Bureau od Flood updating Longport's Flood Damage Prevention Ordinance to be compliant with their Model Ordinance. The

Table 3d.8 Municipal Development Patterns				
Jurisdiction	**Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan**	**Changes in Development Since the 2016 Plan was Prepared**	**Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan**	**Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)**
		regulatory standard, a good thing. If the development process continues at the same rate over the next 10 years, then in 2031 over half of Longport's single family homes will have been replaced to today's higher standards. But with sea level rise and subsidence, are the current standards adequate?		Model Ordinance incorporates the NJ Flood Hazard Control Act higher floodplain standards and required regulatory requirements with statewide Uniform Construction Code flood resistant requirements.
Margate City, City of	Around 2011 Margate began to see a large increase in new home construction. Also, after 2012 Superstorm Sandy Margate began a substantial amount of construction of new homes and home elevations. In 2014 Margate had over 64 demolitions.	Since 2016, each year has seen a continual rise in issuance of zoning and construction permits. The increased activity has been across the island with a higher number perhaps near the Bayfront areas mainly single family construction along with a smaller number of multi-family construction activity. There is some mixed use development proposed for 2021. Trends for single family homes are to maximize building coverage and lot coverage.	Margate currently requires all new and substantial improved properties to elevated to the 1988 datum and also meet the 2013 preliminary flood maps. Margate enforces a 3 foot freeboard to all construction.	The zoning office confirms Base Flood Requirements and have changed the zoning to permit parking and storage to be below buildings which permits a freeboard up to 5'-7' or more. All freeboard for residential use is 3 foot to the lowest horizontal structure and an additional 1 foot for floor so in essence a 4 foot freeboard as a minimum. All waterfront properties are required to discharge roof runoff directly into the bay to reduce loading on City stormwater system and enforces new bulkhead elevations.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
				Permeable areas have been enforced as well. New homes have clearly outpaced home elevations however some still occur mainly through grants.
Mullica, Township of	Community has reviewed their feedback from the 2010 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.	Mullica Township is a town that is strictly controlled by Pinelands. The Township has no significant residential or commercial development at this time. Over the past several years, the Town has experienced increased Single Family Dwelling Development, but this is limited due to Pineland Restrictions. The restriction haven't changed over the last planned cycle. Township may be building a new municipal complex in the near future. During this next planned cycle there should be a carpenters training center constructed. The planning board does not have anything else yet.	Community has reviewed their feedback from the 2010 Land Uses and Development Trends assessment and has certified that all information previously provided is still current. .	Mullica Township works closely with Department of Environmental Protection and the Pinelands Commission for wetlands areas and utilizes flood maps to identify floodplain. Mullica works with Department of Community Affairs to ensure all building regulations are met. Mullica also has a Fire Management Ordinance to ensure fire safety for structures.
Northfield, City of	Northfield is basically fully developed. The only possible area for future development would be the Atlantic City Country Club, which is located	No change	CAFRA Development Regulations Flood Hazard Area Waterfront Development Tidelands	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
	between Shore Road and the bay. If the Country Club was to ever be redeveloped it could have flooding issues with its close proximity to the bay.		Freshwater Wetlands FEMA Floodplain management ordinances	certified that all information previously provided is still current.
Pleasantville, City of	Center City Redevelopment. Two of four buildings completed. Mixed use of commercial and residential. 135 units (1-4 story and 1-5 story). Recent completion of wholesale electric warehouse south expressway and west of new road. New dollar Tree store East BHP & Lyons Ct.	No changes since 2016. The City is still recovering from economic decline. On a positive note, the City has qualified for Neighborhood Preservation Funding through NJDCA for the Downtown area. This has provided funds for mural, flowers, street lighting, a farmers' market, and other beautification efforts. The City has also qualified for the Neighborhood Revitalization Tax Credit Program and the required plan is currently being prepared. These two programs will assist in the recovery of the central section of the City.	Adopted a new floodplain management ordinance that reflects the elevation and flood areas of the ABFE map.	No additional actions have been taken.
Port Republic, City of	Port Republic is a rural community that is connected to and influenced by the Mullica River. The City has a small Historic District located between Route 624 and Route 575. Much of the City is tidally influenced wetlands and	Conditions remain the same. Port Republic has limited property that is suitable for building due to the presents of wetlands and marshland with no access to sewerage.	Port Republic enforces the FEMA regulations and flood plain management measures at the time a property obtains a building permit. Also, the City utilizes the International Building Code	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
	marshland and not developable. In addition, a large percentage of the City is permanently preserved open space. Future development is likely to occur as infill development in close proximity to existing developed portions of the City along the major roadways.		for all building permit requests which sets the rules for all design standards for wind, soil, structural, electrical, etc.	
Somers Point, City of	Proposed New Growth and Development: (1) residential at 10 Somers Point – Mays Landing Rd; (2) new commercial at 1 Bethel Rd; (3) new commercial at 575 New Rd.; (4) proposed restaurant at 924 Bay Ave.	Proposed New Growth and Development: (1) residential at 90 Broadway; (2) residential at Shore Rd and Pleasant Ave (3) new commercial at 19 McArthur Blvd; (3) new commercial at 425 New Rd.; (4) new commercial at Bay Ave and Pleasant Ave.	None reported.	Floodplain Management Ordinances § 114-217 Safety standards for stormwater management basins. § 114-218 Requirements for a site development stormwater plan.
Ventnor City, City of	There are numerous houses being raised since Superstorm Sandy. Removed old motel and constructing 27 new townhomes on waterfront development.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.	90% of the Community is located in an A-8 flood zone, also being coastal, 120 MPH wind speed is designated for new construction. Wetlands and floodplains are also incorporated thus the following agencies are prior approvals, DEP & FEMA. High wind speeds, and flood resistant construction. UCC Regulations.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.

Table 3d.8
Municipal Development Patterns

Jurisdiction	Land Uses and Development Trends in Hazard Areas As Reported in the 2016 Plan	Changes in Development Since the 2016 Plan was Prepared	Regulations/Codes/ Ordinances To Protect New Development From Natural Hazards as Reported in the 2016 Plan	Changes since the 2016 Plan was Prepared (as related to Regulations/Codes/ Ordinances)
			Community has been notified of new working flood maps which are AE8, AE9, AE10 and minimal AE11. All other information is the same.	
Weymouth, Township of	The Township is predominantly residential with significant areas of dedicated open space. Very limited new construction has occurred in recent years. An age restricted community of manufactured housing represents the greatest activity for new dwellings. The majority of development activity outside of this community is the renovation and/or additions to existing structures. No changes in development in recent years.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.	The majority of Weymouth lies within the New Jersey Pinelands Management Area with the remainder of the Township being governed by the New Jersey Coastal Facilities Review Act. The Township's land use code is in conformance and is consistent with these state/regional land use regulations. In addition, the Township has adopted a comprehensive Master Plan that directs new development away from environmentally sensitive areas. No changes in recent years.	Community has reviewed their feedback from the 2016 Land Uses and Development Trends assessment and has certified that all information previously provided is still current.

SECTION 3E – CONCLUSIONS ON HAZARD RISK

Priority Risk Index

The hazard profiles presented in this section were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its guidance document entitled *Local Mitigation Planning Handbook*. It relies heavily on historical and anecdotal data, stakeholder input, and professional and experienced judgment regarding observed and/or anticipated hazard impacts; and carefully considers the findings in other relevant plans, studies and technical reports.

In order to draw some meaningful planning conclusions on hazard risk for Atlantic County as a whole and each participating jurisdiction, the hazard profiling and risk assessment processes were used to generate hazard classifications according to a "Priority Risk Index" (PRI) - a tool used to measure the degree of risk for identified hazards in a particular planning area. The purpose of the PRI, described further below, is to categorize and prioritize all potential hazards as high, moderate or low risk. The PRI is used to assist in the determination of those hazards that pose the most significant threat to Atlantic County based on a variety of factors. The PRI is a qualitative assessment methodology meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks based on standardized criteria. Combined with the asset inventory and quantitative vulnerability assessment provided in the previous sections, the summary hazard classifications generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes, and more specifically, the identification of hazard mitigation opportunities for Atlantic County jurisdictions to consider as part of their proposed mitigation strategies. Each jurisdiction focused on the identification of mitigation actions that will reduce or eliminate their own unique hazard risks.

The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time and duration). Each degree of risk has been assigned a value (1 to 4) and an agreed upon weighting factor[1], as summarized in **Table 3e.1**. To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the example equation below[2]. According to the weighting scheme applied for Atlantic County, the highest possible PRI value is 4.0.

PRI VALUE = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

[1] The Atlantic County Planning Committee, based upon any unique concerns or factors for the planning area, may adjust the PRI weighting scheme during future plan updates.

[2] "Hazard Mitigation: Integrating Best Practices into Planning" (available online at www.fema.gov/media-library/assets/documents/19261), prepared by the American Planning Association (APA) and supported through a contract with the Federal Emergency Management Agency (FEMA), discusses the calculation of Priority Risk Indices in Chapter 6 in its case study on the Mecklenburg County Hazard Mitigation Plan (www.charmeckem.net/sites/charmeckem.net/files/HMP/Sections/06_Vulnerability_Assessment.pdf). The Atlantic County HMP Update uses the same PRI calculation and weighting factors.

Table 3e.1
Priority Risk Index for Atlantic County

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

As part of the 2016 Plan Update, the application of the PRI was done for *every* participating jurisdiction. The process was reviewed and results were updated as part of the 2021 Plan Update process, including a reorganization of hazard presentation to align with the overall new presentation of the updated hazard identification step documented of Section 2, and the hazard profiles of Section 3a.

PRI Results

The application of the PRI was done separately for each jurisdiction in Atlantic County, and for the County as a whole. Assigned risk levels were based on the detailed hazard profiles developed for this section, as well as input from the Planning Committee and results of the vulnerability assessment. The results were then used in calculating PRI values and making final determinations for the risk assessment.

Table 3e.2 summarizes the degree of risk assigned to each category for all identified hazards based on the application of the PRI for Atlantic County, as a whole.

Table 3e.3 presents an overview of the PRI Results for each jurisdiction.

Detailed tables for each jurisdiction (similar to Table 3e.2) are included in **Appendix 3e**.

Table 3e.2
Summary of PRI Results for Atlantic County

Hazard	Category/Degree of Risk											
	Probability	PROBABILITY INDEX VALUE	Impact	IMPACT INDEX VALUE	Spatial Extent	SPATIAL INDEX VALUE	Warning Time	WARNING INDEX VALUE	Duration	DURATION INDEX VALUE	PRI Score	Hazard Ranking
Atmospheric Hazards												
Extreme Temperatures	Highly Likely	4	Minor	1	Large	4	More than 24 hours	1	Less than one week	3	2.7	M
Extreme Wind	Highly Likely	4	Limited	2	Large	4	More than 24 hours	1	Less than 24 hours	2	2.9	M
Hail	Highly Likely	4	Minor	1	Negligible	1	Less than 6 hours	4	Less than 6 hours	1	2.2	L
Hurricane & Tropical Storm	Possible	2	Catastrophic	4	Large	4	More than 24 hours	1	Less than one week	3	3.0	H
Lightning	Highly Likely	4	Minor	1	Negligible	1	Less than 6 hours	4	Less than 6 hours	1	2.2	L
Nor'easter	Likely	3	Minor	1	Large	4	More than 24 hours	1	Less than one week	3	2.4	M
Tornado	Possible	2	Catastrophic	4	Negligible	1	Less than 6 hours	4	Less than 6 hours	1	2.5	M
Winter Storm	Highly Likely	4	Minor	1	Large	4	More than 24 hours	1	Less than one week	3	2.7	M
Hydrologic Hazards												
Coastal Erosion	Highly Likely	4	Critical	3	Small	2	More than 24 hours	1	Less than one week	3	2.9	M
Sea Level Rise	Highly Likely	4	Critical	3	Small	2	More than 24 hours	1	More than one week	4	3.0	H
Dam Failure	Unlikely	1	Catastrophic	4	Negligible	1	Less than 6 hours	4	Less than 6 hours	1	2.2	L
Levee Failure	N/A	No recorded levees in Atlantic County										N/A
Drought	Possible	2	Minor	1	Large	4	More than 24 hours	1	More than one week	4	2.2	L
Flood	Highly Likely	4	Critical	3	Moderate	3	6 to 12 hours	3	Less than one week	3	3.3	H
Tsunami	Unlikely	1	Limited	2	Small	2	6 to 12 hours	3	Less than 24 hours	2	1.8	L
Storm Surge	Likely	3	Catastrophic	4	Moderate	3	More than 24 hours	1	Less than one week	3	3.1	H
Wave Action	Highly Likely	4	Critical	3	Small	2	More than 24 hours	1	Less than one week	3	2.9	M
Geologic Hazards												
Earthquake	Unlikely	1	Minor	1	Large	4	Less than 6 hours	4	Less than 6 hours	1	1.9	L
Other Natural Hazards												
Wildfire	Possible	2	Critical	3	Small	2	Less than 6 hours	4	Less than one week	3	2.6	M

Table 3e.3
PRI Results for Each Jurisdiction[3]

Jurisdiction	Atmospheric								Hydrologic								Geologic	Other
	Extreme Temperatures	Extreme Wind	Hail	Hurricane and Tropical Storm	Lightning	Nor' easter	Tornado	Winter Storm	Coastal Erosion	Sea Level Rise	Dam Failure[4]	Drought	Flood	Tsunami	Storm Surge	Wave Action	Earthquake	Wildfire
ATLANTIC COUNTY	2.7	2.9	2.2	3.0	2.2	2.4	2.5	2.7	2.9	3.0	2.2	2.2	3.3	1.8	3.1	2.9	1.9	2.6
Absecon, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.3	3.0	1.9	2.2	3.0	1.8	3.0	2.5	1.9	2.0
Atlantic City, City of	2.7	2.9	2.2	3.0	2.2	2.7	2.2	2.7	2.7	3.0	N/A	2.2	3.2	2.2	3.0	3.1	1.9	2.0
Brigantine, City of	2.7	2.9	2.2	3.0	2.2	2.7	2.2	2.7	2.7	3.0	N/A	2.2	3.2	1.8	3.0	2.8	1.9	2.0
Buena, Borough of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	N/A	1.6	2.2	3.1	N/A	N/A	N/A	1.9	2.8
Buena Vista, Township of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	N/A	N/A	2.2	2.8	N/A	N/A	N/A	1.9	2.5
Corbin City, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	N/A	2.2	3.0	1.8	3.0	2.3	1.9	2.8
Egg Harbor City, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	3.0	1.6	2.2	3.0	1.8	2.8	N/A	1.9	2.8
Egg Harbor, Township of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	2.7	2.2	3.0	2.0	2.8	2.6	1.9	2.8
Estell Manor, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	1.9	2.2	3.0	1.8	2.8	2.1	1.9	2.8
Folsom, Borough of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	N/A	1.6	2.2	3.0	N/A	N/A	N/A	1.9	2.8
Galloway, Township of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	1.6	2.2	3.0	2.2	2.8	2.5	1.9	2.8
Hamilton, Township of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	3.0	2.4	2.2	3.0	1.5	2.8	N/A	1.9	2.8
Hammonton, Town of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	N/A	1.9	2.2	2.8	1.3	1.2	N/A	1.9	2.8
Linwood, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	1.9	2.2	3.0	2.0	3.0	2.8	1.9	2.0
Longport, Borough of	2.7	2.9	2.2	3.0	2.2	3.0	2.2	2.7	3.0	3.0	N/A	2.2	3.2	2.2	3.0	2.8	1.9	1.8
Margate City, City of	2.7	2.9	2.2	3.0	2.2	3.0	2.2	2.7	3.0	3.0	N/A	2.2	3.2	2.2	3.0	2.6	1.9	1.8
Mullica, Township of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	N/A	3.0	1.9	2.2	3.0	1.5	2.8	N/A	1.9	2.8
Northfield, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	N/A	2.2	3.0	2.1	2.8	N/A	1.9	2.0
Pleasantville, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	N/A	2.2	3.0	2.1	2.8	2.3	1.9	2.0

[3] N/A = The hazard was not identified as a significant hazard of concern for the jurisdiction because the footprint of the hazard area is entirely outside of the jurisdictional boundary, as detailed in the hazard profiles of Section 3A.
[4] Levee Failure: Atlantic County has no significant levees recorded, therefore PRI was not done for levee failure

Table 3e.3
PRI Results for Each Jurisdiction[3]

Jurisdiction	Atmospheric								Hydrologic								Geologic	Other
	Extreme Temperatures	Extreme Wind	Hail	Hurricane and Tropical Storm	Lightning	Nor' easter	Tornado	Winter Storm	Coastal Erosion	Sea Level Rise	Dam Failure[4]	Drought	Flood	Tsunami	Storm Surge	Wave Action	Earthquake	Wildfire
Port Republic, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	1.6	2.2	3.2	1.8	3.0	2.3	1.9	2.8
Somers Point, City of	2.7	2.9	2.2	3.0	2.2	2.4	2.2	2.7	2.9	3.0	N/A	2.2	3.0	2.3	3.0	2.6	1.9	1.8
Ventnor City, City of	2.7	2.9	2.2	3.0	2.2	2.7	2.2	2.7	2.7	3.0	#N/A	2.2	3.2	2.2	3.0	2.3	1.9	2.0
Weymouth, Township of	2.7	2.9	2.2	3.0	2.2	2.7	2.2	2.7	N/A	N/A	2.4	2.2	2.8	1.8	2.8	#N/A	1.9	2.8

Final Determinations

The conclusions drawn from the application of the PRI process for Atlantic County resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk and Low Risk. Hazards with a PRI of 3.0 or more were deemed "high risk"; hazards with a PRI between 2.4 and 2.9 were deemed "moderate risk"; and hazards with a PRI of 2.3 or less were deemed "low risk". For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout all of Atlantic County. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or unprecedented magnitudes is still possible in some cases and their assigned classification will continue to be evaluated during future plan updates. **Table 3e.4** presents conclusions on hazard risk for the County as a whole, based on the PRI scores for each hazard in the County. **Table 3e.5** presents an overview of the resultant hazard risk rankings for each jurisdiction. Detailed tables for each jurisdiction are included in **Appendix 3e.1**.

Table 3e.4
Hazard Risk Rankings for Atlantic County

HIGH RISK **PRI ≥ 3.0**	Hurricane and Tropical Storm Flooding Storm Surge Sea Level Rise
MODERATE RISK **2.4 ≤ PRI ≤ 2.9**	Extreme Temperatures Extreme Wind Nor'easter Tornado Winter Storm Coastal Erosion Wave Action Wildfire
LOW RISK **PRI ≤ 2.3**	Hail Lightning Dam Failure Drought Tsunami Earthquake

Table 3e.5
Hazard Risk Rankings for Each Jurisdiction

Jurisdiction	Atmospheric								Hydrologic								Geologic	Other
	Extreme Temperatures	Extreme Wind	Hail	Hurricane and Tropical Storm	Lightning	Nor' easter	Tornado	Winter Storm	Coastal Erosion	Sea Level Rise	Dam Failure	Drought	Flood	Tsunami	Storm Surge	Wave Action	Earthquake	Wildfire
ATLANTIC COUNTY	M	M	L	H	L	M	M	M	M	H	L	L	H	L	H	M	L	M
Absecon, City of	M	M	L	H	L	M	L	M	L	H	L	L	H	L	H	M	L	L
Atlantic City, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	H	H	L	L
Brigantine, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	H	M	L	L
Buena, Borough of	M	M	L	H	L	M	L	M	N/A	N/A	L	L	H	N/A	N/A	N/A	L	M
Buena Vista, Township of	M	M	L	H	L	M	L	M	N/A	N/A	N/A	L	M	N/A	N/A	N/A	L	M
Corbin City, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	H	L	L	M
Egg Harbor City, City of	M	M	L	H	L	M	L	M	N/A	H	L	L	H	L	M	N/A	L	M
Egg Harbor, Township of	M	M	L	H	L	M	L	M	M	H	M	L	H	L	M	M	L	M
Estell Manor, City of	M	M	L	H	L	M	L	M	M	H	L	L	H	L	M	L	L	M
Folsom, Borough of	M	M	L	H	L	M	L	M	N/A	N/A	L	L	H	N/A	N/A	N/A	L	M
Galloway, Township of	M	M	L	H	L	M	L	M	M	H	L	L	H	L	M	M	L	M
Hamilton, Township of	M	M	L	H	L	M	L	M	N/A	H	M	L	H	L	M	N/A	L	M
Hammonton, Town of	M	M	L	H	L	M	L	M	N/A	N/A	L	L	M	L	L	N/A	L	M
Linwood, City of	M	M	L	H	L	M	L	M	M	H	L	L	H	L	H	M	L	L
Longport, Borough of	M	M	L	H	L	H	L	M	H	H	N/A	L	H	L	H	M	L	L
Margate City, City of	M	M	L	H	L	H	L	M	H	H	N/A	L	H	L	H	M	L	L
Mullica, Township of	M	M	L	H	L	M	L	M	N/A	H	L	L	H	L	M	N/A	L	M
Northfield, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	M	N/A	L	L
Pleasantville, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	M	L	L	L
Port Republic, City of	M	M	L	H	L	M	L	M	M	H	L	L	H	L	H	L	L	M

Table 3e.5
Hazard Risk Rankings for Each Jurisdiction

Jurisdiction	Atmospheric								Hydrologic								Geologic	Other
	Extreme Temperatures	Extreme Wind	Hail	Hurricane and Tropical Storm	Lightning	Nor' easter	Tornado	Winter Storm	Coastal Erosion	Sea Level Rise	Dam Failure	Drought	Flood	Tsunami	Storm Surge	Wave Action	Earthquake	Wildfire
Somers Point, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	H	M	L	L
Ventnor City, City of	M	M	L	H	L	M	L	M	M	H	N/A	L	H	L	H	L	L	L
Weymouth, Township of	M	M	L	H	L	M	L	M	N/A	N/A	M	L	M	L	M	N/A	L	M

Key Risk Findings

Key Risk Findings are problem statements arising from the risk assessment by each participating jurisdiction. Each jurisdiction was encouraged to consider different types of mitigation actions for addressing their highest hazards and Key Risk Findings.

Key Risk Findings for Atlantic County (as determined by the Atlantic County JAT) are presented in **Table 3e.6**. Key Risk Findings reported by each individual jurisdiction are included in **Appendix 3e**.

Table 3e.6 Key Risk Findings for Atlantic County
The current configuration of the intersection and roadway allows for flooding on regular tidal events and during larger storms prevents evacuation of the Ventnor Heights and Chelsea Heights neighborhoods.
Pump station is critical in removal of flood water in the communities of Ventnor and Margate. Storm water system is antiquated and has produced multiple failures of the system resulting in flooded streets and residential/commercial properties in Ventnor and Margate and surrounding areas.
By ensuring that local plans incorporate natural disaster techniques the risks to people and property could be reduced from hazards such as hurricanes, tropical storms, flooding, storm surge, nor'easters, coastal erosion, etc. Hazard mitigation techniques in local comprehensive plans can provide improved life safety and protection of property in communities.
Prevent risks from increasing if local planning and zoning decisions are made without consideration of natural hazard and mitigation techniques.
Keeping new and updated development in line with the Hazard Mitigation Plan Strategies.
The general public's understanding of natural hazards and preparedness and mitigation possibilities could be improved. The planning area's overall level of disaster resistance would increase if a greater number of households had a thorough understanding of their risks and things they can do to reduce these risks.
Local codes & ordinances can be updated to address natural disaster mitigation techniques or, if already included, they can be re-evaluated to improve upon or expand the mitigation approach.
The community's overall level of disaster resistance would increase if hazard mitigation principles were more closely aligned with day-to-day operations and activities.

SECTION 4 - CAPABILITIES AND RESOURCES

Performing a Capability Assessment is one step of a FEMA-approved hazard mitigation plan update. A mitigation planning Capability Assessment consists of taking an in-depth look at community mechanisms (such as plans, codes, ordinances, staffing, etc.) that can affect hazard mitigation activities. Performing the Capability Assessment helps communities identify the regulatory, administrative, technical, and fiscal capacities and capabilities of their jurisdiction and consider ways that these tools can be used to further hazard mitigation and disaster resiliency goals.

Capability Assessments were undertaken by each participating jurisdiction as part of the development of the initial Hazard Mitigation Plan in 2010, and its first update in 2016. In both cases, the consultant (URS/AECOM) distributed worksheets[1] to the Atlantic County Office of Emergency Preparedness and the Core Planning Group members in order to document local assessments of capabilities. The worksheets requested information pertaining to existing plans, polices, and regulations that contribute to or conflict with the community's ability to implement hazard mitigation actions. They also requested information pertaining to the legal and regulatory capability, technical and administrative capacity, and fiscal capability of each jurisdiction. During the 2016 Plan Update, each JAT also provided an assessment of their overall legal and regulatory, technical and administrative, and fiscal capabilities; and then identified opportunities for bridging recognized gaps in capabilities to ensure that they are in line with jurisdictional mitigation actions and goals. All locally provided assessments were incorporated by the consultant into this section of the plan, and copies of local worksheets were provided in previous plan annexes.

This same process was used for the 2021 Plan Update Capability Assessment. Each JAT was asked to review their prior feedback from the 2016 Plan, and identify any changes that have occurred since that time. Each JAT either: (a) reviewed their prior feedback and certified that all information previously provided was still current and relevant, or (b) reviewed their prior feedback and provided markups to the consultant noting any changes in capabilities that have occurred during the most recent plan maintenance window since the prior update (2016 to 2021). Each jurisdiction documented the reassessment of their respective capabilities on Worksheet 4 – Capability Assessment Update. The consultant used worksheet responses to update this plan section to reflect each jurisdiction's assessment of their current capabilities. Capability assessment updates for each jurisdiction are included in **Section 9 – Jurisdictional Annexes**.

This section describes the activities currently reported to be underway which contribute to, or can be utilized for, hazard mitigation. This assessment of local jurisdictional capabilities also emphasizes various technical and financial resources available at the State and Federal levels, which can be accessed by plan participants in order to effectively implement their respective jurisdictional hazard mitigation programs.

[1] During the initial plan development process, URS distributed FEMA's Capability Assessment Worksheet to each jurisdiction ("Worksheet Job Aid #2: Local Hazard Mitigation Capabilities", as included in the FEMA How-To #3 *Developing the Mitigation Plan*, online at http://www.fema.gov/media-library-data/20130726-1521-20490-5373/howto3.pdf).

Capabilities and Resources – Atlantic County and Participating Jurisdictions

Legal and Regulatory Capabilities

Atlantic County and its incorporated jurisdictions have several policies, programs, and capabilities, which help to prevent and minimize future damages resulting from hazards **(Table 4.1)**[2]. These tools are valuable instruments in pre- and post-disaster mitigation as they facilitate the implementation of mitigation activities through the current legal and regulatory framework. The checkbox (■) indicates that the local government reported to have that particular code, ordinance, or plan in place as of 2021. In New Jersey, each community is required to enforce a building code and have a master plan and capital improvements plan.

Table 4.1 - Jurisdictional Legal and Regulatory Capabilities

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purposes Ordinance	Growth Management Ordinance	Site Plan Review Requirements	Comprehensive/Master Plan	Capital Improvements Plan	Economic Development Plan	Emergency Response Plan	Post-Disaster Recovery Plan	Post-Disaster Recovery Ordinance	Real Estate Disclosure Ordinance	Evacuation Plan	Overall legal and regulatory capability to implement hazard mitigation strategies*
Atlantic County			■			■	■	■	■	■	■	■		■	L
Absecon City of	■	■	■	■	■	■	■	■	■	■				■	H
Atlantic City, City of	■	■	■	■	■	■	■	■	■	■	■	■	■	■	H
Brigantine, City of	■	■	■	■	■	■	■	■	■	■	■		■		M
Buena Vista, Township of	■	■	■				■	■		■				■	M
Buena, Borough of	■	■	■			■	■	■	■	■	■			■	L
Corbin City, City of	■	■	■	■	■	■	■	■		■	■	■	■		L
Egg Harbor City, City of	■	■	■		■	■	■	■	■	■				■	M
Egg Harbor, Township of	■	■	■	■	■	■	■	■	■	■	■			■	H
Estell Manor, City of	■	■	■			■	■			■				■	M
Folsom, Borough of	■	■	■	■	■	■	■			■				■	L
Galloway, Township of	■	■	■	■	■	■	■	■	■	■					H
Hamilton, Township of	■	■	■	■	■	■	■	■	■	■				■	H
Hammonton, Town of	■	■	■	■	■	■	■	■	■	■	■		■	■	M
Linwood, City of	■	■	■	■		■	■	■		■		■		■	H
Longport, Borough of	■	■	■	■		■	■	■		■	■		■	■	H
Margate City, City of	■	■	■	■	■	■	■	■	■	■	■		■	■	H
Mullica, Township of	■	■	■	■	■	■	■	■	■	■	■			■	M
Northfield, City of	■	■	■	■		■	■	■	■	■				■	H
Pleasantville, City of	■	■	■	■		■	■	■	■	■				■	H

[2] A description of each legal and regulatory capability that was considered can be found in **Appendix 4.1**.

Table 4.1 - Jurisdictional Legal and Regulatory Capabilities

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purposes Ordinance	Growth Management Ordinance	Site Plan Review Requirements	Comprehensive/Master Plan	Capital Improvements Plan	Economic Development Plan	Emergency Response Plan	Post-Disaster Recovery Plan	Post-Disaster Recovery Ordinance	Real Estate Disclosure Ordinance	Evacuation Plan	Overall legal and regulatory capability to implement hazard mitigation strategies*
Port Republic, City of	■	■	■			■	■	■		■	■			■	M
Somers Point, City of	■	■	■	■	■	■	■	■	■	■					M
Ventnor City, City of	■	■	■	■	■	■	■	■	■	■	■	■		■	H
Weymouth, Township of	■	■	■			■	■	■	■	■				■	M

* H=High, M=Moderate, L=Low

Administrative and Technical Capabilities

The ability of a local government to develop and implement mitigation projects, policies, and programs is contingent upon its staff and resources. Administrative capability is determined by evaluating whether there are an adequate number of personnel to complete mitigation activities. Similarly, technical capability can be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in surveying and Geographic Information Systems.

Table 4.2 provides a summary of the administrative and technical capabilities currently in place in each participating jurisdiction as of 2021. The checkbox (■) indicates that the local government reported that they maintain a staff member with responsibility for the listed function.

Note: The following municipalities did not report having a Floodplain Manager in Worksheet 4, but did record the name of the Floodplain Manager for their municipality in Worksheet 2 (NFIP):

- *Estell Manor*
- *Northfield*
- *Pleasantville*

Table 4.2 - Administrative and Technical Capability Inventory

Jurisdiction	Planner(s) with knowledge of land development and management practices	Engineer(s) with knowledge of land development and management practices	Planner(s) or engineer(s) with knowledge of land development and management practices	Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Planner(s) or engineer(s) with an understanding of natural and/or human caused hazards	Floodplain manager	Surveyors	Staff with education or expertise to assess the community's vulnerability to hazards	Personnel skilled in GIS and/or HAZUS	Scientists familiar with the hazards of the community	Emergency Manager	Code Enforcement Official	Public Works or Highway Superintendent	Emergency Management Coordinator	Overall technical capability to implement hazard mitigation strategies*	Overall administrative capability to implement hazard mitigation strategies*
Atlantic, County of	■	■	■	■	■	■***	■	■	■	■***	■			■	H	M
Absecon**, City of	■	■	■	■	■	■	■	■	■	■	■	■	■	■	H	H
Atlantic City, City of	■	■	■	■	■	■		■	■		■	■		■	H	H
Brigantine, City of			■	■	■	■	■	■	■		■				M	M
Buena Vista, Township of			■	■	■	■					■				L	L
Buena, Borough of	■	■	■	■	■	■	■				■	■	■	■	L	L
Corbin City, City of	■	■	■	■	■	■	■	■	■		■	■		■	L	L
Egg Harbor City, City of	■	■	■	■	■	■		■	■		■	■	■	■	M	M
Egg Harbor, Township of	■	■	■	■	■	■	■	■	■	■	■	■	■	■	H	H
Estell Manor, City of		■	■	■	■		■				■	■	■	■	M	M
Folsom, Borough of	■	■	■	■	■	■		■	■		■	■	■	■	L	L
Galloway, Township of	■	■	■	■	■	■	■	■			■	■	■	■	H	H
Hamilton, Township of	■	■	■	■	■	■		■			■	■	■	■	H	H
Hammonton, Town of	■	■	■	■	■	■	■	■	■		■	■	■	■	H	M
Linwood, City of		■	■	■	■	■	■	■	■	■	■	■	■	■	H	H
Longport, Borough of	■	■	■	■	■	■	■	■	■		■	■	■	■	M/H	H
Margate City, City of	■	■	■	■	■	■	■	■	■	■	■	■	■	■	H	H
Mullica, Township of	■	■	■	■	■	■	■	■	■		■	■	■	■	M	M
Northfield, City of	■	■	■	■	■		■	■			■	■		■	M	L
Pleasantville, City of	■	■	■	■	■		■	■			■	■	■	■	H	H
Port Republic, City of	■	■	■	■	■	■	■	■	■		■	■	■	■	M	M
Somers Point, City of			■	■	■	■	■	■	■	■	■	■	■	■	M	M
Ventnor City, City of	■	■	■	■	■	■	■	■	■	■	■	■	■	■	H	H
Weymouth, Township of	■	■	■	■	■	■	■					■	■	■	M	M

* H=High, M=Moderate, L=Low

*** The County Department of Regional Planning has depth of staff in biologic and hydrologic sciences that perform a significant amount of work in conjunction with Engineering/Planning.

Fiscal Capabilities

The ability of a local government to implement mitigation activities is also associated with the funding available for policies and projects. Funding for such initiatives is often locally based revenue and financing, as well as outside grants. Costs associated with mitigation activities range from staffing and administrative costs to the actual cost of the mitigation project. **Table 4.3** provides a summary of the fiscal capabilities currently in place in each participating jurisdiction as of 2021. The checkbox (■) indicates that the financial resource was reported to be available in the local jurisdiction for mitigation purposes.

Table 4.3 - Jurisdictional Fiscal Capabilities

Jurisdiction	Community Development Block Grants (CDBG)	Capital Improvements Project Funding	Authority to Levy Taxes for Specific Purposes	Fees for Water, Sewer, Gas, or Electric Service	Impact Fees for Homebuyers or Developers for New Developments/Homes	Incur Debt through General Obligation Funds	Incur Debt through Special Tax and Revenue Bonds	Incur Debt through Private Activity Bonds	Withhold Spending in Hazard-Prone Areas	Other (i.e., coastal, sustainability, or climate change initiatives; or Brownfield funds)	Overall fiscal capability to implement hazard mitigation strategies*
Atlantic County	■	■	■	■		■	■		■		M
Absecon, City of	■	■	■	■		■	■		■	■	H
Atlantic City, City of	■	■	■	■	■	■	■	■		■	M
Brigantine, City of	■	■	■	■	■	■	■		■		M
Buena Vista, Township of	■	■	■			■	■				L
Buena, Borough of	■	■	■	■	■	■					L
Corbin City, City of	■	■	■	■	■	■	■	■	■	■	L
Egg Harbor City, City of	■	■	■	■		■			■		L
Egg Harbor, Township of	■	■	■	■		■	■			■	M
Estell Manor, City of	■	■									L
Folsom, Borough of	■	■	■			■					L
Galloway, Township of	■	■	■	■	■	■				■	H
Hamilton, Township of	■	■	■	■	■	■	■		■		H
Hammonton, Town of	■	■	■	■	■	■			■		M
Linwood, City of	■	■	■	■	■	■	■				H
Longport, Borough of	■	■	■	■	■	■	■				H
Margate City, City of	■	■	■	■		■				■	H
Mullica, Township of	■	■	■		■	■				■	M
Northfield, City of	■	■	■	■							M
Pleasantville, City of			■	■		■					L
Port Republic, City of	■	■	■			■	■				M
Somers Point, City of	■	■		■	■	■	■	■	■		M
Ventnor City, City of	■	■	■	■	■	■	■	■	■	■	M
Weymouth, Township of	■	■	■	■		■	■				M

* H=High, M=Moderate, L=Low

Conclusion

This capability assessment finds that Atlantic County and its participating jurisdictions which submitted completed capability assessment worksheets collectively have a significant level of legal, technical, and fiscal tools and resources necessary to implement hazard mitigation strategies. As shown in the preceding tables, legal and regulatory capabilities to implement hazard mitigation strategies were considered to be moderate to high in 20 of 24 jurisdictions. Similarly, technical capabilities were also considered to be moderate to high in 20 jurisdictions; and administrative capabilities were considered to be moderate to high in 19 jurisdictions. Fiscal capabilities to implement hazard mitigation strategies were considered to be moderate to high by fewer respondents (17 of 24 jurisdictions). Finally, 23 of 24 jurisdictions considered their political leadership's willingness to enact policies and programs that reduce hazard vulnerabilities as moderate or high - even if met with opposition. Each jurisdiction also considered ways of improving their capabilities to ensure that they are in-line with their mitigation actions and goals. Local responses are provided in **Table 4.4**. This table also shows that municipalities have identified opportunities to bridge recognized gaps in capabilities to ensure that they are in line with jurisdictional mitigation actions and goals.

Table 4.4 - Opportunities for Improving Local Capabilities						
Jurisdiction	Overall Legal & Regulatory Capability	Overall Technical Capability	Overall Fiscal Capability	Overall Admin Capability	Overall Level of Political Willingness	Locally identified opportunities to bridge recognized gaps in capabilities to ensure that they are in-line with jurisdictional mitigation actions and goals
Atlantic County	L	H	M	M	H	State regulatory structure (home rule), requires revision to empower counties to enact regional mitigation planning.
Absecon, City of	H	H	H	H	H	The City of Absecon aggressively pursues every avenue relevant to the safety of the citizenry and property especially in terms of potential flooding from either tidal or fresh water. In conversation with the NJ State Office of Emergency management, who met with our Mayor, it was deemed appropriate that our classification that was marked as "moderate" for the above categories should have been rated "high" through the efforts of our scrutiny of the potential flooding the outreach efforts not only in our own community but statewide.
Atlantic City, City of	H	H	M	H	H	The City of Atlantic City continues to pursue grant funding at the State and Federal level to implement hazard mitigation projects. Our ongoing partnerships with FEMA, Army Corps of Engineers, NJDEP and the County of Atlantic are vital to obtaining the funding and resources needed to implement our mitigation projects. The City of Atlantic City intends on bridging the gaps in our local capabilities by educating all the departments involved with pre and post disaster mitigation to ensure the goals and objectives of the hazard mitigation plan are met. This will include establishing points of contacts and liaisons that can coordinate between the different departments to ensure pre and post disaster mitigation procedures are completed properly and not duplicated.
Brigantine, City of	M	M	M	M	M	We have a good working relationship with all members of council, department heads and other NGO entities. As items arise (such as the need to raise the normal 1st floor elevation, all parties are brought into the discussion to forge the solution. If additional people (i.e.; divisions within the city), employees are given the task or a consultant is brought on board. PPI committee has enabled city officials as well as hired consultants to get real time information from the public. The learned information can then be applied to any ongoing projects
Buena Vista, Township of	M	L	L	L	H	Buena Vista Township is a small municipality with limited resources and limited development and economic growth due to Pineland Commission regulations. The Township has both volunteers and staff to complete tasks in order to follow the NFIP standards. On a regulatory basis, the Township is not active in floodplain management with ordinances exceeding minimum requirements. We rely heavily on financial assistance from outside agencies to implement hazard mitigation strategies and related capital improvement projects. The tax base suffers significantly when the Township is hit by a natural disaster.
Buena, Borough of	L	L	L	L	H	A collaborative approach when developing the updated hazard mitigation plan will be the primary method of identifying goals and bridging gaps within the town. Bringing all stakeholders together will allow for mutual conversation to occur.
Corbin City, City of	L	L	L	L	L	Will continue to monitor and work on beach stabilization.
Egg Harbor City, City of	M	M	L	M	M	Council is not usually afraid to enact policies they feel are in the best interest of the City even if residents voice opposition. City actively pursues grant funding for needed

Table 4.4 - Opportunities for Improving Local Capabilities						
Jurisdiction	Overall Legal & Regulatory Capability	Overall Technical Capability	Overall Fiscal Capability	Overall Admin Capability	Overall Level of Political Willingness	Locally identified opportunities to bridge recognized gaps in capabilities to ensure that they are in-line with jurisdictional mitigation actions and goals
						improvements since have limited budget.
Egg Harbor, Township of	H	H	M	H	H	Employing a Community Rating System for discount to flood insurance policies.
Estell Manor, City of	M	M	L	M	M	Specifically regarding the City of Estell Manor's ability to implement Hazard Mitigation, from the perspective of our fiscal capability, the city is a community with very limited ability to take in revenue. We rely on residential properties limited to develop ratables. Properties: our 54 SQ miles is 65% state-owned and we receive limited grant monies from this. We also are host to the county (Atlantic). This is a significant constraint from our fiscal ability to dedicate toward Hazard Mitigation impact areas identified above as moderate as well as many other areas of concern identified throughout all areas of the work sheets regarding Hazard Mitigation.
Folsom, Borough of	L	L	L	L	H	By including public works as well as ongoing public discussions we will be able to know of any existing and emerging hazards. Through ordinance and resolution and to bring in outside resources for technical capabilities.
Galloway, Township of	H	H	H	H	H	All capabilities deemed to be currently in-line with our mitigation actions and goals.
Hamilton, Township of	H	H	H	H	H	All capabilities deemed to be currently in-line with our mitigation actions and goals.
Hammonton, Town of	M	H	M	M	H	Inform M&C of identified possible gaps in capabilities; provide time for training in areas identified; inform staff of the County GIS assistance and capabilities; and work with professionals regarding areas of hazard.
Linwood, City of	H	H	H	H	H	Linwood is committed to complying with all FEMA flood requirements.
Longport, Borough of	H	M/H	M	H	H	Our flood hazard mitigation plan consists of seven priorities with 68 site-specific objectives. To date, 65% have been completed. We have done an outstanding job getting homes elevated and/or built higher and out of harm's way. We have completed some kind of initial projects incorporated. Beach side storm water outfall pipe extensions, rock revetment 22-17th or Atlantic Ave. Stormwater pump 33rd and Atlantic replacement bulkheads. Where we are currently lacking is protection and/or elevation of critical facilities – fire department and borough hall. Currently working on initial plans to elevate heating/mechanical equipment above 500 year level. Current goal to do a feasibility study for public works for their building/equipment/wells and pumping stations. But no money allocated to date for study. Any grants available? As noted above the majority of our previous "Hazard Mitigation Plan have been met. Over the past 5 years the utilities within Borough Hall and the Fire Department have been elevated to a 500 year level. We are currently looking at/planning for mitigating flood concerns at our other critical facilities, like the Public Works Complex. The Borough Engineer is working on short term-long term capital improvement projects for those facilities as well as nuisance flooding and hardening our infrastructure. THE PROBLEM – in order to accomplish our mitigation goals it will take millions of dollars

Table 4.4 - Opportunities for Improving Local Capabilities						
Jurisdiction	Overall Legal & Regulatory Capability	Overall Technical Capability	Overall Fiscal Capability	Overall Admin Capability	Overall Level of Political Willingness	Locally identified opportunities to bridge recognized gaps in capabilities to ensure that they are in-line with jurisdictional mitigation actions and goals
						that I do not think can be locally supported! We need to stay on top of and continue to apply for Federal Funding. *(See also the Longport Jurisdictional Annex for additional information provided on Worksheet 4)*
Margate City, City of	H	H	H	H	H	Leadership will act accordingly to prohibit negligent construction. Media such as websites, newspaper, tax bills, or water bill inserts. Community outreach lectures on flood warnings and proper flood construction methods.
Mullica, Township of	M	M	M	M	M	Additional public awareness education. Continue our outreach to members of town committee as well as members of the community. Their input will help guide us moving forward. Speak with public works Foreman as well as fire chiefs to ensure we are prepared for future events. I will also speak with my local township council in reference to allocating funds to continuing the funding of any of our mitigation plans.
Northfield, City of	H	M	M	L	H	None noted.
Pleasantville, City of	H	H	L	H	M	Have better communications with neighboring towns' floodplain teams and engineers. On state side, working to fix both sides of the street instead of just one side, for example accessibility easier to DEP and EPA, with FEMA being on same page.
Port Republic, City of	M	M	M	M	M	Opportunities that could bridge recognized gaps in capabilities to ensure that they are in-line with jurisdictional mitigation actions and goals include assessment of actions and goals on an ongoing basis in order to keep the hazard mitigation plan updated. This includes updating ordinances and plans as well as seeking grant funding.
Somers Point, City of	M	M	M	M	M	The City of Somers Point continues to evaluate mitigation actions for public facilities, fleets and equipment deemed necessary to build local resilience and recovery into the Municipal Budget on an annual basis. The City will continue to evaluate and update the City Code to ensure compliance with the latest FEMA flood requirements and best practices. The City will coordinate with neighboring communities and additional governmental entities in order assist with equipment sharing and mutual aid assistance to identify beneficial synergies that may exist.
Ventnor City, City of	H	H	M	H	H	Reaching out to County and State officials to remedy some community issues. Looking for grant money. Use tax money for hazard mitigation. Increase staffing to assist with outreach and mitigation.
Weymouth, Township of	M	M	M	M	H	Weymouth Township, although small, has a competent staff of professional Engineers, Planners and persons working in the Land Use area. As a Pinelands "No Growth" zone, in the major portion of the municipality, we have very little development and what development there is, is highly controlled by development ordinances and Pinelands restrictions

Capabilities and Resources – State of New Jersey

The 2019 State Plan includes an updated evaluation of the State's overall pre- and post-hazard mitigation policies, programs, and capabilities; the policies related to development in hazard prone areas; and the State's funding capabilities. The Atlantic County Multi-Jurisdictional Hazard Mitigation Plan incorporates many of the resources identified in the State Plan to demonstrate the capabilities present for local jurisdictions to consider in the development of local hazard mitigation. It provides an overview of these funding sources, potential availability, applicability of pre- or post- disaster requirements, and the type of funding that is available.

2019 State Plan Capability Assessment. New Jersey's state-level capabilities are summarized in the 2019 State Plan in Section 6.2 from page 6-5 to page 6-60. http://ready.nj.gov/mitigation/pdf/2019/mit2019_section6_Mitigation_Strategy.pdf
Please refer directly to the State Plan for more information, as the volume of even the summary table of these capabilities is too extensive to reproduce here.

This capability assessment finds that the State of New Jersey's various departments collectively have a significant level of legal, technical, and fiscal tools and resources necessary for implementation of State hazard mitigation strategies, and to support local municipalities in their mitigation endeavors as well.

Capabilities and Resources - Federal

At the Federal level, resources and capabilities to support hazard mitigation and mitigation planning are also quite extensive.

FEMA has developed a large number of documents that address implementing hazard mitigation at the local level. Key resource documents are briefly described here.

Local Mitigation Planning Handbook. This handbook is the official guide for local governments to develop, update and implement local mitigation plans. While federal requirements have not changed, the Handbook provides revised and expanded guidance, offering practical approaches, tools, worksheets and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook can be found on the FEMA web site at:
https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf

Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013. The purpose of this document is to provide a resource that communities can use to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters. The focus of this document is mitigation, which is action taken to reduce or eliminate long-term risk to hazards. Ideas for mitigation actions are presented for the following natural hazards: drought, earthquake, erosion, extreme temperatures, flood, hail,

landslide, lightning, sea level rise, severe wind, severe winter weather, storm surge, subsidence, tornado, tsunami, and wildfire. This resource can be found on the FEMA web site at:
https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf

Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials. The purpose of this document is to provide succinct and practical information to local government officials on how to best integrate hazard mitigation into the full range of community planning activities. It is intended for those who are engaged in any type of local planning, but primarily community planners and emergency managers that bear responsibility for hazard mitigation planning. This resource can be found on the FEMA web site at: https://www.fema.gov/media-collection/integrating-hazard-mitigation-local-planning-case-studies-and-tools-community

How-to Guides. FEMA has developed a series of nine "how-to guides" to assist States, communities, and tribes in enhancing their hazard mitigation planning capabilities. The first four guides mirror the four major phases of hazard mitigation planning used in the development of the Atlantic County Multi-Jurisdictional Hazard Mitigation Plan. The last five how-to guides address special topics that arise in hazard mitigation planning such as using benefit-cost analysis and integrating man-made hazards. The use of worksheets, checklists, and tables make these guides a practical source of guidance to address all stages of the hazard mitigation planning process. They also include special tips on meeting DMA 2000 requirements.

Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments. FEMA, DAP-12, September 1990. This handbook explains the basic concepts of hazard mitigation and shows State and local governments how they can develop and achieve mitigation goals within the context of FEMA's post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.

Mitigation Resources for Success CD. FEMA 372, September 2001. This CD contains a wealth of information about mitigation and is useful for State and local government planners and other stakeholders in the mitigation process. It provides mitigation case studies, success stories, information about Federal mitigation programs, suggestions for mitigation measures to homes and businesses, appropriate relevant mitigation publications, and contact information.

A Guide to Federal Aid in Disasters. FEMA 262, April 1995. When disasters exceed the capabilities of State and local governments, the President's disaster assistance program (administrated by FEMA) is the primary source of Federal assistance. This handbook discusses the procedures and process for obtaining this assistance and provides a brief overview of each program.

The Emergency Management Guide for Business and Industry. FEMA 141, October 1993. This guide provides a step-by-step approach to emergency management planning, response, and recovery. It also details a planning process that companies can follow to better prepare for a wide range of hazards and emergency events. This effort can enhance a company's

ability to recover from financial losses, loss of market share, damages to equipment, and product or business interruptions. This guide could be of great assistance to Atlantic County industries and businesses located in hazard prone areas.

Important Websites

The following are important websites that provide focused access to valuable planning resources for communities interested in sustainable development initiatives.

- **http://www.fema.gov** - Web site of the Federal Emergency Management Agency includes links to information, resources, and grants that communities can use in planning and implementation of sustainable measures. Most notably:
  - **https://www.fema.gov/grants/mitigation** To learn more about mitigation and how to make it work for you.
  - **https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf** For mitigation project ideas.
  - **https://www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning** For information about multi-hazard mitigation planning.
  - **http://www.region2coastal.com/** - For the latest information about flood risk in coastal New York and New Jersey.

- **https://www.fema.gov/flood-insurance** The official site of FEMA's National Flood Insurance Program (NFIP).

- **http://mitigationguide.org/** - "Beyond the Basics: Best Practices in Local Mitigation Planning", a website developed as part of a multi-year research study funded by the U.S. Department of Homeland Security, and led by the Center for Sustainable Community Design within the Institute for the Environment at the University of North Carolina at Chapel Hill.

- **http://www.planning.org** – Web site of the American Planning Association, a non-profit professional association that serves as a resource for planners, elected officials, and citizens concerned with planning and growth initiatives.
  - **https://www.planning.org/nationalcenters/hazards/** Includes information about hazard mitigation planning prepared by the association's Hazards Planning Research Center.

- **http://www.ibhs.org** – Web site of the Institute for Business and Home Safety, an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters. Online resources provide information on natural hazards, community land use, and ways you can protect your property from damage.

Federal Technical Assistance and Funding

The Federal government offers a wide range of funding and technical assistance programs that communities can access to assist in their long-term recovery. Some of these programs are geared to disaster preparedness and mitigation planning, while the focus of others is the

long-term vitality of the communities. **Table 4.5** presents a summary of Federal funding sources available for mitigation activities. Further information on these and other Federal programs can be found in the 2019 State Plan at http://ready.nj.gov/mitigation/2019-mitigation-plan.shtml and in the Assistance Listings online at https://sam.gov/content/assistance-listings (legacy CFDA.gov).

Table 4.5 - Federal Funds Available for Mitigation Activities

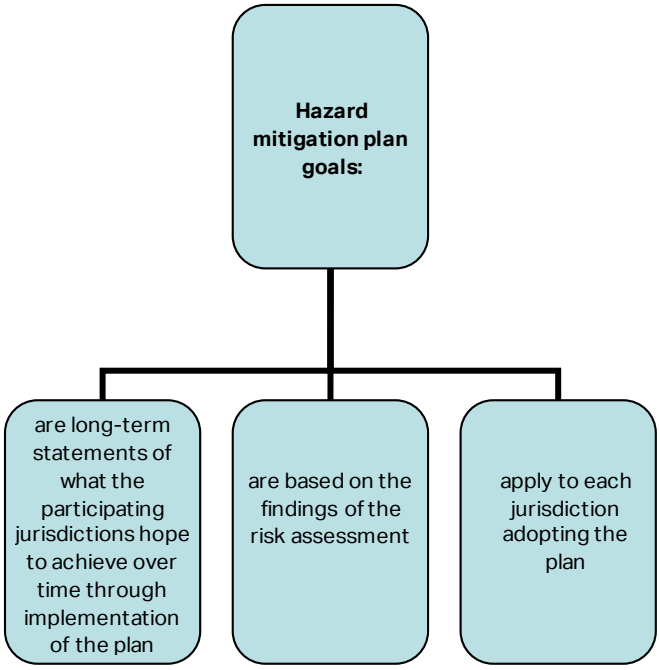
Funding Source	Description
Funding that Requires an Approved Hazard Mitigation Plan:	
Flood Mitigation Assistance Program (FMA)	*Availability*: Pre-disaster, annually *Description*: FMA provides funds for planning and projects to reduce or eliminate long-term risk of flood damage to repetitive loss (RL) properties and severe repetitive loss (SRL) properties, including residential and non-residential structures insured under the National Flood Insurance Program (NFIP).
Hazard Mitigation Grant Program (HMGP)	*Availability*: Post-Disaster; After FEMA disaster and emergency declarations *Description*: Following a Presidential major disaster declaration, the state receives 15% of the total federal share of the declared disaster damage amount to fund hazard mitigation plans and projects under the HMGP. HMGP funds projects in accordance with priorities identified in State, Tribal or local hazard mitigation plans, and enables mitigation measures to be implemented during the recovery from a disaster. The Federal government may fund up to 75 percent of total eligible project costs, with a 25 percent non-Federal match.
Pre-Disaster Mitigation Program (PDM)	*Availability*: Pre-disaster; annually *Description*: To provide funds to states, territories, Indian Tribal governments, and communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.
Building Resilient Infrastructure and Communities (BRIC)	*Availability*: Pre-disaster; annually *Description*: BRIC is a new (FY 2020) FEMA pre-disaster hazard mitigation program that replaces the existing Pre-Disaster Mitigation (PDM) program. BRIC will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience.
Public Assistance Program (PA) Mitigation	*Availability*: Post-Disaster; After FEMA disaster and emergency declarations *Description*: Section 406 of the Stafford Act, provides funding for mitigation measures in conjunction with the repair of disaster-damaged public facilities. This allows the opportunity to maximize recovery dollars by building back stronger and more resilient, thus reducing potential damage in the future.
Other Available Federal Funds for Mitigation Planning and Implementation:	
RiskMAP	*Availability*: Pre-disaster *Description*: FEMA's Risk Mapping, Assessment and Planning (RiskMAP) program provides high quality flood maps and information, tools to better assess the risk from flooding and planning and outreach support to communities to help them take action to reduce (or mitigate) flood risk. Each Risk MAP flood risk project is tailored to the needs of each community and may involve different products and services.

Table 4.5 - Federal Funds Available for Mitigation Activities	
Funding Source	**Description**
National Flood Insurance Program (NFIP)	*Availability*: Pre- or post-disaster *Description*: New York State Department of Environmental Conservation administers the National Flood Insurance Program (NFIP) within the State of New York. The office of the State NFIP Coordinator facilitates municipal participation in the NFIP; provides technical assistance, training and support to local Floodplain Administrators on the minimum NFIP design standards; and encourages participation in the Community Rating System (CRS) program.
FEMA Cooperating Federal Partners (CTP)	*Availability*: Pre-disaster *Description*: FEMA's Cooperating Technical Partnership (CTP) Program was created to partner with communities, state or regional agencies, universities or Tribal nations to enhance hazard data in the creation of Flood Insurance Rate Maps (FIRMs) and Digital FIRMs. DHSES intends to pursue this partnership in the future and enhance our awareness of and involvement in the RiskMAP process.
Fire Management Assistance Grant Program	*Availability*: Post-disaster *Description*: Assistance for the mitigation, management, and control of fires on publicly or privately-owned forests or grasslands, which threaten such destruction as would constitute a major disaster.
Community Development Block Grant (CDBG) and Community Development Block Grant – Disaster Recovery (CDBG-DR)	*Availability*: Pre- or post-disaster *Description*: Federal grant provided to CDBG "entitlement communities" (typically, municipalities with populations over 50,000 and urban counties with populations over 200,000) and to all states. The Community Development Block Grant (CDBG) and Community Development Block Grant- Disaster Recovery (CDBG-DR) funds are some of the limited number of federal grant funds that lose federal identity when it is allocated to the state and therefore can be used to assist with meeting the non-federal match for Hazard Mitigation Assistance (HMA) grant programs.
Reimbursement for Firefighting on Federal Property	*Availability*: Post-disaster *Description*: Provides reimbursement only for direct costs and losses over and above normal operating costs
National Dam Safety Program	*Availability*: Pre-disaster *Description*: The NDSP was formally established by the Water Resources and Development Act of 1996. Led by FEMA, the NDSP is a partnership of the states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety. Provides vital support for the improvement of the state dam safety programs that regulate most of the 79,500 dams in the United States.
Land and Water Conservation Fund (LWCF)	*Availability*: To States, local and conservation organizations *Description*: Funding for outdoor recreational development, renovation, land acquisition, and planning. The program is divided into two distinct funding pots: State grants, and Federal acquisition funds.

Table 4.5 - Federal Funds Available for Mitigation Activities	
Funding Source	**Description**
The Forest Legacy Program (FLP)	*Availability*: Participation in Forest Legacy is limited to private forest landowners. *Description*: Federal program in partnership with States, supports State efforts to protect environmentally sensitive forest lands. Designed to encourage the protection of privately-owned forest lands, FLP is an entirely voluntary program. To maximize the public benefits it achieves, the program focuses on the acquisition of partial interests in privately owned forest lands. FLP helps the States develop and carry out their forest conservation plans. It encourages and supports acquisition of conservation easements, legally binding agreements transferring a negotiated set of property rights from one party to another, without removing the property from private ownership. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values. To qualify, landowners are required to prepare a multiple resource management plan as part of the conservation easement acquisition. The federal government may fund up to 75 percent of project costs, with at least 25 percent coming from private, State or local sources. In addition to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use. In 2008, NJ has one project funded: Sparta Mountain South at $2,474,000.
Transportation Trust Fund (TTF)	*Availability*: Pre- and post-disaster *Description*: Grants are funded by the TTF through a competitive application-based process administered by the Local Aid District Offices. The County Aid Program is funded through the TTF and provides funding for eligible costs of projects included in the County's approved Annual Transportation Program. The program is intended for road and bridge infrastructure improvements under county jurisdiction. Each County receives an annual formula-based allotment that takes into consideration county road lane mileage and population.

SECTION 5 - MITIGATION GOALS

This section of the plan presents 2019 State Plan goals, and updated goals for this county-wide, multi-jurisdictional hazard mitigation plan.



New Jersey State Hazard Mitigation Plan Goals

As outlined in the New Jersey State Hazard Mitigation Plan (2019), the State's goals are:

1. Protect life
2. Protect property
3. Increase public preparedness and awareness
4. Develop and maintain and understanding of risks from natural hazards
5. Enhance State and local mitigation capabilities to reduce hazard vulnerabilities
6. Support continuity of operations pre-, during, and post- hazard events

To accomplish the State goals through the mitigation strategy, New Jersey has documented in Section 6 of the 2019 State Plan that it will use the following approach:

- Recognize flooding as the major disaster threat facing the State and use mitigation methods such as building elevation or land acquisition between a voluntary seller and a public agency as a means to accomplish all of the goals and objectives (with additional Repetitive Loss Strategy information discussed in Section 8 of the State Plan, and summarized at the end of this subsection).

- Another means of accomplishing the State goals is to offer assistance in the elevation of homes where or when acquisition is not an option.
- Work with county and municipal governments that have an approved local mitigation plan or plans that are nearing completion to develop sound and beneficial projects to alleviate the impacts of all-natural disasters, including but not limited to flooding.
- Cooperative focused efforts to address energy and retail fuel resiliency, and continuity of operations
- Coordinated funding efforts
- Incentivizing best practices through the creation and prioritization of mitigation actions

New Jersey Repetitive Loss Strategy: The State's strategy to reduce the number of repetitive loss and severe repetitive loss properties is documented in full in Section 8 of the 2019 State Plan. In summary, the State's strategy for mitigation Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties consists of the following objectives:

- Ensure that local jurisdictions with SRL properties take actions to reduce the number of these properties
- Include SRL in the description of process for providing funding and technical assistance to prepare mitigation plans
- Prioritize project grants for communities that have RL and SRL properties.

The 2019 State Plan lists the following six priorities to fund elevation and buyouts projects, and indicates that funding to mitigate SRL properties that are substantially damaged is the State's highest priority.

1. Substantially Damaged, Severe Repetitive Loss Properties (FEMA insured)
2. Substantially Damaged, Repetitive Loss Properties (FEMA insured)
3. Severe Repetitive Loss Properties (FEMA insured)
4. Repetitive Loss Properties (FEMA insured)
5. Substantially Damaged (FEMA insured)
6. Other Properties (Non FEMA Insured)

Atlantic County Multi-Jurisdictional Vision Statement and Goals

Vision Statement

Per FEMA guidance (386-1), a mission statement (vision statement) or guiding principle describes the overall duty and purpose of the planning process and serves to identify the principal message of the plan. Atlantic County did not opt to develop a formal vision statement as part of its 2016 Plan. However, the plan did include a general statement of the overall aim of the plan. As part of the 2022 Plan update, Atlantic County OEP opted to transform this overall aim statement into a formal vision statement. The draft plan section featuring the vision statement was made available to the CPG for review and comment via the

plan website on June 2, 2021. No comments were received suggesting revisions, hence the statement below represents the CPG's final vision statement for this 2022 Plan Update.

Atlantic County and its participating jurisdictions will continually aim to reduce deaths, injuries, and economic losses stemming from natural hazards, and to lead by example in fostering community resilience and protecting the environment in the face of future natural events to improve the lives of the people of the County.

Goals

Goals for the Atlantic County multi-jurisdictional hazard mitigation plan were developed by taking into consideration both state and jurisdictional goals for mitigation. The goals or actions in this County plan are in close alignment with the goals of the State Hazard Mitigation Plan. Since this plan's inception in 2010, Atlantic County's multi-jurisdictional hazard mitigation plan goals had been largely structured around specific hazard types. The previous goals (as presented in the original 2010 plan and the 2016 update) were as follows:

1. Promote disaster-resistant development.
2. Build and support local capacity to enable the public to prepare for, respond to, and recover from disasters.
3. Reduce the possibility of damage and losses due to flooding caused by floods, hurricanes and nor'easters (including storm surges).
4. Reduce the possibility of damage and losses due to earthquakes.
5. Reduce the possibility of damage and losses due to lightning strikes.
6. Reduce the possibility of damage and losses due to droughts.
7. Reduce the possibility of damage and losses due to coastal erosion and wave action.
8. Reduce the possibility of damage and losses due to dam failure.
9. Reduce the possibility of damage and losses due to wildfires.
10. Reduce the possibility of damage and losses due to winter storms.
11. Reduce the possibility of damage and losses due to extreme temperatures.
12. Reduce the possibility of damage and losses due to tornadoes and high winds caused by windstorms, hurricanes and nor'easters.
13. Reduce the possibility of damages to emergency and critical facilities from damage due to flooding, storm surge, wildfires, and extreme winds.

As part of the 2021 Plan update, and in consideration of the 2019 State Plan goals, the planning team reconsidered its 2016 Plan goals and opted to streamline them. Preliminary goal statements were developed by Atlantic County OEP (with consultant guidance) and the draft plan section featuring the streamlined goals was made available to the CPG for review and comment via the plan website on June 2, 2021. No comments were received suggesting further revisions, hence the list below represents the CPG's updated goals for this 2021 Plan Update.

1) **Increase Public Awareness**. Promote and sustain disaster resilient communities by increasing the awareness of hazard risks within the whole community (general public, County government, local governments, and key stakeholders), and how these risks can be mitigated.
2) **Improve Capabilities.** Enhance and support the capacity and capability of the County and its communities to prepare for, respond to, and recover from disasters and ensure continuity of operations.
3) **Protect Existing Assets.** Reduce the potential dangers and losses caused by hazards that pose a significant risk to Atlantic County through implementation of hazard mitigation initiatives that will protect people and property (structures, infrastructure, and critical facilities) in harm's way during future hazard events, with a particular focus on NFIP Repetitive Loss and Severe Repetitive Loss properties when possible.
4) **Promote Resilient New Development.** Promote mitigation actions and construction and design techniques that will minimize or eliminate potential impacts of natural hazards at sites where new development is taking place or where existing development is being expanded.

SECTION 6 – MITIGATION STRATEGIES

The Atlantic County mitigation strategy emerged as a result of the discussions held during plan update meetings, a review of the previously proposed hazard mitigation actions from the 2016 Plan, a review of existing resources and capabilities, and a review of the 2019 State Plan. This plan section presents the mitigation initiatives that have been identified to reduce or avoid long-term vulnerabilities to the County's most significant hazards and key risks.

Selection and Prioritization of Mitigation Actions

Atlantic County and each participating jurisdiction updated their respective 2016 Plan mitigation strategies using this four-step process: (1) Report on Progress of 2016 Plan Initiatives, (2) Identify Past Mitigation Accomplishments, (3) Develop an Updated Local Mitigation Strategy for the 2021 Plan, and (4) Prepare Action Worksheets for the Community's Projects. These steps are described further below.

1. **Report on Progress of 2016 Plan Initiatives**
   First, each jurisdiction assessed the progress of actions identified in the 2016 Plan. Team members described whether each project was completed, initiated but not completed, ongoing, or not initiated. Then, each action was either deemed to be still relevant for carrying forward to the updated 2021 mitigation strategy; or no longer relevant, and hence slated for omission from the updated 2021 mitigation strategy.

2. **Identify Past Mitigation Accomplishments**
   State and Federal agencies require the documentation of local mitigation efforts and accomplishments since the previous hazard mitigation plan was prepared, regardless of funding source and regardless of whether the project was included in the prior plan. They note that the goal of this requirement is to provide a context for each jurisdiction's projects, act as a source of ideas for mitigation projects, and evaluate the accuracy of assumptions and engineering solutions to inform future projects, and to support future mitigation planning and its coordination with other planning, zoning, and environmental procedures within the jurisdiction. Each jurisdiction highlighted its past mitigation accomplishments from the time the 2016 Plan was approved. Jurisdictions identified each project, the hazard(s) addressed, provided a brief summary of the original problem and the solution (project), project cost, level of protection, and damages avoided (and/or evidence of success).

3. **Develop an Updated Local Mitigation Strategy for the 2021 Plan**
   Next, each community developed a unique mitigation strategy to address their highest hazards and key risks, guided by the results of the updated risk assessment and FEMA's Mitigation Ideas document. This involved: carrying a subset of incomplete actions from the 2016 Plan, removing the actions from the 2016 Plan that were deemed to no longer be applicable, and adding other actions.

In consideration of how to mitigate key risk findings in each jurisdiction, a wide range of potential mitigation actions was considered by the County and each local JAT for each of the identified hazards.

Participating jurisdictions were advised to use FEMA's "*Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*" (January 2013) to inform this step of the process. **Table 6.1** presents a broad-brush summary of measures that are included in the "Mitigation Ideas" document. More detailed information for each type of opportunity can be found in the Mitigation Ideas document, online at: https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf Participating jurisdictions were provided with the full document at the outset of this second plan update.

Participants were also encouraged to use the "Mitigation Ideas" document as a springboard for brainstorming possible solutions, and not limit themselves to the scope of activity types covered in "Mitigation Ideas". Use of the "Mitigation Ideas" document as a starting point across jurisdictions ensured a comprehensive baseline minimum of potential measures considered.

Table 6.1 – Types of Mitigation Alternatives Considered

Coldwave/Heatwave	**Local Planning and Regulations**
	Reduce Urban Heat Island Effect
	Education and Awareness Programs
	Increase Awareness of Extreme Temperature Risk and Safety
	Assist Vulnerable Populations
	Educate Property Owners About Freezing Pipes
Hurricane/Tropical Storm Wind	**Local Planning and Regulations**
	Adopt and Enforce Building Codes
	Promote or Require Site and Building Design Standards to Minimize Wind Damage
	Assess Vulnerability to Severe Wind
	Protect Power Lines and Infrastructure
	Structure and Infrastructure Projects
	Retrofit Residential Buildings
	Retrofit Public Buildings and Critical Facilities
	Education and Awareness Programs
	Increase Severe Wind Risk Awareness

Table 6.1 – Types of Mitigation Alternatives Considered	
Hurricane/Tropical Storm Flood	**Local Planning and Regulations**
	Incorporate Flood Mitigation in Local Planning
	Form Partnerships to Support Floodplain Management
	Limit or Restrict Development in Floodplain Areas
	Adopt and Enforce Building Codes and Development Standards
	Improve Stormwater Management Planning
	Adopt Policies to Reduce Stormwater Runoff
	Improve Flood Risk Assessment
	Join or Improve Compliance with NFIP
	Manage the Floodplain Beyond Minimum Requirements
	Participate in the CRS
	Establish Local Funding Mechanisms for Flood Mitigation
	Structure and Infrastructure Projects
	Remove Existing Structures from Flood Hazard Areas
	Improve Stormwater Drainage System Capacity
	Conduct Regular Maintenance for Drainage Systems and Flood Control Structures
	Elevate or Retrofit Structures and Utilities
	Floodproof Residential and Non-Residential Structures
	Protect Infrastructure
	Protect Critical Facilities
	Construct Flood Control Measures
	Natural Systems Protection
	Protect and Restore Natural Flood Mitigation Features
	Preserve Floodplains as Open Space
	Increase Awareness of Flood Risk and Safety
	Education and Awareness Programs
	Educate Property Owners about Flood Mitigation Techniques
Lightning	**Structure and Infrastructure Projects**
	Protect Critical Facilities and Equipment
	Education and Awareness Programs
	Conduct Lightning Awareness Programs
Tornado	**Local Planning and Regulations**
	Encourage Construction of Safe Rooms
	Require Wind-Resistant Building Techniques
	Education and Awareness Programs
	Conduct Tornado Awareness Activities
Wind	**Local Planning and Regulations**
	Adopt and Enforce Building Codes
	Promote or Require Site and Building Design Standards to Minimize Wind Damage
	Assess Vulnerability to Severe Wind
	Protect Power Lines and Infrastructure
	Structure and Infrastructure Projects
	Retrofit Residential Buildings
	Retrofit Public Buildings and Critical Facilities
	Education and Awareness Programs
	Increase Severe Wind Risk Awareness
	Local Planning and Regulations

Table 6.1 – Types of Mitigation Alternatives Considered	
Winter Storm	Adopt and Enforce Building Codes
	Structure and Infrastructure Projects
	Protect Buildings and Infrastructure
	Protect Power Lines
	Reduce Impacts to Roadways
	Education and Awareness Programs
	Conduct Winter Weather Risk Awareness Activities
	Assist Vulnerable Populations
Drought	**Local Planning and Regulations**
	Assess Vulnerability to Drought Risk
	Monitor Drought Conditions
	Monitor Water Supply
	Plan for Drought
	Require Water Conservation During Drought Conditions
	Prevent Overgrazing
	Structure and Infrastructure Projects
	Retrofit Water Supply Systems
	Natural Systems Protection
	Enhance Landscaping and Design Measures
	Education and Awareness Programs
	Educate Residents on Water Saving Techniques
	Educate Farmers on Soil and Water Conservation Practices
	Purchase Crop Insurance
Flood	**Local Planning and Regulations**
	Incorporate Flood Mitigation in Local Planning
	Form Partnerships to Support Floodplain Management
	Limit or Restrict Development in Floodplain Areas
	Adopt and Enforce Building Codes and Development Standards
	Improve Stormwater Management Planning
	Adopt Policies to Reduce Stormwater Runoff
	Improve Flood Risk Assessment
	Join or Improve Compliance with NFIP
	Manage the Floodplain Beyond Minimum Requirements
	Participate in the CRS
	Establish Local Funding Mechanisms for Flood Mitigation
	Structure and Infrastructure Projects
	Remove Existing Structures from Flood Hazard Areas
	Improve Stormwater Drainage System Capacity
	Conduct Regular Maintenance for Drainage Systems and Flood Control Structures
	Elevate or Retrofit Structures and Utilities
	Floodproof Residential and Non-Residential Structures
	Protect Infrastructure
	Protect Critical Facilities
	Construct Flood Control Measures
	Dam Mitigation Measures
	Natural Systems Protection
	Protect and Restore Natural Flood Mitigation Features

Table 6.1 – Types of Mitigation Alternatives Considered	
Flood, continued	Preserve Floodplains as Open Space
	Education and Awareness Programs
	Increase Awareness of Flood Risk and Safety
	Educate Property Owners about Flood Mitigation Techniques
Earthquake	**Local Planning and Regulations**
	Adopt and Enforce Building Codes
	Incorporate Earthquake Mitigation into Local Planning
	Map and Assess Community Vulnerability to Seismic Hazards
	Conduct Inspections of Building Safety
	Structure and Infrastructure Projects
	Protect Critical Facilities and Infrastructure
	Implement Structural Mitigation Techniques
	Education and Awareness Programs
	Increase Earthquake Risk Awareness
	Conduct Outreach to Builders, Architects, Engineers, and Inspectors
	Provide Information on Structural and Non-Structural Retrofitting
Landslide	**Local Planning and Regulations**
	Map and Assess Vulnerability to Landslides
	Manage Development in Landslide Hazard Areas
	Structure and Infrastructure Projects
	Prevent Impacts to Roadways
	Remove Existing Buildings and infrastructure from Landslide Hazard Areas
Wildfire	**Local Planning and Regulations**
	Map and Assess Vulnerability to Wildfire
	Incorporate Wildfire Mitigation in the Comprehensive Plan
	Reduce Risk through Land Use Planning
	Develop a Wildland Urban Interface Code
	Require or Encourage Fire-Resistant Construction Techniques
	Structure and Infrastructure Projects
	Retrofit At-Risk Structures with ignition-Resistant Materials
	Create Defensible Space Around Structures and Infrastructure
	Conduct Maintenance to Reduce Risk
	Natural Systems Protection
	Implement a Fuels Management Program
	Education and Awareness Programs
	Participate in FireWise Program
	Increase Wildfire Risk Awareness
	Educate Property Owners about Wildfire Mitigation Techniques

Local mitigation strategies in this 2021 Plan Update include: (1) actions carried forward from the 2016 Plan, and (2) new actions added over the course of this first plan update. For each action, jurisdictions have laid out the initiative name, goals being met, hazard(s) to be mitigated, a description of the problem and proposed solution. They also have identified whether the project is related to critical facility, whether there are known environmental or historic preservation issues, provided an estimated timeline for completion, identified a local lead for project implementation, estimated costs and benefits, and identified potential funding sources. Project priorities were determined using a qualitative prioritization process. A higher priority was assigned to projects where: the life/safety risk of taking no action was deemed to be unacceptably high; the project addresses one of the community's highest hazards and/or key risks; benefits were projected to equal or exceed project costs; critical facilities or key local assets were being protected; funding and staff resources were deemed to be sufficient and/or accessible for project implementation; negative impacts were not anticipated on environmental and/or historic resources or any segment of the population; and/or where there was overall support for the project from the local community (government officials, public, and stakeholders).

4. **Prepare Action Worksheets for the Community's Projects**
   In accordance with the State Plan, each jurisdiction prepared a detailed Action Worksheet for each project in their mitigation strategy. Action Worksheets for carried forward projects were checked and updated as needed by each jurisdiction. Action Worksheets for deleted projects were deleted. New Action Worksheets were prepared for projects added during this second plan update process. For jurisdictions containing a Special Flood Hazard Area, at least one of these Action Worksheets has been prepared for a project that addresses flooding. Please refer to each Jurisdictional Annex for details.

Local Mitigation Strategies

Using this four-step process, the County and each participating jurisdiction developed an updated mitigation strategy for this 2021 HMP. The County and its consultant facilitated this process through a series of virtual working sessions held between the consultant and representatives of individual jurisdictions during the week of June 14-18, 2021. The consultant also provided support to individual municipalities in the development of their mitigation strategies and completion of the worksheets via numerous emails and telephone calls throughout the plan update timeline, but especially in the period from mid-August 2021 through mid-September 2021.

Communities that were not able to attend meetings or working sessions received meeting and support materials via ACOEP. This second update of the plan proposes the actions determined to be the most appropriate for the resources and capabilities of the County and each of the participating jurisdictions based on the experience of local officials, with input from the public and other stakeholders. The relatively large number of flood mitigation actions proposed in the local mitigation strategies reflects the fact that flooding as a generic event involving inundation by water from any source is perceived as the hazard of greatest concern in most communities.

The updated risk assessment indicates that the predominant source of flood damage in Atlantic County is coastal flooding, which for the purposes of the vulnerability assessment was considered to be equivalent to the stillwater component of storm surge flooding (i.e. without the damages associated with wave action) in HAZUS. Much of the significant flooding observed in Atlantic County occurs in back bay areas (both on the barrier islands and the mainland) away from the shorefront areas, and often takes the form of drainage systems backing up because their outlets have been blocked by inundation, so they may not always be perceived as directly storm-derived. However, these flood events may be attributable to storm surges in some form since they are caused by the effects of meteorological events of a wide range of magnitudes.

Also, it was emphasized in meetings and individual support sessions with CPG members that the 2019 State Plan Section 3.3 continues to make Severe Repetitive Loss (SRL) and Repetitive Loss (RL) properties the top priority for prioritizing mitigation actions at the state level.

Actions selected include activities to protect existing and future structures and infrastructure and enhance community resilience. Communities evaluated a range of mitigation actions to address their greatest vulnerabilities and key risk findings. Specific mitigation actions were less frequently considered for hazards that were not identified for a given community. "Lesser hazards" – those of least concern due to low average annual damages and/or risk findings where the identified risk was deemed to be acceptable – were typically addressed via less tangible measures, often via education and awareness programs.

Local mitigation strategies are summarized briefly in **Table 6.2** (for County projects) and **Table 6.3** (for municipal projects); they are presented in much greater detail in each Jurisdictional Annex. These tables present all new and previous municipal and County actions that are being carried forward into the next plan update cycle

Note: The Action Number in Table 6.3 may not be entirely sequential for all municipalities. Some municipalities chose to retire action numbers once they had been completed, considered no longer relevant, or otherwise not selected to be carried forward in the plan update, while some elected to reassign the numbers of dropped or completed actions to new actions.
Actions carried forward from the 2016 plan have the same action number as in the previous plan update unless otherwise noted in Tables 6.2 and 6.3.

Table 6.2 – Overview of Atlantic County Mitigation Strategy
Detailed information is provided in the Atlantic County Jurisdictional Annex

Action #	Project Description	Hazard(s) Addressed	Priority
1	Road elevations and bulkheading: intersection of Wellington Avenue (County Route 629) and Albany Avenue (US Route 40/322)	Flood, Hurricanes/Tropical Storms, Nor'easters	H
2	Improve stormwater pump facility (Ventnor Avenue (County Route 629), New Brunswick Avenue, and Winchester Avenue)	Flood, Hurricanes/Tropical Storms, Nor'easters	H
3	Public Awareness and Education	All	H
4	Review of local comprehensive plans for incorporation of disaster mitigation techniques	All	M
5	Workshops for municipalities regarding zoning and planning issues that arise regarding hazard mitigation	All	L
6	Integrate principles of hazard mitigation plan into local planning and regulations	All	H
7	Update and maintain ACOEP website	All	H
9	Review and update of local codes and ordinances to address hazards	All	M
10	Integrate hazard mitigation into development plans and strategies	All	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
Absecon, City of	1	Elevation of Shore Road and intersecting streets; storm sewer infrastructure to provide positive drainage for stormwater runoff; improved pedestrian and mass transit facilities	Flood	H
	2	Euclid Drive - Steel sheet piling; storm sewer infrastructure; timber ramps to provide access to various boating facilities; and roadway reconstruction.	Flood, Storm Surge	M
	3	Marlin Road, Showellton Avenue, and Ohio Avenue - Steel sheet piling; storm sewer infrastructure; timber ramps to provide access to various boating facilities; and roadway reconstruction.	Flood	M
	5	South Mill Road - Roadway elevation; storm sewer infrastructure to provide positive drainage for stormwater runoff; and roadway reconstruction.	Flood	M
	6	The Faunce Landing Pump Station, Drive-in Pump Station, Reeds Bay Pump Station, and Illinois Avenue Pump Station - New elevated wet well with site lighting, fencing, emergency generator, elevated access platform, and other required components.	Flood, Storm Surge	M
	7	Replace existing outfall pipe with new 6'x3' box culvert pipe on Berkley Avenue; construct new outfall to Absecon Creek on Euclid Drive; reconstruct roadways	Flood	M
	8	Hobart Avenue Drainage Improvements - Replace existing undersized outfall pipe with larger pipe within existing drainage easements and on Amy Lane, Shore Road (NJ Route 157) and Sooy's Lane; extend outfall and upgrade channel; reconstruct roadways. **(New)**	Flood	M
	9	Assist homeowners located on repetitive loss properties in applying for FEMA funding to elevate their existing dwellings above the design flood elevation. **(New)**	Flood	M
Atlantic City, City of	1	Install and maintain inlet grates that keep debris out of the drainage system **(New)**	Flood	H
	2	Baltic Avenue Drainage Improvement/Stormwater Project	Flood	H
	3	Boardwalk Hall Flood Control System	Flood	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	4	Installation of new bulkhead along Inside Thorofare from Albany Avenue to Jackson Avenue	Flood, Storm Surge	H
	5	Install new bulkheads, living shorelines, and pump stations in low lying areas	Flood, Storm Surge	H
	6	Continue to Update Codes	All	H
	7	Develop microgrids, backup electric, and telecommunications systems in critical facilities **(New)**	All	H
	8	Elevate Albany Avenue between Sunset Avenue and Ventnor Avenue **(Action 10 in 2016 Plan)**	Flood	H
	9	Elevate repetitive loss residential properties (**Action 8 in 2016 Plan**)	Flood	H
	10	Elevate Traffic Signal Control Boxes **(Action 9 in 2016 Plan)**	Flood, Coastal Erosion	H
	11	Install Emergency Communications Systems	All	H
	12	Install ten Emergency Generators at various locations	All	H
	13	Maintain the Floodplain Management Plan (**Action 13 in 2016 Plan)**	All	H
	14	Promote public education about hazards and the mitigation plan **(Action 13 in 2016 Plan)**	All	H
	15	Install new bulkheads along Sunset Avenue in Chelsea and Ducktown	Flood, Coastal Erosion	H
	16	Dry Flood Proof City Hall and the All Wars Memorial Building **(Action 7 in 2016 Plan)**	Flood	H
	17	Repair Bulkheads and Dredge Gardner's Basin Park **(New)**	Flood	H
	18	Inspect and Replace Check Valves along the bayfront **(New)**	Flood, Coastal Erosion	H
	19	Improve Community Rating System Designation **(New)**	Flood	H
Brigantine, City of	1	Periodic review of plans and codes, and changes **(Action 5 in 2016 Plan)**	All	H
	2	Targeted area for Blue Acres Acquisition primarily on Brigantine Avenue, Harbor Beach Boulevard and East Evans Avenue. **(New)**	Flood	H
	3	Maintain active training schedules for all relative officials **(Action 3 in 2016 Plan)**	All	H
	4	Continue to revise local codes that needed to be adjusted to mitigate potential damages and loss of life **(Action 4 in 2016 Plan)**	All	H
	5	Emergency Generator Installation-City Hall, South End Sewer Lift Station, Jenkins Parkway Sewer, Harbor Beach Boulevard Stormwater Lift Station, Public Works SCADA Control Center, 12th Street Stormwater Pumping Station. **(New)**	Flood	H
	6	Inspect all check valves and replace/repair as needed. **(New)**	Flood	H
	7	Utilize existing "reverse 911", Nixle service, social media accounts, local emergency AM radio system. Ensure local websites are up to date and information linked to AC Install City-Wide Warning System/Implement IPAWS notifications using cell towers OEM. Install remotely actuated road flood barrier warning system **(Action 7 in 2016 Plan)**	All	H
	8	Continue to revise the Floodplain Management Plan, Repetitive Loss Analysis, Natural Resources Plan, Watershed Management Plan, mapping elevation certificates, and other actions. **(New)**	All	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	9	Close bulkhead gaps; Elevate bulkheads (Public and Private) Poinsettia Way, Lilac Way, Golf Course, Pepper Cove, 13th Street North to 14th Street North, Bayside Gabion, 9th Street North to 5th Street North - Oceanside **(New)**	Flood	H
	10	Continue the apply for FEMA Funding to elevate homes. **(New)**	Flood	H
	11	Support floodproofing for commercial buildings in the Business District **(New)**	Flood	H
	12	Install and maintain inlet grate, debris collectors, and outlet structures. **(New)**	Flood	H
	13	Install and maintain inlet grate, debris collectors, and outlet structures. **(New)**	Flood	H
	14	Maintain golf course drainage area **(New)**	Flood	H
	15	Install City wide warning system and implement IPAWS notifications using cell towers. **(New)**	Flood	H
	16	Elevate evacuation routes **(New)**	Flood	H
	17	Elevate selected roads with drainage improvements - Brigantine Boulevard by Edgewater; Harbor Beach Boulevard; Sarazen Boulevard; Evans Boulevard; Lafayette Boulevard **(New)**	Flood	H
	18	Extend North End Seawall by 275 feet northward and to Bayside Create vehicle crossover; implement beachfill from 15th Street North to 4 WD entrance. **(New)**	Flood, Coastal Erosion	H
	19	Continue back passing operation for beach replenishment - North End **(New)**	Flood, Storm surge	H
	20	Complete drainage improvements and inlet installation (for example 32nd - 40th Street South). **(New)**	Flood	H
	21	Install flood wall at City dock (2519-2601 Bayshore Avenue) **(New)**	Flood	H
	22	Road Elevation/Berm Transformation - identify and construct streets that can also function as berms or floodwalls. **(New)**	Flood	H
	23	Real estate disclosure of hazards **(New)**	Flood	H
	24	Integrated flood hazard/sea level mapping **(New)**	Flood, Sea level rise, Storm surge	H
Buena Vista, Township of	1	Replace aging and collapsing existing failing stormwater piping and inlets	Flood	H
	2	Elevation of Pancoast Mill Rd and Dam bridge improvement.	Flood	H
	3	Alleviate flooding of Chestnut Ave via stormwater management.	Flood	H
	4	Alleviate flooding on Vine Rd via stormwater management and drainage.	Flood	H
	5	Review existing hazard mitigation plan and recurring situations within Buena Vista.	All	H
	6	Advocate for inclusion of Cranberry Run in flood zones	Flood, Hurricane/Tropical Storm, Nor'easter	M
	7	Install retention areas to limit flooding and risk to properties. Areas inclusive of, but not limited to, the Highland Avenue/Milmay area.	Flood, Hurricane/Tropical Storm, Nor'easter	H
	8	Retrograde/upgrade inadequate piping currently in place to handle projected flows inclusive of but not limited to the Collings Lakes area. Areas inclusive of, but not limited to, the Highland Avenue/Milmay area.	Flood, Hurricane/Tropical Storm, Nor'easter	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	9	Upgrade drainage systems. Actions that are inclusive of but not limiting to increasing capacity and culverts to limit ponding in the areas throughout the township.	Flood, Hurricane/Tropical Storm, Nor'easter	M
	10	Retrofit and upgrade the drainage system in the area of Cedar Gardens	Flood, Hurricane/Tropical Storm, Nor'easter	M
	11	Identify and retrofit shelters for vulnerable populations	Flood, Hurricane/Tropical Storm, Nor'easter	M
	12	Personnel to establish plans to educate community including use of PSAs, website, flyers, brochures, social media, etc. and enhance OEM deployment and community emergency preparedness capabilities.	All	H
	13	Retrofit or acquire/relocate to protect structures from future damage, with recurring loss and severe repetitive loss properties as a priority. 'Phase 1 - identify appropriate candidate properties and prioritize. Phase 2 - determine most cost effective mitigation option. Phase 3 - Work with the property owners to implement selected action based on available funding from FEMA and local match availability	Flood, Hurricane/Tropical Storm, Nor'easter	H
	14	Lake Ann Access Route / Firewise. Determine feasibility of restoring previous secondary access road or identify and create secondary access for at least emergent ingress/egress access. Participate in fire community efforts to reduce risk.	Flood, Hurricane/Tropical Storm, Nor'easter	H
Buena, Borough of	1	Install generator for Road Department Building to replace temporary generator currently being utilized. Road Dept trucks needed to maintain passable roadways during severe weather and storms for the public and emergency services. **(Action 2 in 2016 Plan)**	All	H
	2	Addition and installation of two, 20 kilo watt generators at pumping stations located within the Borough to prevent an interruption of the sanitation system and water supply to residents and businesses the Borough. **(Action 3 in 2016 Plan)**	All	H
	3	Purchase three mobile 20kW Towable Diesel Generators **(New)**	All	H
	4	Utilize existing Reverse 911 and Everbridge system through Gloucester County ERC as well as link Borough website to ACOEM. **(New)**	All	H
Corbin City, City of	1	Installing coir logs and sand to stabilize beach	Coastal Erosion	H
Egg Harbor, City of	1	Participation in County Plan Update	All	H
	2	Retrofit dam to prevent to prevent overtopping during a hazard event; retrofit retaining wall and spillway	Flood	H
	3	Increase carrying capacity of creeks	Flood	M
	4	Identify and prioritize with residents/business owners to trim trees and develop City-wide maintenance program. Acquire equipment and obtain training to allow City personnel to remove fallen tree.	Flood, Hurricane/Tropical Storm, Nor'easter	M
	5	Assess system and identify locations to upgrade City water & sewer mains	Drought, Earthquake	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	6	Prioritize and investigate options to mitigate vulnerable structures	Flood, Hurricane/Tropical Storm, Nor'easter, Winter Storm, Wildfire	H
	7	Develop and implement and enhanced all hazard, public outreach, education, and mitigation information plan. Prepare and distribute surveys, provide information in mailings, use various media to distribute information, and develop/maintain page on City website dedicated to hazard mitigation.	All	H
	9	Code update: Review existing local codes and ordinances against the identified hazards to determine whether there need to be any amendments to address identified hazards and, where a need is identified, modify/amend the codes/ordinances as applicable. (prevention)	All	H
	10	Code enforcement: Enforcement of State and Local Building Codes with Continual CEO training. (prevention)	All	H
	11	Ensure that local comprehensive plans incorporate natural disaster mitigation techniques through a courtesy review of draft plans by the County Planning Department	All	M
	12	Update information on the local web site regarding preparing for emergencies to incorporate profiled hazards not already discussed in these documents, and ensure that the information continues to be maintained on the web site. (public education)	All	H
	13	Hold periodic workshops for municipalities regarding zoning and planning issues that arise regarding natural hazards and hazard mitigation (prevention)	All	M
	14	Ensure that the principles of this hazard mitigation plan are integrated into the new and updated development plans/strategies. (prevention)	All	M
Egg Harbor, Township of	1	The use of the media and social media to educate the public on what mitigation is and the benefits.	All	H
	3	The reconstruction of damaged bulkheads in Seaview Harbor Area.	Flood	H
	4	Generators on the pumps on West Avenue and in Delilah Oaks would prevent flooding and property damage in severe weather.	Flood	H
	6	Upgrade the current diesel generator at the Police Department to a larger natural gas powered generator	All	H
	7	Purchase and installation of generators at #12, #13, #15, #20, #21, #28, #29, #32, #33, #34, #35, #38, #40, #43 provide for uninterrupted power to sewer pumping stations, avoiding sewer overflows that create a health, safety, and welfare issue	All	H
Estell Manor, City of	1	Install Dry Hydrants	Wildfire	H
	2	Drainage improvements - storm drains throughout the city	Flood	L
	3	Public Outreach	All	H
	5	State building codes - code enforcement **(Action 4 in 2016 Plan)**	All	M
	7	County website updates	All	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	8	Conduct workshops on hazards and hazard mitigation	All	L
	9	Add into master plan - information on hazards and hazard mitigation	All	H
Folsom, Township of	1	Drainage improvements - cleaning debris and upgrading systems. South River Dr. and Park Ave area and Collings Lakes area for town. (address to be identified in the future)	Flood	H
	2	Public awareness and education program. Put on local TV station, links on town website along with monthly announcements at town hall meetings. Share pertinent information on social media	All	H
	3	Review and update our local codes and ordinances. The committee along with planning and zoning board of adjustments review and bring back to council for approval and or changes.	All	M
	4	Review and enforce all plans and permits and codes. Protect existing development and future development	All	M
	6	Hold periodic workshops regarding zoning and planning issues that arise regarding natural hazards. Educate public and planning and zoning board members. Workshops for municipalities regarding planning and zoning. Committee reviews and brings to council for approval.	All	L
Galloway, Township of	1	Retrofit the Municipal Complex to withstand hurricane force winds by installing storm shutters and a vestibule that would sustain 120 mph winds.	Extreme Wind, Hurricane/Tropical storm, Nor'easter	H
	2	Protection of Fire stations Reducing damage to structures and infrastructure. Preventing the evacuation of firefighters during a natural disaster. The economic benefit is the continuation of emergency services during time of disaster.	Extreme Wind, Hurricane/Tropical storm, Nor'easter	H
	3	Investigate mitigation option for all repetitive loss properties **(new)**	Flood	M
Hamilton, Township of	1	Repair water level control system and maintenance of the dam structure (Lake Lenape Dam)	Flood, Hurricane/Tropical Storm, Nor'easter	H
	3	Replacement of the existing cedar shake roofing and siding on at least three campus buildings with flame resistant materials. (Atlantic County Community College)	Wildfire	M
	4	College staff at Atlantic County Community College will work with the NJ Forest Fire Service to manage understory vegetation and prevent the buildup of leaf litter in wooded areas proximate to campus facilities.	Wildfire	M
	5	Public works will conduct periodic inspection & maintenance of Township owned stormwater management basins to maintain function	Flood, Hurricane/Tropical Storm, Nor'easter	H
	6	Retrofit inlets and install piping to convey floodwater from this location to the Great Egg Harbor River below the Lake Lenape Dam	Flood, Hurricane/Tropical Storm, Nor'easter	M

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	7	Conduct a watershed study to determine the current and future stormwater entering the lake; conduct a capacity analysis of the ability of the dam to retain current & future stormwater flows; identify alternate pre-lake flood mitigation measures; and, implement a redesign of the dam to provide the capacity needed to retain the increased stormwater flow.	Flood, Hurricane/Tropical Storm, Nor'easter, Dam failure	H
	10	Relocate and harden the Masonic Pump Station.	Flood	H
	12	Install standby backup generators at each of the rural fire companies to power the wells.	All	M
	13	Public awareness program on Hazards, Prevention, and Mitigation: County will maintain a hazard mitigation and mitigation planning web presence (local municipal web sites to link up to this site, if they haven't already done so); all participating jurisdictions to support preparation of a joint annual hazard mitigation and mitigation planning fact sheet and its distribution; periodic discussion of hazard mitigation and the mitigation plan at other regular local meetings; use of annual flyers, newsletters, advertisements, or radio/tv announcements, etc. at the discretion of each jurisdiction (incorporating as much free information as possible from the FEMA Publications Warehouse and other appropriate sources). (public education)	All	H
	17	Update information on the local web site regarding preparing for emergencies to incorporate profiled hazards not already discussed in these documents, and ensure that the information continues to be maintained on the web site. (public education)	All	H
	18	Hold periodic workshops for municipalities regarding zoning and planning issues that arise regarding natural hazards and hazard mitigation.(prevention)	All	L
	19	Ensure that the principles of this hazard mitigation plan are integrated into the new and updated development plans/strategies. (prevention)	All	H
	20	Retrofit Town Hall to withstand hurricane force winds to provide shelter and maintain essential emergency services	Flood, Hurricane/Tropical storm, Nor'easter, Winter storm	M
	21	Construct an emergency spillway for the Lake Lenape dam	Flood, Hurricane/Tropical Storm, Nor'easter	M
Hammonton	1	Install power switches at local gas stations and in other locations to use a mobile generator to purchase fuel for response vehicles	All	H
	3	Retrofit locations (multiple locations) to accept mobile generators (generators under separate action worksheet	All	H
	4	Convert existing generator to use alternate fuel/ energy source	All	H
	6	Use Town CFMP & other means to remove trees that cause a hazard to power lines/ buildings & roadways	Extreme wind	H
	7	Identify flood prone properties in the A-Zone for reference and possible acquisition	Flood	H
	8	Complete conceptual design to provide flooding relief, Anderson Ave	Flood	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	9	Desilt, desnag stream corridors, replace damaged pipe, provide areas for stream water during heavy rain events	Flood	M-H
	CF-1	Clean/manage basins on evacuation route	Flood	H
	CF-3	Public awareness program	All	H
	CF-4	Send code enforcement officer to training to improve education	All	M
	CF-5	County review of Natural Disaster plans	All	M
	CF-6	Hold workshop to educate town staff/ volunteers	All	M
	CF-7	Integration of Hazard Mitigation Plans into development plans	All	H
Linwood, City of	1	Edgewood Avenue Drainage Improvements. Replace portions of storm drainage system with large capacity pipe and new storm drain inlets, and new head wall at the outfall at the end of Edgewood Ave.	Flood	H
	2	Lincoln Avenue Drainage Improvements. Replace portions of storm drainage system with large capacity pipe on the downstream portion of the system. Replace storm drain inlets and new headwall at the outfall.	Flood	H
	3	Several locations; Sea Garden Drive, Bloom Site, Fallingwater & Van Sant Ave, require construction of new head walls and installation of back flow prevention valves to prevent tidal waters from infiltrating the stormwater management system and retrofitting of the upstream stormwater inlets.	Flood	H
	4	West Ave Culvert replacement. West Ave bisects a section of coastal marshlands along Patcong Creek. The marsh is tidally influenced and tidal water passes beneath West Ave through two 24-inch pipes comprising the "culvert." The project would replace the culvert including pipes and headwalls with larger diameter pipes to allow tidal and primarily flood waters to recede a quicker rate.	Flood	M
	5	River Drive Reconstruction. Project involves elevating River Drive as well as a portion of Poplar Ave. Reconstruct four stormwater outfalls as well as their up-stream stormwater inlets. The outfall structures will be fitted with a backflow prevention valve to prevent tidal waters from infiltration.	Flood	M
	6	Raise sanitary sewer pump stations, or vulnerable components thereof, and install permanent back-up generators.	Flood, Storm surge, Hurricane/Tropical Storm, Nor'easter	M
Longport, Borough of	1	The Borough thru the CRS Director distributes Emergency Preparedness information to the public via Town Topics, Legion Phone Directory, Library & annual mail	All	H
	3	Preparedness & resiliency planning	All	H
	4	"Post Recovery Plan" should address all concerns with reconstruction within our community after a major event -	All	H
	5	Reverse 911 - warning banner on Boroughs Web Site & local TV, Facebook & twitter	All	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	7	Structural Flood Mitigation, Elevates RL, SRL, and properties below the BFE to a minimum of +2' above BFE	Flood	H
	8	Purchase a generator, install on mobile trailer, cross connections to feed existing generators in case of power failures	Flood	H
	12	Structural project - all utility lines going under ground	All	L
	14	Dunes installed to protect our community	Flooding	H
	15	Increase setbacks beach front properties	Flood, Wave action	L
	17	Annually review our codes to make sure they address the plan's goals & objectives	All	M
	18	Hire consultant to perform a feasibility study all critical facilities in order to determine best mitigation practices and/or reconstruct	Flood	H
	20	Elevate/Protect Critical Facilities	Flood	H
	22	Construct a new Public Works Complex to a 500 yr level	Flood	H
	24	Install flood vents, back fill basement and/or crawl space, elevate electric Borough Buildings **(New)**	Flood	H
	25	Plug open scuppers in bay side bulkheads and install Duck bills for approximately 10 storm drain outfalls **(New)**	Flood	H
	26	Install new bulkheads at street ends at higher level - approx. 15 **(New)**	Flood	H
	27	Install new bulkheads on bay front properties **(New)**	Flood	H
	28	Upgrade storm system/pumps in 6 areas of the Borough **(New)**	Flood	H
	29	Jetty/groin construction **(New)**	Coastal erosion, Wave action	H
Margate, City of	A-1	Targeted Open Space Acquisition including wetlands parcels owned by private parties. **(New)**	Flood	L
	A-2	Strengthen Floodplain Management Ordinance: Critical facilities standards, higher Freeboard **(New)**	Flood	M
	A-3	Future Conditions Standards for New Developments: adjust bulkhead ordinance to increase heights in vulnerable areas, freeboard, and other regulations to account for climate change. **(New)**	Sea level rise	M
	A-4	(From Capital Plan) Emergency Generator Installation- Bayshore Pump Station, Gladstone Water Tower Stormwater Pump Replacement **(New)**	Flood	M
	A-5	Check Valve Inspections/Replace **(New)**	Flood	M
	A-6	Draft a Capital Improvement Plan **(New)**	Flood	M
	A-7	Complete a Repetitive Loss Area Analysis and Green Infrastructure /Natural Resources Plan **(New)**	Flood	M
	A-8	Update land use and Margate Master Plan. **(New)**	All	M

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	A-9	(From Capital Plan) Locate the EOC and Communications Center on the 2nd floor of 9001 Winchester Avenue including dispatching, 911, etc. **(New)**	All	M
	A-10	(From Capital Plan) Secure additional GIS capabilities to add layers of information to evaluate flooding issues. **(New)**	Flood	M
	B-1	(From Capital Plan) Home Elevations- continue to apply for FEMA reimbursement grants and develop gap financing to support homeowners who have received grants **(New)**	Flood	H
	B-2	Close bulkhead gaps - Elevate bulkheads at various locations **(New)**	Flood	H
	B-3	Support floodproofing for commercial buildings in business districts **(New)**	Flood	M
	B-4	Amherst Avenue - Construct a new stormwater pump station with includes a concrete wet well, three submersible pumps, electric to the pumps, connection of existing piping, and installation of check valves. **(New)**	Flood	H
	B-5	Complete study to evaluate all Bay and Beach elevations and make recommendations for floodproofing (Action 3 in 2016 Plan) **(New)**	Flood	M
	B-6	Address flooding in Margate Business District	Flood	M
	B-7	Replace bulkheads at beach end of Jefferson and Frontenac Avenue **(Action 1 in 2016 Plan)**	Flood	M
	B-8	Replace bulkheads at Brunswick and Beach **(Action 2a in 2016 Plan)**	Flood	M
	B-9	(From Capital Plan) Improve School Fields to address flooding **(New)**	Flood	M
	B-10	(From Capital Plan) Decatur Playground Improvements **(New)**	Flood	M
	B-11	(From Capital Plan) Shelter Island Reclamation **(New)**	Flood	M
	B-12	(From Capital Plan) Back Bay Dredging – secure City-wide permit and complete phase 1 of the dredging project. **(New)**	Flood	M
	B-13	(From Capital Plan) Develop Plan for replacing bulkheads on private properties **(New)**	Flood	M
	B-14	(From Capital Plan) Dry Flood Proof City Hall heater room **(New)**	Flood	M
	B-15	(From Capital Plan) Public Works Property/Police Property Land Use Feasibility Study **(New)**	Flood	M
	B-16	(From Capital Plan) Implement Minnie Creek Drainage Recommendations **(New)**	Flood	M
	C-1	Establish a solar installation program including reintroducing solar at 9001 Winchester Avenue, Municipal Building **(New)**	Flood	M
	C-2	Establish a LED streetlight program including automated flashing flood zone signs during flood events. **(New)**	Flood	M
	D-1	Install City-Wide Warning System/Implement IPAWS notifications using cell towers **(New)**	All	M
	D-2	(From Capital Plan) Install remotely actuated Road Flood Barrier Warning System **(New)**	Flood	M
	D-3	Elevate Evacuation Routes **(New)**	Hurricane/Tropical storm	M
	E-1	Install flood wall at City dock (2519-2601 Bayshore Ave) **(New)**	Flood	H
	E-2	Road Elevations/Berm Transformation- identify and construct streets that can also function as berms or floodwalls **(New)**	Flood	L

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	E-3	Install and maintain inlet grates and debris collectors. Identify debris hotspots **(New)**	Flood	M
	E-4	Fire Station #2, Phase 2 garage space **(New)**	Wildfire	L
	E-5	Fire Hydrant Adapters **(New)**	Wildfire	L
	F-1	Require real estate disclosure of flood hazard **(New)**	Flood	M
	F-2	Elevation Certificates mapping **(New)**	Flood	M
	F-3	Integrated flood hazard/sea level rise mapping for Margate **(New)**	Flood	L
Mullica, Township of	1	Continue to make information easily accessible to residents at the municipal complex, on our website and hold periodic breakout sessions in areas of the township when the need arises.	All	H
	2	Acquisition of an attachment for a township owned front end loader that will enhance the ability to remove debris from a storm. The attachment is a grapple bucket that is able to move downed trees and large debris **(Action 3 on 2016 Plan)**	All	H
	3	Acquisition of 4 new tires for the compact utility vehicle capable of accessing unimproved and dirt roads, confined areas **(New)**	All	H
	4	Install 2 new headers and a pipe to help with water drainage on New Hampshire Ave. and 7th Ave. **(New)**	Flood	H
	5	Install 2 new drainage basins on Moss Mill Road and Darmstadt **(New)**	Flood	H
Northfield, City of	1	Hire an arborist(s) to assess tree health within the community and remove those at risk of falling due to disease or other factors to prevent the loss of power due to a tree (limbs) falling on power lines and creating additional hazards	Hurricane/tropical storm, Extreme wind, Lightning, Nor'easter, winter storm	H
	2	Evaluate, Design and Install an 50kW emergency power generator to provide 100% power generation at the Public Works facility in the event of a power failure.	Hurricane/tropical storm, Extreme wind, Lightning, Nor'easter, winter storm	H
	4	Seek out through various means (social media, senior citizens organizations, public presentations, Register Ready, Fire Department) the at-risk population for the City of Northfield	Hurricane/tropical storm, Extreme wind, Nor'easter, winter storm, Flood	H
	7	Purchase and installation of public warning siren/public address system.	Hurricane/tropical storm, Extreme wind, Nor'easter	L
	9	Construct EOC to local hurricane standards and state of the art technology	Severe Weather, High Winds, Lightning/Electrical Storms, Flooding, Multi-Hazard	M
	10	Identify and design improvements to existing storm drainage problem areas	Hurricane/tropical storm, Extreme wind, Nor'easter, winter storm, Flood	M

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	15	Equipping of a facility for emergency shelter capability	Hurricane/tropical storm, Extreme wind, Nor'easter, Lightning, winter storm, Flood	H
	16	Purchase and installation of mapping software (ArcViewer is free) with plotter to aid in future development and planning with regards to floodplains and other emergency preparedness activities	Hurricane/tropical storm, Extreme wind, Nor'easter, Lightning, winter storm, Flood	L
	17	Software acquisition – Reverse 911 mass notification system **(New)**	All	H
	18	Upgrading of existing infrastructure – old sewer lines **(New)**	Flood	H
	19	Upgrading of existing infrastructure – map storm sewer system **(New)**	Flood	H
	20	Installation of emergency backup generator for emergency shelter **(New)**	Hurricane/tropical storm, Nor'easter	H
Pleasantville, City of	1	Edgewater Avenue - install new culvert	Flood	M
	2	Park Avenue- install additional outfall	Flood	M
	3	City provides technical assistance to residents in their engagement in NFIP	Flood	H
	4	Continue to provide preparedness education and community outreach. The action will involve community focused meetings targeting the at risk areas, flood insurance, resiliency and actions that property owners can take to reduce damage.	All	H
	5	Continue to adopt higher standards, adopted state codes, and incorporate all flood standards on an ongoing basis.	All	M
	6	Continue to ensure that all buildings and structures are up to current code.	All	M
	7	Continue to ensure that local comprehensive plans incorporate natural disaster mitigation techniques and future planning recommendations.	All	M
	8	Continue to update information and monitor the City website to include updates and emergency preparedness information.	All	H
	9	Hold periodic workshops for municipalities through zoning/planning boards and town meetings.	All	L
	10	Make sure principles of this hazard mitigation plan are integrated into new and updated development plans.	All	H
	11	Develop specific mitigation solutions for flood prone roadways: Edgewater Avenue, Route 9 and Park Avenue, California Avenue and Main Street, Mulberry Avenue between Franklin Blvd and Main Street, Leeds avenue 200-300 block, Decatur Ave and Franklin Avenue, Franklin and Tunis Avenue, Bayview Ave and Edgley Avenue. Roads that need to be elevated per Atlantic County Flood Hazard Inventory include: E. Edgewater Avenue, E. Oakland Ave., E. Greenfield Avenue, E. Park avenue, S. Edgely Avenue, Prospect avenue, S. Main Street from E Bayview Ave to E. Greenfield Avenue	Flood	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	12	Installation of new emergency generators at pumping stations and the Recreation Center. New alert and warning system at two points in the city will be able to provide immediate notification of the citizens of upcoming events.	Flood	H
	13	Bulkhead replacement along Lakes Bay and Tunis Basin to protect existing homes and infrastructure. **(New)**	Flood	H
	14	Continue the purchase of low lying areas using Blue Acres Funds**. (New)**	Flood	H
	15	Continue to the apply for FEMA Funding to elevate homes. **(New)**	Flood	H
Port Republic, City of	1	Slope Protection at Mill Pond	Hurricane/tropical storm, Coastal erosion, Flood	H
	4	Upgrade drainage by increasing the flow of capacity along areas that are inclusive of but not limited to Clarks Mill Stream and Moss Mill Stream drainage areas; may include increasing culvert sizes.	Hurricane/tropical storm, Coastal erosion, Flood	H
	5	Implement protective measures for stone slope protection to prevent erosion along the east bank of Nacote Creek.	Hurricane/tropical storm, Coastal erosion, Flood	H
	6	Update Mill Street Dam with automatic spillway	Hurricane/tropical storm, Coastal erosion, Flood	H
	7	Fully participate in future 5-year updates of the Atlantic County Multi-Jurisdictional Hazard Mitigation Plan.	All	H
	8	Work together with the County, State and local agencies to develop and implement an enhanced all hazard, public outreach, education, and mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. Prepare and distribute surveys, provide information in mailings, use various media to distribute information, and develop/maintain page on City website dedicated to hazard mitigation.	All	H
	10	The proposed action is to: (1) analyze the relevant issues as well as funding options to provide protection to natural areas like the Mullica River and Nacote Creek to the maximum extent possible, and (2) implement prioritized actions as funding becomes available.	Hurricane/tropical storm, Coastal erosion, Flood	H
Somers Point	1	Construct living shorelines to protect against flooding and wave action along Bay Avenue, Somers Point-Mays Landing Road and properties adjacent to the Parkway **(New)**	Hurricane/tropical storm, Nor'easter, Flood, Wave action	H
	2	Raise the height of existing bulkheads along Bay Avenue to protect from wave action and flooding **(Action 8 in 2016 Plan)**	Hurricane/tropical storm, Nor'easter, Flood, Wave action	M
	3	Inspect all check valves and replace/repair as needed. **(Action 9 in 2016 Plan)**	Flood, Storm surge	H
	4	Install and maintain inlet grate, debris collectors, and outlet structures (check valves). **(New, includes elements of prior actions)**	Flood	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	5	Install School House Pump Station; Yale Boulevard Pump Station and Generator; Gulph Mills Pump Station and Generator; upgrade/retrofit undersized stormwater systems on Atlantic Avenue from Groveland to Wilmont, Bethel Road/Route 9 intersection, Jordon Road, Defeo Lane, Osborne Road, Princeton Road, Haddon Road, and Amber Road then parallel along Dartmouth Road and perpendicular across Exton Road; an area that runs perpendicular through Woodland Avenue across the block and across Somers Point Mays Landing Road to a small section behind Broadway Avenue that floods due to tidal and rainwater drainage issues; Address flooding that occurs along Bucknell Road North and around the block to Bucknell Road South due to tidal issues; Address flooding that occurs along Amber Road from Yale Boulevard to Bala Drive due to tidal issues; Address flooding that occurs along Exton Road from Cornell Road to Bala Dive due to tidal issues; Address pipe that runs perpendicular through Wisteria Walk across Laurel Drive that floods due to tidal and rainwater that cannot drain; Address a section of Somers Point Mays Landing Road that runs along the marsh and Patcong Creek that floods the intersection of Horter Avenue to Cliveden Avenue and Woodlawn Avenue and beyond to the bridge to Egg Harbor Township. **(New, includes elements of prior actions)**	Flood	H
	6	Acquisition of three properties on Jordon Road, Block 1129, Lots 24 and 25; Block 1127, Lot 9 **(Action 6 in 2016 Plan)**	Flood, Storm surge	H
	7	Maintain active training schedules for all relevant officials **(New)**	Extreme wind, Flood	H
	8	Require real estate disclosure of flood hazards **(New)**	Flood	H
	9	Continue to apply for FEMA Funding to elevate homes. **(New)**	Flood	H
	10	Continue to revise the Floodplain Management Plan, Repetitive Loss Analysis, Natural Resources Plan, Watershed Management Plan, mapping elevation certificates, and implement all hazards education/outreach programs.**(New, elements of prior actions)**	All	H
	11	Utilize existing "reverse 911", Nixle service, social media accounts, local emergency AM radio system. Ensure local websites are up to date and information linked to AC Install City-Wide Warning System/Implement IPAWS notifications using cell towers OEM. Install remotely actuated road flood barrier warning system **(New)**	All	H
	12	Revised Flood Prevention codes, construction codes and planning guidance **(New)**	Flood	H
Ventnor, City of	1	New bulkheading along Winchester Avenue from Jackson to Dorset **(Action 2 in 2016 Plan)**	Hurricane/tropical storm, Nor'easter, Flood, Coastal erosion, Storm surge, Wave action	H
	2	Elevate Wellington Avenue so that initial flooding will not wash out evacuation road. **(Action 4 in 2016 Plan)**	Hurricane/tropical storm, Nor'easter, Flood, Coastal erosion, Storm surge	H
	3	Code enforcement: Enforcement of State and Local Building Codes with Continual CEO training. (prevention) **(Action 5 in 2016 Plan)**	All	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

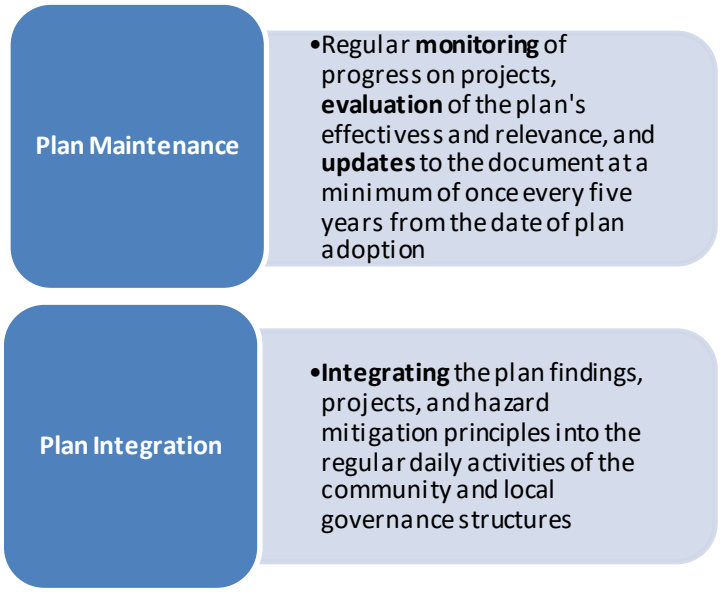
Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
	4	Work with city and planning board engineer along with city solicitor to ensure building codes meet state requirements **(Action 6 in 2016 Plan)**	All	H
	5	Distribution of flyers, posting information on web-site, newsletter and Facebook page. Public awareness program on Hazards, Prevention, and Mitigation: County will maintain a hazard mitigation and mitigation planning web presence (local municipal web sites to link up to this site, if they haven't already done so); all participating jurisdictions to support preparation of a joint annual hazard mitigation and mitigation planning fact sheet and its distribution; periodic discussion of hazard mitigation and the mitigation plan at other regular local meetings; use of annual flyers, newsletters, advertisements, or radio/tv announcements, etc. at the discretion of each jurisdiction (incorporating as much free information as possible from the FEMA Publications Warehouse and other appropriate sources). **(Action 7 in 2016 Plan)**	All	H
	6	Installation of storm water pumping stations for flood mitigation at Freemont & Little Rock Avenues and at Derby & Marshall Avenues **(Action 8 in 2016 Plan)**	Hurricane/tropical storm, Nor'easter, Flood, Storm surge	H
	7	Installation of backup power generators at following pump stations: Lafayette Ave, City Yard (Cornwall Ave), Fulton & Harvard Avenues, and Freemont & Little Rock. **(Action 9 in 2016 Plan)**	All	H
	8	Installation of city wide warning system for notification of residents and visitors **(Action 12 in 2016 Plan)**	All	H
	9	Elevate & recondition pump stations at Lafayette Ave, Fulton & Harvard, City Yard (Cornwall) **(Action 10 in 2016 Plan)**	Hurricane/tropical storm, Nor'easter, Flood, Storm surge	H
	10	The City has received a FEMA scoping grant which will fund the evaluation of the Ventnor Heights area and make recommendations for improvements. **(New)**	Hurricane/tropical storm, Nor'easter, Flood, Storm surge	H
	11	Inspect all check valves and replace/repair as needed. Existing structures **(New)**	Flood, Storm Surge	H
	12	Continue to revise the Floodplain Management Plan, Repetitive Loss Analysis, Natural Resources Plan, Watershed Management Plan, mapping elevation certificates, and other actions. **(New)**	Flood	H
	13	Close bulkhead gaps; Elevate bulkheads (Public and Private) Newport, Portland, Edgewater, evaluate piping system for the Ventnor Gardens Pump Station. **(New)**	Flood	H
	14	Continue to apply for FEMA Funding to elevate homes**. (New)**	Flood	H
	15	Contribute documentation for and work with the US Army Corps of Engineers New Jersey Back Bays Coastal Storm Risk Management Study. As the project progresses, Somers Point will adjust its mitigation activities considering more comprehensive improvements planned by the Army Corps**. (New)**	Flood, Storm surge	H

Table 6.3 – Overview of Municipal Mitigation Strategies
Detailed information is provided in each Jurisdictional Annex.

Jurisdiction	Action #	Project Description	Hazard(s) Addressed	Priority
Weymouth, Township of	1	1. The Township will enlist the help of the State Forest Fire Service which has available information on Wildfires to provide presentations at local campgrounds and the local elementary school. 2. The Township will print and distribute existing available information in regard to Wildfires and Fire Prevention in general.	Wildfire	H
	2	Public Works Employees will be educated regarding trees , e.g. types of trees for specific needs, diseases, etc. Information made availed to Public through web site and links to Rutgers Extension Service, etc.. Tag trees in public areas with numbers and maintain an inventory.	Winter storms	M
	3	Assess scope of project over three municipalities, including County roadways, investigate funding sources, obtain easements, then clear existing drainage ditches.	Flood	M
	4	Municipality must look for venues to advertise information available on the County web site. Flyers and printable information should be distributed with the local newsletter and through other municipal mailings. All Township meetings of Boards, Commissions / Authorities should be used to discuss mitigation possibilities.	All	H
	5	Municipality's land use boards and Environmental Commission must review all ordinances and codes in light of mitigating hazards.	All	M
	6	Review all development plans and investigate all development complaints.	All	M
	7	Ensure that the principles of this hazard mitigation plan are integrated into the new and updated development plans/strategies through a courtesy review of draft plans by the County Planning Department.	All	M
	8	Provide all emergency preparedness update information to the ACOEP to ensure that the most current and accurate information is available to the public on the County web site.	All	H
	9	Remain in contact with the County to ensure educational workshops offered through the County to the municipality on zoning and planning issues are timely and well attended.	All	L
	10	Share the hazard mitigation plan with all members of the Planning and Zoning boards as well as their professional staff to keep the principles of the plan at the forefront of all planning and development issues.	All	H
	11	Extend water and sewerage hookup availability to homes on Lowell Street and Riverside Drive in Belcoville area of Weymouth Township	Flood	M
	12	Build levee or berm to check extreme high tide flooding	Flood, Storm Surge	M

SECTION 7 - PLAN MAINTENANCE AND INTEGRATION

A formal plan maintenance process for monitoring, evaluating, and updating the Hazard Mitigation Plan must take place to ensure that the Plan – the hazard information within it, most importantly, the mitigation strategy - remains current and relevant. Updates are required every five years from the date the plan is approved[1]. Regularly scheduled evaluations during each five-year cycle are important to assess the effectiveness of the program and to reflect changes that may affect mitigation priorities. Additionally, each plan development, maintenance and update cycle involves outreach to the public and other stakeholders; and each version of the document itself sets forth a public and stakeholder engagement process for the upcoming five-year cycle to be undertaken to keep the public engaged throughout the plan's ongoing implementation.



As part of this second plan update, the Atlantic County OEP and the County JAT have reviewed the plan maintenance and integration procedures set forth in the 2016 plan, as well as new recommendations provided in the 2019 State Plan, and have generally opted to pursue a similar strategy for the next five years (2022 to 2027), as the previous strategy directly aligned (and in some cases, was identical to) the 2019 State Plan; however, it is noted that some revisions have been made to account for expressed County and municipal preferences, and agency recommendations.

As with the two prior versions of this plan (2010 and 2016), the Atlantic County OEP will continue to take the lead role in coordinating the overall multi-jurisdictional plan maintenance effort, with ongoing support from the County JAT members. Mr. Vincent Jones, Director, who has served as coordinator for this second plan update, will oversee the overall plan maintenance process with support from Ms. Karen Koptic, Operations and Training Officer, who served as deputy

[1] After FEMA completes its plan review and determines that all requirements have been adequately addressed, it issues a determination of "Approvable Pending Adoption". Participating jurisdictions then each move forward with formally adopting the plan. For multi-jurisdictional plans, FEMA considers the plan approval date to be the date of the first jurisdictional adoption.

coordinator for this plan update[2]. Each CPG member will, in turn, take the lead role for plan maintenance and integration activities for their respective jurisdictions[3].

Please refer to Jurisdictional Annexes as directed throughout the balance of this plan section for further details.

Additionally, please note: As part of this second plan update, the contents of this section have been updated based on a review of the 2019 State Plan Section 3 and a coordination call between Atlantic County OEP and the consultant on June 3, 2021, with subsequent follow-up email coordination as needed to ensure that the text reflects progress on activities since last approval in 2016, and the County's desired approach for the upcoming 5-year plan maintenance cycle (2022 to 2027).

Monitoring the Plan

An important step in any mitigation planning process is to document the method by which the CPG will monitor the plan's implementation throughout the five-year plan maintenance cycle (post-adoption). The lead entity in each jurisdiction coordinates with other departments/agencies responsible for implementing hazard mitigation actions identified in the plan in order to maximize the opportunities to implement actions, track progress of actions, identify and address any barriers to implementation of the actions, and to take advantage of grant funding opportunities. Monitoring the plan, therefore, becomes part of the regular function of the office and position to which it is assigned.

Past Progress (2016 to 2021)

The 2016 Plan was approved by FEMA and adopted in March 2016; therefore, Annual Work Progress Monitoring Reports[4] were targeted for jurisdictional completion and submittal to Atlantic County OEP in March of each year thereafter. The bullets below summarize plan monitoring activities that have occurred since the initial plan's adoption in 2010.

Since 2016, each of the jurisdictions has taken strides toward implementing their hazard mitigation initiatives. Municipal Emergency Manager meetings are held bi-monthly. At each meeting a roundtable is initiated for the municipalities to discuss updates and progress. Annual project tracking and monitoring activities on the Annual Work Progress Monitoring Reports have continued to be hampered by a lack of funds and lack of (and/or turnover of) staff at both the county and municipal levels. Atlantic County OEP did not receive Annual Work Progress Monitoring Reports during Cycle 2 (2016 to 2021) . Hurricane Sandy recovery activities continue to require dedication of what are limited staff resources for ongoing aspects of the recovery phase.

2 Mr. Jones and Ms. Koptic have replaced the previous plan leads, Mr. Edward Conover and Mr. Don Weger, who are no longer employed by Atlantic County OEP but who lead the plan during its initial preparation and first update.

[3] In completing the Statement of Authority to Participate (discussed in Section 1), each jurisdiction designated a primary CPG representative as well as an alternate. For plan maintenance purposes, it is the position title of the person designated as the 'primary representative' who is responsible for shepherding plan maintenance activities.

[4] As of the 2022 Plan update, these are now call "Annual Project Progress Reports"; however, despite the name change, content is the same.

- 2011 – Project progress was discussed at bi-monthly Emergency Management Coordinators Meetings.
- 2012 – Project progress was discussed at bi-monthly Emergency Management Coordinators Meetings. Progress reports were submitted to Atlantic County OEP by Atlantic City in October 2012.
- 2013 – Project progress was discussed at bi-monthly Emergency Management Coordinators Meetings. Progress reports were submitted to Atlantic County OEP by Pleasantville in January 2013 and by Atlantic City in February 2013.
- 2014 to 2015- As part of the first hazard mitigation plan update, project progress was tracked via Worksheet #5, for all progress made on mitigation projects over the whole of the first planning cycle. Detailed tracking is provided in each jurisdictional annex, and additional information may be obtained by contacting members of the relevant County or municipal JAT as listed in each jurisdictional annex.
- 2016 to 2021 – Municipal Emergency Manager meetings are scheduled bi-monthly. Each meeting a roundtable is initiated for the municipalities to discuss updates and progress. Additionally, as part of the second hazard mitigation plan update, project progress was tracked via Worksheet #5, for all progress made on each mitigation project over the whole of the second planning cycle. Detailed project tracking is provided in each jurisdictional annex, and additional information may be obtained by contacting members of the relevant County or municipal JATs as listed in each jurisdictional annex.

Approach (2022 to 2027)

The plan monitoring approach outlined in the 2016 Plan and shown below was reselected for the next 5-year cycle.

Annual Project Progress Reports[5] will be prepared by the County and each participating jurisdiction to track the progress of each of their respective hazard mitigation actions. Annual Project Progress Reports will be prepared by the JAT team members listed on the first page of each jurisdictional annex for each participating jurisdiction. The reports will be submitted on an annual basis to both Atlantic County OEP and their local governing body at this same time to demonstrate local progress or changes to-date, beginning one year from the date of FEMA's approval of the Final plan. Atlantic County OEP will maintain a central repository of responses. A blank Annual Project Progress Report is included on the next page[6]. The Annual Project Progress Reports provide an overview of the hazard mitigation action(s), responsible and supporting agencies/entities responsible for implementation, a delineation of the various

[5] During the second plan update, a change in terminology was implemented for the sake of clarity. What had previously been called "Annual Work Progress Monitoring Reports" are now being referred to as "Annual Project Progress Reports". This was done for two reasons. First, to make it clearer that there is to be one sheet completed per project per year. Second, to eliminate potential confusion between this step and the new format that is now being recommended in the 2019 State Plan for plan evaluation (page C-35 to C-36). This new format, which has been incorporated in the next subsection on plan evaluation, is termed by the State an "Annual HMP Monitoring Report".

[6] The 2010 HMP identified a FEMA form for annual work progress monitoring. The form in the 2010 HMP represents an abbreviated version of what was used in 2010 HMP. The County reviewed this information on June 3, 2021 and opted to continue its use for the 2022-2027 plan maintenance phase.

project milestones, the current status of the project, any issues that may hinder implementation, and next steps.

Annual Project Progress Reports will be completed by each municipality once per year for each project in their mitigation strategy, beginning one year from the date of FEMA's approval of the Final plan[7].

[7] For multi-jurisdictional plans, this is the date of the first jurisdictional adoption of the plan, regardless of whether the first jurisdiction is a county government entity or some other local municipal government.

Annual Project Progress Report

Municipality:		Progress Report Period:		Date Prepared:	

Mitigation Action Project Title:

Brief Project Description:			
Risk Addressed:			
Who is responsible for implementing the action?	Contact Person *(include name, title, department, phone, email)*:		
Has the project been initiated (check one): __yes ___no *If yes, when?* *If no, why not?*	List Supporting Agencies and Contacts *(if any)*:		
Status (check one): __on schedule __completed __delayed* * *If delayed subsequent to initiation, explain here:*	Original target date for completion:	Current estimated target date for completion:	

Original cost estimate:	Cost Status (check one): __ unchanged __overrun _underrun *If overrun/underrun, explain here:*	Anticipated overrun amount:	Anticipated underrun amount:

Description of the Project *(fill in table with a description of each phase, if applicable, and the time frame for completing each phase):*		
Project Milestones *(e.g. grant application, approval, design, permitting, construction, etc.)*	**Complete? (y/n)**	**Projected Completion Date**

Indicator of Success: *In most cases, you will describe any damages/losses that have been avoided as a result of the project. Leave blank if project is not completed. In cases where it is difficult to quantify the benefits in dollar amounts, you will use other indicators, such as the number of people who now know about mitigation or who are taking mitigation actions to reduce their vulnerability to hazards.*

What was accomplished during this reporting period?

What obstacles, problems, or delays did you encounter, if any?

How was each problem resolved?

What is/are the next step(s) to be accomplished over the next reporting period?

If the action has been completed, were the outcomes as expected?

Other comments:

Evaluating the Plan

After a mitigation plan is formally approved by FEMA and adopted by participating jurisdictions, it should be evaluated on a regular basis in order to track progress and assess the effectiveness of the plan at achieving its stated purpose and goals.

Past Progress (2016 to 2021)

The 2016 Plan was approved by FEMA and adopted in March 2016; therefore, Annual Plan Evaluation Meetings were targeted for March of each year thereafter. The bullets below summarize plan monitoring activities that have occurred since the initial plan's adoption in 2010.

- 2011 – Plan evaluation discussions occurred at bi-monthly Emergency Management Coordinators Meetings.
- 2012 – Plan evaluation discussions occurred at bi-monthly Emergency Management Coordinators Meetings.
- 2013 – Plan evaluation discussions occurred at bi-monthly Emergency Management Coordinators Meetings.
- 2014 – Plan evaluation discussions occurred at bi-monthly Emergency Management Coordinators Meetings.
- 2015 – Plan evaluation discussions occurred at bi-monthly Emergency Management Coordinators Meetings.
- 2016 to 2021 – Plan evaluation discussions continued to occur at bi-monthly Emergency Management Coordinators Meetings.

Approach (2022-2027)

The plan evaluation approach outlined in the 2016 Plan and shown below has been reviewed by Atlantic County OEP and has been modified slightly for the 2022 Plan Update in order to better align with the 2019 State Plan (Section 3, page 3-35).

The 2019 State Plan recommends the use of its **HMP Monitoring Report** as the manner in which each participating jurisdiction will document their annual evaluation of the plan. The Atlantic County OEP reviewed the State's recommended report on a call with their consultant on June 3, 2021 and determined that the County's will follow the State Plan's recommendation and use the HMP Monitoring Report for documenting annual plan evaluations. The State Plan recommends that this step is completed by each participating jurisdiction prior to annual plan evaluation meetings. Therefore, Atlantic County opted to have its participating jurisdictions prepare their respective HMP Monitoring Reports once per year, and turn them in to Atlantic County OEP three months prior to the scheduled Annual Plan Evaluation meeting.

A copy of the Annual Monitoring Report from the 2019 State Plan is included on the next page.

Preparing your Annual HMP Monitoring Report

All Hazard Mitigation Plans have agreed to the provisions of Code of Federal Regulations; Local Mitigation Plan Review Guidance (October 1, 2011); and Element A6 Regulation [§201.6(c) (4) (i)] that states "The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle".
The intent of this 4 part supplement is to establish an annual process for jurisdictions to track the progress of the plan's implementation; serves as the basis of the next plan update; and also provides for continued public participation and can reduce the cost and time involved in the formal update of the HMP. This handout outlines and suggests what might be included as you report on progress.

1. Report Format	
The XXX COUNTY Hazard Mitigation Planning Team has monitored activities that have occurred since the 20XX Hazard Mitigation Plan (HMP) approval in its effort to keep the plan current. As noted in the HMP's Plan Maintenance section, Chapter XX, the county will keep track of all changes annually and incorporate these updates into a revised plan document at the end of the five-year plan-update cycle in 20XX.	It identifies: • Your jurisdiction • Your plan • The HMP chapter/section on "Plain Maintenance" • When the current plan expires
2. What the report should cover	
Please find the attached 20XX supplement which includes updates on the planning process, risk assessment, and mitigation strategy chapters of the HMP in addition to a new hazard profile on hazardous materials releases.	It identifies: • The date of this supplement • The sections of the HMP the annex covers
3. Updates (attached) are summarized below:	
3A Section (1) – Chapter 2: Planning Process: Mitigation Planning Team meetings, agency and representative names (with any changes noted), and summary of resiliency initiatives	It references a specific chapter in the HMP and identifies: • When the meeting was held • Who was there • An overview of accomplishments
3B Section (2) – Chapter 3: Risk Assessment: Additional resources/reports that increase our knowledge of hazards as well as hazard events that have occurred since the last annual HMP Update Annex	It references a specific chapter in the HMP and identifies: • New materials, reports, tools, plans and/or information • Events that have occurred
3C Section (3) – Chapter 4: Mitigation Strategy: Mitigation Actions Overview and increases in our abilities to implement mitigation strategies	It references a specific chapter in the HMP and identifies: • Accomplishments • Project status • Changes in capabilities
4. Optional Special Features	
4A Assessment (Example: the risk and general strategies for reducing the risk of a hazardous materials release incident.)	Identify changes to special sections unique to your HMP. Other topics may cover: • Climate change • Terrorism
4B Posting – Changes will be posted to our website.	Identify website address,

For More Information, Contact:

Sgt. Bradley Waugh, State Hazard Mitigation Officer
Phone: (609) 963-6900 ext. 6208 Fax: (609) 530-3649 Email:lpp6433@gw.njsp.org

Chris Testa, Hazard Mitigation Unit Manager
Phone: (609) 508-6557 Fax: (609) 530-3649 Email:lpptestc@gw.njsp.org

The State Plan recommends that at least one county coordinator meeting per year could become a hazard mitigation plan update meeting, during which the lead jurisdiction (in this case, Atlantic County OEP) will lead the discussion of progress and address key implementation and plan maintenance issues.

The Core Planning Group will convene once per year for an **Annual Plan Evaluation Meeting**. Annual Plan Evaluation Meetings will be led by Atlantic County OEP and will be conducted within three months after each annual batch of Annual Project Progress Reports (see previous "Monitoring" subsection) and HMP Monitoring Reports are due (see previous "Evaluation" discussion). At each meeting, the Core Planning Group will review the Annual Work Progress Monitoring Reports, and use the following 2019 State Plan criteria as points for group discussion to evaluate the effectiveness of the plan at achieving its stated purpose and goals:

Regarding projects:

- Has the hazard mitigation action(s) for which local jurisdiction is responsible been accomplished? If not, why? If so, how?
- Are the responsible agencies/entities responsible for implementation the same?
- Is the mitigation action in process? If so, describe stage of work along with timelines and sources of funding (milestones should be included);
- Were permits or approvals necessary to implement the action?
- Have new projects been identified as a result of recent hazard events?

Regarding incorporation into day-to-day operations:

- How have the actions been incorporated within the organization?
- How was the mitigation duty/duties assigned to agency?
- What issues hinder incorporation or implementation?

Updating the Plan

As part of the process to maintain FEMA mitigation funding eligibility, a plan update must always be submitted to NJOEM/FEMA for their review. This must occur within five years of the plan's approval by FEMA (and during subsequent five-year cycles thereafter).

Past Progress (2016 to 2021)

The 2016 Plan was approved by FEMA and adopted in March 2016; therefore, an updated document was required in March 2021. Atlantic County OEP applied for, and received, FEMA FY 2017 Pre-Disaster Mitigation Program planning grant funds to offset the cost of this second plan update. The County released a Request for Proposals (RFP#202008.3) for consultant services to prepare the updated document. Proposals were due on June 24, 2020. AECOM was approved via County Commissioner Resolution #373 of August 18, 2020 and Resolution #128 of March 2, 2021. A contract was executed in April 2021, with AECOM receipt of a notice to proceed on April 19, 2021. This document represents the County's second update of its hazard mitigation plan.

Approach (2022 to 2027)

The plan evaluation approach outlined in the 2016 Plan and shown below has been reviewed by Atlantic County OEP and has been reselected for the 2022 Plan Update.

The Atlantic County Hazard Mitigation Plan was first approved by FEMA in 2010 and its first plan update went into effect in 2016. This 2022 plan update represents the second required update of the document. Atlantic County OEP has taken the lead on Plan development and updates in the past, and they have opted to continue to do so in the future. Atlantic County OEP shall be responsible for ensuring that the plan is maintained in accordance with all applicable guidance and regulations.

The Update Process Itself. Regardless of whether or not the next plan update is grant funded[8], the following must occur within five years from the date that the plan is adopted by the first of its participating jurisdictions:

- An updated planning process must be undertaken.
- An updated plan document must be prepared.
- The updated document must be resubmitted to FEMA (through NJOEM).
- The updated plan must be reviewed by FEMA, who will provide formal comments indicating both required and recommended revisions.
- At a minimum, all required revisions must be addressed.
- The revised document needs to be routed back to FEMA, who will review to ensure that all required revisions have been satisfactorily addressed. If so, they will deem the plan "approvable pending adoption."
- The plan must then be adopted by participating jurisdictions.

Allowing one year for the update process, and one year for the review/approval/adoption process has historically been observed. That having been said, it is recommended that the County initiate each requisite plan update no later than three years after the plan's approval date[9]. If grant funding is sought, applications should be submitted at the first opportunity following the plan's approval date (and no later than two years after the plan is approved).

The plan update involves a comprehensive review and evaluation of each section of the plan, and also discusses the results of evaluation and monitoring activities detailed in the Plan Maintenance section of the previously approved plan. Plan updates may validate the information in the previously approved plan, or may involve a major plan rewrite. A plan update

[8] Funding the Updates. In the past, Atlantic County has sought out FEMA hazard mitigation planning grant funding to offset the fairly significant costs associated with both the initial plan development and each plan update. If the Atlantic County OEP is interested in obtaining grant funds for the next required plan update (which must be completed and readopted in 2027) then a grant application should be submitted for the first opportunity after this 2022 plan update is adopted. This would allow for the possibility of the application not being approved on the first pass, and would allow sufficient time for an alternate approach to be taken within the requisite 5-year window. If grant funding is selected as the primary funding source for any given update cycle, the County should be keenly aware of grant application review times, as well as applicable County procurement rules, when moving forward. It is not uncommon for grant submittal, review, approval, RFP issuance, review of proposals, selection of a contractor, and contract negotiations and contract execution to take one to two years out of the 5-year cycle. In addition, grant funding is not guaranteed so the County should be prepared with a backup funding source for meeting requirements if outside assistance does not materialize.

[9] After FEMA completes its plan review and determines that all requirements have been adequately addressed, it issues a determination of "Approvable Pending Adoption". Participating jurisdictions then each move forward with formally adopting the plan. For multi-jurisdictional plans, FEMA considers the plan approval date to be the date of the first jurisdictional adoption.

cannot be an annex referring to the previously approved plan; it must stand on its own as a complete and current plan. Plans are required to be updated to reflect changes in development, progress in local mitigation actions, and changes in priorities. Other criteria considered during the update included:

- if changing situations have modified goals/objectives/actions and/or hazards/risks;
- if additional information is available to perform more accurate vulnerability assessments;
- if local capabilities have changed in a way that impacts jurisdictional ability to implement the plan and the projects within it;
- if it is determined that participating jurisdictions wish to be added to and/or removed from the Plan; or
- if it is determined that the Plan no longer addresses current and expected future conditions.

At the time of each update, Atlantic County OEP shall consult with NJOEM and FEMA for the latest guidance in place regarding plan updates to ensure that the latest criteria are addressed in the update process.

All plan updates will be maintained on the County web site and made available in hard copy at the Atlantic County OEP offices.

Public Participation in Plan Maintenance

As required by FEMA and as emphasized in Section 3 of the 2019 State Plan, the public and other stakeholders must be given opportunities to become involved during the Plan's regular maintenance and implementation. It is important to understand perceptions of the plan's effectiveness and degree of success to help maintain support for the plan and provide accountability for those responsible for its maintenance and implementation.

Public and stakeholder participation in the plan is two-fold:

- During any plan update, specific activities are undertaken by each participating jurisdiction to engage the general public and other stakeholders in the update process itself.
- Separately, during each 5-year plan maintenance cycle, additional opportunities must be provided to continue public/stakeholder participation and engagement.

Past Progress (2016 to 2021)

Atlantic County OEP reports the following progress was made in continued outreach to the public and other stakeholders over the most recent plan maintenance cycle (2016 to 2021):

- Atlantic County OEP will continue to maintain the mitigation planning website and document repositories.

- Each participating jurisdiction will maintain a link on their jurisdiction's web page to the County mitigation planning website, if they have not already done so.
- Atlantic County OEP will prepare an annual fact sheet on the plan. This fact sheet will be submitted via email to Core Planning Group members for posting on community notice boards, at a minimum, and preferably supplemented with distribution at meetings as applicable. Atlantic County OEP will post the fact sheet on the County mitigation plan web site.
- Participating jurisdictions will conduct annual interviews and/or smaller meetings with civic groups, the public and other stakeholders. This will be accomplished through incorporating discussion of the mitigation plan into other regularly attended meetings.
- Participating jurisdictions will consider annual flyers, newsletters, newspaper advertisements, and Radio/TV announcements to supplement annual interviews/meetings, and will implement some or all of these at the discretion of the jurisdiction. At a minimum, the County will issue an annual press release.
- Participating jurisdictions are responsible for keeping track of any comments they receive on the plan, and bringing these forward for discussion at the Annual Plan Evaluation Meetings.
- Beginning in May 2021, all participating jurisdictions conducted regular outreach to the public and other stakeholders regarding plan updates. Their activities are summarized in the Outreach Logs for each jurisdiction, as included in each Jurisdictional Annex.

Approach (2022 to 2027)

As part of the 2022 plan update, during a call with their contractor on June 3, 2021, Atlantic County OEP evaluated the array of activities that was included in the 2016 plan.

As a result of this assessment, and in consultation with Section 3 of the 2019 State HMP, the County opted to carry forward the activities that were in the 2016 Plan.

The array of activities below was ultimately selected by Atlantic County OEP for the next planning cycle (2022 to 2027):

- Atlantic County OEP will continue to maintain the mitigation planning website and document repositories.
- Each participating jurisdiction will maintain a link on their jurisdiction's web page to the County mitigation planning website, if they have not already done so.
- Atlantic County OEP will prepare an annual fact sheet on the plan. This fact sheet will be submitted via email to Core Planning Group members for posting on community notice boards, at a minimum, and preferably supplemented with distribution at meetings as applicable. Atlantic County OEP will post the fact sheet on the County mitigation plan web site.
- Participating jurisdictions will conduct annual interviews and/or smaller meetings with civic groups, the public and other stakeholders. This will be accomplished through incorporating discussion of the mitigation plan into other regularly attended meetings.

- Participating jurisdictions will consider annual flyers, newsletters, newspaper advertisements, and Radio/TV announcements to supplement annual interviews/meetings, and will implement some or all of these at the discretion of the jurisdiction. At a minimum, the County will issue an annual press release.
- Participating jurisdictions are responsible for keeping track of any comments they receive on the plan, and bringing these forward for discussion at the Annual Plan Evaluation Meetings.
- Beginning in 2014, all participating jurisdictions conducted regular outreach to the public and other stakeholders regarding plan updates. Their activities are summarized in the Outreach Logs for each jurisdiction, as included in each Jurisdictional Annex.

Plan Integration

For a participating jurisdiction to succeed in reducing risk in the long term, the information and recommendations of the hazard mitigation plan must be integrated into day-to-day local government operations, as well as into comprehensive plans. Throughout the planning process, partnerships are formed between departments and agencies, and sustained actions between these partners will increase the community's resilience to disasters. "Plan integration" can be thought of as the process whereby each participating jurisdiction will incorporate the mitigation plan findings and projects into other planning mechanisms (local governance structures that are used to manage local land use development and community decision making).

Past Progress (2016 to 2021)

Background. The initial 2010 Plan included an overview of the plan integration requirement and a brief range of example plan integration activities to guide municipalities during the plan maintenance phase. Jurisdictions were made aware that the examples in the 2010 Plan were by no means limiting, and that communities were advised and encouraged to consider plan integration activities outside of the examples included in the 2010 Plan text. The 2010 Plan text was general in nature and did not include details as to which jurisdictions would ultimately undertake which particular plan integration activities during the 2010 to 2015 plan maintenance phase (it stated that plan integration would be undertaken by each participating jurisdiction, via activities including but not limited to the examples that were set forth in the document, but did not specify exactly how or by whom).

In the course of preparing the 2016 Plan update, the approach taken to obtain information from each participating jurisdiction regarding their respective plan integration activities undertaken in the 2010 to 2016 plan maintenance window was to provide each jurisdiction with a worksheet that listed (in tabular form) the range of example plan integration activities that had been documented in the 2010 Plan text, and each jurisdiction was asked to provide feedback to the consultant on which activities they had opted to undertake. These activities could have included items not on the list of example types. Feedback was collected in the form of worksheet tables that were incorporated directly into the 2016 Plan.

Past Progress. In 2021, at the outset of the current plan update process, the planning team was requested by the State to remove the uniform suite of examples approach. Therefore, as

part of this 2021 plan update, jurisdictions were each asked to provide text summarizing their progress on the plan integration activities that they had identified in the 2016 plan, and provide text explaining their plan integration accomplishments to the consultant for insertion into this second plan update.

These jurisdictional responses documenting plan integration activities undertaken during the 2016 to 2021 plan maintenance cycle, as prepared by the County and each community and inserted into the 2021 Plan by our consultant, are included in each Jurisdictional Annex.

Overall, plan integration activities that were ultimately undertaken during the 2016 to 2021 plan maintenance cycle were generally limited, suggesting a need for awareness at the local level to both implement mitigation strategies and monitor progress and overall plan evaluation accordingly. That said, a number of municipalities reported undertaking tangible integration activities including updating local master, capital, and emergency plans to incorporate hazard risk assessment and resiliency, training of staff across multiple departments and disciplines, and collaboration with colleges.

Approach (2022 to 2027)

As discussed above, in 2021, at the outset of the current plan update process, the planning team was requested by the State to steer away from using the previous uniform suite of examples approach. Therefore, as part of this 2021 plan update, instead of each jurisdiction reviewing a list of possible types of plan integration activities and checking off a box for those that it wished to include in its integration strategy (with previously discussed flexibility to add limitless other unlisted options as well), jurisdictions were instead asked to provide text to the consultant describing the plan integration activities that their particular jurisdiction wished to undertake over the next plan maintenance cycle (2022 to 2027).

These jurisdictional responses documenting plan integration activities planned for the 2022 to 2027 plan maintenance cycle, as prepared by the County and each community and inserted into the 2021 Plan by the consultant, are included in each Jurisdictional Annex.

SECTION 8 - FOR MORE INFORMATION

If you have any questions or comments on the Atlantic County Multi-Jurisdictional Hazard Mitigation Plan, additional information can be obtained by contacting:

Vincent Jones
County OEM Coordinator
Atlantic County Office of Emergency Preparedness
5033 English Creek Avenue
Egg Harbor Township, New Jersey 08234
Phone: (609) 407-6740
E-Mail: jones_vincent@aclink.org

or

Karen Koptic
Operations and Training Officer
Atlantic County Office of Emergency Preparedness
5033 English Creek Avenue
Egg Harbor Township, New Jersey 08234
Phone: (609) 407-6767
E-Mail: koptic_karen@aclink.org

For specific information regarding a particular community, please contact the Jurisdictional Representative and/or Alternate as identified in that community's Jurisdictional Annex.

Plan information is also continuously maintained on the County web site at:

https://www.atlantic-county.org/hazard-mitigation/