

OCEAN COUNTY, NEW JERSEY MULTI-JURISDICTIONAL ALL HAZARD MITIGATION PLAN



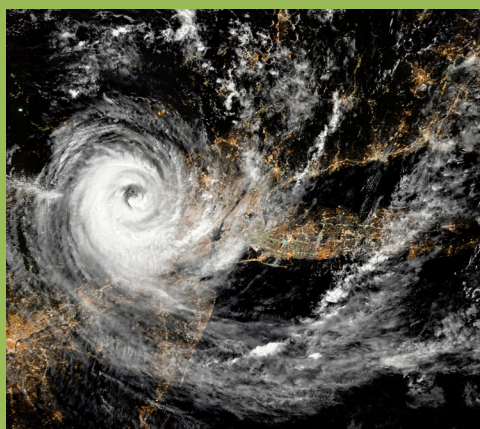
Prepared for:



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INTERNATIONAL



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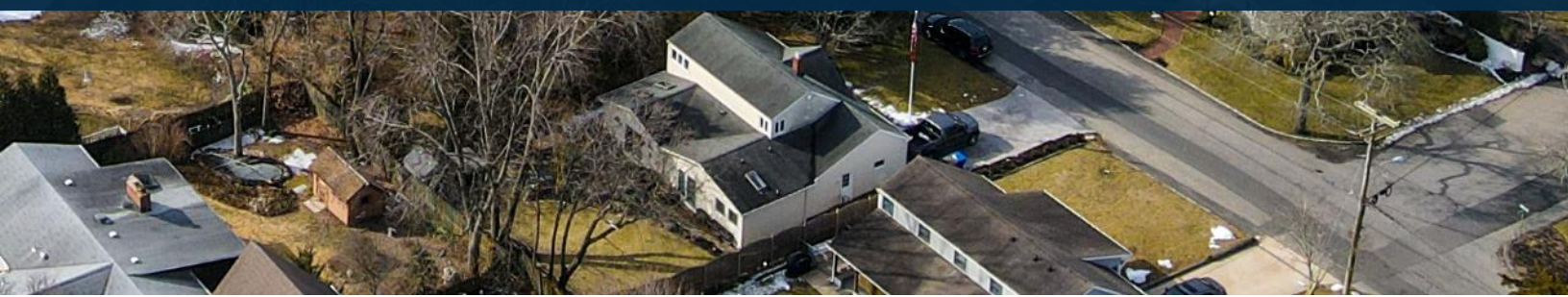
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1.0 INTRODUCTION



1.0 INTRODUCTION

1.2 BACKGROUND

The 2025 Multi-jurisdictional All Hazard Mitigation Plan for Ocean County (Ocean County HMP) is an update to the 2020 County HMP. The Plan is the result of work by citizens of the County to develop a pre-disaster, multi-hazard mitigation plan that will not only guide the County towards greater disaster resistance but will also respect the character and needs of the community. A website at <https://sheriff.co.ocean.nj.us/frmHazardMitigationPlan> was used throughout the planning process to provide information, announce meetings, provide the public an opportunity to comment on the plan throughout the entire project, and post the draft plan for review.

Hazard mitigation planning has the potential to produce long-term and recurring benefits by breaking the cycle of loss. A core assumption of mitigation is that current dollars invested in mitigation practices will significantly reduce the demand for future dollars by lessening the amount needed for recovery, repair, and reconstruction. These mitigation practices will also enable residents, businesses, and industries to re-establish themselves in the wake of a disaster, getting the economy back on track sooner and with less interruption.

Ocean County, New Jersey is an area with a wealth of natural resources which include 45-miles of Atlantic Ocean coast, the Barnegat Bay, and the Pinelands National Reserve. This beautiful landscape attracts residents, visitors, and businesses. Hazard mitigation and related planning are critical to managing the balance of the risks associated with flooding, coastal storms, heavy rain events, wildfire, and other natural and human-made hazards in Ocean County. The Ocean County HMP brought community officials, stakeholders, and members of the public together in order to further mitigation efforts. All municipalities participate in the National Flood Insurance Program (NFIP). Many municipalities participate in the Community Rating System (CRS), StormReady, and FireWise. The County and municipalities have invested in programs and projects that prevent, prepare mitigation respond and recover for natural and human made disasters. This plan furthers ongoing projects and encourages new mitigation efforts with a formal blueprint to make Ocean County more resilient.

Ocean County declared five Presidential Disaster, Emergency, and Fire Management Assistance Declarations since the last plan update, including COVID-19 in 2020, a severe winter storm and snowstorm in 2021, and remnants of Hurricane Ida in 2021. The emergency management community, citizens, planners, elected officials and other stakeholders in Ocean County recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and human-caused hazards.

This Ocean County HMP update is led by the Ocean County Sheriff's Office, Office of Emergency Management.

1.3 PURPOSE

This Ocean County HMP was developed for the purpose of:

- Providing a blueprint for reducing property damage and saving lives from the effects of future natural and man-made disasters in Ocean County;
- Qualifying the County for pre-disaster and post-disaster grant funding;
- Complying with state and federal legislative requirements related to local hazard mitigation planning;
- Demonstrating a firm local commitment to hazard mitigation principles; and
- Improving community resiliency following a disaster event.

The Disaster Mitigation Act of 2000 (DMA 2000), Section 322 requires that local governments (communities/counties), as a condition of receiving federal disaster mitigation funds, have a mitigation plan that describes the process for identifying hazards, creating a risk assessment and vulnerability analysis, identifying, and prioritizing mitigation strategies, and developing an implementation schedule for the County and each of the municipalities. Congress authorized the establishment of a Federal grant program to provide financial assistance to States and communities for flood mitigation planning and activities. The Federal Emergency Management Agency (FEMA) has designated this Hazard Mitigation Assistance (HMA).

1.4 SCOPE

This Ocean County HMP has been prepared to meet requirements set forth by FEMA and the New Jersey Office of Emergency Management (NJOEM) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. This multi-jurisdictional plan includes participation and will be adopted by Ocean County and all 33 municipalities. Ocean County and the municipalities participating in the plan have undergone hazard mitigation planning and related activities in the past. Previous and ongoing hazard mitigation activities are documented throughout the plan.

1.5 ORGANIZATION OF THE PLAN

The Ocean County HMP is organized into the following nine sections and two volumes of appendices:

1.0 Introduction: Discusses the purpose and scope of this HMP and the planning requirements for the HMP.

2.0 Community Profile and Asset Inventory: provides an overview on Ocean County and discusses population and the economy (including underserved communities and socially vulnerable populations), the built environment (including recent and future changes in development), and ecosystems and natural assets.

3.0 Planning Process: Discusses the planning process, the planning team that led this HMP update, county, stakeholder, and municipal participation, and public participation.

4.0 Risk Assessment: Provides an overview of the hazard identification process, an analysis on each hazard affecting Ocean County, and key risk findings.

5.0 Capability Assessment: Discusses state building codes and the unique planning, regulatory, administrative, technical, financial, and education and outreach capabilities present in Ocean County. This section also describes how the County and its municipalities integrate their plans and regulations with hazard mitigation.

6.0 Mitigation Strategy: Ocean County's mitigation strategy is the blueprint for reducing potential future losses from hazards. Topics covered in this section include the process taken to update the strategy, mitigation goals and objectives, the evaluation and prioritization of mitigation actions, a summary of each municipalities mitigation strategy, and Ocean County's mitigation strategy.

7.0 Plan Maintenance: Explains the plan maintenance process for monitoring, evaluating, and updating the HMP once the plan is approved by FEMA.

8.0 Plan Adoption: Discusses the County and municipal HMP adoption process.

Appendices Volume I – Jurisdictional Information: Each municipality has their own appendix detailing their local community profile and mitigation strategy, including the following information:

- Planning Team and Participation: lists the names of local officials and representatives that attended the municipal meetings and helped write the municipal appendices.
- Community Profile: provides an overview on the municipality; land use, development, and growth since the previous plan (including recent, known, or anticipated major development and infrastructure); and information on demographics and vulnerable populations.
- Hazard Identification: includes each municipality's hazard ranking, an explanation for that hazard ranking, and significant storms events since the last plan update.
- Risk Assessment: includes municipal National Flood Insurance Program (NFIP) statistics, vulnerability of the built environment, and risk maps, including current flood risk, future flood risk (NJ Inland Design Flood Elevation and Sea Level Rise (if applicable)), and Wildland Urban Classification (if applicable).
- Capability Assessment: includes tables of local planning and regulatory; administrative and technical; education and outreach; and financial capabilities.
- Mitigation Strategy: provides an overall mitigation strategy since the previous plan and looking forward towards the next five years, completed or removed actions, and new and ongoing actions. Each action has a description, addressed hazards, priority, responsible party, potential funding sources, cost estimate, timeline, status, and notes on the risk that is getting reduced by the action, if the action address socially vulnerable populations, and if the impacts of climate change will affect the outcome of the action.

Appendices Volume II – Other Plan Materials: Includes the FEMA Plan Review Tool, resolution template, Community Rating System (CRS) crosswalk, annual progress report, adopted resolutions and engagement documentation.

1.6 AUTHORITY AND REFERENCES

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 *et seq.*

Authority for this plan originates from the following State of New Jersey sources:

- State of New Jersey 2024 State Hazard Mitigation Plan

FEMA's *Local Mitigation Planning Policy Guide*, effective April 19, 2023, was the primary guide used for the development of this plan. Previous FEMA guides including the 386 series and information available from NJOEM on hazard mitigations was used to guide this plan's development.



2.0 COMMUNITY PROFILE AND ASSET INVENTORY

2.0 COMMUNITY PROFILE AND ASSET INVENTORY

2.1 OVERVIEW

Geography

Ocean County comprises 628.3 square miles of land area, making it the second-largest county in New Jersey, and is home to 33 municipalities. It is bounded by Monmouth County to the north; Burlington County to the west and south; Atlantic County to the southeast; and the Atlantic Ocean to the east. Notably, the County boasts 45 miles of Atlantic coastline. The topography of Ocean County is largely flat and coastal. The topography is generally low and rolling from a maximum of 225 feet in elevation down to sea level. The 33 municipalities include the following:

- Barnegat Light Borough
- Barnegat Township
- Bay Head Borough
- Beach Haven Borough
- Beachwood Borough
- Berkeley Township
- Brick Township
- Eagleswood Township
- Harvey Cedars Borough
- Island Heights Borough
- Jackson Township
- Lacey Township
- Lakehurst Borough
- Lakewood Township
- Lavallette Borough
- Little Egg Harbor Township
- Long Beach Township
- Manchester Township
- Mantoloking Borough
- Ocean Gate Borough
- Ocean Township
- Pine Beach Borough
- Plumsted Township
- Point Pleasant Beach Borough
- Point Pleasant Borough
- Seaside Heights Borough
- Seaside Park Borough
- Ship Bottom Borough
- South Toms River Borough
- Surf City Borough
- Stafford Township
- Toms River Township
- Tuckerton Borough

The County lies nearly equidistant from Philadelphia and New York. This proximity has strongly influenced the growth and transportation patterns countywide. Major transportation routes include the Garden State Parkway, Interstate 195, US Route 9, and State Routes 13, 35, 37, 70, 72, 88, and 166. The Toms River Park and Ride is one of the busiest bus terminals in New Jersey and provides express bus service to New York City. Major east to west traffic to Philadelphia is accommodated by Route 70 and north and south circulation to New York and Atlantic City relies on the Garden State Parkway. Figure 2.1-1 displays a base map of the County.

Physiographic Provinces

Ocean County is located in New Jersey's Atlantic Coastal Plain. According to the State of New Jersey 2024 All-Hazard Mitigation Plan (State HMP), the Coastal Plain contains sand, gravel, clay, and greensand formations. Deposits along the Atlantic Ocean between 10 and 120 million years ago have led to the development of this province. The Coastal Plain is often divided into the Inner Coastal Plain, which is made mostly of sand and clay formations, and the Outer Coastal Plain, which can be identified as having more sandy soil (Harper, 2013).

Watershed Management Areas

Ocean County falls into five Watershed Management Areas (WMAs). Most of the county falls into the Barnegat Bay Watershed. The western edges of Ocean County are defined by the Assiscunk, Crosswicks and Doctors; Rancocas; and Mullica WMAs. A small portion of the Arthur Kill WMA crosses into Ocean County in the northeastern portion of the county near Brick Township and the Borough of Point Pleasant (NJDEP, 2017). Major streams include the Manasquan River, North

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Branch Metedeconk Creek, Toms River, Cedar Creek, and Westcunk Creek. Most of the county's waterways drain into the three major natural water bodies: Barnegat Bay, Little Egg Harbor, and Great Bay.

Figure 2.1-1 Ocean County Base Map

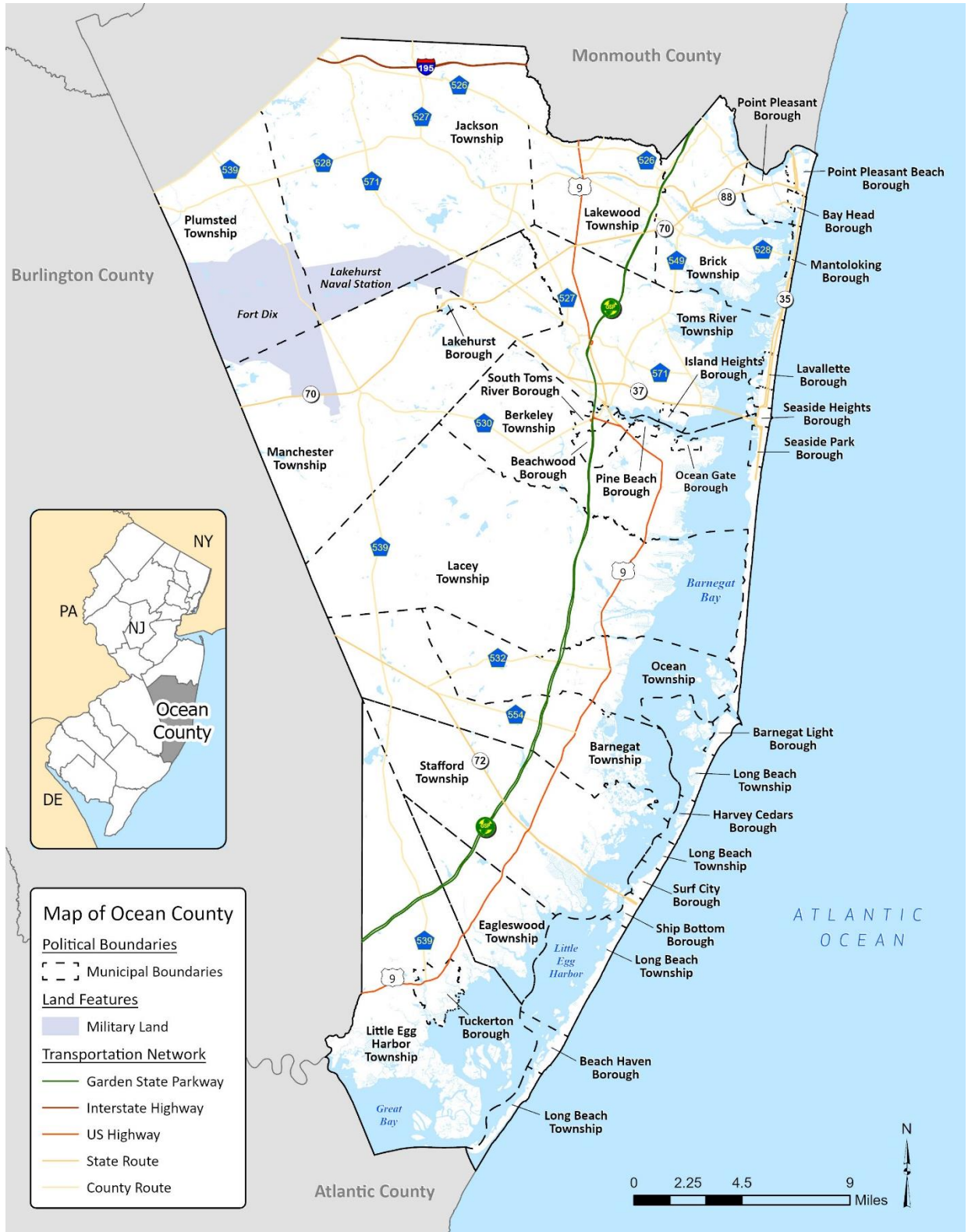
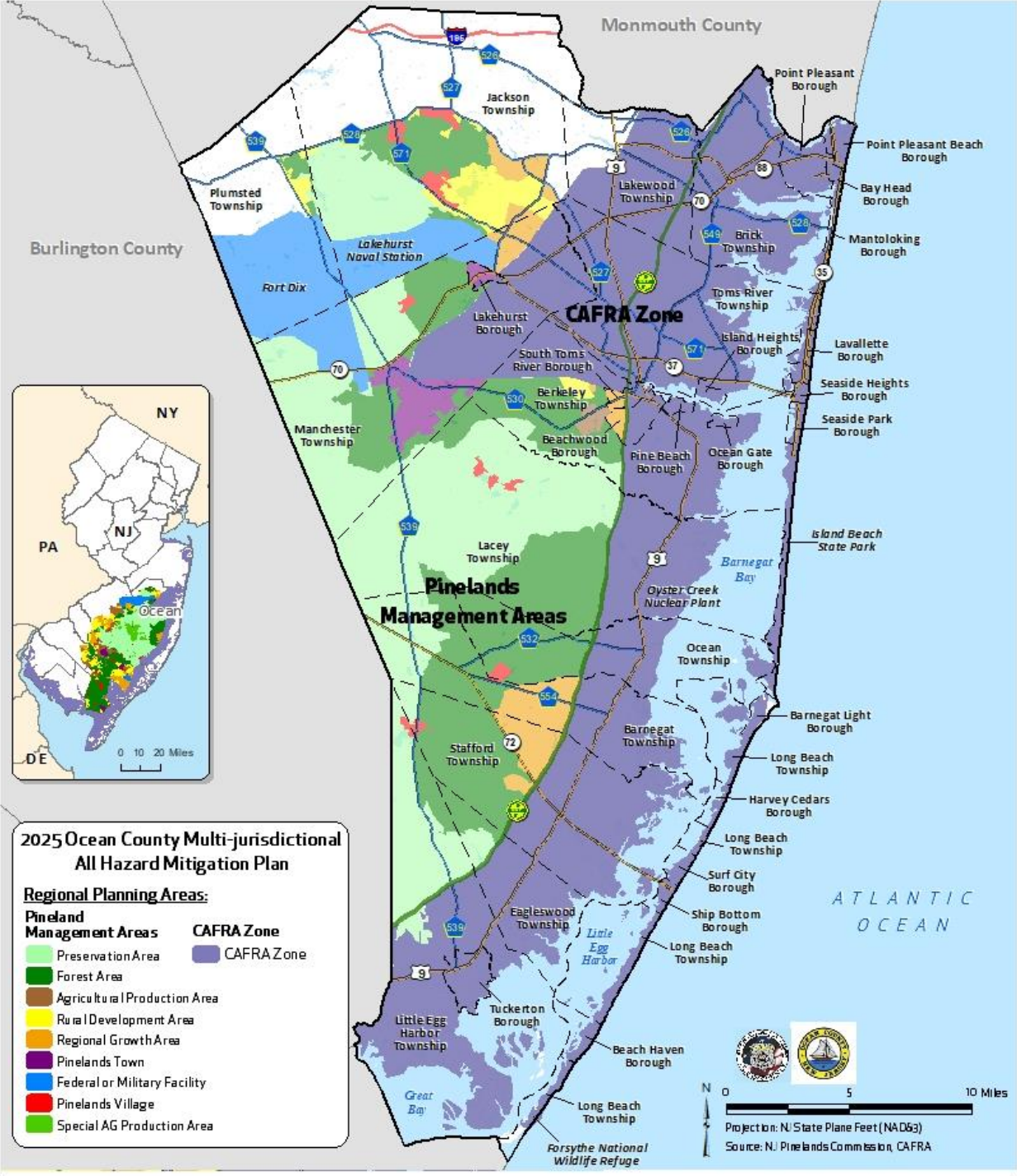


Figure 2.1-2 New Jersey Pinelands Area and the CAFRA Zone



New Jersey Pinelands and the CAFRA Zone
2025 Multi-jurisdictional All Hazard Mitigation Plan
Ocean County, New Jersey



The County maintains a large amount of protected federal, state, and county open space, as well as preserved farmland. As shown in Figure 2.1-2, much of Ocean County falls into one of two state-designated regional land use-planning areas focused on balancing economic development with environmental preservation: the Pinelands Area and the Coastal Area Facilities Review Act (CAFRA) Zone. The Pinelands Commission, an independent state agency, regulates development and preservation in the Pinelands Area through overlay zoning known as Pinelands Management Areas (PMAs). The CAFRA Zone is New Jersey’s coastal zone; in this area, NJDEP has the authority to approve the location, design, and construction of major facilities with the intention of protecting coastal resources.

2.2 POPULATION AND THE ECONOMY

Population Trends

The population of Ocean County was estimated at 684,474 in the year 2022 according to the American Community Survey (ACS) 5-year estimates. From 2018-2022 the population grew by 16.1 percent. However, on the municipal level, there was a higher variety of population change. Mantoloking Borough grew at the fastest rate between 2018 to 2022 at 41.8%, followed by Lakewood Township at 34.6%, which is also the most populous municipality in Ocean County and fifth in the state of New Jersey. The municipality that experienced the largest decrease in population is Seaside Heights Borough at -30%, followed by Ocean Gate Borough at -12%.

Both Toms River Township and Lakewood Township have over 95,000 residents. The least populous communities are Barnegat Light Borough, Mantoloking Borough, and Harvey Cedars Borough, which each have fewer than 500 residents. Even after the horrific damages caused by Superstorm Sandy, Ocean County residents rebuilt, and the county continually grows.

Table 2.2-1 Population Change in Ocean County 2015 to 2022, by Municipality.

Municipality	Total Population (2013-2017 ACS 5-Year)	Total Population (2018-2022 ACS 5 Year)	Percent Change (%)
Mantoloking Borough	294	417	41.8%
Lakewood Township	99,467	133,875	34.6%
Seaside Park Borough	1,566	1,799	14.9%
Harvey Cedars Borough	430	479	11.4%
Pine Beach Borough	2,185	2,402	9.9%
Barnegat Township	22,141	24,295	9.7%
Bay Head Borough	1,011	1,096	8.4%
Stafford Township	27,012	28,917	7.1%
Surf City Borough	1,238	1,325	7.0%
Tuckerton Borough	3,371	3,582	6.3%
Berkeley Township	41,676	43,846	5.2%
Toms River Township	91,415	95,997	5.0%
Point Pleasant Beach Borough	4,577	4,786	4.6%
Manchester Township	43,418	45,206	4.1%
Jackson Township	56,501	58,793	4.1%
Long Beach Township	3,040	3,135	3.1%
Eagleswood Township	1,605	1,653	3.0%
Point Pleasant Borough	18,519	19,024	2.7%
Lacey Township	28,444	28,879	1.5%
Ship Bottom Borough	984	995	1.1%
Little Egg Harbor Township	20,695	20,901	1.0%
Ocean Township	8,838	8,838	0.0%
Lavallette Borough	2,042	2,036	-0.3%
Brick Township	75,118	74,230	-1.2%
Lakehurst Borough	2,687	2,653	-1.3%
South Toms River Borough	3,741	3,662	-2.1%
Beachwood Borough	11,193	10,933	-2.3%
Plumsted Township	8,509	8,211	-3.5%

Municipality	Total Population (2013-2017 ACS 5-Year)	Total Population (2018-2022 ACS 5 Year)	Percent Change (%)
Beach Haven Borough	1,102	1,061	-3.7%
Island Heights Borough	1,581	1,521	-3.8%
Barnegat Light Borough	494	435	-11.9%
Ocean Gate Borough	1,911	1,682	-12.0%
Seaside Heights Borough	2,894	2,027	-30.0%
Total	589,708	684,474	16.1%

Source: 2013-2017 American Community Survey (ACS) 5-Year Estimates, 2018-2022 American Community Survey (ACS) 5-Year Estimates

Underserved Communities and Socially Vulnerable Populations

The median age of the population of Ocean County is 41.4 years old. According to the 2018-2022 Census ACS, Ocean County has nearly 700,000 residents (684,474), with 6.7% of the population under 5 years of age, and 21.0% (143,400 residents) over 65 years of age. In general, smaller resort towns along the County’s shore and barrier peninsulas have greater shares of their populations over 65. These populations are important when looking at hazard mitigation and recovery because they are frequently the populations that need the most assistance during a disaster event and are, therefore, more vulnerable to the impacts of hazard events.

Table 2.2-2 lists the percentage of each municipality’s population age 5 or younger and population age 65 or older. Lakewood Township has the highest percentage of age 5 or younger population. Manchester Township, Surf City Borough, Long Beach Township, Barnegat Township, Ship Bottom Borough, Berkeley Township, and Harvey Cedars Borough all over 41% of their population age 65 or older.

Table 2.2-2 Percentage of Population Age 5 or Younger and Age 65 or Older, by Municipality

Municipality	Percentage of Population Age 5 or Younger	Percentage of Population Age 65 or Older
Barnegat Light Borough	3.8%	31.4%
Barnegat Township	0.0%	43.0%
Bay Head Borough	0.5%	31.3%
Beach Haven Borough	2.6%	31.9%
Beachwood Borough	5.6%	18.1%
Berkeley Township	2.9%	41.3%
Brick Township	4.3%	20.1%
Eagleswood Township	4.7%	18.1%
Harvey Cedars Borough	1.0%	41.1%
Island Heights Borough	2.6%	32.0%
Jackson Township	7.7%	17.7%
Lacey Township	6.0%	21.3%
Lakehurst Borough	4.7%	15.7%
Lakewood Township	16.6%	10.2%
Lavallette Borough	7.2%	39.6%
Little Egg Harbor Township	3.0%	28.1%
Long Beach Township	2.6%	43.0%
Manchester Township	3.1%	49.1%
Mantoloking Borough	2.9%	36.7%
Ocean Gate Borough	3.0%	34.7%
Ocean Township	1.7%	23.4%
Pine Beach Borough	4.4%	25.7%
Plumsted Township	6.8%	17.7%
Point Pleasant Beach Borough	4.0%	17.0%
Point Pleasant Borough	2.2%	23.7%
Seaside Heights Borough	5.3%	14.5%
Seaside Park Borough	3.7%	39.4%
Ship Bottom Borough	1.1%	41.7%
South Toms River Borough	8.5%	7.2%
Stafford Township	3.8%	21.2%

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Municipality	Percentage of Population Age 5 or Younger	Percentage of Population Age 65 or Older
Surf City Borough	1.1%	45.1%
Toms River Township	5.3%	19.7%
Tuckerton Borough	6.2%	20.6%

Source: 2013-2017 American Community Survey (ACS) 5-Year Estimates, 2018-2022 American Community Survey (ACS) 5-Year Estimates

The distribution of the minority population tells a different story. About 18.7% of Ocean County’s population is part of a minority group, including 10.2% of residents who are Hispanic or Latino. The county is 89.8% White (including Hispanic and Latino whites), 4.6% black or African American, 2.5% Asian, 0.8% American Indian or Alaska Native, and 0.1% is Native Hawaiian or Other Pacific Islander. 9.9% percent identify as some other race. 7.4% of the population are two or more races (US Census ACS, 2022). About 12.2% of the population speaks a language other than English at home including 1.3% which are considered limited English speaking. This segment of the population would likely need extra assistance during a disaster event.

To further assess social vulnerability within Ocean County, the Project Team used three different groupings of vulnerability criteria, making up [Overburdened Communities \(OBC\)](#), identifications by the federal [Climate and Economic Screening Tool \(CEJST\)](#), and federally defined [Community Disaster Resilience Zones \(CDRZ\)](#). The following bullets summarize the County’s social vulnerability:

- Ocean County has **no** tracts designated under the Community Disaster Resilience Zone (CDRZ) designation – tracts which are eligible for enhanced hazard mitigation benefits from FEMA for at least five years, and which qualify for more expansive government investments (such as Climate Smart Communities Initiative, which prioritizes CDRZs).
- Ocean County has **74** block groups (2020) in 16 different municipalities labeled as Overburdened Communities (OBC) – a New Jersey designation which identifies areas with (1) at least 35% low-income households, *or* (2) at least 40% of residents identifying as minority or members of a State recognized tribal community, *or* (3) at least 40% of households having limited English proficiency.
- Ocean County has **19** Census Tracts (2010) in 7 different municipalities identified through the Federally designated Climate and Economic Justice Screening Tool (CEJST), noting communities which are underserved and overburdened by active and legacy pollution.

Based on the above designations, Lakewood Township is the municipality in the County with the most underserved tracts/communities – there are 27 block groups within Lakewood alone that are designated OBC, and 9 tracts which are designated CEJST communities.

Economy

Historically, Ocean County’s main economic driver has been tourism, especially in the coastal areas. However, with the advent of the Garden State Parkway and the interstate highway system, Ocean County grew to include a more year-round population with a more diverse economic base. The United States Census Bureau estimates that in 2022, there were 159,793 private sector jobs in Ocean County. In 2022, the largest industry sector in Ocean County was Healthcare and Social Assistance consisting of 25.6% of all jobs in the County. Retail Trade was the second largest at 18.1%. The other industries rounding out Ocean County’s top five are Accommodation and Food Services, Construction, and Other Services (Except Public Administration) (Economic Surveys County Business Patterns, 2022). The last comprises a variety of industries including equipment and machinery repairing, promoting, or administering religious activities, grantmaking, advocacy, and providing drycleaning and laundry services.

The high proportion of jobs in the health care and social assistance field correlates to Ocean County’s high proportion of elderly residents. Retail trade and accommodation and food services directly relate to Ocean County’s tourism trade, which generated almost \$6 billion for the local economy in 2022 (Ocean County, 2023). From 2016-2022, the number of jobs in the county grew by almost 9%, largely due to growth in the healthcare industry as well as in the green technology industry, which has grown significantly in an effort to promote resiliency post Hurricane Sandy. New Jersey is a leading

State in advancing and implementing green technology, which has been reflected in Ocean County by the evident growth of green technology jobs.

Major employers include Saint Barnabas Health Care System, Six Flags Theme Park, Joint Base McGuire-Dix-Lakehurst, Toms River Regional School System, and the Ocean County Government. Each of these employers has greater than 2,000 total employees countywide.

2.3 BUILT ENVIRONMENT

Land Use/Land Cover

As of 2020, Ocean County’s primary land use/land cover is forest, followed by urban/developed, and wetlands. The total acreage by land use type is shown in Table 2.3-1. The largest change in land use since 2015 includes 7.09% less barren land and 5.12% less agriculture within Ocean County.

Table 2.3-1 Distribution of Land Use Land Cover

Land Use Type	2015 Acres	2020 Acres	Percent Change (%)
Agriculture	5,765	5,470	-5.12
Barren Land	8,119	7,543	-7.09
Forest	205,345	201,998	-1.62
Urban or Developed	114,625	115,983	1.18
Water	97,687	98,656	0.99
Wetlands	102,191	102,184	-0.01
Total	533,732	531,834	-0.36

Source: MOV-IV Data, 2015, 2022, 2023

Examining the percentage of developed land in the County is crucial for a hazard mitigation plan because it directly indicates the potential vulnerability of a community to natural disasters, as areas with high development tend to have more structures and infrastructure at risk, making them more susceptible to damage from hazards like flooding and wildfire. Table 2.3-2 lists each municipalities’ percentage of developed land, percentage of developed land within the 1% Floodplain, and percentage of developed land within the 0.2% Floodplain.

The municipalities with above 99% of developed land within the 1% Floodplain are most vulnerable to sea-level rise, flooding, and hurricanes, tropical storms, and nor’easters. This includes all six municipalities on Long Beach Island (Barnegat Light Borough, Beach Haven Borough, Long Beach Township, Harvey Cedars Borough, Ship Bottom Borough, and Surf City Brough) and Seaside Heights Borough, Lavallette Brough, and Mantoloking Borough on the Barnegat Peninsula.

Table 2.3-2 Percentage of Developed Land by Municipality

Municipality	Percentage Developed Parcels	Percentage Developed within the 1% Floodplain	Percentage Developed within the 0.2% Floodplain
Barnegat Light Borough	71.9%	100.0%	N/A
Barnegat Township	41.0%	5.7%	3.6%
Bay Head Borough	90.4%	71.3%	9.0%
Beach Haven Borough	81.2%	100.0%	N/A
Beachwood Borough	63.4%	1.2%	0.8%
Berkeley Township	42.3%	16.5%	4.4%
Brick Township	74.4%	18.1%	11.2%
Eagleswood Township	34.5%	21.2%	9.3%
Harvey Cedars Borough	84.6%	100.0%	0.0%
Island Heights Borough	88.1%	15.8%	8.0%
Jackson Township	70.8%	4.2%	0.6%
Lacey Township	37.2%	30.9%	12.7%
Lakehurst Borough	63.7%	3.9%	2.0%
Lakewood Township	98.2%	1.6%	0.3%

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Municipality	Percentage Developed Parcels	Percentage Developed within the 1% Floodplain	Percentage Developed within the 0.2% Floodplain
Lavallette Borough	96.9%	99.9%	0.1%
Little Egg Harbor Township	64.8%	36.7%	10.4%
Long Beach Township	45.9%	99.9%	N/A
Manchester Township	49.4%	2.4%	0.7%
Mantoloking Borough	89.2%	99.7%	N/A
Ocean Gate Borough	91.1%	55.5%	20.1%
Ocean Township	31.8%	26.2%	19.5%
Pine Beach Borough	92.9%	4.1%	3.7%
Plumsted Township	89.9%	15.7%	5.4%
Point Pleasant Beach Borough	93.5%	67.8%	10.1%
Point Pleasant Borough	99.8%	24.5%	13.3%
Seaside Heights Borough	99.5%	99.9%	0.0%
Seaside Park Borough	92.9%	93.4%	3.0%
Ship Bottom Borough	99.0%	100.0%	N/A
South Toms River Borough	71.1%	5.5%	3.4%
Stafford Township	22.6%	36.0%	N/A
Surf City Borough	95.7%	100.0%	N/A
Toms River Township	79.2%	30.5%	6.1%
Tuckerton Borough	73.0%	43.9%	14.1%

Source: MOV-IV Data, 2022; FEMA, 2024

Note: Developed Parcels excludes beaches, bird sanctuaries, fields (and variations), forest, island, land conservation (and variations), natural land trust, open space (and variations), park (and variations), vacant land (and variations), wetlands (and variations), and wildlife preserves.

Housing

The majority of housing units in Ocean County’s built-up areas are year-round, owner-occupied households. Approximately 74% of housing units are single family detached dwellings (US Census ACS, 2022). Some of the smaller communities are considered built-out (see Table 2.3-2) with few large development sites left. The western and southern parts of the county are on the whole maintained as vegetated or forested land due in large part to the conservation efforts of the Pinelands National Preserve. According to the 2022 American Community Survey 5-year estimates, in 2022 there were 293,899 housing units in Ocean County with a 18.5% vacancy rate. The estimated median value of an owner-occupied home was \$343,500, which is more than a \$80,000 increase from 2015.

Recent and Future Changes in Development

During the planning process, each municipality identified any recent and future changes in development and if that development is located within a high-risk area. Table 2.3-3 summarizes recent and future development by municipality.

Table 2.3-3 Recent and Future Development in Ocean County, by Municipality

Municipality	Recent and Future Development
Barnegat Light Borough	None identified.
Barnegat Township	14-home retirement community
Bay Head Borough	None identified.
Beach Haven Borough	Infill redevelopment; affordable housing redevelopment (adorable housing overlay zone)
Beachwood Borough	None identified.
Berkeley Township	Infill; 25-home development near Sloop Creek
Brick Township	10-parcel development on the barrier island; Camp Osborne redevelopment post-Sandy; Beach Cottage Community Zone; Barrier Island Pioneer Fire House
Eagleswood Township	None identified.
Harvey Cedars Borough	None identified.
Island Heights Borough	Siddons Court Subdivision

Municipality	Recent and Future Development
Jackson Township	None identified.
Lacey Township	The Township reported that since the last plan update, developers have been subdividing land and building new homes throughout Lacey, many of which are in the SFHA. For example, eight new homes have been built on Throop Road and Porter Court which are located in Flood Zone. Additional large-scale developments include Lacey Pines consisting of 68 condominiums. In many cases, the township feels that density is increasing faster than they are able to build new infrastructure to support the development.
Lakehurst Borough	None identified.
Lakewood Township	There are new schools going in near an industrial park (light industrial).
Lavallette Borough	None identified.
Little Egg Harbor Township	Within the Flood Hazard Areas, infill, replacement, and individual lot builds; 23-home subdivision on Sandpiper Lane
Long Beach Township	Elevation of an existing mobile home development, 'Island's End' with 44 homes in Holgate in 2020 (8' and above); construction of bioswales around Island's End mobile home development in this oceanfront subdivision; development of a condominium at 24 th with 22 new housing units
Manchester Township	In recent years, Manchester Township has seen large scale residential and commercial development. The under-construction Presidential Gardens development consists of 509 residential units including mid- and low-income housing in a wildfire risk area of northern Manchester Township, along Route 37. Also, along S. Hope Chapel Road, near the Township's borders with Jackson Township, two large residential projects are under construction, bringing a total of 1,100 new units of residential housing to the community.
Mantoloking Borough	None identified.
Ocean Gate Borough	None identified. The Borough is significantly built out.
Ocean Township	Tradewinds at Waretown; Waretown Family Apartments; Ocean Isle; Waretown Plaza Redevelopment
Pine Beach Borough	Seven affordable housing units built by local Community Action Agency (OCEAN Inc.)
Plumsted Township	None identified. Development in Plumsted is limited by the presence of the Joint Base McGuire-Dix-Lakehurst.
Point Pleasant Beach Borough	There is a mixed-used one-unit structure at Channel Drive and Broadway. At 1805 Route 35, at Sea Avenue, condominium units were built in a flood zone, which contributes to the runoff.
Point Pleasant Borough	Construction of five to six new houses, including site remediation, on a property where an oil company once was located; construction of Waters Edge Condominiums at Point Pleasant Canal and Manasquan River
Seaside Heights Borough	At Hamilton Avenue and Boulevard, all four corners have been converted from bars to condominiums and townhouses. 56 condominiums and a hotel are being constructed on Ocean Terrace, which is in a flood zone. Many bars and restaurants in the Borough are being converted into condominiums.
Seaside Park Borough	No Borough fully built out.
Ship Bottom Borough	Continuation of demolition or rehabilitation of 50+ year old bungalow style and other small homes in favor of larger and more flood-resistant dwellings that can accommodate multiple families; subdivision of larger parcels which has resulted in a small increase of residential densification; new commercial development within the Gateway corridor to the island between 8th and 9th Streets, including the Hotel LBI (a 186,515 SF 102 room year-round hotel and dining location, which provides 200 on-site parking spaces as well as offsite parking lots for valet service) and the Ron Jon Surf Shop Project; other minor site plan commercial developments primarily along the southern end of Long Beach Boulevard; multi-year NJDOT Route 72 Manahawkin Bay Bridges Project; bicycle accommodations, intersection and drainage improvements along 8th and 9th Streets; environmental mitigations; public access improvements; site-specific redevelopment plan for the LBI Grade School property which includes demolition of the existing school building and construction of no more than 21 residential units and a 60,000 SF set aside for public open space and recreation; continued replacement of its existing water, sanitary sewer, and stormwater drainage systems as well as any infrastructure improvements related to flooding or that otherwise become necessary
South Toms River Borough	In recent years, 360 residential units were developed along Dover Road, and a 100-unit extended stay development was complete. Neither project is in a flood zone. Two small commercial buildings have been developed during this time. An affordable housing development is currently under land use board review.
Stafford Township	Large mixed-use property, Stafford Park, adjacent to the Garden State Parkway; 400 single-family homes were adjacent to the Pinelands
Surf City Borough	None identified.
Toms River Township	Development of 250 units (comprised of two six-story multi-family buildings) in a larger mixed-use parcel at the intersection of Iron Street and W. Water Street; four-story mixed-use structure including a parking garage

Municipality	Recent and Future Development
Tuckerton Borough	In 2020, Yellowbrook properties (Tuckerton Landing) along Portsmouth Lane and Providence Court in northern Tuckerton developed 20 homes, none of them in a flood zone. Along Route 9, at 361-369 E. Main Street in Tuckerton, apartment buildings and duplexes were recently developed; none of them in a flood zone.

2.4 ECOSYSTEMS AND NATURAL ASSETS

New Jersey’s Wildlife Management Area System is administered by Fish and Wildlife’s Bureau of Land Management with the purpose of preserving fish and wildlife habitats. There are 15 Wildlife Management Areas populating more than 75,000 acres in Ocean County, with concentrations in the south and west ([NJDEP, 2022](#)). By preserving these ecosystems including their plant life, Wildlife Management Areas help to protect the surrounding area. One such ecosystem is the saltmarsh, which is a coastal wetland that salt water from the ocean tides floods and drains. According to a collaborative study led by the University of California Santa Cruz, the Nature Conservancy, and Wildlife Conservation Society, properties behind existing marshes experience 20% less loss ([Coastal Wetlands and Flood Damage Reduction, 2016](#)). The benefits are multiplied for those at lower elevations in Ocean County, which may experience as much as 50% lower annual losses, according to the study.

Per the 2024 New Jersey Statewide Water Supply Plan, Ocean County sources its water supply from Atlantic City’s 800-foot Sand Aquifer, Piney Point Aquifer, and Rio Grande Water-Bearing Zone. Groundwater supplies almost all of the county’s drinking water needs (New Jersey Geological and Water Survey, 2011). Several other aquifers run through Ocean County; the storage capacity of the aquifers in Ocean County is estimated to be 180 billion gallons of water (Ocean County Comprehensive Master Plan, 2011).

Almost all of Ocean County’s shoreline is developed with the exception of 10.5 miles in the Island Beach State Park in Berkeley Township and 10.8 miles in the Forsythe National Wildlife Refuge in Long Beach Township ([Stockton University](#)). Given the high level of development along the coastline, various methods of shore protection are utilized. Resilient dune systems are a primary. Those in Ocean County are regularly replenished, and dune plants are added annually. Such vegetation helps to stabilize the dunes against wind and water by trapping new sediment.

3.0 PLANNING PROCESS



3.0 PLANNING PROCESS

3.1 INTRODUCTION TO THE PLANNING PROCESS

The Ocean County HMP included a robust planning process and participation strategy. The project is led by the Office of Emergency Management under the Ocean County Sheriff’s Office. The HMP Project Manager is Allen J. Mantz, Radiological Officer, Acting Domestic Preparedness Planner for the Ocean County Office of Emergency Management. Ocean County selected Michael Baker International, Inc. (Michael Baker) to support the development of the Ocean County HMP. This comprises the Project Team, which spearheaded and coordinated the plan update.

The Ocean County HMP update was prepared through numerous meetings, both in-person and virtual, with the Steering Committee, County Agencies and Departments, regional stakeholders, all 33 municipalities, and members of the public. The County’s Office of Emergency Management webpage was used throughout the plan update to bring awareness to hazard mitigation and give the public an opportunity to provide comments. The Ocean County HMP followed FEMA’s HMP process by following their four core steps in completing a HMP update.

Table 3.1-1 Ocean County HMP Planning Process

FEMA’s Four Core Planning Steps	Ocean County HMP Action
1. Organize the Planning Process and Resources	Created an online project website for public meeting notices, general information on hazard mitigation, and a platform to submit questions or concerns, in addition to comments on the draft HMP.
2. Assess Risks and Capabilities	Provided risk estimates based on Hazus-MH, which was based on an updated critical facility data layer and reviewed local capabilities at the municipal meetings.
3. Develop a Mitigation Strategy	Developed Mitigation Action Worksheets, which document each jurisdiction’s analysis of actions considered to reduce the impacts of hazards identified in the risk assessment.
4. Adopt and Implement the Plan	After receiving formal approval from both NJOEM and FEMA, the County will adopt this plan and each of the 33 municipalities will formally adopt a resolution approving the finalized Ocean County HMP update.

This plan update was completed through a combination of research and municipal, stakeholder, and public participation. The Project Team researched existing local plans, reports, projects, and ordinances in addition to acquiring data from the County, New Jersey Geographic Information Network (NJGIN), Centers for Disease Control and Prevention (CDC), New Jersey Department of Environmental Protection (NJDEP), and FEMA to write the Ocean County HMP.

Plan participation began with the Steering Committee kick-off meeting in November 2023 and concluded when the final plan was submitted to FEMA. After receiving formal approval from both NJOEM and FEMA, each participating municipality formally adopts a resolution (Section 9.0) approving the finalized Ocean County HMP update, 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.

3.2 STEERING COMMITTEE

Ocean County formed a Hazard Mitigation Steering Committee prior to the start of the 2025 planning process to guide plan development. The Steering Committee included municipal officials from 18 of the 33 municipalities (all municipalities were invited to participate), Ocean County government representatives, state and federal partners, and other stakeholder organizations (e.g. New Jersey Office of Emergency Management and Ocean County Utilities Authority). In addition to the Steering Committee Kick-off meeting, discussed in more detail in Section 3.3, the Steering Committee reviewed the draft plan and provided comments.

3.3 COUNTY, STAKEHOLDER, AND MUNICIPAL PARTICIPATION

This HMP update included a broad range of stakeholders, including seven county agencies and departments, 23 regional stakeholders, and each of the 33 municipalities. The County invited stakeholder organizations and nonprofits that support underserved populations, climate change experts, neighboring counties, agencies that have the authority to regulate development, and other private and nonprofit interests involved in hazard mitigation activities. Table 3.3-1 lists which organization participated in each meeting. This section provides a summary of each of the county, regional stakeholder, and municipal meetings conducted during this planning process.

Summary of Meetings Held during this Plan Update

November 14, 2023: Steering Committee Kick-off Meeting (SC Kick-off)

The County invited six County agencies and departments, four regional stakeholders, and all 33 municipalities to the Steering Committee kick-off meeting to obtain diverse feedback at the start of the planning process. This hybrid meeting included the following topics: the role of the steering committee; an overview on hazard mitigation and the six-step planning process; changes since the last plan and new FEMA guidance; high-level overview of the planning process, risk and vulnerability assessment, capability assessment, mitigation strategy; and the project schedule. Participants that were physically at the meeting completed two worksheets during this meeting to evaluate the goals and objectives and profiled hazards from the previous plan. Hazards profiled by the New Jersey State Hazard Mitigation Plan (2024) were considered for this plan update. Virtual participants were emailed both worksheets as a follow-up to the meeting. The Project Team received several completed worksheets by both the Steering Committee and municipalities, which assisted the County revise the mitigation goals and objectives and profiled hazards.

Table 3.3-2 Steering Committee Kick-off Meeting Invitations and Attendance

Organization Invited to Meeting	Attended
Ocean County Office of Emergency Management/Sheriff's Office	✓
Ocean County Planning Department	✓
Barnegat Bay Partnership	
Ocean County Engineering Department	
Ocean County Human Services	
Ocean County Utilities Authority	✓
Lakewood Township - Underserved Community Representative	
Jacques Cousteau National Estuarine Research Resource Center	
Hazard Mitigation Unit Manager (NJOEM)	✓
Barnegat Light Borough	✓
Barnegat Township	
Bay Head Borough	
Beach Haven Borough	✓
Beachwood Borough	
Berkeley Township	✓
Brick Township	
Eagleswood Township	✓
Harvey Cedars Borough	✓
Island Heights Borough	
Jackson Township	✓
Lacey Township	✓
Lakehurst Borough	
Lakewood Township	
Lavallette Borough	✓
Little Egg Harbor Township	
Long Beach Township	✓
Manchester Township	

Organization Invited to Meeting	Attended
Mantoloking Borough	✓
Ocean Gate Borough	
Ocean Township	
Pine Beach Borough	
Plumsted Township	
Point Pleasant Beach Borough	
Point Pleasant Borough	
Seaside Heights Borough	
Seaside Park Borough	
Ship Bottom Borough	✓
South Toms River Borough	
Stafford Township	✓
Surf City Borough	✓
Toms River Township	✓
Tuckerton Borough	✓

January 11, 2024: Ocean County Emergency Management Coordinators Association (EMCA) Meeting

The County invited all 33 municipalities to this quarterly EMCA meeting. Michael Baker used this meeting to announce the plan update and introduce the Project Team. The presentation included an overview on hazard mitigation planning, new FEMA guidance, and how to be involved in this plan update. The Project Team asked each municipality to post the Public Workshop #1 flyer to their municipal website.

Table 3.3-3 Ocean County EMCA Invitations and Attendance

Organization Invited to Meeting	Attended
Ocean County Office of Emergency Management/Sheriff's Office	✓
Barnegat Light Borough	
Barnegat Township	✓
Bay Head Borough	✓
Beach Haven Borough	✓
Beachwood Borough	✓
Berkeley Township	✓
Brick Township	✓
Eagleswood Township	
Harvey Cedars Borough	✓
Island Heights Borough	✓
Jackson Township	
Lacey Township	✓
Lakehurst Borough	
Lakewood Township	
Lavallette Borough	✓
Little Egg Harbor Township	
Long Beach Township	✓
Manchester Township	✓
Mantoloking Borough	
Ocean Gate Borough	✓
Ocean Township	✓
Pine Beach Borough	✓
Plumsted Township	
Point Pleasant Beach Borough	✓
Point Pleasant Borough	✓
Seaside Heights Borough	
Seaside Park Borough	

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Organization Invited to Meeting	Attended
Ship Bottom Borough	
South Toms River Borough	✓
Stafford Township	✓
Surf City Borough	
Toms River Township	✓
Tuckerton Borough	

January 11, 2024: Ocean County Emergency Management Council (CEMC) Meeting

The County invited 57 regional stakeholder organizations and non-profits to the quarterly CEMC meeting, several of which represent socially vulnerable populations and are climate change experts (e.g. Salvation Army, American Red Cross, National Oceanic and Atmospheric Administration). Michael Baker used this meeting to announce the plan update and introduce the Project Team. The presentation included an overview on hazard mitigation planning, new FEMA guidance, and how to be involved in this plan update. The Project Team asked each agency to send the Public Workshop #1 flyer to their listserv of organizations that represent socially vulnerable populations.

Table 3.3-4 Ocean County CEMC Invitations and Attendance

Organization Invited to Meeting	Attended
American Red Cross	
Atlantic City Electric	
Bayada Home Health Care	
Berkeley Hazmat	
Community Animal Response Team	
Oyster Creek NGS	
Community Medical Center	
Encompass Health Rehabilitation Hospital	
Holy Redeemer Home Care	
Jersey Central Power and Light Company	✓
Joint Base McGuire-Dix-Lakehurst	
Long Island Health Department	
Monmouth Medical Center Southern Campus	
National Oceanic and Atmospheric Administration	
New Jersey American Water	
New Jersey Department of Agriculture	
New Jersey Department of Environmental Protection	
New Jersey Department of Department of Health and Senior Services	
New Jersey Division of Forest Fire Service	
New Jersey Natural Gas	✓
New Jersey State Police OEM	✓
Ocean Air Support Squadron	
Ocean County Board of Social Services	✓
Ocean County Bridge Department	
Ocean County Business Development & Tourism	
Ocean County College	
Ocean County Department of Corrections	
Ocean County Engineering	
Ocean County EMS Coordinators	✓
Ocean County Finance	
Ocean County Fire Coordinators	
Ocean County Fire Marshals Office	
Ocean County Health Department	✓
Ocean County Human Services	✓
Ocean County Information Technology	
Ocean County Medical Examiner	

Organization Invited to Meeting	Attended
Ocean County Mosquito Extermination Commission	
Ocean County Parks and Recreation	
Ocean County Planning Department	
Ocean County Prosecutors Office	✓
Ocean County Public Information	
Ocean County Road Department	
Ocean County Security	
Ocean County Senior Services	
Ocean County Sheriff's Office	✓
Ocean County Solid Waste	
Ocean County Superintendent of Schools	
Ocean County Transportation	
Ocean County Utilities Authority	✓
Ocean Medical Center	
Salvation Army	
Six Flags Great Adventure	
Southern Ocean Medical Center	
Team Rubicon	
Town Square Media Jersey Shore	
Veolia	
Verizon	
Veterinarian Coordinator	

January 25, 2024: CRS Users Group

Michael Baker presented at the quarterly CRS Users Group meeting to announce the plan update and introduce the Project Team. The presentation included an overview on hazard mitigation and the six-step planning process; changes since the last plan and new FEMA guidance; high-level overview of the planning process, risk and vulnerability assessment, capability assessment, and mitigation strategy; the project schedule; and how the CRS program overlaps with the HMP.

Table 3.3-5 CRS Users Group Invitations and Attendance

Organization Invited to Meeting	Attended
Ocean County Office of Emergency Management/Sheriff's Office	✓
Ocean County Engineering	✓
Ocean County Planning Department	✓
Coastal Coalition	✓
Monmouth County Planning	✓
New Jersey Department of Environmental Protection	✓
Resilient LBI Team	✓
Rutgers Climate Resilience and Urban Policy	✓
Barnegat Light Borough	
Barnegat Township	✓
Bay Head Borough	
Beach Haven Borough	
Beachwood Borough	
Berkeley Township	
Brick Township	✓
Eagleswood Township	
Harvey Cedars Borough	✓
Island Heights Borough	
Jackson Township	
Lacey Township	
Lakehurst Borough	
Lakewood Township	

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Organization Invited to Meeting	Attended
Lavallette Borough	
Little Egg Harbor Township	
Long Beach Township	✓
Manchester Township	
Mantoloking Borough	
Ocean Gate Borough	
Ocean Township	
Pine Beach Borough	
Plumsted Township	
Point Pleasant Beach Borough	✓
Point Pleasant Borough	
Seaside Heights Borough	✓
Seaside Park Borough	
Ship Bottom Borough	✓
South Toms River Borough	
Stafford Township	✓
Surf City Borough	
Toms River Township	
Tuckerton Borough	

May 15, 2024, to August 30, 2024: Individual Meetings

Starting in May and ending in August, Michael Baker and Ocean County OEM meet individually with each municipality to discuss the plan update. To initiate the municipal meetings, the Project Team sent emails to emergency management coordinators from each municipality. The emails requested the emergency management coordinator consider extending the invitation, as appropriate for their municipality, to the mayor, business administrator, council members, engineers, zoning officers, planners, building officials, GIS specialists, public work employees, municipal managers, and other municipal representatives. Michael Baker also emailed municipal specific plan documents for review, including a capability assessment survey, their previous list of critical facilities, and previous mitigation strategy. Additionally, the Project Team requested each municipality send their latest master plan, floodplain development ordinance, and emergency operations plan for review and inclusion in this plan update.

Topics covered in the meetings included significant hazard events since the last plan update, recent and future changes in development (and if they are in a high hazard area), list of community lifelines and critical facilities, ranking of hazards, the status of Repetitive Loss (RL)/Severe Repetitive Loss (SRL) properties, and their mitigation strategy. The Project Team also discussed their existing plans, studies, reports, and technical information during the meeting and asked if there were any new capabilities needed, which was added to their mitigation strategy. Lastly, Michael Baker asked each municipality if they know of any organizations that support socially vulnerable populations and for their contact information, which was put into a database and used to invite those organizations to the roundtable meeting in August 2024. The information collected from the individual meetings were incorporated into their Community Profile, located in Appendices Volume I – Jurisdictional Information. The result was 30 in-person meetings and three virtual meetings, achieving participation from 100% of the municipalities.

In addition to hosting individual meetings with each municipality, the Project team met individually with Ocean County departments and agencies and regional stakeholders, including the Resilient LBI team through Resilient NJ and a non-profit organization that could not attend the socially vulnerable roundtable meeting. Information from those meetings were also incorporated into their corresponding municipal appendix (e.g. Resilient LBI’s mitigation actions are located within the municipal appendices on the Long Beach Island that gave their approval).

August 21, 2024: Socially Vulnerable Roundtable

In recognition that different populations have different vulnerabilities, and capacity to prepare, respond and recover from hazard events, the Project Team held a roundtable discussion to gather input from organizations that work with residents and businesses on the risks natural hazards pose in the community and what actions can help reduce the risk to residents, businesses, visitors. The Project Team invited groups that represent vulnerable populations based on feedback from Ocean County and the municipalities during their individual meeting.

During the meeting, participants were asked about their hazards of concern. Representation from an adult community in Jackson stated that fallen trees from storm events block roadways and the community would like to see improved coordination between the utility companies and the County to restore power after a storm. The American Red Cross described their response to a wildfire in the summer of 2023, which has been the only hazard within the County since the last plan update. The American Red Cross also described their capabilities in responding to storm events. The Ocean County Board of Social Services described their work with high-risk populations. They are considering the impacts of extreme heat events and instating a Code Red system. Lastly, Ocean County medical centers/hospitals discussed how they reestablish community lifelines after an event. Participants pointed out that the health systems currently operate at a high capacity on a daily basis and any impact from a major event stresses the capabilities of the facilities.

As a follow up to the Roundtable, the Project Team met with Starve Poverty, a non-profit organization located between two low-income, senior communities in Barnegat Township (Brighton at Barnegat and Pinewood Estates). Starve Poverty provides emergency home repairs for these two communities, totaling approximately 500 manufactured homes built in the 1960s and 1970s. These homes have roofs that often leak water during heavy rain events that have led to structural damage. Starve Poverty operates in a renovated fire house which is leased from the Township. The organization operates a food pantry that has served over 5,000 meals from January to August 2024, in addition to a community center for residents of Brighton at Barnegat and Pinewood Estates. Starve Poverty also installs window air condition units, as many members are elderly and have breathing problems. The community center operates as a cooling and warming center during extreme temperature events. Starve Poverty provides home repairs through private fundraising and private grants and has a grant writer on staff. The organization needs a storage container to hold additional food for the food pantry and air conditioning units, which was added to the Barnegat Township’s mitigation strategy during this plan update.

Table 3.3-6 Socially Vulnerable Roundtable Invitation and Attendance

Organization Invited to Meeting	Attended
Ocean County Core Advisory Group	
Manahawkin Nursing and Rehab	
The Residence at Stafford - Assistant	
Genesis Health	
Stafford At the Bay	
Starve Poverty & Rt. 702 Firehouse	✓
Solutions to End Poverty Soon (STEPS)	
American Red Cross	✓
Ocean County Health Department	✓
Community Medical Center	✓
Fountainhead Adult Community	✓
Hackensack Meridian Health	✓
Salvation Army	
Ocean County Board of Social Services	✓
New Jersey Health Department	
Health Redeemer	
Encompass Health	
Robert Wood Johnston Hospital	

August 22, 2024: Municipal Utility Authority

This meeting targeted regional municipal utility authorities within the County. Topics covered in the meeting included significant hazard events since the last plan update, existing capabilities, and their mitigation strategies. The Project Team reviewed mitigation actions that were included in the previous plan and new actions to add as part of this plan update. Information from the meeting was incorporated into the utility authorities’ corresponding municipal appendices (e.g. Brick Municipal Utility Authority’s mitigation actions are located within Brick Township’s appendix).

Table 3.3-7 Municipal Utility Authority Invitation and Attendance

Organization Invited to Meeting	Attended
Berkeley Township Sewerage Authority	✓
Brick Township Municipal Utilities Authority	✓
Jackson Township Municipal Utilities Authority	✓
Little Egg Harbor Township Municipal Utilities Authority	✓
Ocean County Utilities Authority	✓

August 29, 2024: Regional Stakeholder Meeting

This meeting targeted participation from climate change experts, neighboring counties, agencies that have the authority to regulate development, and other private and nonprofit interests involved in hazard mitigation activities. During the meeting, the Project Team summarized risk assessment findings and discussed the hazards of concern. Participants were asked if the assessment aligns with what they have experience within the last five years.

Participants noted that a hazard of concern is the risk of wildfire in northern Ocean County that is adjacent to Monmouth County, especially with the increase in population occurring in these areas. There were inquiries about potential mutual aid agreements between the two counties. Power outages are becoming an increasing concern, and more roadways are becoming impassable during a high tide wind event. This is a concern shared by both Monmouth and Atlantic County. Barnegat Bay Partnership explained that a concern they have is the degradation of salt marshes.

The Project Team asked the regional stakeholders what existing capabilities and mitigation projects they are undergoing to reduce hazards of concern. Rutgers University/New Jersey Climate Research Center described their tools available to support local hazard mitigation, such as Hazard Adapt. The Pinelands Commission worked with NASA on a Wildfire Assessment in 2018; wildfire remains their biggest risk they face. The Barnegat Bay Partnership surveyed hundreds of road-stream crossings to assess flood risk and culvert flows. The Partnership is restoring a small pocket marsh in Point Pleasant and plans to conduct seven to eight large-scale restoration projects within the next two years. Lastly, the Project Team asked if there are any known populations within the County that should be considered in developing mitigation actions.

Table 3.3-8 Regional Stakeholder Meeting Invitation and Attendance

Organization Invited to Meeting	Attended
Monmouth County	✓
Atlantic County	✓
Burlington County	
Atlantic County Electric	
Rutgers University and New Jersey Climate Research Center	✓
Joint Base McGuire-Dix-Lakehurst	✓
New Jersey Pinelands Commission	✓
New Jersey Natural Gas	✓
Barnegat Bay Partnership	✓
FirstEnergy	
Long Beach Island Health Department	
NOAA HazMat	

Organization Invited to Meeting	Attended
New Jersey Resources	
Ocean Air Support Squadron	
United States Coast Guard	

Plan Participation Summary

Table 3.3-1 provides a summary of which stakeholders were involved in the meetings described above. The table is organized by County Agencies and Departments, regional stakeholders, and by municipality.

Table 3.3-1 Participation by Meeting

Participation	Meeting Type							
	SC Kick-off	CEMC	EMCA	CRS Users Group	Socially Vulnerable Roundtable	Municipal Utility Authority	Regional Stakeholder	Individual Meetings
County Agency/Department								
Ocean County Board of Special Services		✓			✓			
Ocean County EMS Coordinators		✓						
Ocean County Engineering Department				✓				✓
Ocean County Health Department		✓			✓			
Ocean County Planning Department	✓			✓				✓
Ocean County Prosecutors Office		✓						
Ocean County Utilities Authority	✓	✓				✓		
Regional Stakeholder								
American Red Cross					✓			
Atlantic County Planning							✓	
Barnegat Bay Partnership							✓	
Berkeley Sewage Authority						✓		
Brick Municipal Utility Authority						✓		
Coastal Coalition				✓				
Community Medical Center					✓			
Fountainhead Adult Community					✓			
Hackensack Meridian Health					✓			
Jackson Municipal Authority						✓		
Jacques Cousteau National Estuarine Research Reserve								
Jersey Central Power and Light		✓						
Joint Base McGuire-Dix-Lakehurst							✓	
Little Egg Harbor Municipal Authority						✓		
Monmouth County OEM							✓	
Monmouth County Planning				✓			✓	
New Jersey Department of Environmental Protection				✓				
New Jersey Natural Gas		✓					✓	
New Jersey OEM	✓	✓						
New Jersey Pinelands Commission							✓	
Resilient LBI Team				✓				✓
Rutgers University and New Jersey Climate Research Center				✓			✓	
Starve Poverty								✓

OCEAN COUNTY, NEW JERSEY
HAZARD MITIGATION PLAN 2025

Participation	Meeting Type							
	SC Kick-off	CEMC	EMCA	CRS Users Group	Socially Vulnerable Roundtable	Municipal Utility Authority	Regional Stakeholder	Individual Meetings
Municipality								
Barneget Light Borough	✓							✓
Barneget Township		✓	✓	✓				✓
Bay Head Borough		✓	✓					✓
Beach Haven Borough	✓	✓	✓					✓
Beachwood Borough		✓	✓					✓
Berkeley Township	✓	✓	✓		✓			✓
Brick Township		✓	✓	✓				✓
Eagleswood Township	✓							✓
Harvey Cedars Borough	✓	✓	✓	✓				✓
Island Heights Borough		✓	✓					✓
Jackson Township	✓							✓
Lacey Township	✓	✓	✓					✓
Lakehurst Borough								✓
Lakewood Township								✓
Lavallette Borough	✓	✓	✓					✓
Little Egg Harbor Township								✓
Long Beach Township	✓	✓	✓	✓				✓
Manchester Township		✓	✓					✓
Mantoloking Borough	✓							✓
Ocean Gate Borough		✓	✓					✓
Ocean Township		✓	✓					✓
Pine Beach Borough		✓	✓					✓
Plumsted Township								✓
Point Pleasant Beach Borough		✓	✓	✓				✓
Point Pleasant Borough		✓	✓					✓
Seaside Heights Borough				✓				✓
Seaside Park Borough								✓
Ship Bottom Borough	✓			✓				✓
South Toms River Borough		✓	✓					✓
Stafford Township	✓	✓	✓	✓				✓
Surf City Borough	✓							✓
Toms River Township	✓	✓	✓					✓
Tuckerton Borough	✓							✓

3.4 PUBLIC PARTICIPATION

Starting at the beginning of the planning process, members of the public were given the opportunity to be involved in the planning process. The Project Team hosted the first public workshop on January 23, 2024, where the County OEM website was announced. This website was the main point of communication for the public throughout the planning process.

Project Website

The Ocean County Sherriff’s Office hosted the Ocean County HMP website, which was used to announce information on the plan update. At the beginning of the planning process, the Project Team updated content on the Ocean County HMP website to announce the 2025 HMP update and the first public workshop. The County added a public comment section to

the website which remained open throughout the entire planning process. Comments from the public were used to update the municipal community profiles (Appendices V.1 – Jurisdictions). Each public workshop was advertised on this website. The draft plan was also posted on this website for public review and comment. See Figure 3.6-1 for a snapshot of the Ocean County HMP website.

FIGURE 3.4-1 Ocean County HMP Website on January 11, 2024

SHERIFF'S OFFICE

OCEAN COUNTY 2025 MULTI-JURISDICTIONAL ALL HAZARD MITIGATION PLAN

The Ocean County Sheriff's Office, Office of Emergency Management is updating its 2018 Multi-Jurisdictional All-Hazard Mitigation Plan (HMP), which expires in 2025. This HMP is required by state and federal agencies in order for communities in Ocean County to be eligible for certain types of state and federal disaster relief funds after a disaster occurs.

This website will be used throughout the planning process to post information, collect comments, announce meetings, and to post draft plan documents.

HAZARD MITIGATION

The term "Hazard Mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards, or disaster, such as floods, hurricanes, wildfires, landslides, tornadoes, earthquakes, dam failures, or terrorism. Hazard mitigation focuses on long-term strategies that help governments and citizens find ways to reduce hazard risks and disaster-related costs to communities. Efforts made to reduce hazard risks should be compatible with other community goals; mitigation is most effective when it is a part of the larger responsibility of the government, individuals, private businesses, institutions, and non-profits. As communities plan for new development and improvements to existing infrastructure, mitigation can and should be an important component of the planning effort.

While mitigation activities can and should be taken before a disaster occurs, after a disaster, hazard mitigation is essential. Oftentimes after disasters, repairs and reconstruction are completed in such a way as to simply restore damaged property to pre-disaster conditions. These efforts may "get things back to normal," but the replication of pre-disaster conditions may result in a repetitive cycle of damage, reconstruction, and repeated damage. Hazard mitigation breaks this repetitive cycle by producing less vulnerable conditions through post-disaster repairs and reconstruction. The implementation of such hazard mitigation actions leads to building stronger, safer and smarter communities that are better able to reduce future injuries and future damage.

When the same kind of disaster occurs in the same place, like flooding along the coast, it can cause repeated damage and require repeated reconstruction. This constant reconstruction becomes more expensive over time. Hazard mitigation breaks this expensive cycle of recurrent damage and increasing reconstruction costs by taking a long-term view of rebuilding and recovering following disasters - hazard mitigation builds a safer community from the beginning.

2018 ALL HAZARD MITIGATION PLAN

[View information regarding the previous 2018 plan](#)

LATEST NEWS

PUBLIC WORKSHOP #1

Tuesday, January 23, 2024, 5:00 - 6:00 PM

Ocean County, alongside consultant Michael Baker International, Inc., will host a series of public workshops during this plan update. The purpose of the workshops is to provide an update on the project and to gather input from residents. Public input will help the project team better understand risks, vulnerabilities, and impacts of natural hazards to the community and identify potential mitigation actions to reduce that risk.

For information on Public Workshop #1, please see the [Ocean HMP Public Outreach Flyer.pdf](#).

WE WANT TO HEAR FROM YOU

Throughout the 2025 plan update, you may contact the project team with questions and/or comments. Once the draft plan is released for public comment, you may use this form to submit your questions and/or comments.

** Indicates required fields*


Submission may take a moment, please do not re-submit.

Name*

Email*

Questions/Comments*

I'm not a robot

 reCAPTCHA
Privacy • Terms

Public Outreach

For each of the four public workshops, the Project Team created a workshop handout (Figure 3.6-2) with information on how to attend the public meeting and what it covers. The public workshop handout was sent via email to the following stakeholders:

- Municipal Mayors, Clerks, Borough Administrators List (includes all 33 towns)
- Ocean County, Office of Senior Services
- Ocean County College, Office of Disability Services
- Ocean County Emergency Management Council (CEME)
- Ocean County Emergency Management Coordinators Association (EMCA), which includes organizations that represent socially vulnerable populations and FEMA community lifelines.

In addition to sending the public workshop handout to regional stakeholders, the project website advertised each public meeting and the County released a press release (Figure 3.4-3), and posted on the County’s social media. For the second public meeting on the risk assessment, the Patch release a [news article](#) about the public meeting (Figure 3.4-4).

Figure 3.4-2 Public Workshop #1 and #2 Handouts

OCEAN COUNTY, NEW JERSEY 2025 MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

OVERVIEW
The Ocean County Sheriff’s Office, Office of Emergency Management, is updating its 2020 Ocean County Multi-Jurisdictional Hazard Mitigation Plan (HMP). Hazard mitigation planning identifies risks and vulnerabilities associated with natural disasters and develops long-term strategies for protecting people and property from future hazard events. A HMP is required by state and federal agencies to be updated every five (5) years in order for communities in Ocean County to be eligible for certain types of state and federal disaster relief funds after a disaster occurs.

PUBLIC WORKSHOPS
Ocean County, alongside consultant Michael Baker International, Inc., will host a series of public workshops during this plan update. The purpose of the workshops is to provide an update on the project and to gather input from residents. Public input will help the project team better understand risks, vulnerabilities, and impacts of natural hazards to the community and identify potential mitigation actions to reduce that risk.

To review the 2020 Ocean County HMP or learn more about hazard mitigation planning, please visit the [Ocean County Hazard Mitigation Planning webpage](#).

Long Beach Island

ATTEND THE WORKSHOP

Tuesday, January 23, 2024
5:00 - 6:00 PM

This is a hybrid workshop; available in-person or via Microsoft Teams.

Physical location:
Robert J. Miller Airpark
901 Route 530
Berkeley Township, NJ 08721

To register for the workshop virtually, please click on [this link](#) or scan the QR Code below.

QUESTIONS? COMMENTS?

Contact:

Brittany Dremluk, AICP, PP, LEED Green Associate
Consultant Project Manager
Michael Baker International, Inc.
(e) brittany.dremluk@mbakerintl.com
(p) 609-807-9556

Allen J. Mantz, Jr.
Radiological Officer
Acting Domestic Preparedness Planner
Ocean County Sheriff’s Office
(e) amantz@co.ocean.nj.us
(p) 732-341-3451 x 6120

OCEAN COUNTY, NEW JERSEY 2025 MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

OVERVIEW
The Ocean County Sheriff’s Office, Office of Emergency Management, is updating its Hazard Mitigation Plan. Hazard mitigation planning identifies risks and vulnerabilities associated with natural disasters and develops long-term strategies for protecting people and property from future hazard events. Updated are required every five (5) years in order for communities in Ocean County to be eligible for certain types of state and federal disaster relief funds after a disaster occurs.

PUBLIC WORKSHOPS
The Project Team is engaging with the public via a workshop to understand unique assets that should be protected, the hazards we face, and findings from the risk assessment. Questions we may discuss include:

- Where are the hazards experienced?
- What are your biggest concerns?
- What are your recommendations for hazard mitigation?

To review the 2020 Ocean County HMP or learn more about hazard mitigation planning, please visit the [Ocean County Hazard Mitigation Planning webpage](#).

ATTEND THE WORKSHOP

Thursday, June 27, 2024
5:00 - 6:00 PM

Join us to discuss our risk assessment findings and discuss how risk in Ocean County is mitigated by existing capabilities and mitigation strategies.

Physical location:
Robert J. Miller Airpark
901 Route 530
Berkeley Township, NJ 08721

To attend the workshop virtually, please click on [this link](#), scan the QR Code below, or call in using the number below

Call In Number: (412) 634-6334
Conference Code: 452 381 67#

QUESTIONS? COMMENTS?

Contact:

Brittany Dremluk, AICP, PP, LEED Green Associate
Consultant Project Manager
Michael Baker International, Inc.
(e) brittany.dremluk@mbakerintl.com
(p) 609-807-9556

Allen J. Mantz, Jr.
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Acting Domestic Preparedness Planner
Ocean County Sheriff’s Office
(e) amantz@co.ocean.nj.us
(p) 732-341-3451 x 6120

3.0-13

3.0 PLANNING PROCESS

Figure 3.4-3 Public Workshop #1 and #2 Press Releases

OCEAN COUNTY PRESS RELEASE

BERKELEY TOWNSHIP – Ocean County is seeking public input as it begins updating its Ocean County Multi-Jurisdictional Hazard Mitigation Plan.

"The Ocean County Office of Emergency Management, under the direction of the Ocean County Office of the Sheriff, is working with Michael Baker International Inc. to update the plan – which is required every five years by state and federal agencies," said Deputy Director of the Ocean County Board of Commissioners Gary Quinn, liaison to the Sheriff's Office. "Public input for this update is imperative. We gain a lot of important insight from our residents and representatives of public agencies so that the plan reflects Ocean County and the hazards we experience."

The first one-hour public workshop is scheduled to begin at 5 p.m. Tuesday, Jan. 23. It's a hybrid workshop. People can attend in-person at the Ocean County Office of Emergency Management, at the Ocean County Airport, Route 530, here.

To access the workshop virtually, the public can visit the Ocean County website at www.co.ocean.nj.us and click on the All Hazard Mitigation Plan tab on the home page and follow the instructions to register.

According to Ocean County Sheriff Michael G. Mastronardy, hazard mitigation planning identifies risks and vulnerabilities associated with natural disasters and develops long-term strategies for protecting people and property from future hazard events.

"Ocean County experiences a host of natural hazards and disasters," Mastronardy said. "From wild fires to flooding to coastal storms, it's important this plan reflects the most accurate information available."

A Hazard Mitigation Plan is required by state and federal agencies to be updated every five-years in order for communities in Ocean County to be eligible for certain types of state and federal disaster relief funds after a disaster occurs.

Ocean County, along with its consultant Michael Baker International, Inc., will host a series of public workshops during the plan update.

"The purpose of these workshops is to provide an update on the project and to gather input from residents," Quinn said. "Public input will help the project team better understand risks, vulnerabilities, and impacts of natural hazards to the community and identify potential mitigation actions to reduce that risk."

OCEAN COUNTY PRESS RELEASE

BERKELEY TOWNSHIP – In order to better understand the risks and vulnerabilities associated with natural disasters, the Ocean County Sheriff's Office, Office of Emergency Management invites input from the public during its second public workshop on updates to the Hazard Mitigation Plan.

"We are working to update the plan and develop long-term strategies for protecting people and property from future hazard events," said Ocean County Sheriff Michael G. Mastronardy, who serves as the County's Emergency Management Coordinator. "The more information we can gather the better prepared we will be."

The one-hour hybrid public workshop is scheduled to begin at 5 p.m. Thursday, June 27. People can attend in-person at the Ocean County Office of Emergency Management, at the Ocean County Airport, Route 530, here.

To access the workshop virtually, the public can visit the Ocean County website at www.co.ocean.nj.us and click on the All Hazard Mitigation Plan tab on the home page and follow the instructions to register. Or, they can access the workshop by using the call in number (412) 634-6334 and Conference Code: 452 381 67#

Possible topics for discussion during the workshop include where are the hazards experienced, what are the biggest concerns and what are recommendations for hazard mitigation?

"The Hazard Mitigation Plan team is engaging with the public through this workshop to understand unique assets that should be protected, the hazards we face, and findings from the risk assessment," said Deputy Director of the Ocean County Board of Commissioners Gary Quinn, liaison to the Ocean County Sheriff's Office. "We are required to update the plan every five years so communities in Ocean County are eligible for certain types of state and federal disaster relief funds following a disaster."

Director of the Ocean County Board of Commissioner Barbara Jo Crea urged Ocean County citizens to participate in the workshops.

"Whether you attend in person or join the discussion virtually, it's important we hear from you," she said. "There is also an opportunity to participate by accessing the information on the County website."

For questions about the plan or the public workshop please contact Brittany Dremluk, Consultant Project Manager at Michael Baker International, Inc. by emailing brittanydremluk@mbakerintl.com or calling 609-807-9556, or Allen J. Mantz, Jr., Radiological Officer, Acting Domestic Preparedness Planner, Ocean County Sheriff's Office at amantz@co.ocean.nj.us or calling 732-341-3451, Ext. 6120.

Figure 3.4-4 Patch Article on Public Workshop #2

Politics & Government

Hazard Mitigation Plan Discussed At Ocean County Workshop

What are Ocean County's biggest concerns for future natural disasters? This and more will be discussed at an upcoming workshop.

Veronica Fleisher, Patch Staff

Posted Tue, Jun 18, 2024 at 10:14 am ET

"We are working to update the plan and develop long-term strategies for protecting people and property from future hazard events," said Ocean County Sheriff Michael G. Mastronardy, who serves as the county's Emergency Management Coordinator. (Shutterstock)

BERKELEY, NJ — What are Ocean County's biggest concerns when it comes to natural disasters, and how can they be mitigated? These will be the topic of discussion at an upcoming public workshop dedicated to updating the county's Hazard Mitigation Plan.

This is the second such workshop hosted by the Ocean County Sheriff's Office, Office of Emergency Management, held at the Ocean County Airport.

"We are working to update the plan and develop long-term strategies for protecting people and property from future hazard events," said Ocean County Sheriff Michael G. Mastronardy, who serves as the county's Emergency Management Coordinator. "The more information we can gather the better prepared we will be."

The one-hour hybrid public workshop is scheduled to begin at 5 p.m. Thursday, June 27. People can attend in-person at the Ocean County Office of Emergency Management, at the Ocean County Airport, Route 530, Berkeley.

To access the workshop virtually, the public can visit the Ocean County website at www.co.ocean.nj.us and click on the All Hazard Mitigation Plan tab on the home page and follow the instructions to register. Or, they can access the workshop by using the call in number (412) 634-6334 and Conference Code: 452 381 67#

Public Workshops

January 23, 2024: Public Workshop #1 – Introduction to Plan Update

The first public workshop served as an announcement to the public about the plan update and provided information on how to remain involved through the planning process. This meeting kicked-off the planning process by introducing the Project Team and providing an overview on hazard mitigation, including the planning process, changes since the last plan update, and the Ocean County HMP goals and objectives. The Project Team discussed each plan element and the project schedule, including upcoming public workshops. The floor was then open to members of the public to provide comments or ask questions.

Participants noted that the tide in Barnegat Bay reached its highest levels since Superstorm Sandy in January 2024. During Superstorm Sandy, the tide reached 7-feet, and in January 2024 it reached between 3.5 and 4 feet. Feedback from participants included the need for additional cooling and heating centers. Ocean County has a high rate of 55+ living communities and participants were concerned about heating and cooling for these communities during power outages. While some participants conveyed a need for accessible technologies and cots in shelters for individuals with disabilities was also conveyed, others commented that these populations may be safer at home as long as they are equipped (e.g., with hardened electrical systems and propane-powered generators). Feedback regarding education, awareness, and outreach before, during, and after a disaster included that individuals with disabilities may require specific forms of communication such as American Sign Language interpretation, captions, Braille, and/or accessible electronic messaging. Participants expressed that interior municipalities are experiencing a high risk of major disaster from wildfires, including the risk to 55+ mobile home communities that have been in wildfires' proximity.

Through the discussion around participant feedback, the Project Team provided a brief overview of FEMA's Community Rating System. It also responded to questions around the mitigation response plan for the Oyster Creek Nuclear Power Plant. The nuclear incident response plan that was in place when the plant was operational as well as the post-shutdown plan are no longer in place. Effective are individual municipal and county emergency operations plans. The Project Team explained several of the uses of the county's Register Ready program, namely providing emergency response teams with information on individuals' needs around disabilities, pets, transportation, and more in the event of an emergency. The county also has a RAVE system through which registrants receive emergency communications by phone.

The following organizations were in attendance of the first public meeting, which is in addition to general members of the public:

- Ocean County OEM
- South Toms River
- Ocean County Planning Department
- Bayville
- Asbury Park Press
- Crestwood Village 3
- Stafford Township
- Lacey Township

June 27, 2024: Public Workshop #2 – Risk Assessment Findings

The second public workshop started by providing a project overview, including the purpose and schedule. The Project Team then reviewed the natural and human-caused hazards profiled in this plan update and reviewed risk assessment findings on FEMA's Floodplain, storm surge, wildfires, and sea level rise.

Feedback from participants showed that flooding, including storm surge, back bay, tidal, rainfall, remains a primary hazard in the county. Wildfires are of increasing concern, especially in the Pinelands, Lakewood, Little Egg Harbor, and Berkeley. Lakehurst and Manchester experienced wildfires in 2023 that burned acres of land, although fortunately no homes. Prescribed burning has not been performed in the area since the 1970s. Feedback included concern around evacuating

vulnerable communities during wildfires while still enabling them to access their functional needs. The past three years have shown an increased tornado risk. Several tornados at Enhanced Fujita (EF) level 0 hit Ocean County in that time frame, and in 2023, Jackson had two EF2 tornadoes.

The Jackson Environmental Council raised the issue of maintenance of stormwater basins, culverts, and catch basins. While there has been recent construction and retrofitting of them, maintenance is key to effectiveness during events as demonstrated by a failure of the basins during Hurricane Irene. A participant also discussed addressing basic needs of the community during events like tornadoes and power outages, such as ensuring there are grocery stores accessible without driving and having battery back-ups in place.

Community changes that participants noted were Lakewood's population growth and Beach Haven's acquisition of a battery energy storage system. As Lakewood's population grows, it also experiences an uptick in excessive rainfall and flash flooding from heavy thunderstorms. The Township is aware of the additional flooding occurring because open areas and dirt lots now have new construction or paving to accommodate the population increase; a report notes that three or four homes in Lakewood faced eight feet of flooding directly because of paving that was undertaken in a community near them. Beach Haven's battery energy storage system, run by Atlantic City Electric, creates a new hazardous materials hazard. Beach Haven is aware of this and has also notified the Berkeley Hazardous Materials Response Team.

Effective mitigation strategies for relevant hazards that participants noted were closing the dunes at each break at the streets during heavy storms (as done by Bradley Beach during Superstorm Sandy), angling dune entrances away from the incoming water (as done by Long Beach Township) and performing beach replenishment.

The Planning Team response to the above feedback included recommending communities use Firewise, which helps individuals develop plans for wildfires. Outreach of other forms should also be performed, such as informational sessions at schools and registration for communication systems like Nixle. The Planning Team discussed the feasibility of and factors involved in raising roads as a flood mitigation method.

The following organizations were in attendance of the second public meeting, which is in addition to general members of the public:

- Jackson Environmental Council
- RWJ Barnabas Health
- Salvation Army
- American Red Cross
- Beach Haven Fire
- Ocean County OEM
- Ocean County Engineering Department
- Ocean County Health Department
- Ocean County Utility Authority
- Point Pleasant Borough
- Stafford Township

October 28, 2024: Public Workshop #3 -Mitigation Grants Workshop

The third public meeting was held in October 2024 to engage the public in understanding hazard mitigation grant opportunities within the State. Christopher Testa with the New Jersey Office of Emergency Management, Hazard Mitigation Unit presented on what makes a successful mitigation grant application and various grant programs including FEMA's Flood Mitigation Assistance (FMA) and Building Resilient Infrastructure and Communities (BRIC) programs and the Revolving Loan Fund (RLF) program. The presentation ended with a discussion portion so the public could ask NJOEM questions on mitigation grants.

The following organizations were in attendance of the third public meeting, which is in addition to general members of the public:

OCEAN COUNTY, NEW JERSEY
HAZARD MITIGATION PLAN 2025

- Pine Beach Borough
- South Toms River Borough
- NJOEM
- Ocean County Planning Department
- Little Egg Harbor Township
- Lakehurst Borough
- Mantoloking Borough
- Long Beach Township
- Ocean Township
- Surf City Borough
- Brick Township
- Ship Bottom Borough
- Toms River Township
- Leafree Real Estate

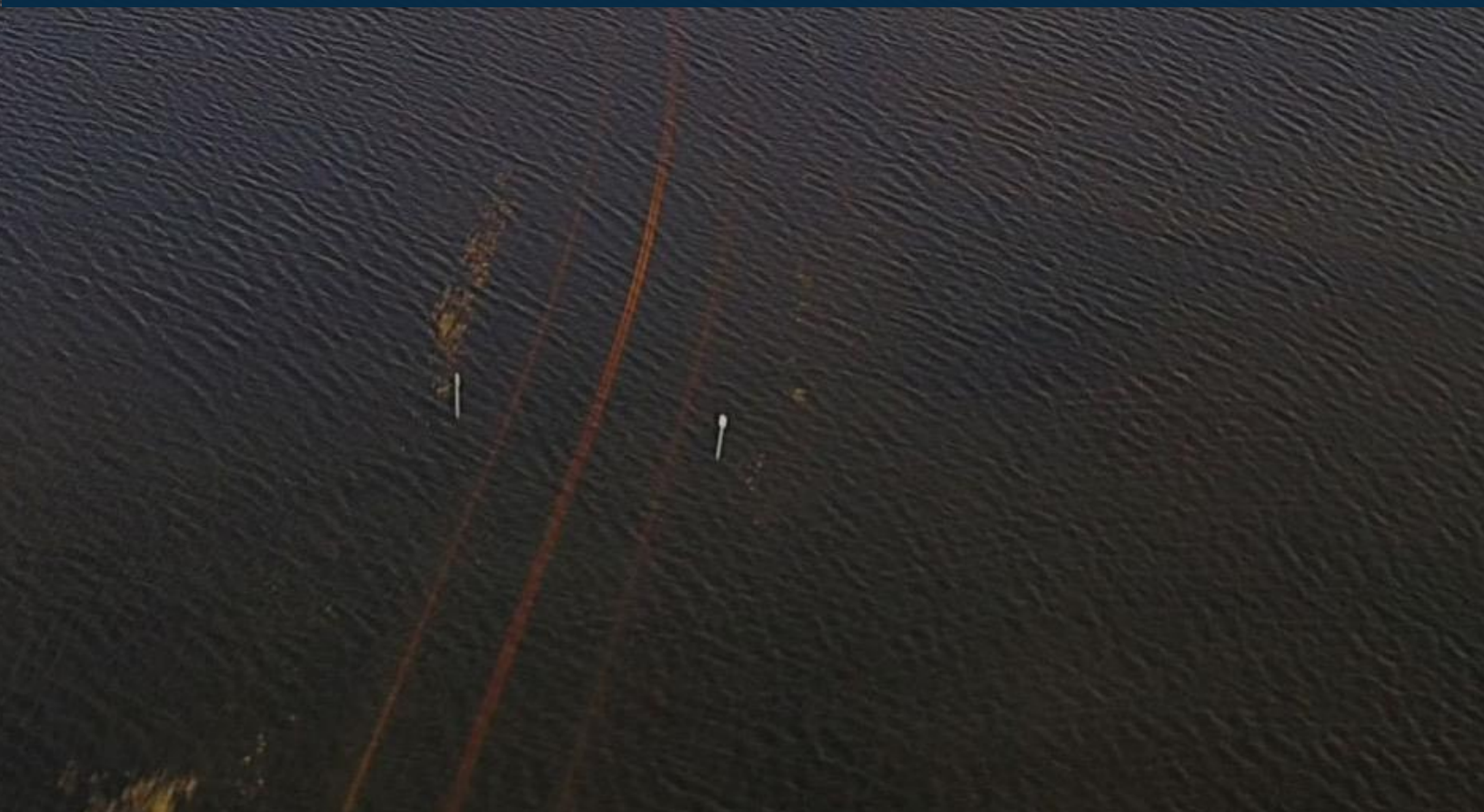
[January 2025] Public Workshop #4 - Draft Plan Review [placeholder]

This meeting will give the public the opportunity to provide feedback on the draft plan. The Project Team will incorporate comments from the public into the final HMP.

DRAFT



4.0 RISK ASSESSMENT



4.0 RISK ASSESSMENT

4.1 CHANGES IN IDENTIFIED HAZARDS

The 2024 plan update includes 10 natural hazards, and seven human-caused hazards. Pandemic was the only new hazard identified for this update. Climate Change, which was identified as a standalone hazard in the previous plan, has been incorporated into each relevant hazard profile. No previously identified hazards were removed in this update.

Table 4.1-1 Previous Plan and New Plan Hazard Identification Crosswalk Table

Identified Hazards	
Natural Hazards	Human Caused Hazards
Coastal Erosion	Environmental Hazards
Drought	Nuclear Incidents
Earthquake	Pandemic
Extreme Temperature	Terrorism
Flooding	Transportation Accidents
Hurricane, Tropical Storm, Nor'easter	Urban Fire and Explosion
Subsidence	Utility Interruption
Tornados and Windstorms	
Wildfire	
Winter Storms	

4.2 RISK ASSESSMENT UPDATE PROCESS

Input from municipalities, Steering Committee members, other stakeholders and members of the general public was used to refine the identification of hazards, their profiles, and the vulnerability assessments. The hazards in this report were selected for review based on research into hazards present in Ocean County, reviewing the previous hazard mitigation plans for the state, Ocean County, and neighboring jurisdictions. Pandemic was added as a new high-risk hazard.

For this plan update, the risk assessment process followed the intent identified in the current FEMA Local Planning Mitigation Policy Guide to focus the information in this section to what helps jurisdictions within the planning area to understand their historical, current, and future risk to identified natural and man-made hazards. Where possible, this risk assessment uses local, state, and federal data (in that order, depending on availability) to understand the locations that are most exposed to each hazard, the predicted level of impact and severity the county may face, how the hazard has affected communities in the county previously, and how climate change will influence risk and vulnerability to this hazard in the future. With this information, vulnerabilities were assessed, both qualitatively and quantitatively. Where appropriate, the National Risk Index was used.

In addition to this chapter, information on current and future flood risk is included in each jurisdictions annex. If a jurisdiction is particularly vulnerable to wildfire, that hazard is also included in the local risk assessment contained in the annex. For hazards that have consistent exposure and vulnerability across the county, they are detailed in this section.

Future Development and Vulnerability

The population in Ocean County grew 1.2% percent from the 2010 to 2015 census. The percent change in population of individual municipalities ranges from -20.9% in Ship Bottom Borough to 23.4% in Harvey Cedars Borough. This range of population percent change should be considered in comparison to the number of people living in each municipality. The range of total population for municipalities in Ocean County is 340 in Mantoloking Borough to 96,575 in Lakewood Township. The municipalities with the largest percent growth are Harvey Cedars Borough with 23.4% and Mantoloking Borough with 14.9%. The communities with the largest change in number of people will have a greater impact on vulnerability. The municipalities that added over five hundred residents between 2010 and 2015 are as follow:

- Lakewood Township, 54% increase with 3,732 new residents
- Jackson Township, 28% increase with 995 new residents
- Barnegat Township, 37% increase with 5,666 new residents

No municipalities that lost over 500 residents between 2010 and 2015. However, Ship Bottom Borough and Beach Haven Borough both had over a 15% reduction in population during that time period. The following municipalities reported a loss of over five percent population during 2010 and 2015:

- Ship Bottom Borough, -20.9% decrease with 242 fewer residents
- Beach Haven Borough, -15.3% decrease with 179 fewer residents
- Surf City Borough decrease with -6.2% decrease, with -75 fewer residents

Since Lakewood Township is by far the largest population change in Ocean County, it represents the largest change in vulnerability. Lakewood's location is partially protected from the County's highest risks. It is not located on the coast or bay so it has a slightly lower risk for hurricanes, tropical storms, nor'easters and flooding and the related risk of utility interruption. It does have some urban wild land interface which concerns the Emergency Management Coordinator for the township based on how it is maintained, so it was moved to a slightly higher risk for wildfire. The community is also at the nexus of many transportation arteries in the county and therefore at a high risk for transportation accidents. The population growth in Lakewood increase vulnerability to wildfire and transportation accidents.

Barnegat Township, Berkeley Township, Lacey Township, Little Egg Harbor Township, Ocean Township, Stafford Township, and Toms River Township are areas of population growth that have bay and/or coastal frontage. The population growth in these communities increases vulnerability to hurricanes, tropical storms, nor'easters and flooding and the related risk of utility interruption. With the exception of Toms River these communities also have urban/ wild land interface which increases the risk for wildfire.

The population increases in Barnegat Township and Ocean Township represent an increase in vulnerability to wildfire. Plumsted Township's interior location and population increase might suggest increased risk to wildfire. However, the urban/ wild land interface is well maintained in Plumsted. Their risk of flooding is higher than the county as a whole and most of the interior municipalities based on flooding from New Egypt Lake.

The highest population decreases were all in coastal communities, thus slightly decreasing risk to hurricanes, tropical storms, nor'easters and flooding and the related risk of utility interruption. However, the overall population increase means more people are vulnerable to these hazards and balances out the slight decrease in vulnerability in these municipalities.

In total the population increases in Ocean County increase vulnerability to the County's highest ranked hazards.

4.3 HAZARD IDENTIFICATION

Hazard identification was completed by reviewing historic occurrences and impacts within Ocean County. The following describes the process of analyzing and identifying the hazards that impact Ocean County.

Presidential Disaster Declarations

Presidential Disaster Declarations represent the disasters which have had the greatest impact on the County since 1955. Presidential Major Disaster, Emergency, and Fire Management Assistance Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event.

Table 4.3-1 Presidential Major Disaster, Emergency and Fire Management Assistance Declarations affecting Ocean County

Number	Date of Declaration	Incident Description	Declaration Type
4614	9/5/2021	Remnants of Hurricane Ida	Major Disaster Declaration
3573	9/2/2021	Remnants of Hurricane Ida	Emergency Declaration
4597	4/28/2021	Severe Winter Storm and Snowstorm	Major Disaster Declaration
4488	3/25/2020	COVID-19 Pandemic	Major Disaster Declaration
3451	3/13/2020	COVID-19	Emergency Declaration
4264	1/22/2016	Winter Storm	Major Disaster Declaration
4086	10/29/2012	Hurricane Sandy	Major Disaster Declaration
4021	8/31/2011	Hurricane Irene	Major Disaster Declaration
3354	10/28/2012	Hurricane Sandy	Emergency Declaration
3332	8/27/2011	Hurricane Irene	Emergency Declaration
3257	9/19/2005	Hurricane Katrina Evacuation	Emergency Declaration
3181	3/20/2003	Snowstorm	Emergency Declaration
3169	9/19/2001	Terrorist Attack Emergency Declaration	Emergency Declaration
3156	11/1/2000	Virus Threat	Emergency Declaration
3148	9/16/1999	Hurricane Floyd	Emergency Declaration
3106	3/17/1993	Severe Blizzard	Emergency Declaration
3083	10/19/1980	Water Shortage	Emergency Declaration
2695	5/16/2007	Warren Grove Fire	Fire Management Assistance Declaration
2411	6/2/2002	Double Trouble Fire	Fire Management Assistance Declaration
1954	2/4/2011	Severe Winter Storm and Snowstorm	Major Disaster Declaration
1897	4/2/2010	Severe Storms and Flooding	Major Disaster Declaration
1873	2/5/2010	Snowstorm	Major Disaster Declaration
1867	12/22/2009	Severe Storms and Flooding from Tropical Depression Ida and a Nor'easter	Major Disaster Declaration
1206	3/3/1998	Coastal Storm	Major Disaster Declaration
1088	1/13/1996	Blizzard	Major Disaster Declaration
973	12/18/1992	Coastal Storm, High Tides, Heavy Rain, Flooding	Major Disaster Declaration
936	3/3/1992	Severe Coastal Storm	Major Disaster Declaration
701	4/12/1984	Coastal Storms, Flooding	Major Disaster Declaration
528	2/8/1977	Ice Conditions	Major Disaster Declaration
519	8/21/1976	Severe Storms, High Winds, Flooding	Major Disaster Declaration
310	9/4/1971	Heavy Rains, Flooding	Major Disaster Declaration
205	8/18/1965	Water Shortage	Major Disaster Declaration
124	3/9/1962	Severe Storm, High Tides, Flooding	Major Disaster Declaration

Number	Date of Declaration	Incident Description	Declaration Type
41	8/20/1955	Hurricane, Floods	Major Disaster Declaration

Hazard Ranking

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A Risk Factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also be used to assist local community officials in ranking and prioritizing those hazards that pose the most significant threat to their area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, local knowledge from the municipalities and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the sixteen hazards profiled. Those categories include *probability*, *impact*, *spatial extent*, *warning time* and *duration*. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor is shown below. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation:

$$\text{Risk Factor Value} = [(Probability \times .30) + (Impact \times .30) + (Spatial \text{ Extent} \times .20) + (Warning \text{ Time} \times .10) + (Duration \times .10)]$$

Ranking Results

Table 4.3-2 lists the Risk Factor calculated for each of the 16 potential hazards identified in the HMP. Hazards identified as high risk have risk factors greater than 2.5. Risk Factors ranging from 2.0 to 2.4 were deemed moderate risk hazards. Hazards with Risk Factors 1.9 and less are considered low risk.

Table 4.3-2 Risk Factors for Hazard Profiles

Risk	Hazard	Risk Assessment Category					Risk Factor
		Probability (1-4)	Impact (1-4)	Spatial Extent (1-4)	Warning Time (1-4)	Duration (1-4)	
High	Flood	4	3	3	1	4	3.2
	Hurricane, TS, Nor'easter	4	4	4	1	4	3.1
	Utility Interruption	2	2	3	3	4	3.1
	Winter Storm	4	2	4	1	3	3.0
	Pandemic	2	4	2	4	2	2.8
	Wildfire	3	2	3	4	2	2.7
Moderate	Extreme Temperatures	2	2	4	1	3	2.4
	Coastal Erosion	4	2	1	2	1	2.3
	Environmental Hazards	3	2	1	4	2	2.3
	Drought	2	1	4	1	4	2.2
	Terrorism	1	3	2	4	2	2.2
	Transport. Accidents	4	1	1	4	1	2.2
	Urban Fire and Explosion	4	1	1	4	1	2.2

Risk	Hazard	Risk Assessment Category					Risk Factor
		Probability (1-4)	Impact (1-4)	Spatial Extent (1-4)	Warning Time (1-4)	Duration (1-4)	
Low	Tornado, Wind Storm	2	2	1	3	1	1.8
	Nuclear Incidents	1	1	1	1	1	1
	Subsidence	1	1	2	4	1	1.5
	Earthquake	1	1	2	4	1	1.5

Natural Hazards

4.4 COASTAL EROSION

Coastal erosion is a natural process where land wears away resulting in beach, shoreline, or dune loss. It may occur as a result of hurricanes, nor'easters or other sources of wave action, wind, and/or flooding. During storms coastal erosion can occur rapidly, causing damage and potential danger to buildings, infrastructure, and people. Additionally, erosion may be exacerbated by human activities, such as boat wakes, shoreline hardening, and dredging. It is measured as the rate of change in the position or horizontal displacement of a shoreline.

Location and Extent

Ocean County's coastal and bayside communities from Point Pleasant Beach to Long Beach are subject to coastline changes due to coastal erosion. The coastal areas of Ocean County are located in the following municipalities: the Township of Barnegat, the Borough of Barnegat Light, the Borough of Bay Head, the Borough of Beach Haven, the Township of Berkeley, the Township of Brick, the Township of Eagleswood, the Borough of Harvey Cedars, the Township of Lacey, the Borough of Lavellette, the Township of Little Egg Harbor, the Township of Long Beach, the Borough of Mantoloking, the Township of Ocean, the Borough of Point Pleasant Beach, the Borough of Point Pleasant, the Borough of Seaside Heights, the Borough of Seaside Park, the Borough of Ship Bottom, the Township of Stafford, the Borough of Surf City, the Township of Toms River and the Borough of Tuckerton. All of these jurisdictions are located either on the ocean or the bay front.

Additionally, the Borough of Beachwood, the Borough of Island Heights, the Borough of Ocean Gate, the Borough of Pine Beach and the Borough of South Toms River are located on the Toms River and are occasionally impacted by coastal storms. Jackson and Plumsted Township have also experienced problems with coastal erosion.

Coastal erosion can be classified as either chronic erosion or episodic erosion. Chronic erosion is characterized as the gradual recession of the shoreline over a period of decades. Episodic erosion occurs in response to flood events or coastal storms with a rapid recession of the shoreline (DNREC, 2013). Across the US, erosion rates can vary greatly; it is not uncommon to find erosion rates ranging from 25 feet per year on barrier islands in the Southeast to 50 feet per year along the Great Lakes (NOAA, 2012). However, coastal erosion rates can also be much lower and will depend on human activities, severe storms, flooding, and sea level rise in a given area. In New Jersey, the Department of Environmental Protection's Coastal Engineering group monitors sites along the Atlantic Ocean to evaluate erosion after significant storm events.

In addition to the beachfront and dune systems, erosion can also impact the estuarine wetland shorelines along the bay in Ocean County. Wetland shoreline erosion is also an increasingly important element of erosion. Wetland plants serve as physical barriers to waves and anchor soils, making soils less likely to wash away. In 2012, NJDEP's Coastal Management Office modeled shoreline retreat along the western side of Barnegat Bay. This GIS exercise showed an average shoreline loss of 75 feet of retreat with an overall range of 21 to 107 feet from 1995 to 2007 (NJCMO, 2012). After Hurricane Sandy, there has been a great deal of attention placed on preventing shoreline loss and using living shorelines to reduce wetland losses and protect wetlands.

Range of Magnitude

Coastal erosion is frequently and naturally occurring hazard within the dynamics of the marine environment. During coastal storms, coast erosion increases in severity and extent. The barrier island is particularly susceptible to the dynamics that move sediment through the marine system. Coastal erosion will result in accumulated sediment in some areas and in depletion of sediment in others (CFOS, 2013). Long-term, this could impact where development is vulnerable on the barrier island.

Estuarine wetlands shoreline loss due to erosion is a result of a dynamic interaction between the physical processes (waves and tides) and the geologic composition of a specific location and sea level rise. Many of the changes observed over days to years are caused by storms or changes in the amount of sediment available to sustain the shore (NJ MACWA 2012).

The marsh surface must also maintain elevation through sediment or organic matter accretion to keep pace with sea level rise. Results of long-term coastal wetlands monitoring being conducted by the Barnegat Bay Partnership is showing that under current conditions wetlands accretion is not keeping pace with the sea level rise (Barnegat Bay Partnership, 2017).

Wetland erosion is more difficult to associate with a single storm or flooding event. However, wetland retreat averaged 75 feet between 1995 and 2007.

Past Occurrence

Ocean County experiences coastal erosion regularly, as a result of sediment transfer along the ocean and bayfronts. These incidents are more severe and obvious after coastal storms, but long-term rates of shoreline change have been computed for open-ocean, sandy shorelines of New Jersey ranging from 1836 to 2000. Shorelines were compiled from National Oceanic and Atmospheric Administration T-sheets, air photos, and lidar data. These data were used to calculate rates of shoreline change using a linear regression method for the U.S. Geological Survey's National Assessment Project. This study found that along the barrier islands of Ocean County, the lower extent of Beach Haven has the greatest long-term shoreline change of more than 2 meters.

Coastal low-pressure and tropical systems passing offshore New Jersey produced high winds, waves, rain, and flooding in eastern Ocean County in 2020. Between January 1, 2020, and January 31, 2021 eastern Ocean County was subjected to a coastal low (April 4, 2020) that produced high waves. High winds were recorded during Tropical Storm Fay (July 10, 2020) and Tropical Storm Isaias (August 4, 2020) that also produced a tornado in Ship Bottom and Brant Beach. During passage of TS Isaias, NOAA National Data Buoy Center Station 44091 (offshore Barnegat Light NJ) recorded a maximum wave height of 17.35 ft with a wave period of 7.76 seconds from the SE (167 deg) (NOAA, 2021). Tropical Storm Kyle (August 14, 2020) was located 250 miles east-southeast of Atlantic City and generated waves that created significant scarping along the Ocean County shoreline. Large swell from passing Hurricane Teddy occurred over a period of three days with over 6.5 ft waves (September 20-22, 2020). Remnants from Hurricane Eta produced waves greater than 12.0 ft (November 14, 2020 – considered a post-tropical cyclone). Three coastal low-pressure systems in late November and December also produced high waves with maximum heights ranging from 12.6 ft to 22.4 ft measured at Buoy Station 44091.

Table 4.4-1 Significant Past Erosion Events in Ocean County

Date	Type of Event	Description
3/13/2010	Coastal Flooding	Caused coastal erosion events with 3–5-foot vertical cuts.
10/29/2012	Hurricane Sandy	Made landfall near Brigantine, New Jersey, causing beach erosion.
10/10/2013	High Wind	Periods of heavy rain and strong winds caused some beach erosion.
1/3/2014	Winter Storm	Strong winds during the storm caused tidal flooding with beach erosion.
12/9/2014	Nor'easter	The storm caused minor to moderate beach erosion. In Ocean County a nine-foot drop-off was reported along the beach.
10/2/2015 to 10/3/2015	High Wind	The beaches at Mantoloking and Brick were closed following the storm due to dangerous drop-offs between a protective steel flood wall and the beach. The severe beach erosion at these locations

Date	Type of Event	Description
		resulted in drop-offs ranging between 5 to 10 feet. In Toms River on the northern barrier island a breach reportedly occurred in the temporary dune line the township had constructed.
1/22/2016 to 1/24/2016	Winter Storm	Out of 66 municipalities surveyed for beach and/or dune erosion by NJDEP Bureau of Coastal Engineering, 28 had minor damage, 21 had moderate damage and 19 had major damage. A 100 foot flagpole was knocked off its base in Ocean County due strong winds.
1/22/2017	Nor'easter	Erosion was evident along the shore and caused certain beach access areas to be temporarily closed down.
March 14, 2017	Nor'easter	Most shore towns experienced at least some beach erosion. This event provided a short window to replenish the beaches before tourist season.
September 5-26, 2017	Hurricane Jose	Of the 66 municipalities and beach areas surveyed statewide after the hurricane, 55 were determined to have minor beach or dune erosion, 11 had moderate beach or dune erosion.
March 6-7, 2018	Nor'easter	Of the 66 beaches surveyed statewide, 55 were determined to have minor beach or dune erosion and 10 had moderate beach or dune erosion.
September 8-12, 2018	Tropical Storm Gordon	Of the 66 municipalities and beach areas surveyed statewide, 53 were determined to have minor beach or dune erosion and 13 had moderate beach erosion.
October 8-13, 2019	Nor'easter/ Subtropical Storm Melissa	Of the 105 areas surveyed, 82 were determined to have minor beach or dune erosion, 15 had moderate beach or dune erosion and 8 had major beach or dune erosion.
August 1-6, 2020	Tropical Storm Isaias	New Jersey experienced strong southerly winds of up to 50mph with gusts over 70mph, heavy rain, and a period of elevated surf and swells. Of the 79 areas surveyed, 75 were determined to have minor beach or dune erosion, and 4 had moderate beach or dune erosion.
August 14-17, 2020	Tropical Storm Kyle	A low-pressure system that formed southeast of Atlantic City and strengthen enough to be considered a Tropical Storm. Of the 79 areas surveyed, 73 were determined to have minor beach or dune erosion and 6 had moderate beach or dune erosion.
September 11-16 & 18-23, 2020	Hurricanes Paulette and Teddy	The impacts of Hurricane Paulette along the coast began on September 11th and were felt through the 16th. Short- to medium-period seas began again on September 18th due to Hurricane Teddy and last through the 23rd. Neither storm made landfall in the United States. Of the 79 areas surveyed, 77 were determined to have minor beach or dune erosion and 2 had moderate beach or dune erosion.
December 16-17, 2020	Nor'easter	The storm had sustained winds over 40 mph with gusts up to 60 mph and generated a sea height peak of 24 feet. Elevated tide levels resulted from the astronomical tide phase and a period of strong offshore winds. Of the 79 areas surveyed, 70 were determined to have minor beach or dune erosion, 5 had moderate beach or dune erosion, and 4 had major beach or dune erosion.
January 31 – February 2, 2021	Nor'easter	The storm had sustained winds near 50 mph with gusts over 60 mph and generated sea height peak of 23 feet. Tides reached minor to moderate flood stage levels due to astronomical tides, strong onshore winds, and the proximity of the storm to the coast. Of the 81 sites surveyed, 54 were determined to have minor beach or dune erosion, 18 had moderate beach or dune erosion, and 9 had major beach or dune erosion.
May 28 – May 30, 2021	Nor'easter	The storm generated sustained winds over 40 mph and gust over 50 mph and a sea height peak of 13 feet. Tides reached minor flood stages due to astronomical tide and strong onshore winds. Of the 81 sites surveyed, 70 were determined to have minor beach or dune erosion and 11 had moderate beach or dune erosion.
October 9-12, 2021	Nor'easter	The storm generated wind gusts over 40 mph and a peak sea height of 15 feet. Tides reached minor flood stage levels due to astronomical tide and moderate onshore winds. Of the 81 sites surveyed, 79 had minor beach or dune erosion and 2 had moderate beach or dune erosion.
August 26 – September 1, 2021	Post Tropical Storm Ida	The storm resulted in wind gusts of up to 69 mph in Burlington and dropped nearly 10 inches of rain in Hillsborough. Heavy rainfall led to severe flash flooding and urban flooding across northern New Jersey and 2 tornadoes were recorded in the southern region of the state. The strongest tornado reached EF-3 level in Gloucester County. In total, the storm caused at least 26 deaths across the state and the flooding resulted in about \$8-10 billion of damage. Federal funding totaled nearly \$1 billion, with the goal of restoring ecosystems and replenishing beaches, along with other flood control measures.
January 16-17, 2022	Winter Storm	The storm generated wind gusts over 50 mph and a sea height peak of 23 feet. Tides reached minor flood stage levels due to moderate onshore winds. Of the 81 sites surveyed, 76 had minor beach or dune erosion and 5 had moderate beach or dune erosion.
May 6 – 11, 2022	Coastal Storm Event	Event result in wind gusts of over 50 mph and peak sea heights of 18 feet. Oceanfront and back bay flooding reached minor levels due to strong onshore winds, with several back bay locations close to

Date	Type of Event	Description
		moderate flood stages. OF the 81 sifers surveyed, 68 had minor beach or dune erosion, 5 had moderate beach or dune erosion, and 8 had major beach or dune erosion.
September 29 – October 5, 2022	Hurricane Ian	The storm resulted in a prolonged period of onshore winds, with gusts near 60 mph and peak sea heights of 22 feet. All oceanfront and back bay location reached minor flooding stages, with several approaching moderate flooding due to the several days of strong onshore winds and the proximity of the storm’s center to the coast. Of the 81 sites surveyed, 63 had minor beach or dune erosion, 6 had moderate beach or dune erosion, and 12 had major beach or dune erosion. Ocean County experienced some of the worst of the erosion with beachfronts losing notable portions of dunes creating 8-to-14-foot drops in certain areas.

The NOAA Storm Events Database did not show high surf events during 2020, though many offshore coastal systems including Isaias and Kyle, and Eta, passed by the county, generating waves that created significant scarping along the shoreline (NJBPN, 2020)

The 30-year assessment for Ocean County revealed ten sites, mostly in the northern part of the county, that experienced shoreline retreats and eight sites across the county experienced volume losses. The remainder of the sites in the county saw varied levels of shoreline advance and sand volume gain (Richard Stockton College, CRC 2016). The average changes for all sites in Ocean County from the 2020 report revealed that during that it was the county with the largest shoreline retreat, yet it did not experience an average loss of volume like Atlantic County did during the same one-year period.

Future Occurrence

Overall, the future occurrence of coastal erosion in Ocean County can be considered highly likely, as defined by the Risk Factor methodology probability criteria. It is already a frequently occurring hazard. Climate change is anticipated to increase the prevalence of coastal erosion as storm intensity increases, sending more forceful waves ashore. Additionally, as sea-levels continue to rise, the frequency of erosive events will increase.

Sea level rise is a result of increased water in the oceans from melting of land glaciers and polar ice caps as well as warmer ocean temperatures causing water to expand and increase in volume (NCA, 2018). In New Jersey this sea level rise is being compounded by subsidence or the sinking of land on the coast, possibly due to the extensively developed nature of the shore and groundwater extraction. Additionally, a geological process called post-glacial rebound (also called isostatic rebound or crustal rebound) related to historic ice sheet retreat causes spatial differences in sea-level rise across the East Coast. The current redistribution of mass associated with this rebound results in New Jersey having greater sea-level rise rates than other parts of eastern seaboard (WHOI, 2018). Since 1900, sea level along the coast of New Jersey has risen about 12 inches. According to the report, under current scenarios there is a 50% chance that sea-level rise will meet or exceed an additional 1.4 feet and a 17% chance it will exceed 2.1 feet by 2050. Those levels increase to 3.3 and 5.1 feet by the end of the century (NJDEP, 2020).

There has not been a study for either the bay or oceanfront to quantify the change in vulnerability associated with an increase storm activity, rising sea-levels, or other changes.

Vulnerability Assessment

Coastal erosion may occur along any part of the county’s shoreline, either developed or undeveloped. Mainland waterfront or bayfront areas with effectively engineered coastal protection structures are less susceptible to long-term or episodic erosion. Areas of the shoreline that have not been hardened against erosion are vulnerable, this includes the beaches, dune systems, and saltwater marshes within the county.

Coastal erosion creates vulnerability to buildings, infrastructure, natural ecosystems, and consequently the economy of Ocean County. Long-term erosion, without renourishment, shifts the floods and wave hazard zones landward, so buildings along or near the waterfront are increasingly susceptible to wave damage (Herrington, 2008). With the longest oceanfront shoreline of any county in New Jersey, Ocean County is significantly vulnerable to the effects of coastal erosion, and impacts of climate change make the coast even more vulnerable to coastal erosion and sea level rise. Along the oceanfront, 13.4 miles out of 45.2 miles of coastline remains undeveloped. The undeveloped shoreline is contained in Island Beach State Park and in Holgate. Approximately 70% of the shoreline in Ocean County is developed (CRC, 2017).

The NJDEP Coastal Engineering program has identified Bay Head, Mantoloking, Brick, Toms River, Lavallette, Long Beach Township, Harvey Cedars, Surf City, and Beach Haven as having potential hot spots of vulnerability to erosion.

Built Environment, Infrastructure, and Community Lifelines

A number of jurisdictions within Ocean County are vulnerable to coastal erosion along unhardened extents of shoreline. However, due to policies around development, Ocean County has no structures seaward of the dune system nor are there any structures within 20 feet or even 50 feet of erodible shoreline. As of this plan update, no jurisdiction in Ocean County has identified any structures or infrastructure facing imminent threat from erosion. The previous hazard mitigation plan update identified 2,770 parcels within 200 feet of vulnerable shoreline. It did not identify which of these parcels held structures. While it is unlikely that an event will remove 200 feet of shoreline in one storm, it gives an understanding of the scale of vulnerability each jurisdiction faces. Without the capability to repair and fill shorelines, dunes, and beach after an erosive event, these structures will face increased risk to collapsing, as well as increased risk from coastal storms.

Population and the Economy

In addition to the individual property owners impacted by coastal erosion, this hazard presents a threat to the economy of several jurisdictions that depend on tourism dollars. Coastal erosion threatens to limit beach access, and consequently tourism, if erosion is not repaired. There is a safety risk after an event if the beach or dune has experienced erosion.

Figure 4.1-1 Heavy erosion displayed at beach in Holgate, NJ (CRC, 2007)



Ecosystems and Natural Assets

Dunes, beaches, barrier islands, and salt marshes are critical natural assets for communities within Ocean County. They provide ecological value, reduce vulnerability to coastal storms and flooding, and create an viewshed that has incalculable value. All three of these systems are vulnerable to erosion within the county. In undeveloped areas, marshes, beaches, and dunes systems will migrate within the marine system. However, once some shorelines are hardened to protect development and land away from the waterfront becomes developed, these systems are not able to move and experience loss in their extent. There are active efforts within the county to install living shorelines and other ecological enhancement projects to conserve and protect these vital resources.

4.5 DROUGHT

Location and Extent

A drought is described as a period of low or no precipitation in a given area. Events may be localized to small areas within the county or the state or span the regional Mid-Atlantic or northeast area. Regions with primarily agricultural land uses are most vulnerable to drought; these uses are largely found in the northwest portion of the County in Plumsted and Jackson townships. Businesses impacted include nurseries and florists, landscapers and farmers who are dependent on their crops are especially hurt by periods of drought. When a drought occurs, it can impact other businesses as well; car washes, swimming pools, recreational water parks, and even restaurants.

Ocean County is divided into two drought regions, the Coastal North Drought Region and the Coastal South Drought Region. The Coastal North Drought Region includes Bay Head, Beachwood, Island Heights, Lakehurst, Lavallette, Mantoloking, Ocean Gate, Pine Beach, Point Pleasant, Point Pleasant Beach, Seaside Heights, Seaside Park, and South Toms River Boroughs, and Berkeley, Brick, Jackson, Lakewood, Manchester, Plumsted, and Toms River townships.

The Coastal South Drought Region includes Barnegat Light, Beach Haven, Harvey Cedars, Ship Bottom, Surf City, and Tuckerton Boroughs, and Barnegat, Eagleswood, Lacey, Little Egg Harbor, Long Beach, Ocean, Stafford, and Toms River townships.

The County’s low elevation and plentiful groundwater supply allow it to be less susceptible to drought than many other counties in New Jersey. When the threat of drought occurs, however, water restrictions are used to ensure water supply is able to keep up with critical demands.

Range of Magnitude

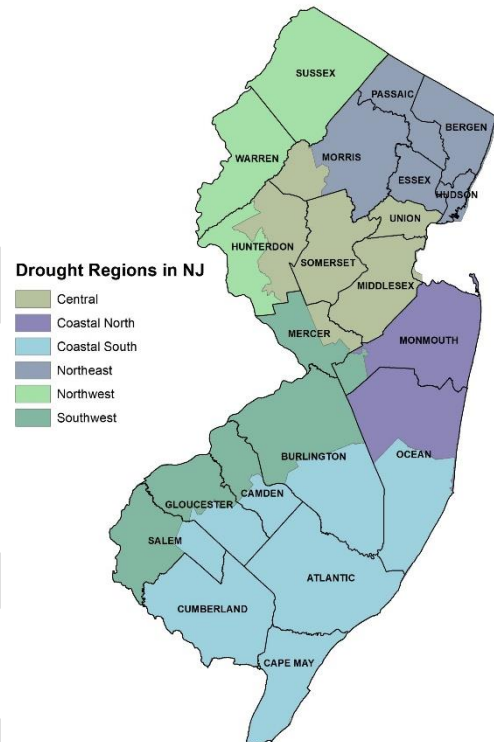
Table 4.5-1 Palmer Drought Severity Index (PSDI) classifications (NDMC, 2013).

Severity Category	PSDI VALUE
Extremely wet	4.0 or more
Very wet	3.0 to 3.99
Moderately wet	2.0 to 2.99
Slightly wet	1.0 to 1.99
Incipient wet spell	0.5 to 0.99
Near normal	0.49 to -0.49
Incipient dry spell	-0.5 to -0.99
Mild drought	-1.0 to -1.99
Moderate drought	-2.0 to -2.99
Severe drought	-3.0 to -3.99
Extreme drought	-4.0 or less

Drought is measured by the Palmer Drought Severity Index – a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature. Drought events adversely affect stream flows, lake/reservoir storage, and groundwater levels. Other resources that may be impacted include public water supplies for human consumption, rural water supplies for livestock consumption and agricultural operations, water quality, natural soil water or irrigation water for agriculture, soil moisture, conditions conducive to wildfire events, and water for navigation and recreation.

The New Jersey Department of Environmental Protection also monitors drought conditions and water supply. The state has authority to order water use restrictions if necessary to

Figure 4.5-1 New Jersey Drought Regions (NJDEP).



mitigate the risk of drought conditions. For the state, the severity of the drought is categorized, in order of increasing severity, as the following:

- **Drought Watch:** Indicates the New Jersey Department of Environmental Protection is closely monitoring drought indicators, including precipitation, stream flows, and reservoir and ground water levels and water demands. Under a drought watch, the public should begin voluntarily cutting back on water usage. The Commissioner of DEP is responsible for exercising non-emergency powers during a Drought Watch. Such non-emergency powers are used to develop alternative water supplies where necessary, rehabilitate and activate interconnections between water systems, and transfers water between different water systems.
- **Drought Warning:** A drought warning condition may be designated by the Commissioner of DEP as a non-emergency response to managing available water supplies. Under a designated drought warning, the DEP may order water purveyors to develop alternative sources of water and to transfer water around the State from areas with relatively more water those with less. The aim of this stage of a response to drought conditions is to avert a more serious water shortage that would necessitate declaration of a water emergency and the imposition of mandatory water use restrictions.
- **Water Emergency or Drought Emergency:** There are four phases of water emergencies:
 - Phase I: Restricts water use for non-commercial plants, cars, streets, hydrant flushing, etc.
 - Phase II-III: Water is allocated and rationed. These restrictions are enforced when there is substantial threat to public health.
 - Phase IV: Considered a disaster stage where public water service is interrupted. Public health and safety cannot be guaranteed and selective business and industrial closings are enforced.

Past Occurrence

The figure below illustrates the history of drought for the County. Created by U.S. Drought Monitor data, the graph uses a five-category system, labeled Abnormally Dry or D0, (a precursor to drought, not actually drought), and Moderate (D1), Severe (D2), Extreme (D3) and Exceptional (D4) Drought. The wet periods are categorized similarly from W0 to W4.

The table below captures historical events of drought across New Jersey that included Ocean County. The yearlong drought from October 2001 until November 2002 was the worst event with the largest impact on Ocean County.

Table 4.5-2 Past Drought Events in Ocean County

Date	Counties Affected	Description
October 1997	Statewide	Unseasonably dry weather with below normal rainfall, which became worse during the summer months, forced the Delaware River Basin Commission to declare a drought warning on October 27th. The yearly precipitation totals on a county weighted average were below normal in all of New Jersey except for Atlantic, Cape May and Cumberland Counties
December 1998	Statewide	July through December 1998 was also 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
January 1999 to February 1999	Statewide	Unseasonably dry months prevailed throughout the second half of 1998. Conditions did not look promising at the start of the month. On January 5th, the Delaware River Basin Commission (DRBC) issued a conditional drought emergency. Subsequent heavy precipitation events on the 15th, 18th and 24th started replenishing reservoir and streamflow levels.
July 1999 to August 1999	Statewide	July 1999 continued the trend of extremely warm and dry weather across New Jersey. On a statewide average it was the seventh driest July on record. The effects of the drought increased as the month wore on with burning restrictions instituted and water shortages declared. The drought continued throughout the first half of August across New Jersey. Crops were decimated, especially grain and forage crops in the northern part of the state. Crop losses were estimated at exceeding \$80 million dollars.
October 2000		Water restrictions enacted; monthly precipitation recorded as lowest on record.
September 2001 to	Statewide	The yearlong drought from October 2001 until November, 2002 was the worst event with the largest impact on Ocean County. On October 30, 2001, a drought watch was issued for the entire state by New Jersey

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Date	Counties Affected	Description
November 2002		Department of Environmental Protection (NJDEP). On November 21, 2001, a drought warning was issued by the NJDEP for Northwest, Southwest and Coastal South. NJDEP extends the drought warning to include the Northern Coast and Northeast areas on January 24, 2002. A statewide drought emergency was issued by New Jersey’s Governor, James McGreevey on March 4, 2002. The State of New Jersey instated water-use restrictions in 2002. Though temporarily lifted in June, drought restrictions were re-issued in August. The actual precipitation that year was seven inches less than normal resulting in depletion of the underlying aquifers in Ocean County and neighboring Monmouth and Mercer counties. The statewide drought emergency was not lifted in New Jersey until January 8, 2003, when rainfall started to replenish ground water and surface water levels. The Coastal South and Southwest areas continued to operate under a drought warning until March 21, 2003 (DRBC, 2013)
September 2005	Statewide	September 2005 was an unseasonably warm and dry month across the state of New Jersey. The unseasonably dry weather began for most in mid-August and continued throughout the month. The lack of rain affected both the agriculture and water supplies. Acting Governor Richard Codey declared a drought watch on September 13th and called for voluntary conservation methods
May 2006		Wildfires are a grave concern; water conservation is urged.
August 2008 to September 2008	Statewide	An unseasonably dry August occurred across the state of New Jersey with the greatest departures from normal in the central part of the state. This exacerbated crop damage that was already inflicted by the heat and the large hailstorm in the southern part of the state on August 10th. The United States Secretary of Agriculture Edward Schafer to declare ten central and southern New Jersey Counties a natural disaster on September 22 nd including Ocean County.
July to October 2010	Statewide	On August 5, the NJDEP issued a drought watch for northeast New Jersey. At the height of the drought event in September, over 27 percent of the state was experiencing severe drought conditions while 56 percent and 16 percent of the state was experiencing moderate drought and abnormally dry conditions, respectively. The meteorological summer was the 10th driest (8.65 inches) on record dating back to 1895 in New Jersey and was also the driest summer since 1966.
March to June 2012	Statewide	Lowest PDSI of -3.29 in April, with 5 weeks of the entire state experiencing moderate drought conditions across April and May. A USDA drought disaster declaration was declared and remained in effect until November.
September 2015 to January 2016	Statewide	A drought watch was issued that impacted more than two-thirds of the state. At the height of the drought event in late September, 43 percent of the state was experiencing moderate drought conditions. The northeast region of the state, specifically Bergen, Essex, Hudson, Middlesex, Monmouth, and Union Counties, dealt with the most extended periods of drought. A USDA drought disaster declaration was declared and impacted many New Jersey counties through September.
October 2016 to April 2017	Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren	Drought conditions were the worst faced by New Jersey in 14 years. The entire state was experiencing some level of drought conditions at the height of the drought event in late November and early December, with nearly 38 percent of the state experiencing severe drought conditions, 34 percent experiencing moderate drought, and 28 percent was abnormally dry. NJDEP issued a Drought Warning for much of Northern and Central New Jersey due to the severity of this period of drought.
September 2019 to October 2019	Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean, Salem, and Somerset Counties	At the height of the drought event, 37 percent of the state was experiencing moderate drought conditions. Salem County experienced drought conditions the longest, with parts of the county under moderate drought for around a month.
July to December 2022	Statewide	A statewide Drought Watch from early August to late December. September was the most severe month, as 67 percent of the state was under moderate drought conditions and an additional 29 percent were under severe drought conditions during the first two weeks of the month.

Sources: NJDEP; NRCC, 2013; Hardison, 1968; NJDEP, 1983; NOAA-NCEI, 2024; NJDEP, Drought Information Center

Future Occurrence

The National Risk Index estimated an average of 2.7 events occurring each year for Ocean County based on historical data collected from 2000 to 2021. There is not data specifically projecting the risk of drought into the future based on climate change. However, the overall trend predicted for the northeast is to see an increase in annual rainfall. It is important to

acknowledge that the probability that a drought event will occur in the future is still quite likely, even if the duration or frequency may be less than other places in the country. The state continues to monitor drought conditions and water supply to minimize the impact a future drought may have on water supply.

Vulnerability Assessment

Built Environment, Infrastructure, and Community Lifelines

Drought has implications for a number of community lifelines and sectors. The most intuitive is the water supply of Ocean County, which uses both surface water and ground water to meet demand. Water supply in the county is serviced by public water systems that use groundwater wells, local surface water supplies, and purchased surface water from other parts of the state. The state monitors groundwater withdrawals for major operators. In addition, an unknown number of households rely on private wells. While drought may have an impact on water supply, and there is an incalculable vulnerability of this impact, another long-term concern for water supply is that overuse of groundwater supplies without comparable replenishment will increase salt-water intrusion and reduce water quality.

Population and the Economy

Drought events most directly impact the agriculture sector of the county's economy. By the end of the yearlong drought from 2001 to 2002, the estimated cost to farmers was \$125 million from crop loss. Crops such as hay, wheat, soybeans, corn, and sorghum had no irrigation, and fared poorly during the drought. Crops were further damaged by deer and bears lacking food and water. While these were statewide impacts, they illustrate the potential for droughts to severely impair the local economy in more agricultural communities. The NRI estimates an estimated annual loss of \$71,282 for the agriculture sector across Ocean County, with the bulk of that estimate falling to the western edge of Plumsted Township.

Ecosystems and Natural Assets

Drought can also have impacts to natural assets. Identified hydrologic effects include lower water levels in reservoirs, lakes, and ponds and reduced stream flow. The reduction in baseflow and lack of recharge can result in groundwater depletion and land subsidence and can have secondary impacts of reduced water quality and increases in water temperature. Without rainfall, plant communities can struggle and become more susceptible to fire, disease, or pests. The potential for long-term drought may affect the potential extent or vulnerability of the county to wildfire.

4.6 EARTHQUAKE

Location and Extent

An earthquake is the sudden movement of the Earth’s surface caused by the release of stress accumulated within or along the edge of the Earth’s tectonic plates, a volcanic eruption, or by a manmade explosion (NJOEM, 2024). Ocean County does not have a greater history of earthquakes than other counties in the state, and the earthquakes on record have been characterized by low severity. Within Ocean County, no specific area or jurisdiction is more susceptible to earthquakes than others.

Compared to other states, especially California and Alaska, New Jersey is relatively free of earthquake activity. Even considering only the eastern half of North America, New Jersey has experienced fewer earthquakes than most other states, however moderate earthquakes such as the one that occurred in Hunterdon County in 2024 can be felt far from the epicenter. This is because soft soils can amplify the shaking of an earthquake. Mapping the ground-shaking and liquefaction potential of soils is an essential component in predicting earthquake damage. Ground-shaking behavior is mapped by summing physical measures of the density and compaction of soil and rock layers to a depth of 100 feet. Liquefaction susceptibility is determined by the geologic history, depositional setting and topographic position of the soil.

Range of Magnitude

There are two common ways to measure earthquakes. Earthquake strength, or magnitude, is measured using networks of seismographs, instruments that precisely measure the shaking of the ground. The most well-known scale of magnitude is the Richter scale, designed by Charles F. Richter in 1935, in which an increase of one point represents a ten-fold increase in power of the earthquake and a thirty-two-fold increase in energy released for an equal duration of shaking.

Table 4.6-1 Richter Scale Magnitudes and Associated Earthquake Size Effects

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally, not felt but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

Although magnitude measures earthquake strength well, it is not an accurate measure of damage or intensity. An earthquake in a densely populated area, resulting in many casualties and building collapses, may have the same magnitude as an earthquake which occurs in a remote, rural locale that does nothing more than flush grouse from the underbrush. The result of earthquake on the built environment is measured as intensity. Intensity measures the combined effects of magnitude, distance from the epicenter and local geology on earthquake effects. The most commonly used intensity scale is the Modified Mercalli Intensity Scale. Originally designed by Giuseppe Mercalli in 1902, the scale was modified in 1931 by American seismologists Harry O. Wood and Frank Neuman to better incorporate effects on modern infrastructure.

The Modified Mercalli scale is based on firsthand reports of people awakening, sound descriptions, timing of the event, movement experienced, and visible effects on structures and landscapes. It is reported in the Roman Numeral format, from I-to-XII, in order to differentiate it from measures of magnitude.

Table 4.6-2 Modified Mercalli Intensity Scale with Associated Impacts

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	<4.2
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	<4.2

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
IV	Moderate	Felt by people walking	<4.2
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves	<5.4
VII	Very Strong	Mild alarm, walls crack, plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	<6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open	<6.9
X	Disastrous	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves	>8.1

Past Occurrence

The following reflects a list of past occurrences in Ocean County. This list does not necessarily reflect all earthquakes that occurred outside the County, but only those that resulted in damage. There have been 11 historical earthquakes either in, or within the vicinity of Ocean County from 1919 to present day, ranging in magnitude from 2.0 to 4.0. Figure 4.6-1 illustrates New Jersey’s Seismic Hazard map with the largest number of hazards occurring in the upper northeast portion of the State. Statewide, the largest earthquake in New Jersey’s history reached a magnitude of 5.3 (NJDEP, 2017). According to records maintained by the New Jersey Geological Survey, there have been 8 historical earthquakes with epicenters within in Ocean County. In the neighboring counties of Burlington and Monmouth, there have been 3 earthquakes within proximity to Ocean County. The range of earthquakes can extend to an area up to 100 kilometers; there have been 178 earthquake epicenters within New Jersey. These prior events are listed in Table 4.6-3 and shown in Figure 4.6-1 below.

Table 4.6-3 Past Earthquake Events Occurring in or near Ocean County

Year	Location of Epicenter	Magnitude
1919	Off Coast of Long Beach Township	Unknown
1938	Jackson Township	4
1938	Jackson Township	3.8
1968	Burlington County	1.9
1977	Manchester Township	2.7
1980	Off coast of Berkeley Township (barrier island section)	2.9
1982	Off Coast and along the border of Tom River and Berkeley Townships	2.9
1984	Asbury Park	2
1986	Monmouth County	2.3
1996	9 km S Crestwood Village, NJ	2
2011	24 Km south-southwest of Lakehurst (Burlington County)	1.9
2014	Millstone Township, border of Monmouth and Ocean Counties	1.9
2021	2 km E of Tuckerton, NJ	2.4

Source: NJDEP, 2023

Future Occurrence

It is impossible to predict earthquakes since they occur without warning. The greatest probability for an earthquake in New Jersey exists in the northern portion of the State near the Ramapo Fault. This does not however, exempt Ocean County from this threat. History shows that past recorded earthquakes have been relatively small, with a magnitude of 2.4-4.0 on the Richter Scale. In Ocean County, the probability of an earthquake occurring is a real likelihood. The impact on Ocean County during these events has been minimal. Overall, the future occurrence of earthquakes in Ocean County is less than one percent annually, or unlikely, as defined by the Risk Factor methodology probability criteria.

Just as likely, is the probability that an earthquake outside of the borders of Ocean County will impact the County. However, due to geologic differences, eastern earthquakes affect areas ten times larger than western ones of the same magnitude. Additionally, Ocean County's proximity to the ocean subjects it exposure from earthquakes on other continents. The county has experienced tidal waves from earthquakes centered in Europe, however there is no record these previous incidents resulted in significant damage.

There is no science indicating that the future extent or magnitude of threat of earthquakes for Ocean County is anticipated to change based on climate change at this time.

Vulnerability Assessment

Built Environment, Infrastructure, and Community Lifelines

Given the extremely low potential for an earthquake of magnitude to cause large-scale damage to the county, the risk associated with earthquakes was not calculated for this plan update. In addition to the low potential for a high-magnitude earthquake, New Jersey's building code has some provisions for earthquake-resistant design. However, there are no requirements for retrofitting existing buildings or for un-reinforced masonry structures that are most vulnerable to earthquake damage. An unknown number of buildings may be vulnerable if an earthquake between 5.4 and 6.0 were to occur within or close to Ocean County.

If a significant earthquake event were to occur, many of the community lifelines within the county and/or region may be impacted. However, given the likelihood of the event, the vulnerability of the lifelines were not assessed for this plan update.

Population and the Economy

The entire population is assumed to have equal vulnerability to earthquakes in Ocean County. The risk to the population is extremely low because of the low probability of occurrence.

Ecosystems and Natural Assets

It is not anticipated that Ocean County's ecosystems, habitats, or other natural assets face vulnerability from earthquakes.

4.7 EXTREME TEMPERATURE

Extreme Cold

In Ocean County, periods of twenty degrees or less for a period of three days or more are considered periods of extreme cold. Pipes may freeze and burst in homes that are poorly insulated or without heat. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. Additionally, long cold spells can cause rivers to freeze.

Extreme Heat

Extreme heat events are defined by summertime weather that is substantially hotter and/or more humid than average for a location at that time of year. Extreme heat occurs when temperatures hover 10 degrees or more above the average high temperature for a region for several weeks. Unlike other defined hazards, extreme heat events are more threatening to people and other living things, and less threatening to properties and structures. Extreme heat event conditions can increase the incidence of mortality and morbidity in affected populations.

Location and Extent

Ocean County is vulnerable to extreme heat events during the summer months. For extreme heat, there is a difference on extent and location based on a few environmental factors. Communities close to the ocean are often spared the brunt of extreme heat events because of the relief provided by wind. Urban environments tend to remain warmer as more heat is retained by dark impervious surface, less cooling benefit is provided by tree canopy, and the surface materials retain the heat after the sun goes down so less cooling takes place in the evenings. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a “dome” of high atmospheric pressure traps hazy, damp air near the ground (CDC, 2007).

Some organizations are using land surface temperatures to try and predict where extreme heat may be worse within a region or community. However, this satellite-derived data does not account for wind patterns and cannot represent the feeling experienced on the ground. Therefore, it is not included in this plan. For the purposes of this plan, each jurisdiction in Ocean County has potential exposure to extreme heat. Within the communities, areas with significant tree canopy and typical breezy days will have less vulnerability than communities where airflow stagnates and there is little naturally occurring shade.

All of Ocean County is susceptible to extreme cold during winter. Winter storms and high winds can exacerbate cold temperatures and endanger people who are exposed for long periods of time. Extreme cold temperatures are well below the average level for an area during the winter and often coincide with winter storm events.

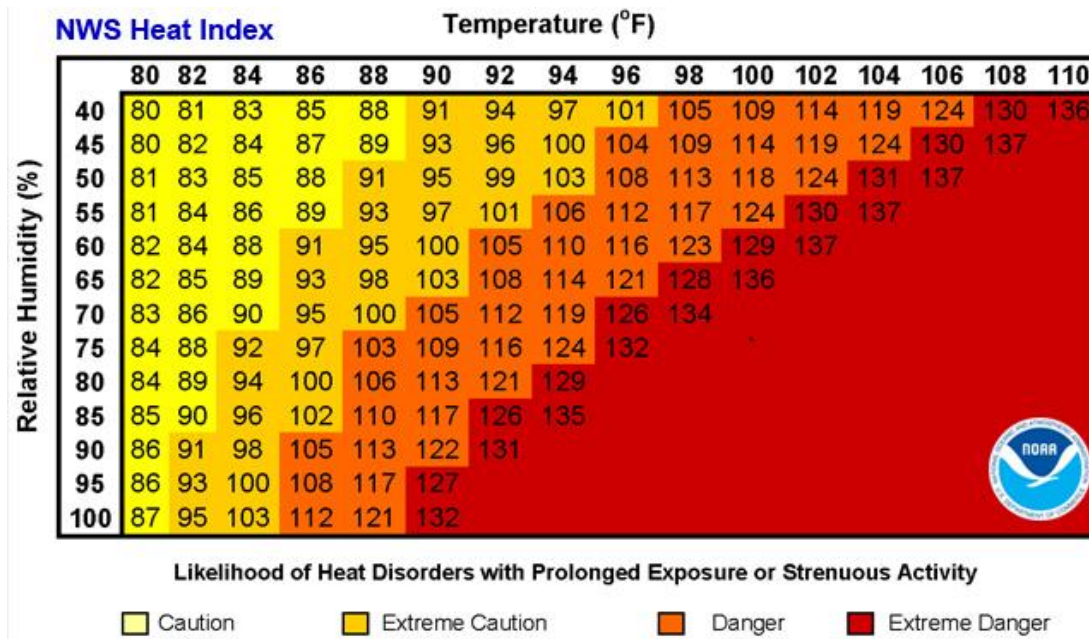
Range of Magnitude

Relative humidity and ambient air temperature are the main factors that determine the severity of extreme heat. Danger ensues when a prolonged heat wave occurs during drought conditions, limiting necessary water resources. If extreme temperatures remain for a prolonged period, Power supplies may be stressed if there are prolonged periods of extreme temperatures due to increased electricity demands from air conditioners that may overdraw the supply and lead to rolling brownouts. Exposure to extreme heat can indirectly cause health problems. This can be especially dangerous to individuals with preexisting medical conditions, typically the elderly, who make up a considerable portion of the population in Ocean County. Other groups at high risk of health impacts from extreme temperatures include infants, homeless individuals, economically disadvantaged people, socially isolated individuals, those with mental and physical disabilities, individuals exercising outdoors, and persons under the influence of drugs or alcohol.

Prior to events, warnings and watches are issued by the National Weather Service to allow people time to prepare. If heat stress conditions are forecast to occur within the next 24 hours, an excessive heat warning will be issued. A heat advisory will be issued if, within the next 24 hours, heat stress is forecast to occur (if air mass is MT+, less than 5 deaths are forecast). If heat stress conditions are forecast to occur in the next 24 to 48 hours, an excessive heat watch is issued. If heat stress conditions are forecast to occur in the next 48 to 120 hours, an excessive heat outlook is issued.

Both relative humidity and ambient air temperature contribute to the severity of extreme heat. Figure 4.7-1 displays the likely health effects suffered by people exposed to extreme heat and humidity.

Figure 4.7-1 The Heat Index (NOAA).



For extreme cold, magnitude is determined by a combination of the length of time a temperature may fall below normal and/or the wind chill. New Jersey state law requires counties to declare a Code Blue event 24 to 48 hours before temperatures are predicted to reach 32 degrees or lower, or if wind chill temperatures will be zero degrees or less for a period of 2 hours or more.

Past Occurrence

Historically, Ocean County has experienced extreme cold, along with snow or freezing precipitation that typically accompanies cold temperatures. Since 1950, periods of extreme cold have resulted in 5 deaths and 7 injuries in New Jersey. One of the worst extreme cold events in Ocean County occurred from January 14 to 29, 2003. During this long cold spell, homeless shelters were filled and several water mains broke due to the cold. In Ocean County, fishing boats stayed at port due to freezing spray that threatens the stability of the vessels. Many homeowners in the county reported pipes bursting, especially for vacation homes that were not winterized properly. The minimum temperature in the county during this period was 3 degrees Fahrenheit.

Table 4.7-1 lists 23 extreme or record heat and cold events that have occurred in the County between 1993 and 2023. This is based on NOAA's storm event database.

One of the worst extreme heat events in Ocean County occurred on July 4, 1999. New Jersey experienced a heat wave throughout the entire Independence Day weekend. A strong wind blowing west to southwest blocked the cooling effects of the ocean breeze. High temperatures combined with stifling humidity produced heat indices of around 110 degrees during the afternoon of each day of the weekend. Seventeen people in New Jersey including three in Ocean County died due to heat-related illness and approximately 160 people reported heat related injuries across the state. Most of the fatalities were elderly individuals in a poor state of health and lacking both air-conditioning and ventilation. Two of the three deaths attributed to Ocean County occurred on Long Beach Island. Many of the injuries reported happened in Ocean County, including eight critical cases of heat exhaustion. Due to the increase in demand for power, outages and blackouts

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in the county began on July 4th, especially on Long Beach Island. As a result, Red Cross opened shelters in Dover, Long Beach and Stafford Townships (NCEI, 2013).

Table 4.7-1 Previous Cold/Wind Chill Events Impacting Ocean County from 1996-2023

Date	Duration (in Days)	Max or Min Temperature	Deaths*	Injuries
2/4/1996	3	-8	0	0
1/17/1997	4	-1	0	0
1/14/2003	16	3	1	7
1/9/2004	3	4	0	0
1/15/2004	2	5	0	0
12/20/2004	1	11	0	0
1/18/2005	1	0	0	0
1/23/2005	2	0	0	0
1/28/2005	1	3	4	0
1/26/2007	1	11	0	0
1/16/2009	3	4	0	0
1/23/2013	2	-3	0	1
1/4/2014	1	-8	0	0
1/7/2014	1	6	0	0
1/22/2014	1	4	0	0
1/7/2015	2	7	0	0
2/13/2015	1	9	1	0
2/15/2015	1	-14	2	0
2/20/2015	2	-22	0	0
2/24/2015	1	1	1	0
2/14/2016	1	-12	0	0
12/23/2022	1	single digits and teens with wind chills ranging from -5 to -20	0	0
12/24/2022	1	single digits and teens with wind chills ranging from -5 to -20	0	0

Table 4.7-2 Previous Extreme Heat Events Impacting Ocean County from 2001-2023

Year	Number of Events	Longest Recorded Duration (in Days)	Max Temperature	Deaths*	Injuries
2001	3	5	103	2	0
2002	6	10	97	2	0
2003	2	6	96	0	0
2005	5	4	98	2	0
2006	1	3	98	0	41
2007	4	3	95	0	0
2008	2	7	100	0	10
2009	1	6	95	0	4
2010	3	2	100	0	0
2011	1	2	102	0	0
2012	5	4	100	0	0
2013	3	6	99	0	0
2014	2	2	97	0	0
2015	1	1	95	0	0
2021	1	1	mid to upper 90s	0	0
2022	1	1	mid to upper 90s	0	0

*Death figures are for the entire area affected by the event. Where available, Ocean County specific death figures are included in parentheses.

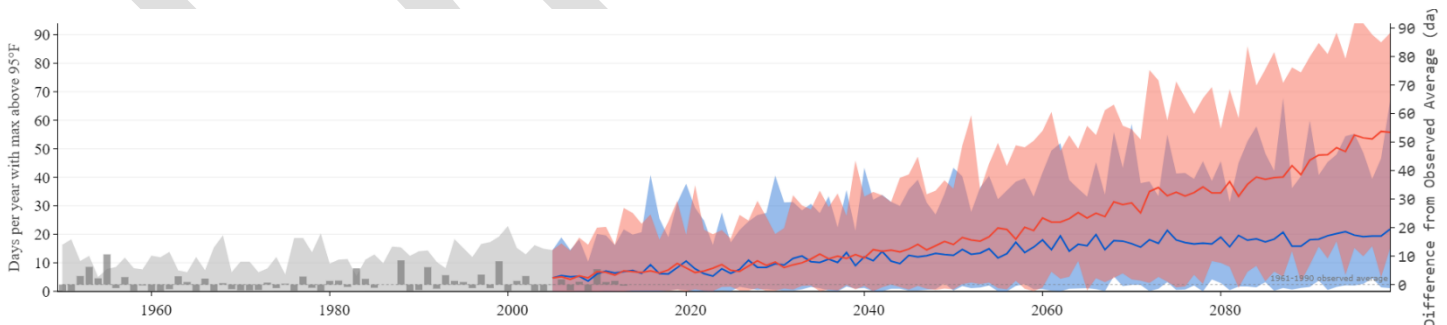
Source: NOAA-NCEI, 2024

Future Occurrence

While Ocean County will likely experience both extreme cold and extreme heat in the future, both historical events and climate change indicate that extreme heat will occur more frequently and predictably.

As climate changes, Ocean County is more likely to experience both extreme heat and extreme cold events. Figure 4.7-2 graphs the historic and projected number of days with a maximum temperature above 95 degrees based on emission scenarios.

Figure 4.7-2 Days with a Maximum Temperature Above 95 Degrees in Ocean County



Source: The Climate Explorer, 2024

The National Risk Index estimates that Ocean County will experience extreme cold less than once a year, on average, based on previous occurrence. Given anticipated changes in the climate, Ocean County will experience higher temperatures throughout the year, but will have periodic drops in temperature as cold air moves down from the arctic. On occasion, as was experienced in the early months of 2023, the stratosphere warms suddenly over the North Pole,

weakening the polar vortex and displacing frigid air that is usually isolated to the pole to be displaced southward and into the New Jersey area.

Vulnerability Assessment

Built Environment, Infrastructure, and Community Lifelines

Transportation Impacts – Cold weather can impact automotive engines, possibly stranding motorists, and stress metal bridge structures. Highway and railroad tracks can become distorted in high heat. Disruptions to the transportation network and accidents due to extreme temperatures represent an additional risk.

Agriculture Impacts – Absolute temperature and duration of extreme cold can have devastating effects on trees and winter crops. Livestock is especially vulnerable to heat and crop yields can be impacted by heat waves that occur during key development stages.

Energy Impacts - Energy consumption rise significantly during extreme cold weather, and any fuel shortages or utility failures that prevent the heating of a dwelling place residents in extreme danger. Extreme heat also can result in utility interruptions, and sagging transmission lines due to the heat can lead to shorting out.

Population and the Economy

During summer and winter seasons, Ocean County residents will encounter extreme heat and cold weather conditions. Heat stress can result when people are exposed to extremely high temperatures. Major human risks for these temperatures include heat cramps, heat syncope, heat exhaustion, heatstroke, and death. The effect of extreme heat will differ for each person impacted. Factors such as health, age, and economic state will influence how a person reacts to heat stress. Ranging in severity, heat disorders share one common feature: the individual has overexposed or over exercised for his age and physical condition in the existing thermal environment.

The general population mortality rate varies by the season and more directly on weather conditions and temperature. On a winter's day the average mortality rate is about 15% higher than on a summer's day. Death and injury can result from cold weather through hypothermia, influenza, frostbite, and pneumonia. Cold weather can often indirectly contribute to death and injury from falls, accidents, carbon monoxide poisoning, and house fires all of which are partially attributable to cold. Studies indicate that, other things being equal, the severity of heat disorders tend to increase with age – heat cramps in a teen may be heat exhaustion in someone forty years old, and heat stroke in a person over sixty years old.

Weather forecasts offer warning prior to most extreme temperature days. Risk of death and injury can be reduced by heeding warnings regarding dangerous high and low temperatures. This holds true especially for long periods of extreme temperatures can overstress power supply systems, resulting in brown outs or blackouts, and leave large communities without means of cooling or heating their homes.

A cascading impact of extreme temperature is a reduction in air quality as contaminated air may result in urban areas during heat waves when stagnant atmospheric conditions trap pollutants.

4.8 FLOODING

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Ocean County. Flooding concerns in Ocean County include riverine/inland flooding from excessive precipitation, stormwater flow issues, or dam failure, and coastal flooding from storm surge, storm tide, and shallow coastal flooding. Winter flooding with ice jams are unlikely in Ocean County, but are possible.

Potential Types of Flooding in Ocean County:

Riverine and inland flooding are typically experienced when precipitation occurs over a given river basin for an extended period of time. Riverine and storm water flooding may include overflow from a river channel, flash floods, alluvial fan floods, mudflows and debris flows, ice-jam floods, flooding due to dam failure, overburdened drainage infrastructure, high groundwater levels, or fluctuating lake levels.

Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas (NOAA, 2009).

Coastal flooding originates from tropical storms, hurricanes and mid-latitude low-pressure systems often referred to as extra tropical storms or nor'easters. During some events, heavy winds push water onto the shore above the predicted tide creating a storm surge or higher wave action than normal. Shallow coastal flooding occurs when there is little to no wind influence, but excessive precipitation occurs during high tides which results in higher water levels along the coastline.

Ice jams can occur when snow melts rapidly and is combined with heavy rains, causing frozen rivers to swell. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. While this has not occurred in the county, it could in the future during a period of rapid cooling/warming.

Dam failures occurs most often during or after a massive rainfall, during a natural flood event, or during a spring thaw. Dam failure-related flooding may occur with little to no warning, and the severity of the flooding is dependent on the size of the water body or impoundment area of the dam.

Location and Extent

Many communities in Ocean County are located along the Atlantic coast or by streams or creeks. Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood. Coastal flooding is often also associated with waves, high winds, coastal erosion, storm surge, and sea level rise.

In assessing the potential spatial extent of flooding, it is important to know that a floodplain associated with a flood that has a 10 percent chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2 percent annual chance of occurring. Community development of the floodplain has resulted in frequent flooding in these areas.

The NFIP, for which Flood Insurance Rate Maps (FIRMs) are published, identifies the 1 percent annual chance flood. This 1 percent annual chance flood event is used to delineate the Special Flood Hazard Area (SFHA) and identify Base Flood Elevations. Figure 4.8-1 illustrates these terms for riverine flood events. The SFHA serves as the primary regulatory boundary used by FEMA, the state of New Jersey, and Ocean County's local governments.

Figure 4.8-1 Diagram Identifying Special Flood Hazard Area, 1 Percent Annual Change (100-Year) Floodplain, Floodway, and Flood

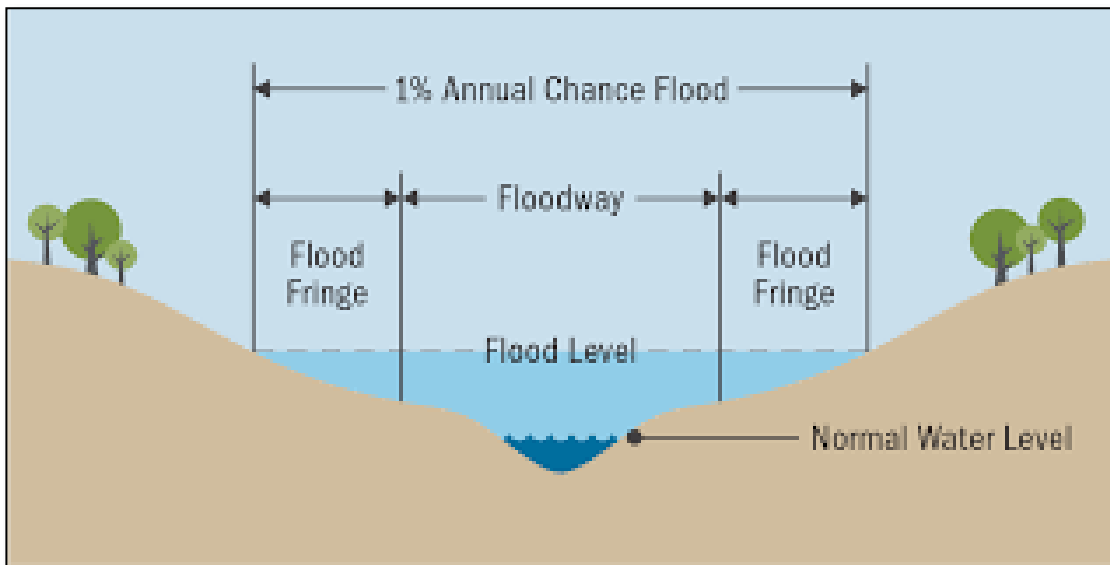
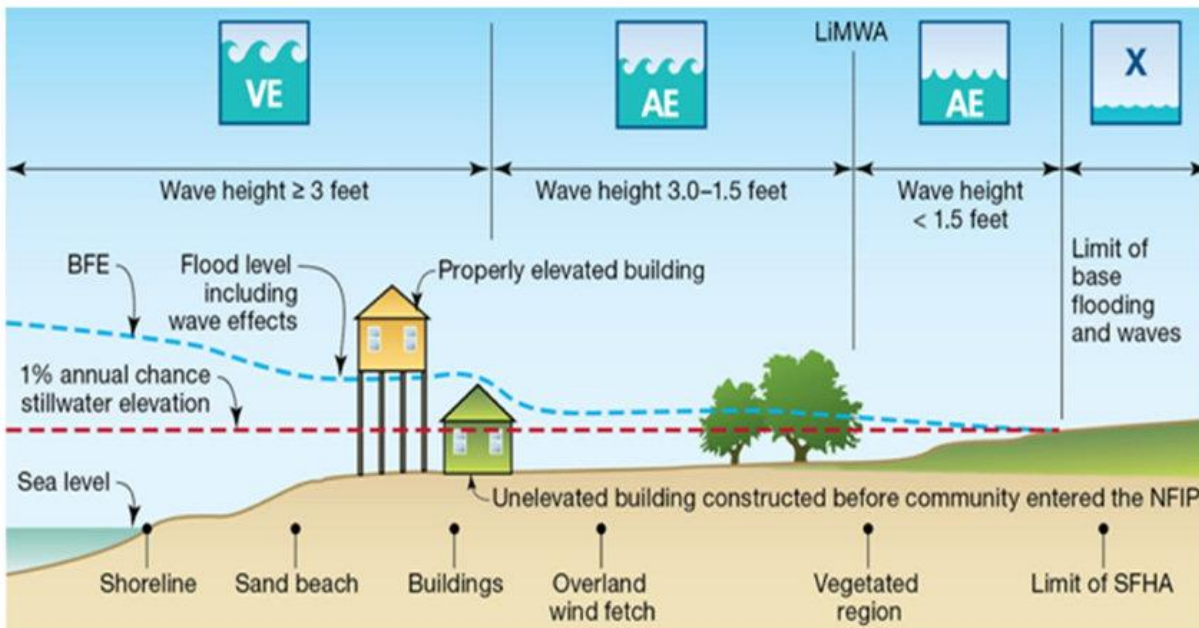


Figure 4.8-2 illustrates SFHA terminology for coastal flood zones. Coastal SFHAs are defined differently as they take into consideration wave height. V zones (coastal high hazard areas) are portions of the SFHA where wave heights are greater than 3 feet. Building requirements are more stringent in V Zones compared to A Zones

Figure 4.8-2 Coastal Flood Zone (FEMA 2013).



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The Effective Countywide DFIRMs were released for Ocean County and all communities on September 29, 2006. All communities within the County are now shown on a single set of countywide FIRMs. Prior to the publication of this digital data, flood hazard information from FEMA was available through paper FIRMs and Q3 data. The final FIRMs and DFIRM data for Ocean County can be obtained from the FEMA Map Service Center (<http://www.msc.fema.gov>). These maps can be used to identify the expected spatial extent and elevation of flooding from a 1 percent and 0.2 percent annual chance event. All of the municipalities in the County have identified SFHAs.

Table 4.8-1 lists the municipalities in Ocean County participating in the NFIP along with the date of the initial FIRM and the current effective map date. All 33 jurisdictions in the County participate in the NFIP.

Table 4.8-1 Ocean County NFIP Participation (FEMA)

Community	Participation Status	CID	Initial FIRM Identified	Current Effective Map Date
Barneгат Township	Participating	340396	12/15/1982	9/29/2006
Barneгат Light Borough	Participating	345280	4/2/1971	9/29/2006
Bay Head Borough	Participating	345281	8/17/1971	9/29/2006
Beach Haven Borough	Participating	345282	4/2/1971	9/29/2006
Beachwood Borough	Participating	340368	5/1/1979	9/29/2006
Berkeley Township	Participating	340369	5/19/1981	9/29/2006
Brick Township	Participating	345285	8/4/1972	9/29/2006
Eagleswood Township	Participating	340372	2/16/1983	9/29/2006
Harvey Cedars Borough	Participating	345296	4/2/1971	9/29/2006
Island Heights Borough	Participating	340374	6/15/1979	9/29/2006
Jackson Township	Participating	340375	9/16/1982	9/29/2006
Lacey Township	Participating	340376	9/1/1977	9/29/2006
Lakehurst Borough	Participating	340377	12/15/1982	9/29/2006
Lakewood Township	Participating	340378	3/15/1977	9/29/2006
Lavallette Borough	Participating	340379	6/11/1971	9/29/2006
Little Egg Harbor Township	Participating	340380	9/1/1983	9/29/2006
Long Beach Township	Participating	345301	5/26/1970	9/29/2006
Manchester Township	Participating	340382	5/2/1983	9/29/2006
Mantoloking Borough	Participating	340383	9/30/1977	9/29/2006
Ocean Township	Participating	340518	1/6/1983	9/29/2006
Ocean Gate Borough	Participating	340384	5/19/1981	9/29/2006
Pine Beach Borough	Participating	340385	8/11/1978	9/29/2006
Plumsted Township	Participating	340386	9/30/1981	9/29/2006
Point Pleasant Borough	Participating	345313	7/7/1972	9/29/2006
Point Pleasant Beach Borough	Participating	340388	6/15/1979	9/29/2006
Seaside Heights Borough	Participating	340389	7/16/1979	9/29/2006
Seaside Park Borough	Participating	345319	8/13/1971	9/29/2006
Ship Bottom Borough	Participating	345320	4/2/1971	9/29/2006
South Toms River Borough	Participating	340392	1/6/1983	9/29/2006
Stafford Township	Participating	340393	9/14/1979	9/29/2006
Surf City Borough	Participating	345324	4/2/1971	9/29/2006
Toms River (Dover) Township	Participating	345293	3/22/1972	9/29/2006
Tuckerton Borough	Participating	340395	5/2/1983	9/29/2006

The DFIRMs are currently in the process of being updated for Ocean County. The best available data is the Preliminary Work Maps of coastal flood hazard areas data released January 30, 2015, and riverine regulatory flood hazard areas data from Ocean County DFIRM released May 30, 2017. The Work Map data was used to prepare maps and analysis in this plan. The DFIRM is being updated for Ocean County through FEMA's Risk Map program. The Risk Map program is working to strengthen the link between hazard mitigation planning and floodplain map updates to improve mitigation strategies and more clearly explain risk to the public, government officials, and other stakeholders. The Risk Map DFIRM update has created tools for Ocean County including an Areas of Mitigation Interest map, Changes Since the Last FIRM polygons, Flood Depth Grids, and Water Surface Elevation Change Grids.

Figure 4.8-3 shows the location of watercourses and flood zones in Ocean County as identified in the DFIRM database. The location of approximate and detailed (including Base Flood Elevations) Special Flood Hazard Areas (1 percent annual chance zones) are shown. Flooding occurs in the major watersheds and along the coast in Ocean County.

Flooding related to dam failures should be expected in areas downstream of Ocean County's 99 dams. While flooding related to dam failures can occur at any of these locations, the biggest concern is for communities downstream of one or the eight high-hazard dams in Jackson, Brick, Lakewood, and Lacey Townships and Tuckerton Borough. Table 4.8-2 lists all Class I High Hazard and Class II Significant Hazard dams. There are a further 70 low-hazard dams in Ocean County.

Range of Magnitude

Several factors determine the severity of floods, including rainfall intensity and duration, topography, tide, wind strength, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. Also, urbanization typically results in the replacement of vegetative ground cover with impervious surfaces such as asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems.

In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snowpack throughout contributing watersheds. Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events, when the velocity of floodwaters has the potential to amplify the impacts of a flood event. Coastal flooding is a concern particularly during hurricane season in the Atlantic, which runs from June 1 to November 30, and in the winter when Nor'easters are likely to occur. For more information on hurricane, tropical storm, and Nor'easter hazards, please see Section 4.9.

Flooding related to dam failures can pose a serious threat to communities located downstream from high-hazard dams. The impact of the failure is dependent on the dam and reservoir characteristics and the amount and distance of populations to the dam. In general, concrete or masonry dams usually fail suddenly due to undermining or the loss of an entire section of the dam while earthen dams fail more gradually, usually due to erosion caused by piping or overtopping (NJDEP Dam Safety Section, 2004). Dam failures due to overtopping of a dam normally give sufficient lead time for evacuation while failures of concrete or masonry dams usually occur too suddenly to effectively evacuate. Dam failures may also be intentional, as their potential to cause serious destruction may make them a potential terrorism target. The range of magnitude for dam failure-related flooding depends on the hazard classification of the dam:

- Class I – High Hazard Potential Dams are expected to cause extensive property damage and cause probable loss of life;
- Class II – Significant Hazard Potential Dams are expected to cause extensive property damage, but a loss of life is not expected;
- Class III – Low Hazard Potential Dams are expected to cause minimal property damage and are not expected to cause a loss of life.
- Class IV – Small Dam Low Hazard Potential Dams are not expected to cause loss of life or significant property damage

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Several factors determine the severity of floods, including rainfall intensity and duration. A large amount of rainfall over a short time span may result in flash flood conditions. A small amount of rain may also result in floods in locations where the soil is saturated from a previous wet period, or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, or other impervious areas. Topography and ground cover are also contributing factors for floods. Water runoff is generally greater in areas with steep slopes and little or no vegetative ground cover.

Flooding related to dam failures should be expected in areas downstream of Ocean County’s 99 dams. While flooding related to dam failures can occur at any of these locations, the biggest concern is for communities downstream of one or the eight high-hazard dams in Jackson, Brick, Lakewood, and Lacey Townships and Tuckerton Borough. Table 4.8-2 lists all Class I High Hazard and Class II Significant Hazard dams. There are a further 70 low-hazard dams in Ocean County.

Table 4.8-2 List of Dams in Ocean County with Hazard Class (NJDEP)

Dam Name	Municipality	Hazard Class
Prospertown Dam	Jackson Township	I
BTMUA Reservoir Dam	Brick Township	I
Lake Carasaljo Dam	Lakewood Township	I
Rainbow Dam	Brick Township	I
Pohatcong Lake Dam	Tuckerton Borough	I
Deer Head Lake Dam	Lacey Township	I
Parker Street Dam	Lacey Township	I
Barnegat Lake Dam	Lacey Township	I
Jacksons Mills Dam	Jackson Township	II
Pine Lake Park Dam	Manchester Township	II
Lake Riviera Dam	Brick Township	II
Holiday Lake Dam	Stafford Township	II
Waddill Lake Dam	Lakewood Township	II
Lake Shenandoah Dam	Lakewood Township	II
New Jersey No Name #113 Dam	Toms River Township	II
Butterfly Bogs Dam	Jackson Township	II
Route 88 Dam	Brick Township	II
Upper Keswick Dam	Manchester Township	II
Manahawkin Lake Dam	Stafford Township	II
Stafford Forge Dam	Eagleswood Township	II

Past Occurrence

Hurricane Irene in August 2011 brought flood waters throughout Ocean County. Heavy rains, tropical storm force winds, and a tornado impacted the state of New Jersey. A three-to-five-foot storm surge led to moderate to severe tidal flooding in Ocean County. Along the coast, communities saw nearly one million people evacuated; meanwhile low-lying lands flooded on the mainland. Two people drowned in Ocean County. Flood waters also led to road closures and damaged corn crops. It was the costliest storm to date in the state of New Jersey. A major disaster declaration was declared on August 31, 2011.

The worst flooding in Ocean County was Super Storm Sandy on October 29, 2012. This powerful storm formed in the Caribbean Sea and brought high winds and heavy rain as it moved north along the Atlantic coastline. The coastal flooding from Hurricane Sandy caused \$29.4 billion statewide and about \$10 billion locally in Ocean County. Though the whole county was impacted, the coastal communities were hardest hit. Several homeowners saw their houses shifted from their foundations and many others had roofs or entire houses collapse. A new temporary inlet was formed in Mantoloking,

creating a channel where houses once stood. The storm claimed the lives of at least 6 people in the county and 38 statewide (NCEI, 2013). The piers at Seaside Heights collapsed and two men drowned due to the storm. Tidal flooding caused Oyster Creek Nuclear power plant to suspend operations. Sandy replaced Irene as the most costly disaster for the state of New Jersey. On October 30, 2012, a major disaster declaration was declared.

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems that have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient-rich sediment that improves soil fertility. However, the destruction of riparian buffers, changes to land use and land cover throughout a watershed, and the introduction of chemical or biological contaminants that often accompany human presence cause environmental harm when floods occur. Hazardous material facilities are potential sources of contamination during flood events. Other negative environmental impacts of flooding include waterborne diseases, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

Ocean County has a long history of flooding events. Thirteen of the twenty-nine Major Disaster Declarations affecting Ocean County have been in response to hazard events related to flooding (see Table 4.3-1 Presidential Disaster Declarations). Table 4.8-3 lists flood event information from 2000 to 2023 obtained from the NCEI database. The majority of the past events have been coastal flooding; almost two-thirds of the events being coastal or tidal flooding events. Additionally, some of the events titled flood, flash flood or urban flooding were linked to or exacerbated by the impact of coast flooding and tidal activity. There have been no major dam failure-related floods in Ocean County, though surrounding counties have experienced dam failures during, for example, the Atlantic County storm in 1997 and Tropical Storm Floyd.

Table 4.8-3 Flood and Flash Flood Events Impacting Ocean County Since 2000

Date	Location and Description
1/25/2000	Coastal flooding - Ocean, Monmouth, Cape May, and Atlantic counties. 6 to 15 inches of snow fell in New Jersey, along with sleet, freezing rain, moderate coastal flooding, and wind gusts up to 60 mph along the shore; drifts as high as four feet; county and government offices, businesses and schools were closed; Both the Millville Airport and the Atlantic City International Airport were shut down; scores of vehicles slid off roadways; at least one man died of a heart attack after shoveling the snow; power lines were downed due to wind and motorist crashing into poles and caused about 3,100 homes and businesses and 1,100 homes and businesses in northern New Jersey respectively to lose power; rough onshore winds generated moderate tidal flooding; severe wind damage occurred on the New Jersey State Route 72 Causeway between Long Beach Island and Stafford Township in Ocean County causing two utility poles to crack and their wires to fall onto the westbound lanes, closing the roadway temporarily; downed wires resulted in 2,500 homes in Surf City losing power; Mystic Islands also reported power outages.
3/21/2000	Coastal flooding - Monmouth, Cumberland, Cape May, Atlantic, and Eastern Ocean counties. Minor tidal flooding affecting areas that normally flood during spring tide events first; some erosion occurred at beaches due to the pounding surf; seas became very high.
4/18/2000	Coastal flooding - Monmouth, Cape May, Atlantic, and Eastern Ocean counties. Minor tidal flooding during high tide; the evening high tides reached 6.7 feet at Ship Bottom in Ocean County.
7/26/2000	Flash flood - Southern and Northwestern New Jersey, including Eastern Ocean County. Thunderstorms and heavy rains at high tide in Ocean County, causing widespread urban and poor drainage flooding along with flooding of some of the waterways that discharge into the Atlantic Ocean; roadways were closed and many cars were overcome by the flood waters; no serious injury reported; the causeway leading to the J. Stanley Tunney Bridge was closed in Ocean County due to the heavy rains; large parts of New Jersey State Route 35 were closed; the worst flooding occurred in Seaside Heights, Seaside Park, Lavallette, Bay Head, Point Pleasant and Point Pleasant Beach; most flooding occurred near Barnegat Bay; heavy rain caused flooding near the bay in Beach Haven and Beach Haven Crest; in Brick Township, flooding led to two roads closures and a voluntary evacuation of Laurelton Village; Toms River rose and flooded the beach; road closures also occurred in Long Branch and Ocean Township; total rainfall was 3.29 inches in Toms River (Ocean County)
8/13/2000	Coastal flooding - Monmouth, Cape May, Atlantic, and Eastern Ocean counties. Minor tidal flooding during high tide.
8/28/2000	Coastal flooding - Monmouth, Cape May, Atlantic, and Eastern Ocean counties. Minor tidal flooding during high tide.
9/25/2000	Coastal flooding - Monmouth, Cape May, Atlantic, and Eastern Ocean counties. Widespread minor tidal flooding during high tide; the onshore flow continued for several tide cycles.
11/10/2000	Coastal flooding - Monmouth, Cape May, Atlantic, and Eastern Ocean counties. Minor tidal flooding during high tide and strong winds.
3/5/2001	Coastal flooding/erosion - Eastern portions of Monmouth, Cape May, Atlantic, and Ocean counties.

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Date	Location and Description
6/17/2001	Flood - Countywide. Tropical Storm Allison brought thunderstorms and heavy rain causing small stream and poor drainage flooding in the county; the worst reported flooding occurred on the shore side; no serious injuries reported; in Point Pleasant Beach, six roadways were closed including New Jersey State Route 35. New Jersey State Route 35 was also closed in Ship Bottom due to severe flooding; an elderly woman was rescued from the water in Ortley Beach; trees were downed and caused isolated power outages; the North Branch of the Metedeconk River at Lakewood reached its 7 foot flood stage at 430 p.m. EDT on the 17th, crested at 8 feet at 10 p.m. EDT on the 17th and was back within bankfull at 340 a.m. EDT on the 18th; Storm totals included 8.10 inches in Tuckerton, 3.50 inches in Manahawkin and 2.65 inches in Bayville.
8/4/2001	Flash flood - Ocean and Monmouth Counties. Thunderstorms and heavy rains resulted in flash flooding of smaller streams in Plumsted Township in Ocean County and Upper Freehold Township in Monmouth County; in New Egypt (Plumsted Township), a SKYWARN Spotter reported 5.5 inches of rain fell in about 90 minutes; no serious injuries were reported.
8/13/2001	Flash flood - Northeast Ocean County. Thunderstorms with heavy downpours caused flooding of streams as well as urban and poor drainage flooding in Ocean County. Vehicles were stranded in Lacey Township with more than three feet of water on some roadways. People were rescued from their vehicles. Flooding was also reported along U.S. Route 9 in Lacey Township and on several roadways in Brick Township. A SKYWARN Spotter in Bayville reported 3.5 inches of rain fell in 90 minutes between 310 p.m. EDT and 440 p.m. EDT. Doppler Radar storm total estimates indicated that 3 to 4 inches of rain fell across much of eastern Berkeley and Lacey Townships.
8/27/2001	Flash flood - Northeast Ocean County. Thunderstorms produced heavy rainfall that resulted in urban, poor drainage, and area stream flooding; Doppler Radar storm total estimates ranged from 3 to 6 inches from Toms River northeast through Point Pleasant; worst flooding occurred from Point Pleasant to Bay Head and also in Toms River in Ocean County; New Jersey State Route 35 was closed in Point Pleasant and New Jersey State Route 37 in Toms River was flooded; flooding formed three foot deep "lakes" in neighborhoods of Dover and Brick Townships; basement flooding and overflowing sewers was also reported in the county; no serious injuries reported.
9/14/2001	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. Minor tidal flooding during high tide.
9/29/2001	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. A nor'easter produced an onshore flow bringing minor to locally moderate tidal flooding and some beach erosion along the New Jersey coast; the onshore flow persisted during several high tide cycles and coincided with a full moon.
10/1/2001	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. A nor'easter produced an onshore flow bringing minor to locally moderate tidal flooding and some beach erosion along the New Jersey coast; the onshore flow persisted during several high tide cycles and coincided with a full moon.
10/14/2001	Coastal flooding - Cape May County and Eastern portions of Monmouth, Salem, Cumberland, Atlantic, and Ocean counties. Strong southeast onshore flow produced minor tidal flooding during high tide.
6/6/2002	Flash flood - Bayville, Ocean County. Heavy rain during thunderstorms produced poor drainage and stream flooding along Cedar Run and across southern Ocean County; Doppler Radar Storm total estimates reached between three and four inches; Berkeley and Stafford Townships observed the worst flooding; roads were closed in the Ocean Acres area of Stafford Township and in Berkeley Township; homes were flooded and many vehicles were left stranded on roadways; the emergency room in the Southern Ocean County Hospital was damaged when an internal drain pipe burst causing the ceiling to collapse above a nurse station; no injuries reported.
6/14/2002	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. Isolated tidal flooding.
7/19/2002	Flash flood - Northern Ocean County. Heavy rain during thunderstorms resulted in Doppler Radar Storm Total estimate of 5 to 6 inches of rain in Lakewood and Jackson Townships; urban, small stream, and poor drainage flooding occurred in northern Ocean County; major roads closed in Lakewood Township including U.S. Route 9 and New Jersey State Route 70; the entrance to the Kimball Medical Center was flooded; street flooding also occurred in Dover Township in Toms River.
10/4/2002	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. Minor tidal flooding during the evening high tide.
10/7/2002	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. High spring tides produced isolated minor tidal flooding during the morning high tide.
10/16/2002	Coastal flooding - Ocean and Monmouth counties. Along the New Jersey coast and in back bays, a strong nor'easter caused minor to locally moderate tidal flooding and beach erosion, the worst of which occurred in Monmouth and Ocean counties; wind gusts reached 50 mph; power outages occurred due to downed trees in Ocean County, mostly in Berkeley, Dover and Lacey Townships; in Ortley Beach, siding was removed from a few homes; peak wind gusts in Ocean County reached 51 mph in Barnegat; significant beach erosion occurred in Beach Haven Borough of Ocean County where a 5 foot cliff was created at Liberty Avenue; the waves also tore away a set of stairs to the beach and freed the wreck of an unidentified ship; on the bay side wave action caused the partial collapse of the bulkhead behind some homes along the Hackensack Lagoon in Barnegat Light Borough; Damage estimates amounted to tens of thousands of dollars.
11/5/2002	Coastal flooding - Middlesex, Monmouth, and Cape May counties along with Eastern portions of Atlantic and Ocean counties. Widespread minor tidal flooding, isolated moderate flooding, and minor beach erosion occurred during a nor'easter; the worst coastal flooding occurred in northern New Jersey and in the back bays.

Date	Location and Description
11/17/2002	Coastal flooding - Ocean and Cape May counties and Eastern portions of Monmouth and Atlantic counties. A nor'easter produced strong winds across Ocean and Monmouth Counties and some minor tidal flooding during high tide; max wind gust was 55 mph at Barnegat Light in Ocean County; minor flooding was reported during high tide on roads adjacent to Barnegat Bay and the Toms River in Ocean County; Doppler Radar Storm Total Estimates ranged between one and three inches; only minor beach erosion was reported, but sand covered the boardwalk in Lavallette in Ocean County.
2/23/2003	Flood - Western Ocean County. Heavy rain and snow melt run-off combined to cause minor flooding along the North Branch of the Metedeconk River; The North Branch of the Metedeconk River in Lakewood rose above its 7 foot flood stage and crested at 7.18 feet; storm totals were 2.20 inches in Point Pleasant.
8/1/2003	Flash flood - Lakewood Township, Ocean County and Monmouth County. Thunderstorms and heavy rains caused poor drainage and small stream flooding from Lakewood Township in Ocean County northeast through Howell and Wall Townships to Asbury Park in Monmouth County; Doppler Radar Storm total estimates indicated widespread 2 to 4 inches of rain fell across the region.
2/7/2004	Flood - Western Ocean County. Heavy rain and snow melt combined to cause poor drainage flooding and later flooding along the Metedeconk River in Ocean County; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 7.34 feet; storm totals were 1.36 inches in Beach Haven.
7/1/2004	Flash flood - Ocean and Monmouth Townships. Thunderstorms resulted in flash flooding in Howell Township of Monmouth County and in Lakewood and Brick Townships of Ocean County; several roads were closed in Brick Township; a few people were trapped in vehicles and were rescued; flooding caused traffic delays along the Garden State Parkway between mile markers 91 and 92.; Doppler Radar storm total estimates exceeded five inches along the county and township borders; a SKYWARN Spotter in Brick Township recorded 2.25 inches of rain.
7/12/2004	Flash flood - Countywide. Thunderstorms with torrential rain caused widespread poor drainage and small stream flooding in Ocean County; Near all municipalities within the county reported flooding; New Jersey State Route 37 near Toms River was flooded; Doppler Radar storm total estimates exceeded one inch throughout the county and reached between 6 to 8 inches in Berkeley and Lacey Townships, and 5.46 inches in Lakewood.
8/1/2004	Flash flood - Northern Ocean County. Thunderstorms with heavy rain caused poor drainage and small stream flooding in northern Ocean County in Jackson and Lakewood Townships; several water rescues from vehicles occurred in Lakewood Township; Doppler Radar storm total estimates reached around three inches, during approximately two hours.
9/29/2004	Flood - Western Ocean County. Hurricane Jeanne produced heavy downpours; Doppler Radar storm total estimates ranged from 1 to 5 inches, from the northern to the southern part of the county, resulting in poor drainage and eventually minor flooding along the North Branch of the Metedeconk Creek; the North Branch of the Metedeconk Creek at Lakewood was above its 7 foot flood stage and crested at 7.03 feet; storm totals included 5.16 inches in Point Pleasant, 2.47 inches in Lakehurst, 1.41 inches in Barnegat and 0.72 inches at Brant Beach.
7/18/2005	Flash flood - Bayville, Ocean County. Thunderstorms with heavy rain caused urban, poor drainage, and small stream flooding in southeastern Ocean County from Berkeley Township south through Eagleswood Township; Doppler Radar storm total estimates reached 5 inches, for a duration of about 90 minutes; Stafford Township reported the worst flooding with many roads flooding; the police advised motorists to stay off the road; New Jersey State Route 72 had four feet of standing water, causing significant backups; minor damage to the bulkheads along Manahawkin Bay was reported in the Beach Haven West section of Stafford Township; both Mill Creek in Stafford Township and Cedar Creek in Berkeley Township flooded; Property damage totaled about \$30,000.
10/12/2005	Flood - Western Ocean County. Heavy rain fell across the Northern part of Ocean County causing poor drainage and small stream and river flooding; three day storm totals were about 1 inch in the southern part of the county and around 10 inches in the northern part of the county; the Metedeconk River flooded and New Jersey State Route 88 was closed in Brick and Lakewood Townships; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 8.58 feet; roads were closed in Dover and Brick Townships and a small stream flooded in Jackson Township; basements and yards were flooded along East Veterans Highway. flooding during damaged over 2,700 single family homes, over 640 apartment units and 220 businesses throughout the state of New Jersey; Specific three day storm totals included 11.41 inches in Point Pleasant, 3.10 inches in Barnegat Light and 1.14 inches in Brant Beach.
12/16/2005	Coastal flooding - Eastern Ocean and Monmouth counties. Minor tidal flooding during the morning high tide.
1/3/2006	Coastal flooding - Middlesex and Cape May counties and Eastern portions of Monmouth, Atlantic, and Ocean counties. Widespread minor tidal flooding during high tide along with some minor to moderate beach erosion; in Ocean County, many beaches were submerged at high tide and minor tidal flooding was reported on the Barnegat Bay side on Long Beach Island; in Ocean Township, flooding reached the foundation of one home and the Poplar Village parking lot.
1/31/2006	Coastal flooding - Ocean, Middlesex, Monmouth, Cumberland, Cape May, and Western Atlantic counties. Widespread minor and isolated moderate tidal flooding during high tide along the ocean as well as in Raritan and Delaware Bays; several streets were flooded and waters reached up to several homes; The high tide reached 6.84 feet above mean lower low water at Point Pleasant in Ocean County; minor tidal flooding begins at 6.7 feet above mean lower low water and moderate tidal flooding begins at 7.7 feet above mean lower low water.

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Date	Location and Description
2/12/2006	Coastal flooding - Middlesex, Monmouth, Ocean, Atlantic, and Cape May counties. Major winter storm that affected the state of New Jersey, especially the New Jersey Shore; coastal flooding and beach erosion resulted due to strong onshore winds and high tides; significant to severe damage to dunes occurred in Bay Head, Bricktown, Ortley Beach, Harvey Cedars and Long Beach Township; vertical cuts across most of the beaches ranged from 2 to 4 feet high by 50 to 75 feet wide; minor structural damage was reported in Holgate (Ocean County), with several towns conducting emergency sand replacement; significant erosion was reported in Brant Beach; on Long Beach Island, strong winds and high tides caused a house under construction to fall off its pilings damaging a neighbor's fence; storm costs totaled up to \$900,000 in Ocean County.
9/1/2006	Coastal flooding - Middlesex, Cumberland, and Cape May counties and Eastern portions of Monmouth, Atlantic, and Ocean counties. Tropical Storm Ernesto brought heavy rain, tidal flooding, strong winds, and beach erosion in New Jersey; coastal counties were hit the hardest with both the tidal and inland flooding and high winds; Atlantic facing beaches reported severe erosion and damage to dune systems in Cape May, Ocean and Atlantic counties especially in Lavallette Borough; in Ocean County vertical cuts averaged 3 to 6 feet (with widths up to 100 feet wide) from Island Beach State Park northward and generally 2 to 4 feet from Barnegat Light southward; all coastal municipalities reported windblown sand.
9/3/2006	Flood -Lakewood Township in Ocean County. Tropical Storm Ernesto brought heavy rain, tidal flooding, strong winds, and beach erosion in New Jersey; coastal counties were hit the hardest with both the tidal and inland flooding and high winds; Atlantic facing beaches reported severe erosion and damage to dune systems in Cape May, Ocean and Atlantic counties especially in Lavallette Borough; in Ocean County vertical cuts averaged 3 to 6 feet (with widths up to 100 feet wide) from Island Beach State Park northward and generally 2 to 4 feet from Barnegat Light southward; all coastal municipalities reported windblown sand.
9/5/2006	Coastal flooding - Cape May County and Eastern portions of Monmouth, Atlantic, and Ocean counties. Minor tidal flooding during high tide.
9/11/2006	Coastal flooding - Monmouth, Cumberland, and Cape May counties and Eastern portions of Atlantic and Ocean counties. Minor tidal flooding at high tide.
9/15/2006	Flash flood - Eastern Ocean County. Thunderstorms produced torrential downpours across eastern sections of Ocean County and caused widespread flash flooding of smaller streams and roadways; Stafford and Berkeley Townships on the mainland and Lavallette, Seaside Heights, Seaside Park and the Ortley Beach section of Dover Township on the barrier islands were the hardest hit areas; Doppler Radar storm total estimates reached 8 to 10 inches in Berkeley Township and 6 to 8 inches in Stafford Township; major roadways were flooded including U.S. Route 9, New Jersey State Routes 37 and 72 and Ocean County Route 537; exit 77 off of the Garden State Parkway was also closed in Berkeley Township because of flooding along the exit roadways; two roads were closed pending inspection because the flooding undermined them; over 100 people were rescued from stranded vehicles including a one-month-old boy in Stafford Township; many home basements, schools, and hospitals were affected in Berkeley and Stafford townships; residents from six homes on Neptune Drive were evacuated by canoe; On the barrier islands, during the height of the heavy rain, it was impossible to get on and off of Long Beach Island; Long Beach and Ocean Boulevards were flooded; In Seaside Heights, Hering Avenue was flooded and apartments below street level were flooded. Actual storm totals included 8.82 inches in Bayville of Berkeley Township and 6.30 inches in Lacey Township; storm costs totaled \$750,000 in Ocean County.
10/6/2006	Coastal flooding - Middlesex, Monmouth, and Western Ocean counties. A nor'easter brought minor to moderate tidal flooding, heavy rain, strong winds and beach erosion to coastal New Jersey; in Harvey Cedars, a 6 by 7 foot vertical cut was reported in the dune system from Middlesex Avenue south to Bergen Avenue; in Brant Beach a 6 to 7 foot cut to the dune system from 54th Street north required Public Works to re-grade the beach; the dune systems were also cut in Holgate, Beach Haven and Surf City; max wind gust reached 47 mph in Barnegat in Ocean County.
10/28/2006	Coastal flooding - Middlesex, Monmouth, and Eastern Ocean counties. Minor tidal flooding during morning high tide.
3/16/2007	Coastal flooding - Eastern Ocean and Monmouth counties and Western Cape County. Strong winds, heavy rains, and minor tidal flooding during morning high tide; storm totals averaged 1.5 to 3.0 inches across southeast New Jersey; high winds caused a few scattered power outages; storm total precipitation was 3.10 inches in Point Pleasant in Ocean County; peak wind gusts reached 58 mph in Seaside Heights of Ocean County and 56 mph in Barnegat of Ocean County; the heavy rain, tidal flooding and strong winds were caused by a nor'easter.
4/15/2007	Coastal flooding - Eastern Ocean and Western Monmouth counties. A nor'easter caused widespread minor tidal flooding, isolated moderate tidal flooding and beach erosion along Delaware Bay, Raritan Bay and the Atlantic Ocean; in Ocean County, tidal flooding occurred along the westward facing side of Barnegat Bay in Ocean County; portions of State Route 35 as well as the ramps into and out of State Route 37 in Seaside Heights were flooded; bay flooding was reported in Lavallette, Mantoloking, Seaside Park and Surf City; tidal flooding reached into the yards of homes on Cedar Bonnet Island. Erosion was severe in Harvey Cedars in the Atlantic Avenue area where the vertical cut reached between 6 and 8 feet, but elsewhere, most of the vertical cuts were between 2 and 4 feet.

Date	Location and Description
4/15/2007	Flood - Lakewood Township, Ocean County. A nor'easter brought heavy rains, flooding along the Metedeconk River, and flooding along the Toms River resulted in road closures in Brick Township and in Island Heights Borough; the North Branch of the Metedeconk at Lakewood was above its 7 foot flood stage and crested at 8.28 feet; precipitation totals included 3.76 inches in Beachwood, 3.04 inches in Point Pleasant, 2.65 inches in Brick, 1.90 inches in Berkeley, 1.76 inches in Seaside Heights, and 1.38 inches in Harvey Cedars; statewide damage was estimated at \$180 million dollars, with approximately \$1 million associated with Ocean County; it was the second worst rain storm (not related to a hurricane) in the state's history; acting Governor Richard J. Codey declared a state of emergency; about 5,000 people were evacuated in 11 of the state's 21 counties; at one time over 70 major roadways and interstates were closed including New Jersey State Routes 20, 23, 38, 46, 70 and 73 as well as U.S. Route 30 and Interstates 80 and 380; over 700 traffic accidents were indirectly caused by the flooding and heavy rain; three people in the state drowned; strong winds resulted in power outages for 120,000 homes and businesses across the state; the Internal Revenue Service extended the tax deadline for 48 hours in affected areas. spring planting on farms was expected to be delayed due to the flooding; heavy rain, snow, and winds downed trees and power lines; max wind gusts ranged between 40 and 60 mph.
12/16/2007	Coastal flooding - Eastern Ocean County. Beach erosion and minor coastal flooding occurred at the neap tides; in Ocean County, erosion was reported in Harvey Cedars, Surf City and Holgate; the worst erosion was reported in Harvey Cedars with vertical cuts reaching 3 to 4 feet.
12/22/2007	Coastal flooding - Eastern Ocean and Western Monmouth counties. Minor tidal flooding during high tide.
12/12/2008	Flood - Lakewood Township, Ocean County. The North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 7.86 feet; minor tidal flooding occurred during morning high tide along the ocean front; storm precipitation totals included 5.05 inches in Lavallette, 4.98 inches in Stafford Forge, 4.69 inches in Brick, and 4.34 inches in Little Egg Harbor.
7/31/2009	Flash flood - Point Pleasant Beach, Ocean County. Thunderstorms and heavy rain resulted in flash flooding to occur in and around the Point Pleasant Canal in Point Pleasant, Ocean County; both New Jersey State Routes 35 and 88 were flooded.
7/31/2009	Flash flood - South Toms River, Ocean County. Thunderstorms and heavy rain resulted in flash flooding to occur along Winding River in Toms River (Dover Township); some motorists were rescued from trapped vehicles on New Jersey State Route 37 near Hospital Drive.
9/11/2009	Flood - North Beach Haven, Ocean County. Thunderstorms and heavy rain caused flooding in and around Tuckerton and on Long Beach Island in Ocean County; in Tuckerton, two women were rescued uninjured from their home after about 18 inches of water invaded it; on Long Beach Island, flooding was reported along Long Beach Boulevard in North Beach Haven resulting in road closure; storm event precipitation totals included 3.37 inches in Stafford Township and 3.30 inches in Little Egg Harbor Township.
12/9/2009	Flood - Lakewood Township, Ocean County. Rain mixed with snow fell across central and southern New Jersey, with totals averaged 1.5 to 3.0 inches; heavy rain combined with snow melt runoff produced poor drainage and small stream flooding; in Ocean County, flooding occurred along sections of the North Branch of the Metedeconk River; the North Branch of the Metedeconk River near Lakewood was above its 7 foot flood stage and crested at 7.2 feet; storm event precipitation totals included 3.09 inches in Bayville, 2.75 inches in Stafford Township, 2.43 inches in Barnegat Township, 2.32 inches in Little Egg Harbor Township, 2.25 inches in Berkeley Township, 2.05 inches in Brick Township, 2.02 inches in Toms River and 1.95 inches in Point Pleasant.
12/26/2009	Flood - Parkway Pines, Ocean County. Melting snow runoff and between 1.5 and 3.0 inches of rain produced field, poor drainage and widespread river flooding in New Jersey; the North Branch of the Metedeconk at Lakewood was above its 7 foot flood stage and crested at 8.59 feet; storm event precipitation totals included 2.78 inches in South Toms River, 2.10 inches in Berkeley Township, 2.02 inches in Brick and 1.98 inches in Lavallette.
2/24/2010	Flood - Parkway Pines, Ocean County. Rain combined with snow melt runoff caused flooding of some of the more flood prone creeks and rivers in central and southern New Jersey; it was snowing when some of the waterways were above flood stage; storm event precipitation totals averaged 1 to 2.5 inches, and were highest in Ocean County with 2.57 in Stafford Township, 2.53 inches in Point Pleasant, 2.43 inches in Pine Beach, 2.29 inches in Berkeley Township, 2.28 inches in Brick Township and 1.95 inches in South Toms River; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 7.31 feet.
2/13/2010	Coastal flooding - Along the New Jersey coast. Moderate to locally severe coastal flooding coupled with pounding surf took battered the New Jersey coast; in Ocean County, 3 to 5 foot vertical cuts were common; in North Beach, four houses were undermined by the erosion on Long Beach Boulevard; in Surf City, a 15 foot high and a 40 foot wide cut in the dunes occurred between 18th and 23rd Streets; in Ortley Beach, 30 to 40 percent of the beach was gone; in Seaside Park, bay flooding occurred and residents used kayaks; in Toms River, both Barnegat Bay and Toms River flooded; in Beach Haven, 10 feet of roadway was lost at Merivale Avenue; in Holgate, a 10 foot high by 16 foot wide cut in the dunes occurred in a residential area; \$2 million in total damages resulted.
2/13/2010	Riverine Flooding - Parkway Pines, Ocean County. Heavy rains led to major flooding in the Passaic and Raritan Basins and flooding throughout New Jersey; four day storm totals averaged around 2.5 to 6 inches with the highest amounts in the Raritan and Passaic Basins; it was the worst flooding in the Raritan Basin since April of 2007 and the worst flooding in the Passaic Basin since April of 1984; over 1000 people were evacuated in Morris and Somerset Counties; damage was estimated at 30 million

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	dollars statewide as thousands of homes and businesses were damaged; New Jersey Governor Chris Christie declared a state of emergency on March 14th; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 8.49 feet; storm event precipitation totals included 5.32 inches in Staffordville, 4.80 inches in Cedar Beach, 4.59 inches in South Toms River and 4.40 inches in Point Pleasant.
3/29/2010	Flood - Lakewood Township, Ocean County. Heavy rain in combination with high caused renewed flooding in New Jersey, especially in the Raritan and Passaic Basins; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 8.27 feet; storm event precipitation totals included 4.61 inches in Lavallette, 4.60 inches in Oakwood, 4.50 inches in Brick and 3.96 inches in Toms River.
4/1/2010	Flood - Parkway Pines, Ocean County. River and stream flooding from the heavy rain that fell on March 28th and 30th continued through April 4th in parts of Morris, Somerset, Burlington, Ocean, Salem and Cumberland Counties. The North Branch of the Metedeconk River near Lakewood was above its 7 foot flood stage and crested at 8.27 feet.
7/3/2011	Flash flood - Pine Lake Park, Ocean County. Thunderstorms with very heavy rain caused flash flooding within Toms River Township; the worst flooding was reported at the intersection of New Jersey State Route 37 and Mule Road; about thirty motorists were stranded within their vehicles throughout the township and several had to be rescued; Many jug handles were also impassable; The Doppler Radar storm total estimate over the township was between 2 and 3 inches, most of which fell within one hour.
8/21/2011	Flash flood - Cassville, Ocean County. Thunderstorms with heavy rain caused poor drainage and stream flash flooding in southern Monmouth County and in the northwest part of Ocean County; the runoff also caused flooding along the North Branch of the Metedeconk River; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 7.42 feet; in Jackson Township, vehicles became trapped in flood waters on six roadways: Bennetts Mills Road, Cedar Swamp Road, Chandler Road, County Line Road, Fox Hollow Drive and Nottingham Way; the most concentrated flooding occurred in the Four Seasons Development; Six Flags, Great Adventure even closed early; No serious injuries were reported; Event precipitation totals included 3.85 inches in Jackson Township and 2.58 inches in Point Pleasant Beach.
8/22/2011	Flood - Lakewood Township, Ocean County. Thunderstorms with heavy rain caused poor drainage and stream flash flooding in southern Monmouth County and northern Ocean County; runoff from the heavy rain then caused some river flooding in central New Jersey; the runoff from the heavy rain on the 21st caused flooding along the North Branch of the Metedeconk River; flooding occurred as far upstream as Aldrich Road (which was closed) in Jackson Township; the North Branch of the Metedeconk River at Lakewood was above its 7 foot flood stage and crested at 7.42 feet.
8/27/2011	Flash flood - New Egypt, Ocean County. 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; approximately one million people were evacuated from the coast and low lying areas prone to inland flooding throughout the state of New Jersey including all of Cape May County; Irene also caused record breaking outages to utility customers as around one and a half million people lost power throughout the state; power was not fully restored until September 5th; the widespread flooding resulted in the second highest crest (highest was with Hurricane Floyd in September 1999) on record for the Raritan Basin, but the highest crest on record for many other river basins including the Passaic; moderate tidal flooding occurred along the tidal Delaware River and Delaware Bay and minor to moderate flooding occurred farther north along the Delaware River; moderate to severe tidal flooding occurred along the Atlantic Coast and Raritan Bay; there were six direct deaths associated with Irene, all drowning; the deaths occurred in Salem County, Mercer County (two), Ocean County (two) and Morris County; preliminary damage estimates in the whole state of New Jersey were near one billion dollars to approximately 200,000 homes and businesses; 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; 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 also damaged the corn crop.
8/28/2011	Flood - New Egypt, Ocean County. flooding rains combined with tropical storm force wind gusts closed thirty-five roadways and about fifteen bridges in Ocean County including parts of New Jersey State Routes 33, 35, 36 and 79 and U.S. Route 9; Plumsted Township was hit hard as flooding divided the township in half as the Crosswicks Creek flooded; three families were stranded after a roadway was washed away; neighboring Jackson Township had eight bridges and culverts washed out; Toms River flooded and the North Branch of the Metedeconk River at Lakewood had major and record breaking flooding; It was above its 7 foot flood stage and crested at 11.40 feet; storm event rainfall totals included 9.10 inches in Jackson Township, 8.38 inches in Whitesville, 7.33 inches in Brick Township and 7.10 inches in Jackson Township; total costs of the storm for Ocean County sum up to \$10 million.
6/4/2012	Coastal flooding - Along the New Jersey coast. Minor to moderate tidal flooding along Raritan Bay, coastal New Jersey and Delaware Bay; the highest tides occurred with the high tide cycle and reached moderate levels along the oceanfront and in Delaware Bay and nearly reached moderate levels on tidal sections of the Delaware River.

Date	Location and Description
6/22/2012	Flash flood - Waretown, Ocean County. Thunderstorms and heavy rain fell across New Jersey; southern Ocean County was hardest hit as multiple thunderstorms moved over the same area; Doppler Radar storm total estimates exceeded 6 inches. the thunderstorms produced torrential downpours and flash flooding in eastern parts of Stafford, Barnegat and Ocean Townships; five inches of rain was reported within ninety minutes; Motorists were stranded within their vehicles with water rising to nearly window level in Manahawkin in Stafford Township; Multiple roadways were closed including New Jersey State Route 72 in Stafford Township; ten vehicles were so badly flooded that they had to be towed away from the Ocean Acres section of Stafford Township; weekend getaway traffic was blocked from reaching Long Beach Island; no serious injuries were reported; two CoCoRahs reports from Stafford Township had event totals of 7.60 inches and 5.77 inches respectively; total costs for Ocean County amounted to \$100,000.
7/20/2012	Flash flood - Tuckerton, Ocean County. Several thunderstorms brought heavy rain across southeast New Jersey, which, in combination with the spring high tide produced poor drainage flooding as well as flash flooding in the Mystic Island section of Little Egg Harbor Township in Ocean County; Doppler Radar storm total estimates reached between 3 and 6 inches in parts of Cape May, Southeast Burlington and Southern Ocean Counties; several vehicles became stuck in flood waters and rescues were performed; actual rainfall amounts were 5.30 inches in Mystic Islands.
9/4/2012	Flash flood - Warren Grove, Ocean County. Heavy rain and thunderstorms resulted in poor drainage and small stream flooding in parts of Barnegat, Little Egg, and Stafford townships; the runoff caused flash flooding along the Wading and Oswego rivers; New Jersey State Route 72 was closed in western Barnegat Township.
9/5/2012	Flash flood - Cedar Run, Ocean County. Heavy rain and thunderstorms caused poor drainage flash flooding and small stream flooding along McKinley Ave. in Stafford Township and several basements flooded on Perry Lane; total precipitation during the 2 hour event was 3.49 inches in Berkeley Township and 3.01 inches in Stafford Township; total storm costs amounted to \$5,000.
10/29/2012	Coastal flooding - Countywide. Hurricane Sandy made landfall in Brigantine City as a post tropical storm; the storm brought high, damaging winds that gusted up to 88 mph in Tuckerton, Ocean County; the maximum sustained winds speed for Ocean County was 60 mph in Bay Head; the highest estimated crest elevations in Ocean County were 8.70 feet above lower low water at Mantoloking, 6.99 feet at Barnegat Light, 6.54 feet at Ship Bottom, and 5.24 feet at Tuckerton; the eastern half of the county suffered widespread damage including roof collapse, ruptured gas lines, house fires, damage to public transit, and homes shifting off their foundations; the piers in Seaside Heights collapsed; Bay Head, Point Pleasant, and Mantoloking were ravaged by the storm; tidal flooding impacted homes on the west side of Barnegat Bay; in Mantoloking, a new temporary inlet was formed, sweeping away homes that once stood there; access to the barrier islands in Ocean County was limited until December; two men drowned in Ocean County, one in Brick Township and one in Little Egg Harbor Township; 3 people died of hypothermia and one man died when a tree stump fell on him in Ocean County; Oyster Creek nuclear power plant suspended operations due to tidal flooding; schools were closed as well as major roadways, such as the New Jersey Turnpike; power outages were worst in Ocean and Monmouth counties; total storm costs amounted to \$7.5 billion for eastern Ocean County, and \$2.5 billion for Western Ocean County; most costly natural disaster in history in the state of New Jersey (29.4 billion statewide).
12/21/2012	Flood - Ocean, Atlantic, and Cape May Counties - Strong onshore flow contributed to higher high tides with minor to moderate tidal flooding occurring along the southern New Jersey oceanfront and in Barnegat Bay. In Ocean County, tidal flooding was reported on the barrier island section of Brick Township. In Toms River Township, tidal flooding was reported in the Green Island and Silverton sections of the township on Barnegat Bay. High tide at Atlantic City Reached 6.71 feet above mean lower low water. Minor tidal flooding starts at 6.0 feet above mean lower low water. High tide at Cape May reached 7.82 feet above mean lower low water. Moderate tidal flooding starts at 7.7 feet above mean lower low water.
12/27/2012	Coastal Flooding - In Ocean County, New Jersey State Route 35 was flooded in Mantoloking Borough. Brick Township closed off its part of the barrier islands to traffic and Toms River Township reported some ocean breaches on its barrier islands. In Barnegat Bay, tidal flooding caused the closure of Mandalay and Drum Point Roads. Tidal flooding was reported along Hovsons Boulevard and in the Silverton and Holiday City areas of the township.
3/7/2013	Coastal Flooding - Nor'easter - Central and Southern Ocean County - Brought strong to high winds on the 6th into the 7th as well as minor to moderate tidal flooding along Raritan Bay, lower Delaware Bay and on the ocean side. The coastal flooding was exacerbated by wave action as waves off of Barnegat (Ocean County) reached 15 feet and seas offshore 25 feet. The coastal flooding caused new breaches in Mantoloking, flooded roadways and prompted some voluntary evacuations in Monmouth and Ocean Counties. In Mantoloking, three dune breaches closed New Jersey State Route 35. Tidal flooding was reported in Long Beach Township in its Brant Beach and Holgate areas. In Berkeley Township tidal flooding in Barnegat Bay reached into Balsam Drive, Main Street and Bayview Avenue. Roadways on Pelican Island and Seaside Park also had some water on them. In Lacey Township, tidal flooding was reported in the Hawaii section as well as along the Bayside Beach Club.
3/9/2013	Coastal Flooding - Nor'easter - Ocean County - A subtle veering of the surface winds slowly drifted offshore brought areas of moderate tidal flooding. In Ocean County, the southbound lane of New Jersey State Route 35 was closed.
6/18/2013	Flash Flood -Thunderstorms and Heavy Rain - Toms River Township, Ocean County - The flooding affected the eastbound lanes of New Jersey State Route 37. Event precipitation totals included 3.48 inches in Berkeley Township and 2.57 inches in Toms River Township.
7/22/2013	Flash Flood -Thunderstorms and Heavy Rain - Jackson Township, Ocean County - Caused poor drainage and small stream flash flooding. Event precipitation totals included 6.07 inches in Jackson.

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8/13/2013	Flash Flood -Thunderstorms and Torrential Downpours - Long Beach Island, Ocean County - Caused flash flooding on Long Beach Island from Surf City south through Beach Haven. Some poor drainage flooding also occurred in Point Pleasant and Little Egg Harbor Township. Doppler Radar storm total estimates reached 2 to 3 inches.
1/3/2014	Coastal Flooding -Winter Storm - Northern Ocean County - A winter storm dropped 10 inches of snow in northern Ocean County. The snow ended first in the far northwest and southwest parts of the state and last in Ocean and Monmouth Counties where the greatest snowfall occurred. Representative snowfall totals included 10.5 inches in Jackson Township and 9.5 inches in Whiting
5/1/2014	Flood - Ocean County - The North Branch of the Metedeconk River at Lakewood had minor flooding and was above its 8 foot flood stage. It crested at 8.37 feet. Event precipitation totals included 4.25 inches in Jackson Township, 3.28 inches in Brick Township, 3.19 inches in Stafford Township, 3.12 inches in Whiting and 3.04 inches in Toms River.
7/14/2014	Flash Flood -Thunderstorms with Torrential Downpours - Ocean and Monmouth Counties - Caused widespread street flooding with several impassable roadways within the township. Doppler Radar storm total estimates reached 6 inches in the township and in nearby Howell (Monmouth County), 5.91 inches of rain fell.
7/15/2014	Flood -Thunderstorms and Heavy Rain - Ocean County - The runoff from the thunderstorms with very heavy rain caused minor flooding along the North Branch of the Metedeconk River. The North Branch of the Metedeconk River near Lakewood was above its 8 foot flood stage. It crested at 8.08 feet. Event precipitation totals included 3.42 inches in Jackson Township and 2.95 inches in Brick Township. Runoff flooding occurred overnight in Ocean County. In Ocean County Doppler Radar storm total estimates reached as high as 6 inches.
8/13/2014	Flash Flood -Thunderstorms with Torrential Downpours - Eastern Ocean County - Doppler Radar storm total estimates reached 9 inches. In Seaside Park, New Jersey State Route 35 was closed north of 5th Avenue. In Point Pleasant, many roadways were flooded, up to two feet deep. Actual precipitation event totals included 8.35 inches in Lacey Township, 7.50 inches in Little Egg Harbor Township, 7.24 inches in Stafford Township, 6.55 inches in Lavallette, 6.02 inches in Point Pleasant, 5.87 inches in Brick Township, 5.43 inches in Berkeley Township, 4.59 inches in Seaside Heights, 4.39 inches in Toms River, 4.02 inches in Lakewood and 2.51 inches in Jackson Township.
10/21/2014	Flash Flood -Thunderstorms and Heavy Rain - Brick Township, Ocean County - Thunderstorms produced heavy downpours in parts of Ocean and Monmouth Counties and caused flash flooding in Brick Township. Event precipitation totals reached as high as around 2 inches, most of which fell within an hour.
12/9/2014	Coastal Flooding - Nor'easter - New Jersey Coast - Caused strong winds as well as minor to moderate tidal flooding in Upper Delaware Bay and around Raritan Bay and moderate tidal flooding in Lower Delaware Bay and Atlantic Coastal New Jersey. In Ocean County, a steel sea wall was exposed in Mantoloking and Brick. A nine foot drop-off was reported along the beach. In Lavallette, flooding forced the closure of one lane on Northbound New Jersey State Route 35 south of Washington Street. More extensive coastal and roadway flooding was reported on the southern half of Long Beach Island. Sections of Long Beach Boulevard were flooded and closed. Highest tides included 3.84 feet above mean lower low water at Ship Bottom (Ocean County) and 7.30 feet above mean lower low water at Tuckerton (Ocean County).
5/28/2015	Flash Flood -Thunderstorms - Toms River Township, Ocean County - New Jersey State Route 37 was flooded from Vaughn Avenue to the Thomas A. Mathis Bridge. No serious injuries were reported. Between 20 and 30 water rescues occurred. Flooding was also reported along Adams Avenue and Bash Road near New Jersey State Route 37 in Toms River. Event precipitation totals within Toms River included 5.24 inches and 4.60 inches.
6/27/2015	Flash Flood -Thunderstorms and Heavy Rain - Eastern Ocean County - Caused flash flooding of smaller streams as well as poor drainage flooding in eastern Ocean County from Toms River Township south through Little Egg Harbor Township. Event precipitation totals included 4.71 inches in Brick Township, 4.49 inches in Berkeley Township, 4.41 inches at Robert J. Miller Airport, 4.26 inches in Toms River, 3.73 inches in Little Egg Harbor Township, 3.70 inches in Pine Beach, 3.51 inches in Stafford Township, 2.90 inches in Tuckerton and 2.25 inches in Lacey Township.
7/15/2015	Flash Flood -Thunderstorms and Heavy Rain - Little Egg Harbor Township, Ocean County - Flash flooding in the Mystics Island section of Little Egg Harbor Township. Major street flooding was reported. No major injuries were reported. Event precipitation totals included 4.16 inches in Little Egg Harbor Township and 2.27 inches in Tuckerton.
1/23/2016	Coastal Flooding - Nor'easter - Southern New Jersey - Blizzard conditions along the eastern seaboard caused major to record flooding in parts of New Jersey and Delaware. The most severe flooding occurred along the southern New Jersey coast in Cape May County, where old tidal flood records were surpassed.
2/8/2016	Coastal Flooding - Onshore Flow Associated with Low Pressure along the Atlantic Coast - New Jersey Coast - A strong onshore flow associated with an intense low pressure system moving north just off the mid-Atlantic coast, in combination with a new moon, produced moderate coastal flooding during the morning high tide on February 9th.
2/9/2016	Coastal Flood - Onshore Flow Associated with Low Pressure along the Atlantic Coast - New Jersey Coast - Coastal flood - An onshore flow associated with low pressure along the mid-Atlantic coast, in combination with a new moon, produced moderate coastal flooding. Multiple roadways were flooded on Long Beach Island due to coastal flooding. Immediately in the wake of a much stronger storm system moving northeast away from the area, another weaker low pressure system developed along the mid-Atlantic coast. Generally between one-half inch and 2 inches of snow fell across the Garden State, with nothing at the shore. One of the highest snowfall amounts reported in the county included 1.1 inches in Berkeley Township.

Date	Location and Description
5/6/2016	Coastal Flooding - Persistent Onshore Flow - Ocean County - A Low pressure system slowly moved onshore leading to a persistent period of onshore flow. Coupled with a New Moon cycle this led to abnormally high tidal levels and frequent minor to moderate coastal flooding corresponding to the high tides.
6/21/2016	Flood - Thunderstorms and Rain Showers - Ocean County - Flooding extended to Brick Blvd and Route 70. A cold frontal boundary moved south into New Jersey. This front served as a focal point for showers and thunderstorms to develop across the region. More than 30,000 people lost power for a time.
7/25/2016	Flood - A trough of low pressure led to the development of afternoon and evening showers and thunderstorms which became severe in spots and produced locally heavy rains. 40,000 were left without power across the state.
7/31/2016	Flood -Several clusters of thunderstorms associated with several shortwaves and a cold front became nearly stationary over Mercer County on the 29th and Hunterdon County on the morning of the 30th. Heavy rainfall over 5 inches occurred in these areas. The persistent heavy rain resulted in severe flash flooding including a state of emergency being issued in West Windsor Twp. Thousands were left without power as a result of the storms. The Monmouth county fair and New Jersey Balloon festival were cancelled due to weather on 7/31. Minor flooding occurred along route 530.
7/31/2016	Flood -Several clusters of thunderstorms associated with several shortwaves and a cold front became nearly stationary over Mercer County on the 29th and Hunterdon County on the morning of the 30th. Heavy rainfall over 5 inches occurred in these areas. The persistent heavy rain resulted in severe flash flooding including a state of emergency being issued in West Windsor Twp. Thousands were left without power as a result of the storms. The Monmouth county fair and New Jersey Balloon festival were cancelled due to weather on 7/31. The main road in Island Beach State park was flooded due to heavy rainfall.
9/19/2016	Flood -The remnants of tropical storm Julia and a frontal boundary interacted leading to several rounds of rainfall over the region. Several inches of water on streets.
9/29/2016	Coastal Flood -A stalled frontal boundary led to rounds of heavy rain across the southern portion of the state. Water was reported to be knee high at both high tides Thursday night and Friday in Tuckerton.
1/24/2017	Coastal Flood -Several inches of water came up with the morning high tide into Ocean City which flooded some roads. Numerous roads flooded throughout county including route 72 between GSP and Long Beach Island.
1/24/2017	Coastal Flood -Flooding reported in numerous locations on Long Beach Island.
3/14/2017	Coastal Flood -Widespread road flooding accompanied the morning high tide in the coastal communities of Ocean County. This led to numerous road closures. Communities such as Point Pleasant, Seaside heights and Long Beach Island were most affected. Tuckerton reached 5.89 ft, moderate begins at 5.6 feet.
7/24/2017	Flood -A stalled frontal boundary was the focus for several rounds of thunderstorms that produced damaging winds and flooding in spots. Several thousand people lost power throughout the state. Several reports of flooding.
8/18/2017	Flood -Severe thunderstorms formed in a hot and humid airmass ahead of a cold front. Flooding on route 37 from Collidge ave to Fischer blvd.
9/19/2017	Coastal Flood -Moderate coastal flooding affected western Ocean County with the evening high tide on Tuesday, September 19. Widespread roadway flooding was reported in the communities along tidal waters and many roads were closed. The following tidal gauge reached the moderate flooding threshold: Atlantic City Inside Thorofare.
9/19/2017	Coastal Flood - Moderate coastal flooding affected eastern Ocean County with the evening high tide on Tuesday, September 19. Widespread roadway flooding was reported in the communities along tidal waters and many roads were closed, including Long Beach Island. The following tidal gauge reached the moderate flooding threshold: Atlantic City Inside Thorofare.
10/30/2017	Flood - Roads were flooded with one to two feet of water.
3/3/2018	Coastal Flood - Moderate coastal flooding with a number of road closures in the coastal communities of Ocean County.
6/11/2018	Flood- Torrential rain across parts of southeastern Pennsylvania, and central and southern New Jersey caused flooding on County Road 528 northbound near County Road 638.
7/6/2018	Flash Flood- Route 70 in Lakehurst was closed due to flooding. Flooding also caused a large sinkhole to develop along Main Street in Lakewood near the intersection of Clifton Avenue.
7/17/2018	Flash Flood- Along with widespread roadway flooding in Seaside Heights, several roads in Toms River were flooded and impassable. Major flooding occurred along the North Branch of the Metedeconk River near Lakewood.
8/13/2018	Flash Flood- Rainfall totals of 3 to 6 inches were reported in southeastern Monmouth County and northeastern Ocean County with isolated amounts near 8 inches. The heavy rain resulted in widespread flash flooding in the area. Widespread flooding occurred in and around the Greenbriar development in Brick Township. Several homes on Markham Road were flooded. Also, a nearby medical building experienced flooding on the first floor. There were a number of water rescues in the area. The adjacent section of the Garden State Parkway was flooded and some of the northbound lanes were closed. Route 88 in Lakewood was flooded and impassable. Some vehicles were trapped in the flood waters.
9/9/2018	Coastal Flood - A persistent onshore flow and unusually high astronomical tides associated with the new moon resulted in widespread moderate coastal flooding along the bays and other tidal waterways in central and southern New Jersey. The flooding occurred across three consecutive high tide cycles, from the evening of September 9 through the early hours of September 11.

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10/27/2018	Coastal Flood- Moderate to major coastal flooding occurred along the back bays and other tidal waterways in the county. There was widespread roadway flooding with water reaching some buildings. Among the locations most impacted were Point Pleasant and Long Beach Island. Stretches of Long Beach Boulevard on Long Beach Island were inundated.
7/6/2019	Flash Flood- Rainfall totals of 3 to over 5 inches fell in parts of Ocean County. Multiple vehicles were trapped in flood waters in the Ocean Acres section of Stafford Township. Several water rescues took place. Sections of US Route 9 in Barnegat Township were impassable due to flood waters.
7/18/2019	Flash Flood- Local rainfall amounts of 4 to around 5.5 inches fell in parts of Ocean County. Flash flooding occurred along NJ Route 72 in Stafford Township. Parts of the road were impassable and at least one vehicle was abandoned in the flood waters
7/31/2019	Flash Flood- Thunderstorms caused flooding along the southbound Garden State Parkway in Berkeley Township and South Toms River. There were lane closures to the north of Interchange 80.
10/10/2019	Coastal Flood- Slow moving low pressure centered well off the coasts of New Jersey and Delaware produced coastal flooding during several consecutive high tide cycles from October 9 through October 12. Moderate coastal flooding occurred with the evening high tide on the 10th, with numerous road closures.
6/5/2020	Flash Flood- Showers and thunderstorms brought heavy rain to much of central New Jersey during the late afternoon and evening of June 5. Rainfall totals of 1 to 2 inches were common with some locations receiving up to 2 to 3 inches in a relatively short amount of time. Flooding occurred on numerous roads the county. Several roads were closed and a few vehicles were stranded in the high water with some flooding occurring along the shore.
7/10/2020	Flash Flood- Tropical Storm Fay moved northward along the coasts of Delaware and New Jersey on the afternoon and evening of July 10. The storm produced rainfall totals up to 3 to 6 inches in New Jersey, with the highest totals occurring in the southern part of the state. Some areas also experienced a period of tropical storm force winds, especially near the coast. Overall impacts from wind were limited.
7/24/2020	Flash Flood- Thunderstorms brought locally heavy rain to parts of southern New Jersey on the afternoon of July 24. Isolated locations received as much as 2 to 3 inches of rain.
2/1/2021	Coastal Flood- Widespread moderate coastal flooding occurred in the tidal communities of Ocean County during the night of February 1. There were numerous road closures.
8/22/2021	Flash Flood- Heavy rains from weakening Hurricane Henri caused widespread street flooding on Long Beach Island from Harvey Cedars to Surf City. Sections of Long Beach Boulevard were closed.
10/28/2021	Coastal Flood- Widespread moderate flooding occurred in the tidal areas around Barnegat Bay in Ocean County. There were many road closures with the flood waters affecting numerous homes and businesses.
8/5/2022	Flash Flood- Thunderstorms brought locally heavy rain to northern Ocean County during the late afternoon and early evening of August 5. Rainfall totals were as high as 3.0 to 4.5 inches. A vehicle became trapped in flood waters in Jackson Township, requiring a water rescue.
8/22/2022	Flash Flood- Thunderstorms brought locally heavy rain to parts of New Jersey on August 22. Rainfall totals were as high as 3 to nearly 6 inches. NJ Route 72 was closed in Stafford Township, along with several roads in Surf City due to flooding. Several vehicles were stranded in the flood waters.
10/3/2022	Coastal Flood- Widespread roadway flooding and some property inundation occurred in the tidal areas of Ocean County.
12/16/2022	Coastal Flood- Widespread roadway flooding occurred in the tidal communities of Ocean County, with the flood waters affecting some vulnerable buildings.
12/23/2022	Coastal Flood- Widespread roadway flooding occurred in the tidal communities of Ocean County. Water entered vulnerable buildings causing some damage.

Source: NOAA-NCEI, 2024

Future Occurrence

In Ocean County, flooding is a common occurrence and can occur during any season of the year. Therefore, the future occurrence of floods in Ocean County can be considered highly likely.

The NFIP recognizes the 1 percent annual chance flood, also known as the base flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1 percent annual chance flood is a flood that has a 1 percent chance of occurring over a given year. The DFIRMs are used to identify areas subject to the 1 and 0.2 percent annual chance flooding. Areas subject to 2 percent and 10 percent annual chance events are not shown on maps; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report.

The effect of sea level rise on coastal flooding due to climate change impacts is a major concern in the region. Generally speaking, sea level rise impacts all areas in Ocean County subject to coastal flood hazards. However, there are two specific mechanisms which influence the location and extent of sea level rise. First, sea level rise can result in the permanent submergence of low-lying coastal areas. In a simple sense, it can be assumed that a one foot rise in sea level will generally inundate areas that have an elevation of one foot or less. It is important to recognize that hazard areas identified in these figures do not consider natural processes such as coastal erosion or marsh migration that will occur due to sea level rise. Future geomorphological changes are expected.

With proper oversight and maintenance, it is unlikely that flooding related to dam will occur in the future. NJDEP's Division of Dam Safety and Flood Control inventories, regulates, and inspects dams in New Jersey; Class I and Class II dams are inspected every two years (or more for large high hazard dams) while Class III dams are inspected every four years. The Division of Dam Safety and Flood Control also coordinates with first responders and communities in preparing and approving Emergency Action Plans, which can save lives during a dam failure-related flood.

FIGURE 4.8-3 Permanent Inundation Under Sea Level Rise (SLR) Scenarios

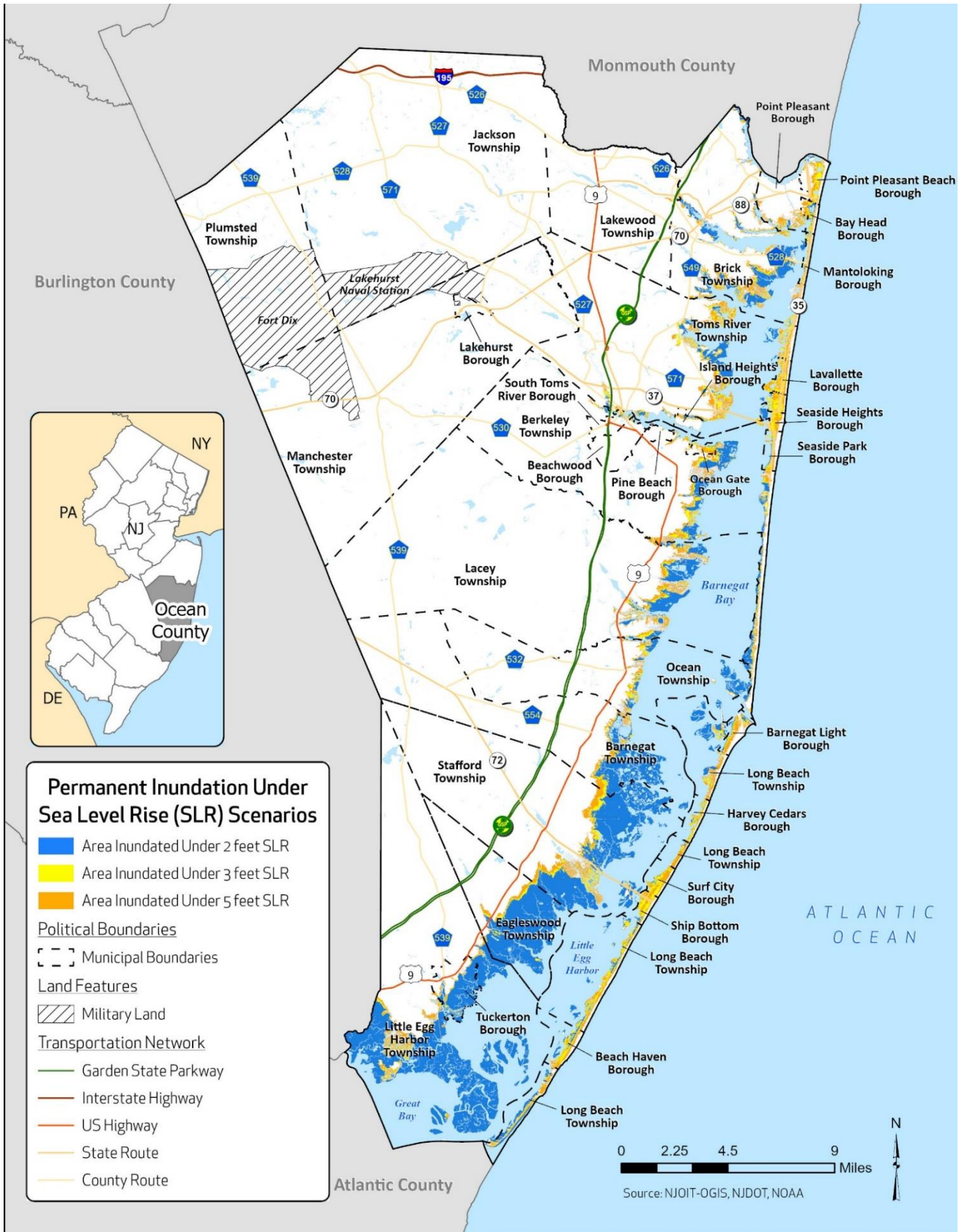
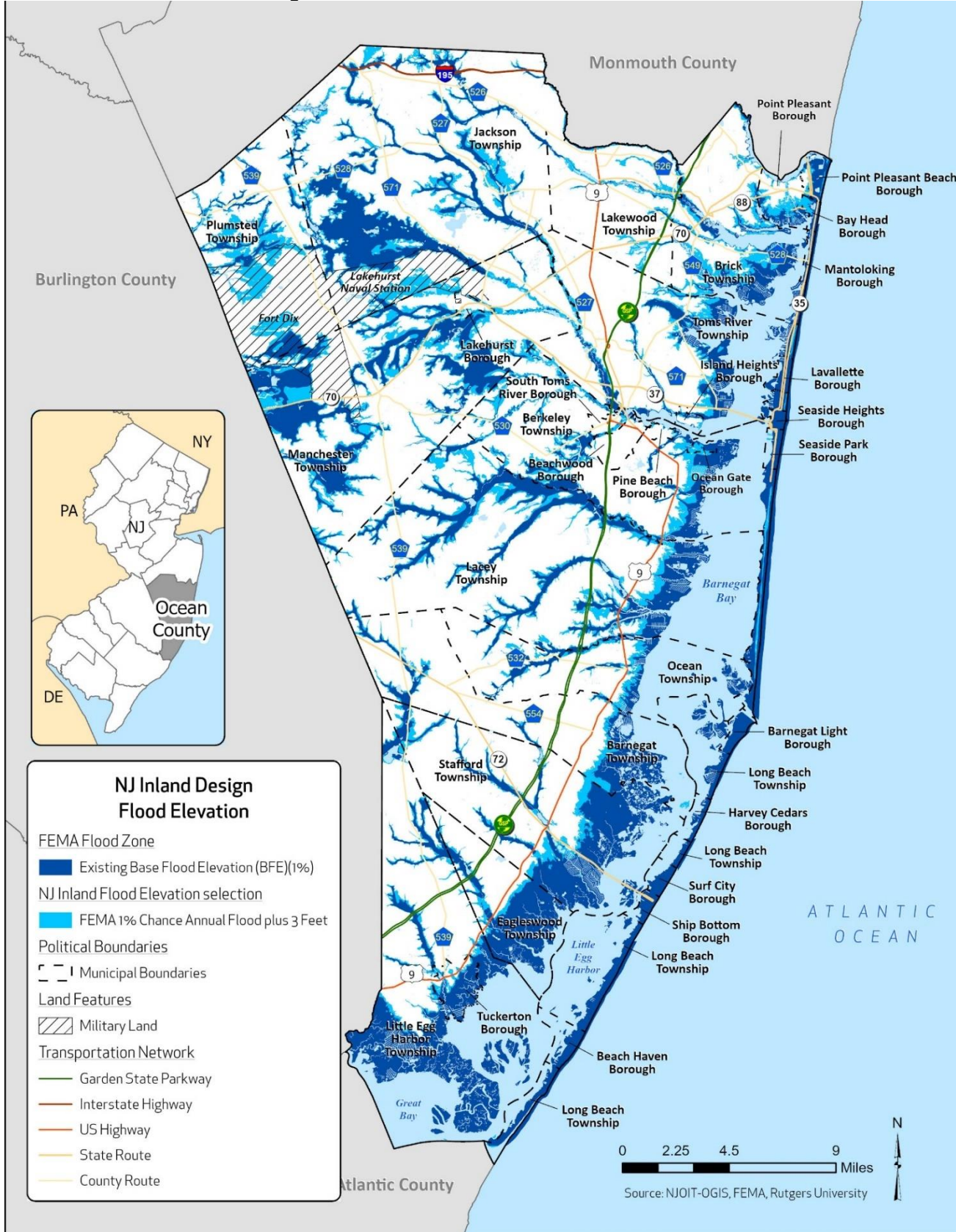


FIGURE 4.8-4 NJ Inland Design Flood Elevation



Vulnerability Assessment

Ocean County is vulnerable to severe flooding with the potential for catastrophic impact. The bulk of the residences in Ocean County are on or near waterfront property. The year-round population of almost six hundred thousand people can swell to nearly a million in the summer. Evacuation planning is critical in Ocean County to address both the year-round and summer population and to mitigate the challenges posed by a limited number of access roads for the barrier islands.

The Coastal Barrier Resources Act restricts federal expenditures and financial assistance, including flood insurance that encourages development in a defined set of undeveloped coastal areas. There are also lands that are designated Otherwise Protected Areas.

Ocean County is vulnerable to flooding that causes loss of lives, property damage, and road closures. Floodwater damages that occur to agricultural, urban, and other properties such as roads, bridges, and utilities are projected to increase when there is development in flood-prone lands. For purposes of assessing vulnerability, the County focused on community assets that are located in the 1 percent-annual-chance floodplain. While greater and smaller floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. The flood vulnerability analysis was completed by selecting critical facilities and parcels whose centers fall within the 1 percent-annual-chance flood hazard zones. The dollar value of improvements is used to represent the value of structures rather than land; the dollar value of improvements in the SFHA is a summation of the entire value of the parcel. While clearly an estimate, this analysis provides an understanding of the magnitude of property loss possible during a countywide 1 percent-annual-chance flood.

Critical facilities data is protected in the State of New Jersey under Executive Order 21. As a result, maps of critical infrastructure and key resources vis-à-vis the 1 percent-annual-chance floodplain in each municipality can be found in Appendix B – Jurisdictions.

This vulnerability analysis and the community flood vulnerability maps in Appendix B were prepared using FEMA's regulatory effective DFIRM data for inland communities and the preliminary work map data for coastal areas. The preliminary work maps are an interim product and are the best available flood hazard data at this time. They will eventually be replaced by the preliminary FIRMs. The preliminary work maps are intended to help local officials and property owners understand current flood risk and provide an opportunity to review and comment on revised flood zones. Please note that riverine tie-ins have not yet been done between the Effective DFIRM and the preliminary work map data.

Table 4.8-4 displays the total number of parcels and associated land improvement values for parcels intersecting the SFHA. Just over 25%, or 107,754, of all parcels in the County are located in the SFHA. The cumulative improvement value of all vulnerable parcels is over \$14 billion. With the exception of Lakehurst Borough and Pine Beach Borough, each municipality has over \$10 million dollars of improvement value within the SFHA with the highest seen in Long Beach, Toms River and Brick Township.

Table 4.8-4 also displays the number of critical facilities that are located in the SFHA by jurisdiction. Approximately 21% of all critical facilities within Ocean County are located in the SFHA; 25 of the 33 communities in Ocean County have at least one vulnerable critical facility. For more information on the flood vulnerability of each individual critical facility, please see Appendix B.

Table 4.8-4 Number of Parcels and Critical Facilities in the SFHA

Municipality	Parcels in SFHA	Total Parcels in Municipality	Percent Vulnerable Parcels	Dollar Value of Improvements in SFHA	Total Number of Critical Facilities in SFHA
Barnegat Light Borough	1,448	13,701	10.57%	\$332,274,100	11
Barnegat Township	1,149	1,448	79.35%	\$73,531,075	0
Bay Head Borough	945	1,223	77.27%	\$376,331,400	10
Beach Haven Borough	3,095	3,098	99.90%	\$363,305,000	23
Beachwood Borough	64	4,325	1.48%	\$10,544,600	0
Berkeley Township	11,978	56,660	21.14%	\$565,245,060	3
Brick Township	10,835	55,329	19.58%	\$1,309,118,080	9
Eagleswood Township	565	4,524	12.49%	\$24,139,800	0
Harvey Cedars Borough	1,487	1,487	100.00%	\$365,896,500	8
Island Heights Borough	278	1,024	27.15%	\$34,426,900	2
Jackson Township	1248	22,210	5.62%	\$376,958,200	1
Lacey Township	9,233	51,408	17.96%	\$774,702,300	12
Lakehurst Borough	47	879	5.35%	\$2,410,800	0
Lakewood Township	430	25,912	1.66%	\$231,679,800	0
Lavallette Borough	2,988	2,991	99.90%	\$445,927,210	19
Little Egg Harbor Township	5,091	13,046	39.02%	\$466,676,500	3
Long Beach Township	10,452	10,458	99.94%	\$2,111,211,300	24
Manchester Township	1275	38,468	3.31%	\$894,926,900	1
Mantoloking Borough	875	875	100.00%	\$418,791,400	9
Ocean Township	2,149	1,202	178.79%	\$193,417,200	1
Ocean Gate Borough	774	10,167	7.61%	\$82,122,700	7
Pine Beach Borough	88	2,976	2.96%	\$9,130,600	0
Plumsted Township	626	3,304	18.95%	\$76,611,000	0
Point Pleasant Borough	2,716	3,639	74.64%	\$514,236,400	5
Point Pleasant Beach Borough	2,893	8,574	33.74%	\$456,808,000	6
Seaside Heights Borough	2,265	2,265	100.00%	\$272,896,200	8
Seaside Park Borough	2,430	2,490	97.59%	\$282,179,300	16
Ship Bottom Borough	2,257	2,257	100.00%	\$397,071,200	9
South Toms River Borough	116	1,354	8.57%	\$13,814,100	0
Stafford Township	5,954	15,715	37.89%	\$693,812,000	1
Surf City Borough	2,557	2,557	100.00%	\$521,857,100	15
Toms River Township	18,270	53,218	34.33%	\$1,974,265,260	15
Tuckerton Borough	1,176	2,187	53.77%	\$99,994,100	3
TOTAL	107,754	420,971	25.60%	\$14,766,312,085	221

Communities located adjacent to and downstream of high and significant hazard dams should be considered vulnerable to a dam failure-related flood. Lacey Township is expected to be the most vulnerable to flooding related to dam failures, as this jurisdiction has three high-hazard dams within its borders. Jackson Township is also expected to have higher vulnerability to dam failures as it is home to one high hazard and three significant-hazard dams. In general, the coastal communities are less vulnerable to flooding from dam failures, as nearly all of Ocean County’s dams are located inland.

The short warning time and significant velocity and volume of water typically means that communities with inadequate warning systems may be more vulnerable to the impacts of a dam failure-related hazard, and populations with low English literacy may be more at-risk due to the time sensitive nature of this kind of an event. Additionally, the elderly, the young,

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and populations without vehicles will face challenges during this kind of event since they typically do not have the ability to evacuate immediately.

High hazard dams in New Jersey are required to have maps of their inundation areas to assist first responders in emergency response. However, these maps are not always available in GIS format; because of this, coupled with the sensitive nature of dam inundation zones, calculated vulnerability and loss analysis was unable to be completed for this plan.

Table 4.8-5 Sum of Repetitive Loss Properties

Municipality	Number of NFIP RL Properties	Number of NFIP SRL Properties	Total NFIP RL/SRL Properties	Total Mitigated Properties	Total Repetitive Loss Payments
Barnegat Light Borough	2	0	2	1	\$53,588
Barnegat Township	18	0	18	4	\$1,027,659
Bay Head Borough	37	5	42	3	\$10,094,960
Beach Haven Borough	81	15	96	24	\$13,154,475
Beachwood Borough	1	0	1	0	\$94,168
Berkeley Township	44	10	54	26	\$6,518,276
Brick Township	122	6	128	54	\$21,620,590
Eagleswood Township	10	1	11	0	\$881,306
Harvey Cedars Borough	17	0	17	3	\$759,353
Island Heights Borough	3	0	3	0	\$202,063
Jackson Township	0	0	0	0	\$0
Lacey Township	70	20	92	9	\$6,713,008
Lakehurst Borough	0	0	0	0	\$0
Lakewood Township	4	0	4	0	\$86,738
Lavallette Borough	57	5	62	18	\$6,312,159
Little Egg Harbor Township	136	24	160	57	\$15,587,125
Long Beach Township	115	16	131	54	\$14,594,350
Manchester Township	2	0	2	0	\$422,852
Mantoloking Borough	21	1	22	11	\$5,452,257
Ocean Township	36	2	38	14	\$3,097,779
Ocean Gate Borough	9	1	10	1	\$977,653
Pine Beach Borough	0	0	0	0	\$0
Plumsted Township	1	0	1	0	\$31,296
Point Pleasant Borough	50	2	52	20	\$6,698,508
Point Pleasant Beach Borough	80	3	83	5	\$10,164,561
Seaside Heights Borough	40	8	48	9	\$4,115,899
Seaside Park Borough	38	7	45	8	\$4,970,614
Ship Bottom Borough	33	11	44	8	\$2,715,499
South Toms River Borough	1	2	3	0	\$344,159
Stafford Township	186	9	195	103	\$17,741,764
Surf City Borough	24	2	26	11	\$1,337,050
Toms River Township	335	59	394	222	\$45,221,763
Tuckerton Borough	63	5	68	15	\$4,148,415

Municipality	Number of NFIP RL Properties	Number of NFIP SRL Properties	Total NFIP RL/SRL Properties	Total Mitigated Properties	Total Repetitive Loss Payments
TOTALS	1,638	214	1,852	680	\$207,680,599

Source: FEMA 2024

The NFIP provides further information on past flood events as it identifies properties that frequently experience flooding. Repetitive loss properties are structures insured under the NFIP that have had at least two paid flood losses of more than \$1,000 over any 10-year period since 1978. A property is considered a severe repetitive loss property either when there are at least four losses (each exceeding \$5,000) or when there are two or more losses where the building payments exceed the property value.

Toms River Township, Stafford Township, Little Egg Harbor Township, Brick Township, and Long Beach Township have the most repetitive loss buildings, repetitive loss events, and amount of paid losses in the County respectively. The five communities listed above also have largest number of policies in force. Table 4.8-5 shows the number of NFIP policies in force, the number and amount of paid losses, the number of repetitive/severe repetitive loss events, and the amount of repetitive loss payments.

As of the previous plan update in 2017, there were 1,642 repetitive loss (RL) properties and 214 severe repetitive loss (SRL) properties in the County. In 2024, the county had four less repetitive loss properties. This indicates jurisdictions have advanced in mitigating floodprone properties and have not experienced any flood events that resulted in additional severe repetitive loss designations.

In keeping with Ocean County’s overall land development patterns, most of these properties are single family homes. Toms River Township has the highest number of both RL and SRL properties, with 206 and 13 properties respectively. Table 4.8-6 lists the numbers of repetitive loss and severe repetitive loss structure.

Table 4.8-6 Summary of Repetitive Loss and Severe Repetitive Loss Properties

Municipality	Repetitive Loss by Property Type				Sum of Repetitive Loss Properties
	Non-Residential	2-4 Family	Single Family	Other Residential	
Barnegat Light Borough	0	1	1	0	2
Barnegat Township	0	1	15	2	18
Bay Head Borough	5	2	35	0	42
Beach Haven Borough	36	19	35	3	96
Beachwood Borough	0	1	0	0	1
Berkeley Township	0	3	50	1	54
Brick Township	2	3	122	1	128
Eagleswood Township	0	1	10	0	11
Harvey Cedars Borough	0	3	14	0	17
Island Heights Borough	0	0	2	0	2
Jackson Township	0	0	0	0	0
Lacey Township	0	0	90	0	90
Lakehurst Borough	0	0	0	0	0
Lakewood Township	0	0	4	0	4
Lavallette Borough	1	8	54	0	63
Little Egg Harbor Township	2	0	159	0	161
Long Beach Township	21	19	91	1	132
Manchester Township	0	0	1	0	1
Mantoloking Borough	0	0	21	1	21

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Municipality	Repetitive Loss by Property Type				Sum of Repetitive Loss Properties
	Non-Residential	2-4 Family	Single Family	Other Residential	
Ocean Township	0	0	38	0	38
Ocean Gate Borough	0	0	10	0	10
Pine Beach Borough	0	0	0	0	0
Plumsted Township	0	0	0	0	0
Point Pleasant Borough	0	0	48	0	52
Point Pleasant Beach Borough	14	4	61	4	83
Seaside Heights Borough	1	22	23	2	48
Seaside Park Borough	0	11	34	0	45
Ship Bottom Borough	13	10	20	1	44
South Toms River Borough	2	0	1	0	3
Stafford Township	0	2	194	0	196
Surf City Borough	1	6	17	0	24
Toms River Township	5	6	396	1	408
Tuckerton Borough	2	0	67	0	69
Total RL/SRL Properties	105	122	1,613	17	1,863

Source: FEMA, 2023

Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are “nature’s number-one disaster.” For that reason, flood insurance is almost never available under industry-standard homeowner’s and renter’s policies. The best way for citizens to protect their property against flood losses is to purchase flood insurance through the NFIP.

Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief. The NFIP is administered by FEMA, part of the U.S. Department of Homeland Security. The NFIP offers federally backed flood insurance in communities that adopt and enforce effective floodplain management ordinances to reduce future flood losses.

Since 1983, the chief means of providing flood insurance coverage has been a cooperative venture of FEMA and the private insurance industry known as the Write Your Own (WYO) Program. This partnership allows qualified property and casualty insurance companies to “write” (i.e., issue) and service the NFIP’s Standard Flood Insurance Policy (SFIP) under their own names.

Today, nearly 90 WYO insurance companies issue and service the SFIP under their own names. More than 5 million federal flood insurance policies are in force. These policies represent about \$1.2 trillion in flood insurance coverage for homeowners, renters, and business owners throughout the United States and its territories (FEMA, 2016).

The NFIP provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development regulations.

The NFIP is based on the voluntary participation of communities of all sizes. In the context of this program, a “community” is a political entity – whether an incorporated city, town, township, borough, village, or an unincorporated area of a county or parish – that has legal authority to adopt and enforce floodplain management ordinances for the area under its jurisdiction.

National Flood Insurance is available only in communities that apply for participation in the NFIP and agree to implement prescribed flood mitigation measures. Newly participating communities are admitted to the NFIP’s Emergency Program. Most of these communities quickly earn “promotion” to the Regular Program. All the municipalities in Ocean County participating in the NFIP are in the Regular Program.

In addition, Regular Program communities are eligible to participate in the NFIP's Community Rating System (CRS). Under the CRS, policyholders can receive premium discounts of 5 to 45 percent as their cities and towns adopt more comprehensive flood mitigation measures. CRS rewards those communities that establish floodplain management programs that go beyond NFIP minimum requirements by providing discounts on flood insurance premiums. Under the CRS, communities receive credit for activities falling into four categories: public information, mapping and regulations, flood damage reduction, and flood preparedness.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1968 Act to codify the CRS in the NFIP, and expands the CRS goals to specifically include incentives to reduce the risk of flood-related erosion and to encourage measures that protect natural and beneficial floodplain functions. These goals have been incorporated into the CRS, and communities now receive credit toward premium reductions for activities that contribute to them.

There are 10 CRS classes that provide varied reductions in insurance premiums. Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction. CRS premium discounts on flood insurance range from 5 percent for Class 9 communities up to 45 percent for Class 1 communities.

4.9 HURRICANE, TROPICAL STORM, NOR'EASTER

Tropical depressions are defined as tropical cyclones with maximum sustained winds of less than 39 miles per hour (mph). They have low pressure systems but lack the spiral shape and eye of stronger storms. A cyclone with maximum sustained winds between 39-74 mph is called a *tropical storm* and is given a name by the National Oceanic and Atmospheric Administration (NOAA). Though these storms typically have no eye, they do start to form a cyclonic shape. Tropical storms sometimes develop into *hurricanes* if the wind speeds exceed 74 mph. Hurricanes have an eye present, which is a central area of calm that is surrounded by a wall of strong winds and thunderstorms. If the cyclone of a tropical storm or hurricane has lost its “tropical” characteristics and has cold air at its core, rather than warm air, the term *extra-tropical* is used to describe it. Extra-tropical storms are characterized by a change in weather pattern; its winds may still be as great as a tropical storm or hurricane force. Wind damage and flooding are the primary impacts associated with hurricanes and tropical storms. Tornadoes may develop during these events. In the past, tropical storm and hurricane events have brought intense rainfall, flooding, high winds, waterlogged soils, and subsequently fallen trees and downed utility poles.

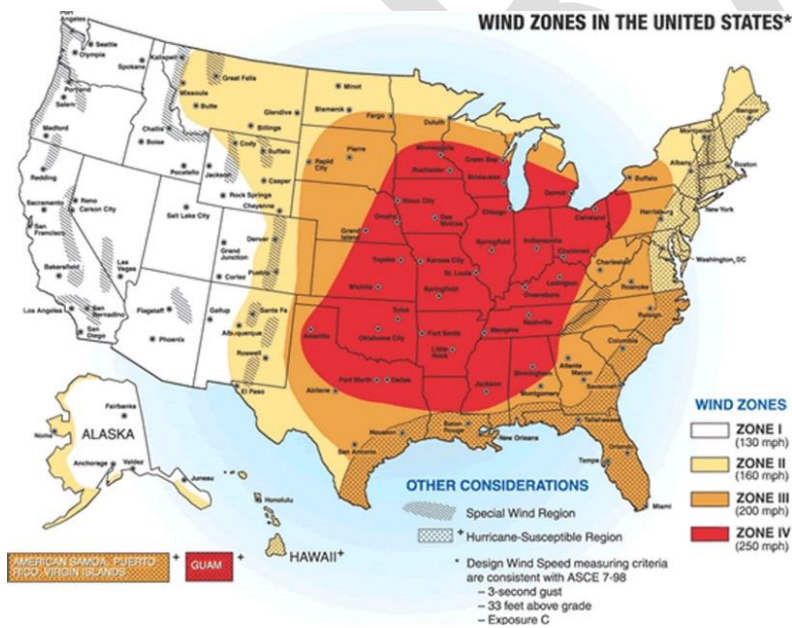
Location and Extent

Hurricanes, tropical storms, and Nor’easters that impact Ocean County originate in tropical or sub-tropical waters found in the Atlantic Ocean between the African Coast and the Lesser Antilles, the Gulf of Mexico, or the Caribbean Sea. Each of these types of storms has a scientific definition based the windspeed and organization of the energy of the storm event. For the purposes of this hazard mitigation plan, this section reviews the impacts of coastal storm events with high windspeeds. The impacts from rainfall and storm surge are examined in the Flooding subsection of this chapter, while the potential for tornadoes is categorized in the Severe Weather

All of the communities within the county have exposure to hurricanes, tropical storms, and nor’easters. These events cause flooding, storm surge, as well as potential straight-line winds. Even if the storm makes landfall south of New Jersey, storms can also track inland causing heavy rainfall and strong winds, putting entirety of Ocean County at risk. Though cooler waters near the New Jersey coast tend to weaken storms as they travel up the coast, New Jersey and Ocean County specifically have been impacted by all three types of storms in the past.

Range of Magnitude

Figure 4.9-1 Wind Zones in New Jersey and Ocean County (NIST, 2011)



Expected damage from hurricane force winds can be anticipated using the Saffir-Simpson Scale. 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.

Figure 4.9-1 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Ocean County lies within Zone II, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 160

mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Ocean County also falls wholly within the identified Hurricane Susceptibility Region.

Table 4.9-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages from wind. Categories 3, 4, and 5 are classified as “major” hurricanes. While major hurricanes comprise only 20 of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. The likelihood of these damages occurring in Ocean County is assessed in *Future Occurrence*.

Table 4.9-1 Saffir-Simpson Scale categories (NHC, 2009)

Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009).		
Storm Category	Wind Speed (mph)	Description of Damages
1	74-95	MINIMAL: Damage is limited primarily to shrubbery and trees, unanchored mobile homes, and signs. No significant structural damage.
2	96-110	MODERATE: Some trees are toppled, some roof coverings are damaged, and major damage occurs to mobile homes. Some roofing material, door, and window damage.
3	111-130	EXTENSIVE: Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Large trees are toppled. Terrain may be flooded well inland.
4	131-155	EXTREME: Extensive damage to roofs, windows, and doors; roof systems on small buildings completely fail. More extensive curtain wall failures. Terrain may be flooded well inland.
5	>155	CATASTROPHIC: Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Massive evacuation of residential areas may be required.

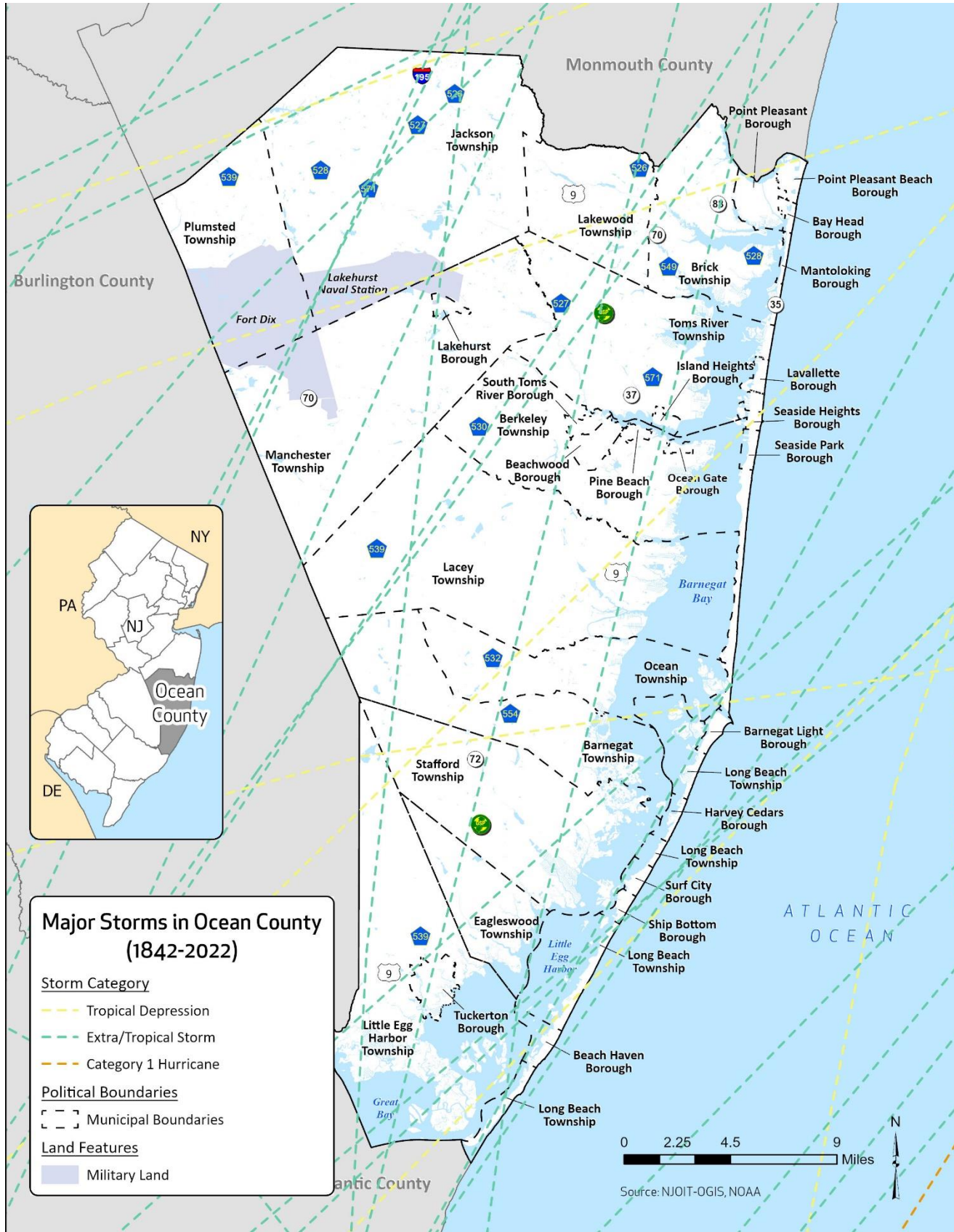
The potential for flooding events during hurricanes and tropical storms is significant; the risk assessment and associated impact for these events is included in Section 4.8. In Ocean County, high winds typically lead to downed trees and utility poles, and often result in utility interruptions. Mobile homes and other manufactured housing are particularly vulnerable to high winds as these structures are not typically well-anchored and are highly susceptible to wind damage in a hurricane, tropical storm, or Nor’easter.

Past Occurrence

Ocean County has experienced over 20 hurricane, tropical storm, or Nor’easter events tracking near or over the land. Additional storms have remained offshore or further inland and did not impact the county through wind, but did create flood impacts. One of the worst recent hurricane, tropical storm, or Nor’easter events in Ocean County was Tropical Storm Irene. Irene struck New Jersey in 2011 and resulted in an Emergency Declaration. Around one million people were evacuated from the coastal and low-lying areas. Heavy rainfall led to cresting of major streams and rivers while strong wind gusts took utilities out of service. A tornado formed during the storm in addition to a 3 to 5 foot storm surge, causing tidal flooding. Six people died of drowning due to Irene across the state of New Jersey, two within Ocean County. The total cost is estimated at one billion across the state. The storm also caused prolonged power outages, damage to crops, and road closures. Till 2011, it was the costliest natural disaster in the state of New Jersey.

The following year, on October 29, 2012, Hurricane Sandy made landfall at Atlantic City. This storm transitioned from a tropical to an extra-tropical cyclone right before landfall. Sandy still had sustained winds of 80 miles per hour when it landed (NCEI, 2012). Coastal communities in Ocean County were hit hardest, devastating the waterfront areas of Lavallette, Toms River, Ortley Beach, and more. Homes were destroyed, beaches were re-shaped, streets were flooded, and active natural gas lines started leaking. Many communities experienced power outages. Approximately 300 people were rescued after not evacuating (Queally, 2012). In Seaside Heights, the boardwalk was damaged beyond repair and the piers collapsed. Remnants of homes, cars, and flood water filled the streets days after the storm (Proebstle, 2012). This event was declared as both an Emergency Declaration and as a Presidential Declaration of Major Disaster. In 2021, Hurricane Ida was declared an Emergency Management Declaration, as well as a Major Disaster declaration. Ocean County was eligible for Public Assistance funding from Ida.

Figure 4.9-2 Major Storms Tracking Through or Near Ocean County



Future Occurrence

The National Oceanic and Atmospheric Administration Hurricane Research Division published the map included as Figure 4.9-2 showing the chance that a tropical storm or hurricane will affect a given area during the entire Atlantic hurricane season spanning from June to November. However, the probability of a storm's intensity cannot be gleaned from the figure. Based on historical data between 1944 and 1999, this map reveals there is approximately 24 to 36 percent chance of experiencing a tropical storm or hurricane event between June and November of any given year in the County. This probability can be described as possible, as defined by the Risk Factor methodology probability criteria (see Table 4.2-3). In 2017, NOAA reported that the outlook for the 2017 hurricane season on the Atlantic Coast was a 60% chance of being an above-normal season, possibly extremely active.

Vulnerability Assessment

Flooding, severe wind, and coastal erosion are the main hazards for which vulnerability for hurricanes and tropical storms should be assessed. Flood-related vulnerability is addressed in Section 4.8, vulnerability to wind damage is addressed in Section 4.11, and vulnerability to coastal erosion is summarized in Section 4.3. Vulnerability to winter weather impacts caused by Nor'easters is evaluated in Section 4.13.

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4.10 SUBSIDENCE

Subsidence is the sinking of the ground because of underground material movement and is most often caused by the removal of water, oil, natural gas, or mineral resources out of the ground by pumping, fracking, or mining activities. Subsidence can also be caused by natural events such as earthquakes, soil compaction, glacial isostatic adjustment, erosion, sinkhole formation, and adding water to fine soils deposited by wind (a natural process known as loess deposits). Subsidence can happen over very large areas like whole states or provinces, or very small areas like the corner of your yard (NOAA).

Sinkholes, the type of subsidence most frequently seen in the New Jersey, are a natural and common geologic feature in areas with underlying limestone, carbonate rock, salt beds, or other rocks that are soluble in water. Over periods of time, measured in thousands of years, the carbonate bedrock can be dissolved through acidic rain water moving in fractures or cracks in the bedrock. This creates larger openings in the rock through which water and overlying soil materials will travel. Over time the voids will enlarge until the roof over the void is unable to support the land above will collapse forming a sinkhole. Manmade actions such as over-withdrawal of groundwater, diverting surface water from a large area and concentrating it in a single point, artificially creating ponds of surface water, and drilling new water wells can serve to accelerate the natural processes of creation of soil voids, which can have a direct impact on sinkhole creation.

While sinkholes are the most common form of subsidence in New Jersey, in many cases in New Jersey and in Ocean County land subsidence has been caused due to groundwater withdrawal and sea level rise. Subsidence due to groundwater withdrawal occurs because the water level drop creates a decline in upward pressure caused by the water. This creates a system where there is no counter to the downward pressure caused by the overlying rock. The imbalance of forces allows for subsidence to occur. Subsidence due to sea level rise occurs for a variety of reasons including the influences of fluctuations of ocean density and circulation, adjustment of land level, the extraction of underground fluids and more (Sun, Grandstaff and Shagam, 1999).

Location and Extent

Subsidence occurs slowly and continuously over time or abruptly for various reasons. Subsidence and sinkholes can occur due to either natural processes or as a result of human activities.

While northern New Jersey is more prone to subsidence than other areas of New Jersey due to the existence of many abandoned mines and the bands of carbonate rock located there, Ocean County is also prone to subsidence.

The very north-west corner of Ocean County consists of carbonate bedrock, which makes it prone to naturally occurring subsidence. Areas underlain by carbonate rock may contain surface depressions and open drainage passages making such areas unstable and susceptible to subsidence and surface collapse. As a result, the alteration of drainage patterns, placement of impervious coverage, grade changes or increased loads can result in land subsidence and sinkhole formation (Piefer, 2006).

The coastal areas of Ocean County are also prone to subsidence due to impacts of groundwater withdrawal and sea level rise. The relationship between water level decline and the rate of subsidence has been observed for many years. Observations of sea level rise along the east coastal areas have averaged 2 to 3 millimeters per year, and approximately 1.5 millimeters per year extra rise for the region is due to natural subsidence of the area (Sun, Grandstaff and Shagam, 1999). One of the triggers for subsidence is an abundance of moisture which has the potential to permeate the bedrock causing an event. Increased precipitation due to a change in climate could impact the extent of subsidence occurrences that influence Ocean County.

Manmade actions can also have an impact on subsidence events in Ocean County. The compaction of unconsolidated aquifer systems that can accompany excessive ground-water pumping can cause subsidence. The overdraft of aquifer systems has resulted in subsidence incidents (USGS, 2016).

Range of Magnitude

Subsidence is often not obvious since it is typically gradual and widespread. Detection of subsidence events can be difficult. The inability to detect subsidence makes it a hazard. Subsidence can occur for a long period of time while going unnoticed, allowing it to do extensive damage (USGS, 2016).

The severity of subsidence can be based on how quickly it is detected. Once subsidence is identified, monitoring programs can be implemented and studies can be launched to better understand a specific case of subsidence. Along the coast in Ocean County, detection enables action to be taken to mitigate against the impacts of subsidence due to sea level rise and groundwater withdrawal.

Past Occurrence

There is limited record of past occurrences of subsidence in Ocean County. However, as subsidence often goes undetected, this does not mean it has not occurred. As previously discussed, Ocean County is at risk of various forms of subsidence. It can be assumed that with various factors of subsidence impacting Ocean County, such as evidence of sea level rise in many municipalities, that subsidence is occurring but has gone unreported.

Future Occurrence

While Ocean County is not identified as being a subsidence hazard area in the New Jersey State Hazard Mitigation Plan, Ocean County may be vulnerable to natural subsidence in the future. Sea level is rising faster along the New Jersey coast than the global average due to land subsidence (Rutgers Department of Earth and Planetary Sciences). Therefore, the probability of subsidence in Ocean County may be high. As coastal areas become increasingly developed, and as more people move out of the cities, the strain on underground aquifers could increase and influence of erosion could be impactful. If the current trend of water-level drop continues, the average subsidence of coastal New Jersey could be as much as up to 3 centimeters over the next twenty years (Sun, Grandstaff and Shagam, 1999). Based on evidence of coastal erosion, subsidence events are likely to occur in the future.

Vulnerability Assessment

The entire State of New Jersey is vulnerable to significant impacts due to geologic subsidence, topography of its coastline, current coastal erosion, and a high density of coastal development. The coastal regions of New Jersey, including many municipalities in Ocean County, may be particularly vulnerable to subsidence as sea level change and erosion occur. According to median projections of current sea level rise, it would threaten the majority of the Ocean County's coastal areas (Rutgers, 2013).

The combination of sea level rise and land subsidence could cause a serious increase in the flooding frequency. It could also result into encroachment onto a coastal community. The overall cost could be millions of dollars over time (Sun, Grandstaff and Shagam, 1999).

4.11 TORNADO, WINDSTORM, WATERSPOUTS, SEICHES

Tornadoes produce winds in excess of two hundred fifty miles per hour. They can be a mile wide and stay on the ground for over fifty miles. A tornado is a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm when a layer of warm air is quickly overlain with cool air. A condensation funnel does not need to reach to the ground for a tornado to form, as a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado in the total absence of a condensation funnel.

Waterspouts fall into two different categories of classification. Tornadic waterspouts are tornados that form over water or that move from land to water. Their characteristics are similar to those of a land tornado and their occurrence is associated with severe thunderstorms. Fair weather waterspouts typically form along the dark flat base of a line of a developing cumulous clouds. They are not usually associated with thunderstorms. Fair weather waterspouts form in light wind conditions. (NOAA, 2017).

Strong winds caused by a thunderstorm can exceed one hundred miles per hour and cause damage equal to a tornado. They can be extremely dangerous to aviation.

High winds are described as sustained winds of forty miles per hour or greater or winds gusting to fifty-eight miles per hour or greater.

A *Seiche* is a standing wave oscillating in a body of water caused by strong winds and rapid changes in atmospheric pressure from one end of a body of water to the other. When the wind stops, the water rebounds to the other side of a body of water, causing sloshing. It occurs in large bodies of water such as bays and lakes. It is like water sloshing back and forth in a swimming pool, bathtub or cup of water (NOAA).

Location and Extent

Tornadoes and wind storms can occur throughout Ocean County. Though tornadoes are less likely to occur in the Northeast region of the country, Ocean County is more susceptible to tornadoes than the northern communities of New Jersey. Tornadoes can occur at any time of day, but often occur during late afternoon or early evening, when the temperature is the warmest. They are more likely to occur from March to August. Severe thunderstorms, hurricanes, or tropical storms can produce tornadoes, but most tornadoes form at the trailing edge of a thunderstorm. Tornado movement can be described in two ways: by forward movement or the storm track and by direction and speed of spinning winds. The storm track or tornado path ranges in length from few hundred yards or several hundred miles in length of forward motion. Tornado width tends to span from less than 100 feet to over a mile in width. Tornadoes can touch ground multiple times or not at all, depending on their duration and severity.

Tornadic waterspouts form downward from a thunderstorm, while fair weather waterspouts develop on the surface of the water working their way upward. Since fair weather waterspouts form in light wind conditions, they normally move very little. However, tornadic waterspouts can be large and often begin as true tornados, moving from land to water.

Straight-line winds and windstorms impact widespread regions. Straight-lined winds are caused by the movement of air from higher pressure areas to lower pressure areas, and often accompany tornadoes. The difference in pressure produces stronger winds. Windstorms are characterized by sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

Seiches can occur in different bodies of water such as lakes, sea, and bays. A seiche can occur in a semi or fully enclosed body of water (NOAA, 2017). In Ocean County a seiche is most likely to occur in the bay or sea as the result of an earthquake, tsunami, severe storm or change in atmospheric pressure.

Range of Magnitude

Each year, tornadoes account for \$1.1 billion in damages and cause over 80 deaths nationally (NCAR, 2001). The extreme winds that occur at the vortex of a tornado can cause significant damage to a localized area. Rotational wind speeds can range from 100 mph to more than 250 mph. Forward motion speed can vary from 0 to 50 mph. Maximum velocity, made

up of a combination of ground speed, wind speed, and upper winds, is about 300 mph for tornadoes. Tornadoes cause damage by strong winds, lightning, hail, and wind-blown debris. The most violent tornadoes have Rotating winds of 250 miles per hour, or more are characteristic of the most violent tornadoes. Winds at this speed can send large objects hurling through the air and are hazards and they alone are capable of destroying buildings, trees, or anything in their path.

Damages and deaths can vary based on whether tornadoes move through densely or sparsely populated and developed areas. Depending on the size, intensity, and duration of the storm, damage from tornadoes ranges from minor to major. Mobile homes and other structures of light construction are most vulnerable to tornadoes. The Enhanced Fujita Scale, also known as the “EF-Scale,” measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the “F-Scale,” that was published in 1971. It classifies United States tornadoes into six intensity categories, as shown in the table below, based upon the estimated maximum winds occurring within the wind vortex. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. F-Scale categories with corresponding EF-Scale wind speeds are provided in Table 4.11-1 since the magnitude of previous tornado occurrences is based on the F-Scale.

Table 4.11-1 Enhanced Fujita Scale

EF Scale Number	Wind Speed (MPH)	F-Scale Number	Type of Damage Possible
EF0	65-85	F0-F1	Minor damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	F1	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	F1-F2	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	F2-F3	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	F3	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	F3-F6	Extreme damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

The worst case scenario of a tornado for Ocean County occurred in August 1999. Southeast of Beach Haven, a waterspout formed over the Atlantic Ocean and proceeded to move northwest and became a tornado while crossing over Long Beach Island. It eventually traveled back into Little Egg Harbor, becoming a waterspout again before it dissolved. At its peak it reached an F2 magnitude and the wind reached a maximum speed of 120 mph. The total property damage was estimated at \$4.2 million. The tornado damaged, boats, homes, vehicles and caused enough damage to the Sea Spray Motel to condemn the building. The roof of the motel ripped off and the back wall was severely damaged. Flying debris injured a guest at the motel and 150 motel guests were displaced due to the event. Widespread power outages occurred on Long

Beach Island after main transmission lines were downed. Off the coast of Atlantic City, the rough weather caused a well craft to sink and three of the men aboard drowned (NCEI, 2013).

On September 16, 2010, an F1 tornado with 90 mph winds occurred in Ocean County causing \$25,000 in damages. A severe thunderstorm and the subsequent tornado led to power outages in Ocean and surrounding counties. Several houses and vehicles were damaged, and a small barn was destroyed. About 300 trees were downed during the storm.

Figure 4.9-2 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Ocean County falls within Zone II, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Therefore, these structures should be able to withstand speeds experienced in an EF3 tornado.

No fatalities that were directly caused by tornadoes have occurred in Ocean County. Most events have involved lower magnitude tornadoes. Six injuries, most being minor in nature, have been reported over the years. Tornadoes in Ocean County typically range from F-0 through F-2 levels. However, one F-3 level tornado was recorded on July 21, 1983. Property damages were estimated at \$2.5 million. While this F-3 tornado was stronger than the August 1999 tornado, the F-2 storm caused significantly more damage and led to three deaths. Therefore, the August 1999 tornado is considered the County's worst case scenario.

Environmental impacts are typically contained, as tornado events occur in localized areas. However, damage to vegetation and trees can be severe. Downed trees and an increased risk of wildfire are common following tornado events. Tornadoes and Windstorms are a hazard that may cause hazards. Tornadoes can damage facilities and transportation containing hazardous materials, cause utility interruptions and cause fires by breaking or rupturing utility connections, and cause transportation accidents. In order to prevent release of hazardous materials into the environment, hazardous materials facilities should be designed to withstand the conditions for their location's respective wind zone as shown in Figure 4.9-2.

In some cases, waterspouts can be just as dangerous as tornados. Tornadic waterspouts are often accompanied by high winds and seas, large hail and frequent lightening. These types of waterspouts can be large and are capable of considerable destruction. Fair weather waterspouts, however, form only over open water, are typically small, brief, and therefore less dangerous (NOAA).

Seiches have the potential to be dangerous. One of the deadliest seiches in history occurred in 1929 in Grand Haven, Michigan. Thousands of people were gathered on the shore of Lake Michigan when high winds caused a 20-foot wave accompanied by a rise in lake level along the shoreline. The seiche occurred quickly that it was difficult for people to react and make it to high ground. Ten lives were lost (Tramley, 2017).

While that is an example of an extreme seiche occurrence, typically the range and magnitude of seiches are insignificant. Often times occurrences go unnoticed.

Past Occurrence

Tornadoes most often occur in the southern, more level portions of the state; however, they have struck in all seasons and all regions of New Jersey. Below a list of tornado events that have occurred in Ocean County between 1950 and 2017 and is shown with an associated Fujita Tornado Scale magnitude. This list is followed by a list of waterspout events that have been recorded in the county. A map showing the approximate location of previous events is included in Figure 4.11-2.

Table 4.11-2 Tornado and Waterspout Events for Ocean County 1950-2023

Tornado Events for Ocean County New Jersey 1950-2023			
Location	Date	Magnitude	Estimated property damage
Ocean County	6/13/1958	Unknown	\$2,500
Ocean County	7/1/1960	F1	\$2,500
Ocean County	3/10/1964	F1	\$250,000
Ocean County	7/24/1974	F1	\$0
Ocean County	6/29/1982	F2	\$2,500,000
Ocean County	7/21/1983	F3	\$2,500,000
Ocean County	8/17/1988	F0	\$2,500
Beach Haven, Ocean County*	8/20/1999	Turned into a F2 tornado as it crossed barrier island	
Ocean County	11/20/1989	F0	\$2,500,000
Forked River, Ocean County	10/21/1995	F0	\$0
Beach Haven, Ocean County	8/20/1999	F2	\$4,200,000
New Egypt, Ocean County	9/16/2010	EF1	\$25,000
Cedar Run, Ocean County	8/13/2013	EF0	\$250,000
Chadwick, Ocean County	4/21/2020	EF0	\$0
Brant Beach, Ocean County	8/4/2020	EF1	\$0
Tuckerton, Ocean County	7/9/2021	EF0	\$0
Archers Corner, Ocean County	7/29/2021	EF0	\$0
Cedar Bridge, Ocean County		EF1	\$0
Barnegat, Ocean County		EF2	\$0
Seaside Park, Ocean County*	10/21/2014	N/A	
Holmeson, Ocean County	4/1/2023	EF2	\$0
Hyson, Ocean County		EF2	\$0

Source: NOAA-NCEI, 2023

*These events were reported in the previous hazard mitigation plan but could not be verified in the state or federal sources consulted during this plan update.

Figure 4.11-1 Recorded Waterspout Events for Ocean County

Recorded Waterspout Events for Ocean County, New Jersey from 1950-2017 (NCDC, 2017)		
Location	Date	Wind Speed Indicators
Beach Haven, Ocean County	8/20/1999	Turned into a F2 Tornado at the Shore
Seaside Park, Ocean County	8/10/2001	N/A
Seaside Park, Ocean County	10/21/2014	N/A
Long Beach Township, Ocean County	6/23/2015	34-63 knots

Since 1997, 268 strong wind events, with 140 of them resulting in property damage, have been recorded in Ocean County (NCEI, 2017). In the past the County has experienced severe windstorms, thunderstorms, and tornadoes. On average, Ocean County encounters fourteen windstorms each year (NCEI, 2017). Figure 4.11-3 shows the locations of windstorms in the County over a 56 year period.

An intense windstorm resulted in \$5.7 million in property damages on March 13, 2010. The Governor declared a state of emergency on the following day. Telephones and trees were downed by the thousands and approximately one million people across the state lost power. Amtrak suspended service along the Northeast corridor and several major roadways were closed, including the New Jersey Turnpike in certain counties. Strong winds of up to 63 mph and fallen trees damaged many homes. Three injuries were reported, but no fatalities. The highest recorded wind speed is 76 mph, which occurred during a thunderstorm wind on March 9, 1998 (NCEI, 2013).

In Ocean County, there has been one recorded instance where a seiche may have occurred. On June 13, 2013, a rare type of tsunami hit Ocean County. It was caused by a strong weather system that moved across the eastern U.S. that day. The weather system caused a jump in air pressure, which created the wave. The impacts were greatest in Barnegat Light. An

approximately 6-foot wave knocked three people off the inlet jetty, injuring at least two of them. No coastline damage was reported (NOAA, 2017). At over 30 gauges the indications were recorded for a tsunami in its strength and wave frequency. However, the nature of movement of the event could classify this event as a seiche. The strong downward rush of air that was caused by low-end derecho made the water slosh back and forth causing this wave event.

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Figure 4.11-2 Tornado History from 1950-2022, (NJDEP)

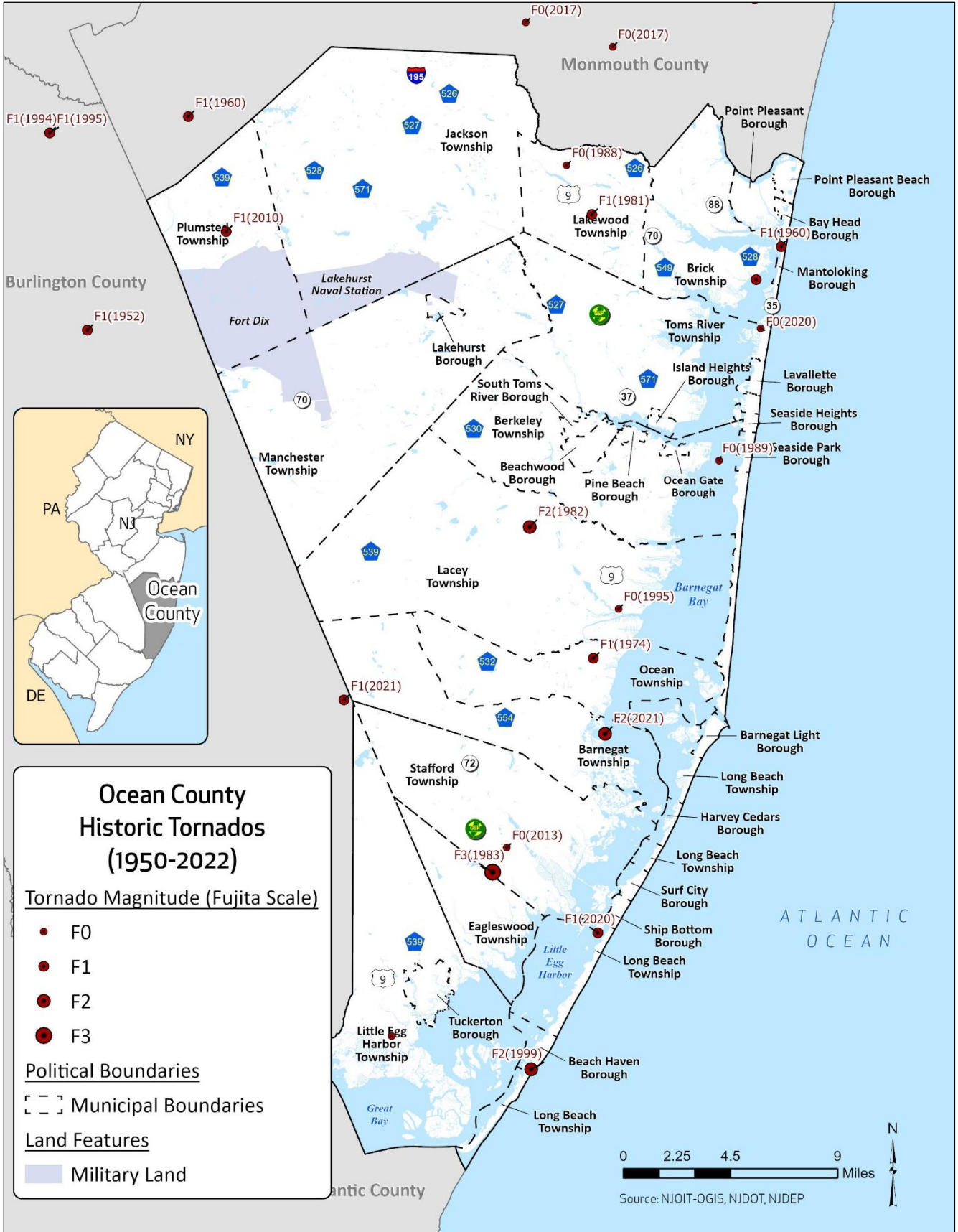
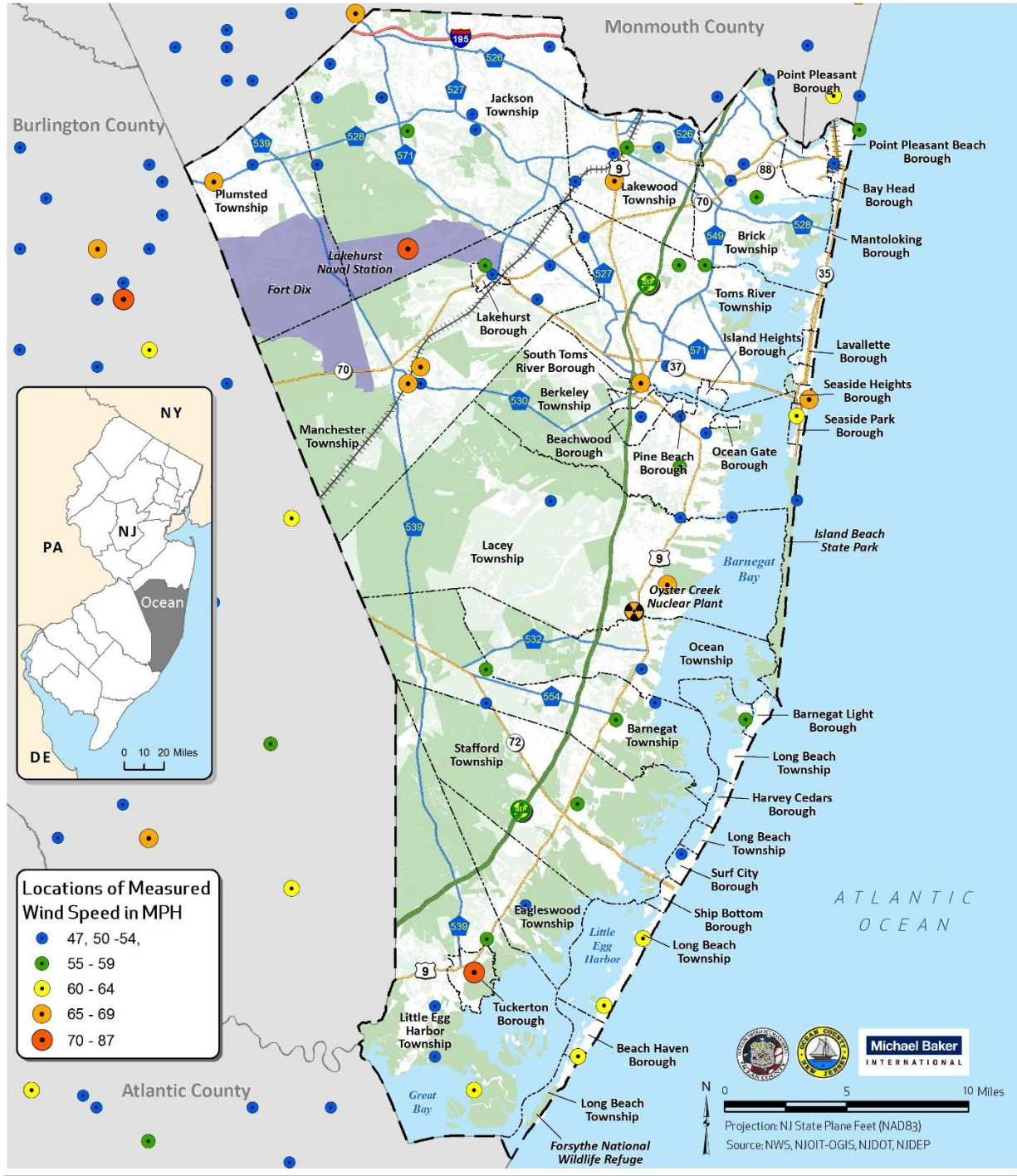


Figure 4.11-3 Windstorm History from 1950-2016, (National Weather Service, 2016)



Windstorm History (1950 - 2016)



2018 Multi-jurisdictional All Hazard Mitigation Plan
Ocean County, New Jersey



Future Occurrence

According to the National Weather Service, the state of New Jersey has an annual average of five tornadoes. Tornadoes are rare events in the northeast. When they do occur, the damage may be severe but is typically limited to a small area. Based on past occurrences, Ocean County is most likely to be impacted by F-0 to F-2 tornadoes. Only one F-3 tornado has occurred in the County on record. While an F4 tornado is unlikely, it has a 0.019 percent annual probability of occurring. F-4 tornadoes can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a “wind load” that exceeds the design limits of most buildings.

The number of windstorms and tornadoes occurring in the County is expected to remain constant. Based on historical events between 1950 and 1998, there are two zones in New Jersey which experience <1 and 1 to 5 F3, F4, and F5 tornadoes per 3,700 square miles. As shown in the table below, communities in Ocean County are expected to have less than one tornado annually.

Waterspouts and seiches are difficult to predict since there have been a limited number of occurrences recorded in New Jersey’s history. Since these events are often influenced by weather events, it can be anticipated that as the climate changes, the frequency and intensity of these events will change as well.

Vulnerability Assessment

Though it is difficult to predict the probability of occurrence of tornadoes, windstorms, waterspouts and seiches, vulnerability will increase as population and properties continue to rise. It is important to identify critical facilities and assets that are more vulnerable to hazard impacts.

Due to their lightweight and often unanchored design, mobile homes and commercial trailers are extremely vulnerable to high winds and will generally sustain the most damage. Jackson, Manchester, and Toms River townships are most vulnerable to tornadoes and wind storms because these communities have the largest populations and/or number of manufactured structures. Manchester Township has the largest number of mobile homes in the County with 1,892, followed by Jackson and Toms River townships, with over 1,000 manufactured homes each. Table 4.11-3 below shows the number of mobile homes for each municipality in Ocean County.

Coastal and waterside homes are most vulnerable to the impacts of seiches due to the nature and extent of these events. The waves, sloshing and water level rise caused by a seiche could damage or impact homes that are within the extent of an event.

Table 4.11-3 Mobile Homes in Ocean County

Municipality	Total Number of Mobile Homes
Barnegat Light Borough	0
Barnegat Township	475
Bay Head Borough	0
Beach Haven Borough	6
Beachwood Borough	5
Berkeley Township	7
Brick Township	74
Eagleswood Township	28
Harvey Cedars Borough	0
Island Heights Borough	0
Jackson Township	931
Lacey Township	0
Lakehurst Borough	62
Lakewood Township	0
Lavallette Borough	5
Little Egg Harbor Township	14

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Municipality	Total Number of Mobile Homes
Long Beach Township	16
Manchester Township	1,545
Mantoloking Borough	0
Ocean Gate Borough	0
Ocean Township	0
Pine Beach Borough	0
Plumsted Township	291
Point Pleasant Beach Borough	23
Point Pleasant Borough	0
Seaside Heights Borough	0
Seaside Park Borough	0
Ship Bottom Borough	0
South Toms River Borough	4
Stafford Township	239
Surf City Borough	0
Toms River Township	1,451
Tuckerton Borough	72
Total	5,244

Source: ACS 5-Year Estimates, 2017-2022

4.12 WILDFIRE

Location and Extent

Most wildfires happen during hot and dry seasons, but they may occur at any time of year. Both human and natural causes start the fires, including carelessness, arson, children, and lightning strikes. Ninety-nine percent, or nearly all wildfires are caused by humans within the state of New Jersey. Wildfire often occurs in the Pinelands, which cover the majority of the western portion of Ocean County and about twenty-two percent of land in New Jersey State; however, wildfire may also occur in brush, grass, or fields.

Because a large portion – about one third - of Ocean County’s land cover is forestland, the potential geographic extent of wildfires is significant. In New Jersey, annually there are approximately one thousand five hundred wildfires, which damage or destroy an average of seven thousand acres. Ocean County leads the State with an average of three hundred fifty-three wildfires that damage or destroy an average of 2,866 acres.

Fall and spring months characterized by dry spells and strong winds are when most wildfires occur. About 75% of all Ocean County wildfires occur in these two time periods. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. In the fall, dried leaves are additional fuel for fires. Accordingly, wildfires most often occur in undeveloped areas where there are fewer fuel sources and lower surrounding populations. However, existing developed areas surrounding the Pinelands increases the risk of wildfires started by human causes.

The Pinelands National Reserve is the first National Reserve in the nation. It encompasses approximately 1.1 million acres covering portions of seven counties and fifty-six municipalities. This internationally important ecological region occupies twenty-two per cent of New Jersey’s land area. It is the largest body of open space on the Mid-Atlantic seaboard between Richmond, Virginia and Boston, Massachusetts and is underlain by aquifers containing seventeen trillion gallons of some of the purest water in the land.

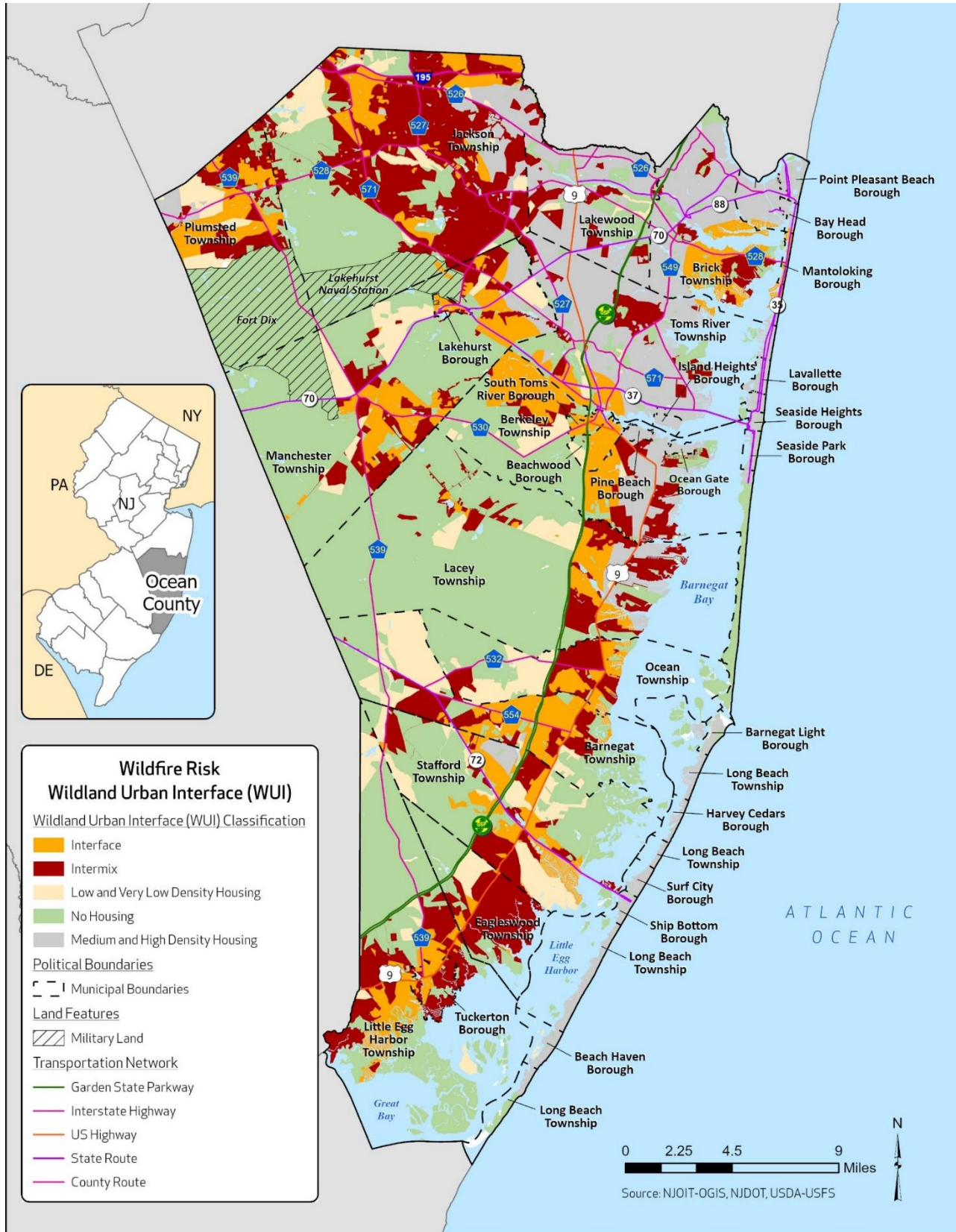
In 1979, New Jersey formed a partnership with the federal government to preserve, protect and enhance the natural and cultural resources of this special place. Today, with the Pinelands Comprehensive Management Plan, the region is protected in a manner that maintains its unique ecology while permitting compatible development.

Thirteen municipalities have the Pinelands within their jurisdiction. According to the Pinelands Commission’s 2015 Long-Term Economic Monitoring Report they are as follows:

- Township of Barnegat – 56% - 14,357 acres
- Borough of Beachwood – 28% - 500 acres
- Township of Berkeley – 30% - 10,484 acres
- Township of Eagleswood – 22.9% - 2,435 acres
- Township of Jackson – 47% - 30,385 acres
- Township of Lacey – 67% - 42,688 acres
- Borough of Lakehurst – 87% - 551 acres
- Township of Little Egg Harbor – 25% - 11,582 acres
- Township of Manchester – 73% - 38,728 acres
- Township of Ocean – 41% - 8,233 acres
- Township of Plumsted – 53% - 13,423 acres
- Borough of South Toms River – 47% - 376 acres
- Township of Stafford – 39% - 13,709 acres
- Toms River Township - <1% - 13 acres

The Pinelands Comprehensive Management Plan protects more than forty-five per cent, or one hundred and eighty-five thousand acres in Ocean County.

Figure 4.12-1 Wildfire Risk Wildland Urban Interface (WUI)



Range of Magnitude

Wildfire events can range in size and intensity. Though some events are small enough to be managed by local firefighters, others impact large plots of land and require more force to subdue. Larger events may necessitate evacuation from communities and require regional or national firefighting support. Severe wildfires have the potential to devastate an area if not controlled.

Pineland fires burn extremely hot and spread rapidly, often by crown fires (fire spreading from tree top to adjacent tree top) or long range spotting (fire spreads due to flying embers). The Pinelands are categorized as Fuel Model B of the National Fire Danger Rating System, or as a high hazard fuel similar to chaparral of California. Drought conditions increase the vulnerability of the Pinelands to fire from small sources such as improperly extinguished campfires, matches, or cigarette butts.

Past Occurrence

Historically, some of the most severe wildfires in New Jersey occur in Ocean County. There have been 24 wildfire events for Ocean County reported to the National Climatic Data Center from 1950-2017. This number does not include wildfires that were not reported to NCEI or that were controlled solely by the volunteer fire departments in the County. For example, there was a forest fire in Berkeley Township in 1998 that destroyed and damaged homes that is not captured in the NCEI. The worst wildfire event to occur in the region took place in 1963 from April 20-21. A series of wildfires burned over 183,000 acres of the Pinelands.

Of all of Ocean County’s jurisdictions, Berkeley Township was impacted by 6 wildfires between 1950 and 2023 according to NCEI, making it the most affected municipality. Lacey Township followed closely with 5 wildfires during that time. Manchester, Lacey, and Ocean Townships had the most area burn during this time period, with 19,225 acres burned by wildfires during one event.

Table 4.12-1 Wildfire Events Reported in Ocean County

Year	Municipalities Affected	Area (Acres)
1995	Manchester, Lacey, and Ocean Townships	19,225
1995	Eaglewood Township	200
1997	Berkeley and Manchester Townships	702
1999	Lacey and Berkeley Townships	115
1999	Lacey Township	70
2001	Berkeley Township	4
2001	Stafford Township	1,600
2002	Berkeley Township and Beachwood Borough	1,300
2002	Fort Dix Military Base	3,000
2007	Stafford and Barnegat Townships	15,550
2008	Barnegat Township	144
2008	Fort Dix Military Base	3,200
2010	Barnegat Township	540
2010	Stafford Township	890
2010	McGuire- Fort Dix – Lakehurst Joint Military Base	4,000
2011	West Tuckerton	20
2012	Lacey Township	6.5
2012	Lacey Township	3
2012	Barnegat Township	20
2014	Berkeley Township and Beachwood Borough	307
2015	Manchester Township	3
2015	Jackson Township	25
2015	Manchester Township	1,012
2021	Lakewood and Brick Townships	170
	TOTAL	50,760

Source: NOAA-NCEI, 2024

Future Occurrence

History demonstrates that Ocean County wildfires have been extremely severe in the past. Compounding the threat of wildfires is the growth of residential areas near forest borders. Wildfires in the future may be equally, and possibly, even more severe.

As long as there are Pinelands in Ocean County, the probability of wildfires will remain extremely high. The average number of wildfires in the State of New Jersey in a ten-year period is 1456. The average number of wildfires per year in Ocean County over a ten-year period is 289. The average number of acres burned each year based on a ten-year period in the State of New Jersey is 3,818, and in Ocean County the average in the same ten-year period is 783. These figures demonstrate why Ocean County has the unfortunate designation as a leader in wildfire events. This is likely to remain unchanged.

The New Jersey Forest Service works to limit the number of wildfires that occur and the acreage burned each year through their fire management program. The Ocean County Office of Emergency Management prescribes several recommendations for homeowners to protect their property from and to prevent the spread of wildfire (OCOEM, 2013).

Over the ten-year period between 2007 and 2017, 25,720 acres of land burned in Ocean County in the wildfire events. The likelihood of wildfires occurring can increase due to weather conditions such as drought.

Though the probability of a wildfire occurring in Ocean County is likely, the probability of one of those fires attaining significant size and intensity is difficult to predict and depends on both firefighting response and environmental conditions.

Vulnerability Assessment

Wildfires threaten the lives of people, livestock, fish and wildlife. Property, timber, forage and recreational and scenic assets are also at risk of damage from wildfires. After a fire event, ground-cover loss may cause environmental impacts such as erosion, flooding, and the silting of streambeds and reservoirs.

Firefighter safety is also at risk due to wildfires. Though loss of life is a potential risk, more common firefighting injuries include falls, sprains, abrasions or heat-related injuries such as dehydration. Response to wildfires also exposes emergency responders to the risk of motor vehicle accidents and can place them in remote areas away from the communities that they are chartered to protect.

Wildfires are often a part of natural succession and can have positive impacts by allowing for new growth. They burn dead trees, leaves, and grasses allowing room for new vegetation and better access to sunlight. New growth on trees and shrubs often follows naturally after a wildfire has occurred.

The New Jersey Forest Fire Service has evaluated the entire state for the risk of wildfire. Results of that assessment are shown in Figure 4.12-1. The ranking of locations for wildfire hazard is based on conditions such as amount and type of fuel, topography and local weather. Based on the assessment, the majority of Ocean County is at an extreme level of risk for wildfires. Much of the remaining land area has a high or very high risk, while a small portion is shown as low or moderate risk. The urban areas are less susceptible to wildfire and are categorized separately (NJ FFS, 2010).

Manchester Township has the most critical facilities vulnerable to wildfire, while Beachwood, Jackson, Lakehurst, and South Toms River boroughs have only one critical facility vulnerable each. The municipalities not listed in the table do not have any critical facilities located within the high wildfire hazard area; however, they may have other structures that are vulnerable.

4.13 WINTER STORMS

Winter storms are characterized by snow, sleet, freezing rain, or any mix of precipitation. A winter storm may last for several hours or continue for several days, and they can vary from a moderate snowfall or ice event to a stronger, wind-driven blizzard. Low temperatures and heavy and/or blowing snow often characterize winter storms, reducing visibility and disrupting transportation systems. Severe winter weather can disrupt everyday life for residents of Ocean County.

Location and Extent

Winter storms impact entire regions and often affect more than one county and more than one state. The entire state of New Jersey is subject to severe winter storms. However, the northwestern regions of the state tend to experience a higher quantity and severity of winter storms than the southeastern region where Ocean County is located. On average, the coastal portion of the County receives 15 inches of snow annually while the northwest section of the County receives approximately 21 inches annually (NCEI, 2013).

Range of Magnitude

The typical components of winter storms are cold temperatures, heavy snow or ice, and oftentimes strong winds. Most storms originate as low-pressure systems that move through New Jersey by following the jet stream. If winter storms develop as extra-tropical cyclonic weather systems over the Atlantic Ocean, they are called nor'easters. Winter storms are common occurrences in northeast America, but severe storms are hazardous due to the result in damage to specific structures or disruption to traffic, communications, electric power, or other utilities. For Ocean County, winter storms can also be associated with coastal flooding.

The following weather events are typical of winter storms:

- **Heavy Snowstorm:** Four inches or more in a six-hour period, or six inches or more in a 12-hour period.
- **Sleet Storm:** Sleet is formed by rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists and pedestrians.
- **Ice Storm:** Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
- **Blizzard:** Temperatures below freezing, winds over thirty-five miles per hour for an extended period of time with snow blowing and reducing visibility to near zero (less than $\frac{1}{4}$ mile)
- **Severe Blizzard:** Temperatures of degrees Fahrenheit or lower, wind velocity of 45 miles per hour, a high density of blowing snow with visibility frequently measured in feet lasting over an extended period of time.

Past Occurrence

Severe weather has characterized many past winter seasons in Ocean County, New Jersey. From 1995 to 2017 a total of 10 people were injured and \$46.5 million in property damage was reported due to winter storms in Ocean County. Along the coastline, the mean annual snowfall is about 15 inches, and this portion of Ocean County has experienced seasonal snowfalls ranging from barely seeing traces of snow during the winter of 1973 to a high of 42.5 inches in the winter of 1899. The inland part of Ocean County sees a mean annual snowfall of approximately 21 inches, but snowfall has ranged from 51.3 during the winter of 1979 to just traces of snow in 1938. The winter months from November to April define the "season".

Five of the 24 Major Disaster and Emergency Declarations impacting Ocean County have been in response to hazard events related to winter storms (see Table 4.2-1). The January 1996 blizzard caused a great deal of damage in New Jersey and in other northeastern states. A state of emergency and a major disaster declaration was declared for the entire state, and evacuations were carried out in Ocean County and in neighboring Cape May and Monmouth counties. Snowfall totals ranged from 14 to 30 inches from the interior portion of the state to the coastal regions. Coastal flooding accompanied

the heavy snowfall, damaging beaches and creating big waves. Mass-transit was suspended during the storm and travel was discouraged across the state. Property damages in New Jersey totaled at least \$18.8 million and three people lost their lives during the storm.

In February 2003, New Jersey was hit by the worst storm since the 1996 blizzard. Power outages lasted for several days in Ocean County. Beach erosion and tidal flooding impacted coastal areas. Inland areas received heavier snowfall and led to roof collapses for some homes. January 2005 brought another powerful snowstorm to New Jersey. Snowfall amounts varied from 8 to 17 inches in north and southwestern parts of the state as well as for Ocean County. A state of emergency was declared by the governor and driving was banned on major roadways. A mix of snow and sleet fell over Ocean County and neighboring Atlantic and Cumberland counties. Strong northwest winds downed wires and tree limbs, caused major power outages, and caused snowdrift to cover roadways. On December 26, 2010, the “Boxing Day Blizzard” dropped between 24 and 30 inches of snowfall throughout the county. Similar to previous significant events, power outages, snow removal, and stranded vehicles were reports as major impacts.

Some of the most recent winter storms that have affected the county are represented in Table 4.2-1. These events represent a comprehensive list of snow events from the NCEI storm events database.

Future Occurrence

Winter storms are a regular occurrence in Ocean County and should be considered highly likely as defined by the Risk Factor Methodology (Table 4.3-2 Risk Factors for Hazard Profiles). The National Risk Index estimates 3.2 winter storms events annual based on data collected between 2005 and 2021. The average temperatures for Ocean County continue to rise and annual snowfall continues to decrease due to shifts associated with climate change. However, there continues to be the potential for a significant dip in winter temperatures coupled with a storm event that may result in a severe winter storm.

Vulnerability Assessment

All communities in Ocean County are vulnerable to the direct impacts of winter storms, though residents in the northwestern portion of the county tend to receive higher annual snowfalls. Emergency vehicles may have greater difficulty in reaching the coastal communities as access points are limited. In the Pinelands region of the county, emergency response can be difficult when roadways are blocked by downed trees and wires.

Severe winter storms can result in transportation accidents, closing of roadways, stranded motorists, power outages, and depletion of oil heating supplies. Damage to vegetation and downed trees are common due to heavy snow loading, ice buildup, and/or high winds. Snow and ice can provide groundwater recharge when they melt gradually. However, if temperatures are too high following a heavy snowfall, rapid surface water runoff and severe flooding may occur.

Severe events involving snow accumulations that exceed six or more inches in a 12-hour period can interrupt power supply and communications, cause traffic accidents, and cause roofs to collapse due to the weight of accumulated snowfall. Historically, winter weather and storm events have been frequent, but loss events.

Older populations, unhoused populations, along with people residing in structures without adequate means or heating equipment to protect against cold temperatures are considerably more vulnerable to winter storm events. Auxiliary heat and power supplies such as wood-burning stoves, kerosene heaters, and gasoline-power generators can help to reduce the vulnerability of humans to extreme cold temperatures commonly associated with winter storms. However, these measures carry a risk of home fires. The County puts out information on its website to help residents make informed consumer decisions on space heaters.

In addition to impacting buildings, utilities, and transportation systems, a winter storm can cause frostbite or loss of life. During the growing season, winter weather can also damage crops and reduce agricultural yields.

HUMAN-MADE HAZARDS

4.14 HAZARDOUS MATERIALS

Overview

Hazardous materials are materials that are considered severely harmful to human health and/or the environment (U.S. EPA). These may also be commonly used substances which are harmless in their normal use but dangerous when released to the environment. The EPA's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 'Superfund Law' designates more than 800 substances as hazardous, and identifies many more as potentially hazardous due to the circumstances of their release (USEPA, 2013). New Jersey also maintains its own hazardous materials definitions in state legislation.

When these materials are released or misused, they can cause damage to structures, properties, and the environment, and may lead to serious injury, long-lasting health effects, and even death. Accidental release of hazardous materials most often occurs during transportation – tanker trucks or trailers, rail, pipelines, aircraft, and watercraft transport pose different risks and opportunity for mitigation. Fixed-site releases, such as groundwater and soil leaching from known Superfund and brownfields sites, or from facilities processing or storing hazardous materials facilities pose a risk for the negative impacts of hazardous materials on populations and environments.

Location and Extent

Hazardous material releases can occur at fixed sites or during transport. Fixed sites releases include legacy pollution from noted Superfund or Brownfields sites, or accidental materials releases at active storage and processing facilities. Releases that occur during materials transport may occur on public roadways, rail infrastructure, and offshore, leading to possible contamination of water, air, or soil of the surrounding environment. Hazardous materials may also be released as a criminal act or act of terrorism.

Facilities in New Jersey that use, manufacture, or store hazardous materials must comply with both Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA). Due to the reporting requirements of EPCRA, communities are to be informed of the presence and/or release of chemicals at facilities. The purpose of the EPCRA is to ensure that state and local communities are prepared to respond to potential chemical accidents through Local Emergency Planning Committees (LEPCs). LEPCs are responsible for developing emergency response plans for SARA Title III facilities; included in the plans are the location and extent of hazardous materials, evacuation plans, response procedures, methods to reduce the magnitude of a materials release, as well as methods and schedules for training and exercises.

There are 12 superfund sites on the National Priorities list in Ocean County, located in Beachwood, Lakehurst, Berkeley, Toms River, Jackson, and Plumsted municipalities (EPA, 2012). There is one noted brownfield site documented by the EPA CIMC, located in Lakewood Township. The location and extent of hazardous materials releases in the county are best illustrated through this dataset.

Ocean County has 22 Toxic Release Inventory (TRI) sites designated by the EPA within the County. Several of these facilities are located in close proximity to population centers that could affect a large number of people should a major accident or spill occur. Many municipalities do not have any TRI facilities located within their jurisdiction, reducing the risk of incidents occurring due to fixed sites.

Additionally, Ocean County has 313 Hazardous Material Facilities. Hazardous Waste Management Facilities data is maintained in the Resource Conservation and Recovery Act Information (RCRAInfo), a national program management and inventory system of hazardous waste handlers.

Range of Magnitude

Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. Hazardous material releases can contaminate air, water, and soils, possibly resulting in injuries and/or death. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events.

The magnitude of a given incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g., centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

Past Occurrence

DOT tracks incidents of hazardous materials related to transportation. With some exceptions, the majority of incidents over the years have involved combustible liquid spills along the highway. Most of the incidents reported by USDOT were determined to be caused by improper preparation for transportation.

One of the worst incidents on record in Ocean County was the 1984 pipeline leak of treated chemical waste from the Ciba-Geigy company at Vaughn and Bay Avenues. The company had been pumping the waste across Barnegat Bay and the barrier island and releasing the waste into the ocean at Ortleigh Beach but was exposed when the pipeline leaked. The leak and ongoing releases resulted in a superfund site to be formed (Miller, 2013). A nearby example of a hazardous material accident happened in Paulsboro, NJ when a train derailed and released vinyl chloride. Nearby school needed to shelter in place and 20 people accessed the hospital for burning throat symptoms. The release and spill also necessitated extensive environmental clean-up (West Deptford Patch, 2012).

Ocean County also has a County Hospital Management of Chemical, Biological, Radiological, Nuclear & Explosive Team (Station 85 -Berkeley Emergency Response Team) that on average responds to 55-65 calls per year, most of which are not reported to USDOT because they do not involve highway incidents. Many of these incidents have direct impacts on water bodies in the County. BERT receives County Environmental Health Act (CEHA) funding from the State (NJDEP) through the Ocean County Health Department. HM/CBRNE incident responses data is reported to OCHD which is included in the County's CEHA reporting to NJDEP.

Future Occurrence

While incidents involving hazardous materials releases have occurred in Ocean County in the past, they are generally difficult to predict. Any occurrence is largely dependent upon the accidental or intentional actions of a person or group. Population growth, especially in areas close to transportation routes, can expose more people to these hazards if a release incident occurs. The probability of future occurrence is likely, according to the Risk Factor Methodology probability criteria.

Vulnerability Assessment

There is an added concern of potential vulnerability to hazardous materials facilities in Ocean County because many of these facilities are located in close proximity to the County's eastern coastline, or nearby bays or rivers. A hazardous materials release into a body of water has the potential to impact not only local residents where the incident occurs, but also those in neighboring municipalities and counties. A contributing factor is the high number of major roadways that run through Ocean County, including the Garden State Parkway, I-195, US Route 9, and New Jersey Routes 35, 37, 70, and 88.

4.15 NUCLEAR INCIDENTS

Nuclear incidents involve the release radioactive materials and/or exposure to radiation. The main source of concern is a nuclear power plant; however laboratory accidents, industrial processes, terrorism attacks, and transportation accidents may also result in nuclear incidents occurring. After a nuclear incident, the main concern is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairments), chronic health effects (e.g. cancer), and psychological effects. Long-term impacts include damage to public and mental health of the overall population in addition to detrimental effects on the Two other nuclear facilities, Hope Creek Nuclear Generating Station and Salem Nuclear Power Plant are located west of Ocean County in Salem, New Jersey. However, the other stations are not close enough to impact Ocean County.

The use of Probabilistic Risk Assessments (PRA) is preferred by the Nuclear Regulatory Commission to estimate quantitatively the potential risk to public health and safety considering the design, operations and maintenance practices at nuclear power plants. PRAs typically focus on accidents that can severely damage the core and that may challenge containment. FEMA, PEMA and county governments have formulated Radiological Emergency Response Plans that include a Plume Exposure Pathway Emergency Planning Zone (EPZ) with a radius of about ten miles from each nuclear power facility and an Ingestion Exposure Pathway EPZ with a radius of about fifty miles from each facility. Specific configuration and size of an EPZ may vary in relation to local emergency response capabilities, topography, road networks, and political boundaries.

Evacuation in case of a disaster at the Oyster Creek Nuclear generating Station is covered in the New Jersey State Police, Office of Emergency Management's Radiological Emergency Response Plan which is exercised twice annually.

Range of Magnitude

The extent of impact of a nuclear incident differs for those within the Plume Exposure Pathway EPZ and those within the Ingestion Exposure Pathway EPZ. The Plume Exposure Pathway refers to whole-body external exposure to gamma radiation from a radioactive plume and from deposited materials and inhalation exposure from the passing radioactive plume. Nuclear accidents can be classified into the three following categories:

- **Criticality accidents:** Involves loss of control of nuclear assemblies or power reactors.
- **Loss-of-coolant accidents:** Occurs whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system.
- **Loss-of-containment accidents:** Involves the release of radioactivity from materials such as tritium, fission products, plutonium, and natural, depleted, or enriched uranium. Points of release have been containment vessels at fixed facilities or damaged packages during transportation accidents.

The nuclear industry has adopted pre-determined, site-specific Emergency Action Levels (EALs). The EALs provide the framework and guidance to observe, address, and classify the severity of site-specific events and conditions that are communicated to off-site emergency response organizations (Nuclear Regulatory Commission, 2008). Other EALs deal specifically with issues of security, such as threats of airborne attack, hostile action within the facility, or facility attack. The purpose of EALs is to ensure that appropriate notifications for the security threat are made in a timely manner.

In the event of an accident, nuclear facilities must notify the appropriate authorities. The Nuclear Regulatory Commission uses the four following classification levels for nuclear incidents (Nuclear Regulatory Commission, 2008):

- **Unusual Event:** An unusual event is signified by the potential for degradation in the level of safety of the plant. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
- **Alert:** An alert is declared, if events have occurred or are occurring which involves an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited to a small fraction of the EPA Protective Action Guides (PAGs).

- **Site Area Emergency:** Events in process or which have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed the EPA PAGs except near the site boundary.
- **General Emergency:** Imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed the EPA PAGs for more than the immediate site area.

Past Occurrence

Though no critical nuclear incidents have occurred in Ocean County, a large series of wildfires threatened the Oyster Creek plant in 1992. The fire began in Lacey Township and caused the plant to shut down as it continued to spread. Fortunately, no damage to the plant was incurred (Batcha, 2003). When natural disasters have occurred, nuclear plants must have a plan for response to avoid compounding the situation with a nuclear incident. Most recently, during Hurricane Sandy, an unusual event was declared at Oyster Creek Nuclear Generating Station and later upgraded to an alert due to rising water levels near the facility (AP, 2012).

In 2003, ground water contamination due to naturally occurring radioactive element, radium was found in central and southern New Jersey. Not only were the levels of radium found to exceed Federal standards. Residents exposed to the contaminated water were found to be significantly more susceptible to developing a rare type of bone cancer called Osteosarcoma (NJDOHSS, 2003).

Though New Jersey has never experienced a catastrophic nuclear accident, the neighboring Commonwealth of Pennsylvania did. A General Emergency level incident occurred at Three Mile Island Generating Station in 1979, causing the nation's worst nuclear incident on record. A partial meltdown of the TMI Unit 2 reactor core occurred due to a combination of "equipment malfunctions, design-related problems, and worker errors," (US NRC, 2011). Nuclear incidents rarely occur, but the incident at Three Mile Island is the worst fixed-nuclear facility accident in U.S. history. The resulting contamination and state of the reactor core led to the development of a fourteen-year cleanup and scientific effort.

Future Occurrence

Oyster Creek has been decommissioned. The threat of a highly impactful nuclear event in Ocean County has been adjusted to reflect a low risk.

Vulnerability Assessment

While the plant has been decommissioned, one concern within Ocean County that remains is the potential for contamination of food, soil, and water.

4.16 PANDEMIC

A pandemic is a spread of disease occurring over a wide geographic area and affecting a high proportion of the population. Pandemics are caused by an infectious agent which humans have no or little natural immunity towards and can spread from person-to-person through a variety of transmission modes. These modes may include direct contact, air, or by the consumption of contaminated products. A pandemic will result in both widespread and sustained effects and is likely to stress the resources of both the State and federal government. An epidemic occurs when new cases of a certain disease in a given population substantially exceed what is expected. An epidemic may be restricted to one locale, or it may be global, at which point it is called a pandemic.

In New Jersey, a municipality in which a pandemic occurs bears the first and primary responsibility to control the epidemic. If the epidemic remains beyond the capabilities of local law enforcement agencies alone, limited State Police assistance may be requested. If the restoration of public health is beyond local, county, and state abilities, the Governor may declare a State of Emergency calling on federal and worldwide support.

Coronavirus

COVID-19 (coronavirus disease 2019) is a contagious and quickly spreading disease caused by a virus named SARS-CoV-2. When a person infected with COVID-19 breathes, droplets and small particles containing the virus can spread and infect others around them. In some circumstances, these droplets may contaminate the surfaces they touch (CDC, 2023a). Anyone infected with COVID-19 can spread it, even if they do not have symptoms. People infected with COVID-19 most commonly experience respiratory cold- and flu-like symptoms, although the disease may affect other parts of the body (CDC, 2023a). Many people with COVID-19 have mild symptoms, but some people become severely ill, and some, including those with minor or no symptoms, will develop Post-COVID conditions – also called "Long COVID."

Viruses are constantly changing, including the virus that causes COVID-19. These changes occur over time and can lead to the emergence of variants that may have new characteristics, including different ways of spreading.

Foodborne Disease Outbreaks

Foodborne illness is caused by consuming contaminated foods or beverages. Many different disease-causing microbes or pathogens can contaminate foods, so there are many different types of foodborne illnesses. Foodborne illness, caused by a variety of bacteria, viruses, and parasites, can be spread by consumption of improperly prepared food items, poor hygiene among food handlers, or contamination in food processing facilities or farms. Many foodborne pathogens also can be acquired through recreational or drinking water, from contact with animals or their environment, or through person-to-person spread (NJDOH, 2017).

After eating contaminated food, people can develop anything from a short, mild illness, often mistakenly referred to as "food poisoning," to life-threatening disease. The Centers for Disease Control and Prevention (CDC) indicate that foodborne illnesses, each year, result in 76 million becoming ill; more than 300,000 hospitalizations; and 5,000 deaths (NJDOH, 2013). Some of the foodborne diseases reported to NJDOH include, Campylobacteriosis, Foodborne Poisonings, Salmonellosis, Cyclosporiasis, Hepatitis A, Shigellosis, E. coli, Listeriosis and Vibriosis.

An outbreak of foodborne illness occurs when a group of people consume the same contaminated food and two or more of them come down with the same illness. It may be a group that ate a meal together somewhere, or it may be a group of people who do not know each other at all, but who all happened to buy and eat the same contaminated item from a grocery store or restaurant. For an outbreak to occur, something must have happened to contaminate a batch of food that was eaten by a group of people. Often, a combination of events contributes to the outbreak (NJDOH, 2013a).

Influenza

The risk of a global influenza pandemic has increased over the last several years. This disease is capable of claiming thousands of lives and adversely affecting critical infrastructure and key resources. An influenza pandemic has the ability to reduce the health, safety, and welfare of the essential services workforce, immobilize core infrastructure, and induce fiscal instability. Pandemic influenza is different from seasonal influenza (or "the flu") because outbreaks of seasonal flu are caused by viruses that are already among people. Pandemic influenza is caused by an influenza virus that is new to people and is likely to affect many more people than seasonal influenza. In addition, seasonal flu occurs every year, usually during the winter season, while the timing of an influenza pandemic is difficult to predict. Pandemic influenza is likely to affect more people than the seasonal flu, including young adults. A severe pandemic could change daily life for a time, including limitations on travel and public gatherings (Barry-Eaton District Health Department, 2013).

At the national level, the CDC's Influenza Division has a long history of supporting the World Health Organization (WHO) and its global network of National Influenza Centers (NIC). With limited resources, most international assistance provided in the early years was through hands-on laboratory training of in-country staff, the annual provision of WHO reagent kits (produced and distributed by CDC), and technical consultations for vaccine strain selections. The Influenza Division also conducts epidemiologic research including vaccine studies and serologic assays and provided international outbreak investigation assistance (CDC, 2011).

Mumps

Mumps is a contagious disease that is caused by the mumps virus. Mumps typically starts with a few days of fever; headache, muscle aches, tiredness, and loss of appetite, and is followed by swelling of salivary glands. Anyone who is not immune from either previous mumps infection or from vaccination can get mumps (CDC, 2017).

West Nile Virus

The CDC indicates that the West Nile virus (WNV) is most commonly transmitted to humans by infected mosquitoes. There are no medications to treat or vaccines to prevent WNV infection. Fortunately, most people infected with WNV will have no symptoms. About one in five people who are infected will develop a fever with no other symptoms. Less than 1% of infected people develop a serious, sometimes fatal, neurologic illness. WNV is established as a seasonal epidemic in North America that flares up in the summer mosquito season and continues into the fall. Mosquitos become infected when they feed on infected birds. The mosquitos can then spread WNV to humans and other animals when they bite. In 2017, there were 2,002 reported cases of WNV in the United States, along with 121 deaths from this disease (CDC, 2018).

Zika Virus

In 2015 the Zika virus disease became a nationally notifiable condition. The Zika virus is an infectious disease spread mostly by the bite of an infected mosquito. In most cases, the virus has no symptoms, but when present, they are usually mild. Symptoms may include fever, red eyes, joint pain, headache, and a rash.

Location and Extent

Compared to epidemics, which occur in a smaller geographic area, pandemics affect larger areas and populations. The exact location and extent of an infected population depends on how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. Pandemics can occur anywhere, including Ocean County, although some geographic and demographic factors, such as population density and vaccination rates, can impact the ability of the virus to spread.

Vaccination Rates in Ocean County

Vaccines help prevent severe illness, hospitalization, and death from infectious diseases as well as help to prevent their spread. In Ocean County, approximately 87.3% of children in Childcare, Pre-K, Kindergarten, and Grades 1 and 6 were immunized during the 2022-2023 school year. Although this number is up from 86.7% during the 2021-2022 school year, it is the lowest percentage of all New Jersey Counties by several points. Approximately 6.1% of children claimed a Religious Exemption, up from 5% during the 2021-2022 school year. Ocean County has the highest percent of Religious Exemptions in the State of New Jersey for the 2022-2023 school year, tied with Sussex County. An additional 5.1% of children were Out of Compliance with immunization requirements. Only 0.2% of enrolled children claimed a medical exemption during the 2022-2023 school year. (Annual Immunization Status Reports, Communicable Disease Service, New Jersey Department of Health.)

Range of Magnitude

In a 2009 report, the Center for Disease Control (CDC) created a framework providing a common method to describe pandemic activity in order to inform public health actions. The framework consists of six stages which are generally (but not always) linear, following the following progression:

1. Investigation of cases of novel influenza infection in humans,
2. Recognition of increased potential for ongoing transmission,
3. Initiation of a pandemic wave,
4. Acceleration of a pandemic wave,
5. Deceleration of a pandemic wave, and
6. Preparation for future pandemic waves.

The duration and magnitude of a pandemic (as well as each interval) depends on the characteristics of the virus and the public health response.

Past Occurrences

Date of Event	Event Type	Description
October 2009	Mumps	On September 26, the NJDHSS was informed of eight suspected mumps cases in two Ocean County private schools. By October 30, a total of 40 cases were reported; the median age of patients was 19.5 years old.
2009	Global H1N1 Pandemic	The first novel H1N1 patient in the United States was confirmed April 15, 2009. The second patient was confirmed on April 17, 2009. On April 22, the CDC activated its Emergency Operations Center to better coordinate the public health response. On April 26, 2009, the U.S. government declared a public health emergency and began actively and aggressively implementing the country's pandemic response plan. By June 19, 2009, all 50 states in the United States reported novel H1N1 infection. On June 11, 2009, the WHO signaled that a global pandemic of H1N1 was underway by raising the worldwide pandemic alert level to Phase 6. At the time, more than 70 countries had reported cases of novel influenza A (H1N1) infection. In total there were 18,306 lab-confirmed deaths as a result of H1N1 worldwide. In the United States between April 2009 and August 2009 there were 9,079 cases that required hospitalization and 593 deaths. In New Jersey, cases were widespread in July 2009, with 1,414 confirmed cases and 15 deaths.
January 20, 2020 - May 11, 2023*	COVID-19	The first confirmed case of COVID-19 in the U.S. was in Washington State on January 21, 2020; the first confirmed case in New Jersey was reported on March 4, 2020. From March 2020 to August 2024, there have been 2,734,577 lab confirmed cases of COVID-19 in New Jersey. During that period, 186,910 people have been hospitalized with confirmed cases and 36,981 have died in deaths associated with COVID-19. In Ocean County, there were a total of 182,287 cases and 3,389 deaths. ¹

*Note: This date shows the incident period of the New Jersey COVID-19 Pandemic as defined by the FEMA Disaster Declaration. As of August 5, 2024, people are still becoming infected with COVID-19.

Future Occurrences

Because viruses are always changing, it is difficult to predict when the next pandemic will occur and how severely it will impact local populations.. The United States and other countries are constantly preparing to respond to pandemic. The Department of Health and Human Services and others are developing supplies of vaccines and medicines. In addition, the United States has been working with the WHO and other countries to strengthen detection of disease and response to outbreaks. Preparedness efforts are ongoing at the national, State, and local level (Barry-Eaton District Health Department, 2013). In New Jersey, the probability for a future pandemic event is dependent on several factors. One factor that influences the spread of disease is population density. Populations that live in close proximity to one another are more likely to spread diseases. As population density increases in the State, the probability of a pandemic event occurring also increases.

Potential Impacts of Climate Change

Climate change has the potential to increase the probability of pandemic occurring. While the relationship between climate change and increase in virus susceptibility is difficult to predict with certainty, there are scientific linkages between the two. As warm habitats that host insects such as mosquitoes increase, more of the population becomes exposed to potential virus threats (The Washington Post, 2017). The notion that rising temperatures will increase the number of mosquitoes that can transmit diseases such as West Nile Virus and Zika among humans (rather than just shift their range) has been the subject of debate over the past decade. Some believe that climate change may affect the spread of disease, while others are not convinced. However, many researchers point out that climate is not the only force at work in increasing the spread of infectious diseases into the future.

4.17 TERRORISM

Location and Extent

Terrorism is the use of force, violence, or threat of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism can include threats of terrorism, violence against people, and damage of property. Terrorist attacks can occur in any location with varied extent. With New Jersey's dense population and location relative to major urban areas, the state may be a particularly attractive target for potential terrorist activity.

¹ NJ DOH COVID-19 Dashboard: https://www.nj.gov/health/cd/topics/covid2019_dashboard.shtml

Range of Magnitude

The effect of a terrorism event can vary dependent on the type of attack, the magnitude of the impacts, and the location of the activity. There is not a developed scale for magnitude of terrorism, but it would like to be characterized based on property damage, destruction, and injury or loss of life.

Past Occurrence

Terrorist attacks have impacted Ocean County in the past. Table 4.17-1 provides details on each attack within and within proximity to Ocean County.

Table 4.17-1 Previous Terrorist Attacks Within and Within Proximity to Ocean County

Date	Type of Event	Loaction of Event	Event Description
4/1/1987	Terroristic Threat	Atlantic County	Apparent Islamic terrorist plan to bomb casinos in Atlantic City was called off due to alerted authorities.
9/11/2001	Terrorist Attack	Various Locations Along the East Coast	The September 11, 2001 terrorist attacks killed nearly 3,000 civilians in coordinated attacks in New York City and Washington D.C.
5/7/2007	Attempted Terrorist Attack	Burlington County	Six men planned to attack Fort Dix, but the plot was stopped by authorities who arrested the individuals prior to the planned event.
9/17/2016	Terrorist Attack	Ocean County	A pipe-bomb exploded near Seaside Park Racecourse during a Marine Corp charity 5k run.

Future Occurrence

While the potential for future terrorism events in Ocean County is difficult to predict, the combination of past event and potential terrorist targets make a terrorism event possible. Efforts from local, state, and federal officials must be coordinated to prevent future terrorist incidents from occurring.

Despite the best efforts of emergency alerts and response systems, a terrorist event may still occur in Ocean County or surrounding areas.

Vulnerability Assessment

The entirety of Ocean County is exposed to potential effects of terrorism and terrorist incidents. As terrorism seeks to instill fear in the greatest number of individuals, those living and working in densely populated areas will have greatest exposure to terroristic incidents. Other indications of vulnerable populations and locations may be those using public transportation (mass transit systems have been the targets of past terrorist attacks outside of New Jersey), those in and around military bases or government facilities, as well as high profile gatherings of a large number of people. However, because terrorism is designed to take victims by surprise, predicting the location and nature of potential attacks is difficult, as is assessing Ocean County’s vulnerability?

Ocean County’s critical facilities are exposed to terrorist attacks, particularly because of the impact that an attack can have on these facilities and the populations they serve. Dams, power stations, and tunnels are all examples of critical infrastructure and facilities that are vulnerable to terrorism. Additionally, communications systems, first-responder stations, and emergency operations centers are all vulnerable to terrorist attacks. The vulnerability of these critical facilities is derived from importance of these buildings and the visual symbols that the buildings represent in New Jersey. Particularly vulnerable are military facilities that are located in Brick, Toms River, Manchester Township, and Lakehurst.

Measuring the economic impact of a terrorist attack on Ocean County can be measured in immediate costs such as those related to emergency response, and those associated with the immediate loss of productivity due to closed businesses. A fuller economic impact of terrorism includes long-term costs such as terrorism mitigation activities.

If an attack would occur along the Coast of Ocean County, effecting the Jersey Shore, the impact of lost tourism dollars would be significant. Depending on the type and location of an act of terrorism, it can impact the environment and result in loss of life for humans and animals. A radiological device or an improvised nuclear device would have a long-term impact that could cost billions of dollars to remediate. Additionally, an attack on waste treatment, natural gas, petroleum, or chemical facilities could also have long term environmental impacts in Ocean County.

4.18 TRANSPORTATION ACCIDENTS

Location and Extent

Transportation accident hazards include any incident involving air, rail and roadway travel, and can result property damage, property loss, serious injury, and even death. These accidents may result in release or spillage of hazardous materials that are harmful to the environment and to humans; these are discussed under the hazardous materials section of this document.

Most commonly seen in Ocean County are transportation accidents involving roadway travel. Ocean County has a large share of roadways and streets maintained by municipalities – second in the state after (COUNTY). Lakewood Airport, in Lakewood, is Ocean County’s sole airport with a Federal Aviation Administration (FAA) tower. Ocean County Airport (Berkeley Township) and Eagles Nest Airport (Eagleswood Township) also accommodate small corporate and passenger planes in private and public routes.

Range of Magnitude

The outcome of transportation accidents can range from minor property damage to extensive property loss, and from human injury to death. Road and railway accidents can increase due to poor weather conditions and the resulting wet or icy roads or rails. Transportation accidents may result in hazardous materials releases, potentially endangering the surrounding environment and population when an event occurs.

Past Occurrence

Highway incidents involving motor vehicles are the most common transportation accidents in the County. Although the population has increased in the County over the last two decades, crash fatality rates have fluctuated up and down, but generally remained about the same.

Although less frequently seen in Ocean County, several transportation accidents involving aircraft have also occurred in the county. The incidents have been with small aircraft. No reported events have resulted in extensive damage. Injuries and deaths were reported with some crashes. There is no indication Ocean County is more prone to transportation accidents than other locations in New Jersey.

Future Occurrence

State, county, regional, and municipal transportation entities continue to work to improve transportation safety. However, it is extremely likely that Ocean County will experience transportation accidents in the future.

Vulnerability Assessment

Transportation accidents can occur anywhere in Ocean County. Accidents are most common and often more severe along major routes such as the I-195, the Garden State Parkway, US-9, or NJ 35 along the coast where traffic volumes are greater.

4.19 URBAN FIRE AND EXPLOSION

Location and Extent

An urban fire involves a structure or property within a developed area. The effects of urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions, extremely rapid releases of energy that usually generate high temperatures, often lead to fires. Urban fire and explosions can cause localized or widespread damage depending on their size and intensity. Vehicles and/or structures are often the sites where fires ignite due to human mishaps or various fuel sources or flammable materials. Residential structures are the most common ignition point, especially when fires spark in denser suburban or urban areas (US Fire Administration, 2009). Denser development can allow fires to spread more rapidly through urbanized areas. During the plan update, at least one participating jurisdiction expressed concern reference to growing awareness of explosion risk due to increased use of (flammable/explode-able) lithium-ion batteries. Urban fires and explosions can often result from other natural hazards, namely severe storms, and can be made more likely by drought. Human caused hazards such as transportation accidents, hazardous materials releases, or criminal activity (such as arson or terrorism) can also ignite urban fires and explosion.

Range of Magnitude

Property damage from urban fire and explosion can vary greatly by intensity and scale, from smoke and/or water damage to complete destruction of buildings and urban fabric. In 2014, the fire death rate in New Jersey was 2.4 per 1,000 fires, which is slightly higher than the 2.3 national rate (USFA, 2014).

Fires and explosions can also result in significant economic consequences. If businesses or personal property are damaged due to urban fires and explosions, wages and investment in properties may be lost. Public, private, and non-profit agencies are relied upon to provide relief to victims in the wake of fire incidents. Recovery from fire and explosion also utilizes human services agencies such as community support programs, health and medical services, public assistance programs and social services. On a community scale, urban fire and explosion can damage response facilities and equipment, , disrupt emergency communications, and destroy critical medical supplies.

Past Occurrence

A number of urban fire and explosion events occur in Ocean County each year. Most events are small, contained events that only affect a limited number of structures.

In recent years, fires have destroyed manufactured homes in the Roberts Trailer Park in Toms River (2012) and a local restaurant (2010). Both occurrences utilized firefighters from Ocean County and local volunteer forces. During Hurricane Sandy, as many as 20 fires broke out in Ocean County. In many cases, Sandy's resulting high water levels and flooding limited firefighter access to subdue the flames.

On September 12, 2013, a massive fire burned in Seaside Park, ultimately destroying at least 50 businesses along the boardwalk. Heavy winds, gusting up to 30 mph over a sustained period of time, exacerbated the fire and pushed it into neighboring Seaside Heights. This urban fire event caused approximately \$4,000,000 worth of damage, and was a clear example of cascading hazards, as sustained winds on September 12 exacerbated the boardwalk fire. Figure 4.19-1 shows the boardwalk after the fire was mostly extinguished.

Figure 4.19-1 Seaside Heights Boardwalk Fire. (CBS News 2013).



Future Occurrence

Urban fire and explosion events will continue to occur in Ocean County. Though residential fires are common, industrial fires involve greater risk because of the potential for large quantities of flammable materials or fuel sources. The probability that an urban fire or explosion will occur can be considered highly likely.

Vulnerability Assessment

To determine more specific vulnerability of buildings to urban fires and explosions, detailed information on the design specifications, materials used, and age of construction of buildings is required. All communities in New Jersey are required to comply with building codes adopted by the NJ Department of Community Affairs. New Jersey has also adopted the National Electrical Code, which was provided by the National Fire Protection Association. The adoption and enforcement of these codes should help to decrease the overall vulnerability of structures in Ocean County. Unfortunately, these regulations only impact new construction, as well as changes to existing structures, under the Rehabilitation sub code. There is no reason to believe Ocean County is more vulnerable than other jurisdictions to this hazard.

4.20 UTILITY DISRUPTION

Location and Extent

Ocean County has experienced utility interruption for each of the following services: fuel, water, electric, and telecommunications capabilities. Utility interruptions are caused by equipment failure, accidents, and natural hazards. Windstorms, extreme temperatures, and severe winter storms alike can cause major power outages due to snow and wind that result in downed trees and wires. Traffic accidents tend to cause localized outages whereas tornados, thunderstorms, and winter storms often result in regional utility interruptions.

Range of Magnitude

Utility interruption can lead to lack of water supply (either because of a damaged pipeline or well pump failure), food spoilage, loss of heating or air conditioning, basement flooding (sump pump failure), lack of indoor lighting, and loss of communication services. Elderly populations and small children rely heavily on utilities to maintain safe ambient temperatures, so loss of heating and cooling capability is more dangerous for them in the winter and summer months. The length of time that a utility is out of service determines the level of impact on residents and businesses and affects the total cost of an event.

Past Occurrence

One of the worst utility interruptions experienced in Ocean County occurred in September 2003 during Tropical Storm Isabel. The storm downed numbers of trees and lines, leading power loss for 220,000 Jersey Central Power and Light customers and 162,000 C Connective Energy Ltd customers (NCEI, 2013).

Future Occurrence

Despite efforts across utility companies to limit vulnerability, future occurrence of this hazard is extremely probable.

Vulnerability Assessment

The most common cause of power outages are trees and overgrown vegetation. In response, Jersey Central Power & Light operates a Vegetation Management Program to clear overgrown trees, shrubs, and brush from power lines, equipment, and facilities (FirstEnergy Corp, 2012). Risk of utility interruption is fairly uniform across the county. However, some locations are more vulnerable to the effects of losing power or another vital service. Hospitals and emergency medical facilities as well as retirement homes and senior centers are among the most vulnerable to power outages, due to the critical nature of these facilities. Back-up power generators are often used at these facilities, but the loss of electricity may still result in hot or cold temperatures for which elderly populations are particularly vulnerable.

5.0 CAPABILITY ASSESSMENT



5.0 CAPABILITY ASSESSMENT

5.1 OVERVIEW

The purpose of the Capability Assessment is to understand the unique planning, regulatory, administrative, technical, financial, and education and outreach capabilities present in Ocean County. This assessment helps Ocean County and its municipalities identify strengths that could be used to reduce losses and reduce risks in the community. It also identifies areas where mitigation actions might be used to supplement current capabilities and create a more resilient Ocean County before, during, and after a disaster event. Finally, the Capability Assessment examines the integration of existing planning mechanisms and the HMP, highlighting areas and initiatives in other planning efforts that seek to reduce risk and losses. While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.2 NEW JERSEY STATE BUILDING CODES

The New Jersey Flood Hazard Area Control Act (FHACA), part of New Jersey Administrative Code (NJAC) § 7:13, contains a regulatory standard for new habitable buildings in a flood hazard area or, in certain cases, in an area that was previously in a flood hazard that exceeds federal regulation. It requires these buildings add one foot of freeboard to the Flood Hazard Design Flood Elevation and be set no lower than the elevation required under the Uniform Construction Code, NJAC 5:23. Habitable buildings are any building intended for regular human occupation and/or residence. This includes single-family homes and duplexes, multi-residence buildings, critical buildings, commercial buildings, accessory structures that are regularly occupied, mobile and manufactured homes and trailers intended for human residence, and any other building that is regularly occupied.

New Jersey Model Code Coordinated Ordinances

For better coordination between the requirements set forth in the National Flood Insurance Program (NFIP), the FHACA, and the Uniform Construction Code (UCC), the New Jersey Model Flood Damage Prevention Ordinances supplied by NJDEP were upgraded to create Model Code Coordinated Ordinances in 2021. These model ordinances include statewide minimum standards and optional suggested language for higher standards. Municipalities that have adopted floodplain ordinance that exceed the statewide minimum standards within Ocean County are described in their municipal appendices (Appendices V.1 – Jurisdictional Information). These updated regulations represent a strengthening and alignment of codes that dictate floodplain management.

5.3 OCEAN COUNTY & REGIONAL CAPABILITIES

This section discusses County and regional-level established capabilities that are used to help advance hazard mitigation.

Good Luck Pointe

Ocean County is currently using funding from Blue Acres and the Natural Lands Trust Fund to buy out, demolish, and restore properties back to a natural state at Good Luck Pointe in Berkeley Township. There is also a proposed living shoreline adjacent to the Good Luck Pointe Marina, which includes restoration and planting of almost 400 linear feet of salt marsh shoreline with a width of approximately 40 feet as well as expansion of an existing oyster bed from a half-acre to two acres. The plan incorporates placement of 360 cubic yards of cured whelk shell in the remaining 1.5 acres of the already permitted Good Luck Pointe site and planting of Spat-on-Shell (SOS) grown at the NOAA funded Ocean Gate Spat Tank ([DEP, 2024](#)). The project remains in the preliminary design stage. The consulting engineer performed design proposals which are currently under review by Ocean County Planning Department.

Jeffrey's Creek Shoreline Restoration Project in Ocean Gate

Barneget Bay Partnership identified county-owned property as a priority location for a living shoreline project and received a NJDEP grant to develop a living shoreline plan for the property. County Parks discussed removing some of the damaged bulkhead and replacing other areas in order to make the area safer and more natural while still maintaining hard structures to protect the roadway. The County will utilize an offshore structure along the 1977 Tidelands line to intercept wave energy and protect the land and nearby road infrastructure. The exact size, location, and type of material will be determined based on the bathymetry, wind, tide and wave energy studies that have yet to be completed. The County may bring in some sand and then utilize native plants to stabilize the nearshore side of the structure. The site will remain open to the public as a day-use area with options for sunbathing, walking, picnicking, and utilizing the cartop boat launch. The County does not plan on allowing trailered boats to access the lagoon, or for swimming to be permitted off the beach.

Cattus Island Shoreline Restoration Project in Toms River Township

Ocean County Parks Department is working directly with Stevens Institute and the consultant to develop the four-year living shoreline restoration project at Cattus Island County Park. Ocean County Planning Department is administering the grant, a \$3 million 2018 Water Quality Restoration Grant from the NJDEP. The County had Stevens Institute of Technology perform most of the preliminary data collection and develop a conceptual plan for a living shoreline. That plan includes a phased approach to break a relatively expensive project into more manageable sizes. Collectively the phases encompass the area from Mizzen Rd. to the west over to Applegate Cove on the east side of Cattus Island County Park. Stevens completed the conceptual plan for this entire area. Ocean County hired a consultant to design and permit Phase 1 of the living shoreline, which primarily covers the tip of Cattus Island. The County will continue future phases as funding becomes available. Phase 1 is currently in the permitting stage with the NJDEP and USACE. The County hopes to complete permitting in the fall of 2024 and advertise the project in order to award construction in the Winter of 2024. The County is in the beginning stages of planning for Phase 2. Complimentary to the Living Shoreline project, Ocean County is also working with Ducks Unlimited, Stockton University and USFWS on an interior marsh restoration plan for Cattus Island to address the subsidence and habitat degradation of the marsh there. Stockton is currently collecting data and working on the restoration plan to potentially use Thin-layer Deposition and other restoration techniques to raise the marsh elevation and reverse the negative effects of past mosquito management while maximizing waterfowl habitat.

Ocean County Community Rating System (CRS) Assistance Program

The Ocean County CRS Assistance Program is intended to promote awareness of the NFIP CRS program among municipal officials responsible for implementing local mitigation activities. It is also intended to help municipalities that may not have access to knowledge or technical capability to participate successfully and/or advance in the NFIP CRS program. Ocean County prioritizes assistance based on a community's technical capacity and professional capability. The Ocean County CRS Users Group is open to municipalities that want to strengthen their knowledge and understanding of the NFIP CRS program. CRS Users Group meetings occur quarterly and are run by the Ocean County Planning Department.

Management of local CRS programs is the responsibility of the participating municipality. If a municipality seeks to request assistance from the County, the request must specify a CRS Activity as identified in the NFIP CRS Coordinator's Manual by Activity Number and Element.

Resilient NJ Program

The Resilient NJ program, funded through United States Housing and Urban Development and managed by DEP, is an assistance program to support local and regional climate resilience planning. The regional program, Resilient Long Beach Island's (LBI) vision includes preserving the functions of natural resources, maintaining community character and economy, and empowering vulnerable populations and youth to serve as forces for change. Resilient LBI developed an action plan to prepare for the anticipated changes. This plan creates projects that reduce risks from flooding and

heavier precipitation as well as achieving a regional vision for the future. The Action Plan includes the following recommendations:

- Policy and outreach including but not limited to developing a climate education program, establishing resilient zoning codes, and creating new or higher flood mitigation design standards.
- A conceptual plan for the popular Bay Village commercial district. This plan offers innovative green infrastructure solutions that may be implemented not only there but incorporated into other applicable sites across the island.
- Establishing / enhancing living shorelines, green streets, and multi-use public spaces that can serve as both open space and stormwater detention systems.
- Enhanced island-wide ecosystem connectivity using roadway improvements and flow path channels.

Thus far, Resilient LBI has evaluated scenarios for long-term solutions and is in the process of implementing an initial group of resilience project concepts. This initial batch of concepts addresses immediate needs like high tide flooding and small storm flood events. The project also pursues long-term and systemic strategies, which are integrated into this Ocean County's mitigation strategy as part of this plan update.

In addition to Resilient LBI, other municipalities within Ocean County have adopted resilience plans through the Resilient NJ program, including Stafford and Ocean Township. Stafford Township adopted Resilient Stafford Action Plan: A Roadmap to Climate Resilience in December 2023, which evaluates current and future risks in Stafford and provides recommended actions to mitigate that risk. Ocean Township adopted the Climate Change-Related Hazard Vulnerability Assessment & Resilience Action Plan in December 2023. This plan focuses on sea level rise and coastal storms, the primary concern for the residents of Ocean, but also considers potential impacts related to increased temperatures, wildfire, and interior stormwater flooding. As part of this analysis, potential threats and vulnerabilities associated with critical facilities and future development are highlighted, setting the stage for the development of potential strategies to reduce or avoid risks.

Dune Grass and Fencing Program

Ocean County has a Dune Grass and Fencing Program where it purchases dune grass and snow fencing for municipalities with beach frontage and municipalities pick it up from the County garages and organizing plantings themselves. The County also donates the surplus to Island Beach State Park through Friends of Island Beach State Park, which has annual volunteer plantings in the Fall and Spring.

Barnegat Bay Partnership

The Barnegat Bay Partnership (BBP) has been engaged in several efforts directly relevant to the HMP. Marsh resilience is critical to many of the coastal watersheds within Ocean County, including Point Pleasant, where the BBP has been engaged in restoring a shoreline and marsh platform to provide improved flood protection for the residents and school which border the degraded marsh. The BBP is also working with Ocean County to restore a shoreline in Ocean Gate on Jeffreys Creek. The BBP organizes a volunteer event every year called "Paddle for the Edge" to survey the bay's shorelines and identify badly eroding sites in need of restoration. The BBP is also nearing completion of two watershed management plans (for the Toms River and Cedar Creek-Forked River-Oyster Creek sub-watersheds) which identify and prioritize stormwater infrastructure and other projects for water quality improvements and flood reduction. The BBP is also offering Bipartisan Infrastructure Law grant funding to address stormwater issues in overburdened communities. Lastly, the BBP has surveyed hundreds of stream-road crossings to identify crossings with potential flooding issues, allowing prioritization of future work to address flooding.

Ocean County Public Outreach and Education

- Mobile Ambulatory Bus (MAB): It is often requested that the Sheriff's Department come to events in the county to perform child ID services. The idea is to collect biometrics and photos of children so that, in the event they are lost or kidnapped, they may be more easily identified.
- Ready, Set, Go! Program: Ocean County supports the New Jersey Ready, Set, Go! Program, which teaches individuals who live in high-risk wildland fire areas how to prepare themselves, their families, and their properties against outdoor fire threats.
- Emergency Preparedness Literature: Ocean County distributes emergency preparedness literature to public-facing services and places like libraries to help educate the public on hazards and preparedness initiatives.
- ReGROUP Program: a mass notification and outreach text for the public as well as CERT team volunteers.
- Ocean County attends and leads long-term care facility and nursing home evacuation drills.
- Pathways to Preparedness Program: Ocean County's new meeting for senior citizens program.

Municipal Coordination

- Mayor's Meeting: Ocean County invites town officials, like mayors, engineers, police, and/or other relevant municipal leaders, to discuss projects along county roads and ensure there are no conflicting projects. This annual meeting occurs each February or March. In 2024, 25 out of 33 municipalities were represented.
- Emergency Operations Plan (EOP) Assistance: The County reviews and provides comments for municipal EOPs and assists municipality access grant money to complete their EOP.
- Joint Ocean County Emergency Management Coordinators Association (EMCA)/ County Emergency Management Council (CEMC): These two committees merged and now meets quarterly to review trainings, EOPs, shelters and long-term facilities, Community Emergency Response Teams (CERT), County Animal Response Teams (CART), and communications. Representation at these meetings include municipal and county officials, organizations that represent socially vulnerable populations (e.g. Salvation Army), climate change experts (e.g. National Oceanic and Atmospheric Administration), and the New Jersey State Police (OEM).
- Quarterly CRS Users Group Meetings: These meetings are open to municipalities that want to strengthen their knowledge and understanding of the NFIP CRS program. CRS Users Group meetings occur quarterly and are run by the Ocean County Planning Department.

5.4 MUNICIPAL CAPABILITIES

This section discusses local-level established capabilities that are used to help advance hazard mitigation. In order to assess local capabilities, a survey was distributed to all municipalities prior to each municipal meeting. Jurisdictions inputted local capabilities that have occurred since the acceptance of the previous plan. The survey asked if each municipal has the listed capability and how it supports hazard mitigation. The municipal capability assessment results are located in each municipal appendix. This section provides an overview of the capability assessment findings.

Participation in the NFIP and CRS

All Ocean County jurisdictions participate in the NFIP. The program is managed by local municipalities participating in the program through ordinance adoption and floodplain regulations. New Jersey DEP provides a coordinating role statewide

while the Ocean County Planning Department provides an oversight and coordination role. Similarly, permitting processes needed for building construction and development in the floodplain are implemented at the municipal level through various ordinances (e.g. zoning, subdivision/land development and floodplain ordinances), but the county provides technical assistance and guidance upon request. Table 5.4-1 provides a summary of Municipal NFIP participation.

Note: Appendix C (located in Appendices Volume II) includes a crosswalk between hazard mitigation participation and the CRS Program (e.g. points municipalities may receive if they participated in the plan update).

Table 5.4-1 Summary of NFIP Participation by Municipality

Municipality	Number of Policies in Force	Total Losses	Total Payments	Number of RL	Number of Mitigation RL Properties	Number of SRL	Number of Mitigated SRL Properties
Barnegat Light Borough	755	232	\$2,682,192.55	8	1	0	0
Barnegat Township	272	308	\$7,560,094.19	29	3	1	1
Bay Head Borough	591	827	\$66,034,965.41	59	2	6	1
Beach Haven Borough	1,619	2,611	\$87,724,416.33	267	23	19	4
Beachwood Borough	26	34	\$1,233,788.55	2	0	0	0
Berkeley Township	1,957	1,963	\$80,613,836.93	110	23	13	11
Brick Township	3,297	3,955	\$274,940,737.86	239	67	13	2
Eagleswood Township	62	190	\$5,598,001.92	21	0	2	0
Harvey Cedars Borough	726	879	\$11,008,223.38	63	3	1	1
Island Heights Borough	57	59	\$2,333,530.99	6	0	0	0
Jackson Township	47	19	\$55,790.69	0	0	0	0
Lacey Township	2,008	2,080	\$53,022,592.95	122	7	21	3
Lakehurst Borough	1	2	\$829.90	0	0	0	0
Lakewood Township	92	19	\$225,229.71	4	0	0	0
Lavallette Borough	1,654	2,043	\$133,861,778.01	101	17	6	3
Little Egg Harbor Township	1,606	4,145	\$205,511,160.85	389	45	50	17
Long Beach Township	4,906	7,634	\$241,807,589.95	549	46	30	7
Manchester Township	70	30	\$1,113,105.97	2	0	0	0
Mantoloking Borough	358	619	\$93,557,495.11	59	10	1	1
Ocean Gate Borough	286	425	\$18,211,172.69	17	1	3	1
Ocean Township	617	816	\$27,215,847.47	73	13	2	1
Pine Beach Borough	22	8	\$98,883.29	0	0	0	0
Plumsted Township	37	39	\$498,133.77	2	0	0	0
Point Pleasant Beach Borough	1,436	1,948	\$103,498,629.22	203	20	7	3
Point Pleasant Borough	1,502	1,285	\$69,452,908.09	64	19	2	1
Seaside Heights Borough	932	1,020	\$54,729,300.69	54	8	9	1
Seaside Park Borough	935	1,085	\$41,509,846.97	67	6	8	2
Ship Bottom Borough	1,132	1,657	\$69,371,173.75	185	7	14	2
South Toms River Borough	5	52	\$2,234,580.77	2	0	2	0
Stafford Township	2,382	4,603	\$269,281,306.77	598	99	25	9
Surf City Borough	1,179	1,396	\$22,464,762	72	10	3	2
Toms River Township	6,564	9,201	\$595,640,863.52	624	240	93	73
Tuckerton Borough	323	1,220	\$42,664,735.77	128	13	9	3

OCEAN COUNTY, NEW JERSEY
HAZARD MITIGATION PLAN 2025

The Community Rating System (CRS) program recognizes communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations, acquisition, relocation, or flood-proofing of flood-prone buildings, preservation of open space, and other measures that reduce flood damage or protect the natural resources and functions of floodplains. 19 communities in Ocean County currently participate in the CRS program and three communities have participated in CRS but have a current status of rescinded (FEMA Community Status Book Report, 2024). The CRS recognizes 18 creditable activities that are organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. Table 5.4-2 lists the CRS status of Ocean County municipalities. The participation of Ocean County municipalities in CRS saves 35,069 policy holders \$5,207,615 in premium savings.

Table 5.4-2 CRS Summary by Municipality

Municipality	CRS Entry Date	Status	Class	Number of Policies	Community Premium Savings	Average Per Policy Savings
Barnegat Light Borough	10/1/1992	Current	7	781	\$92,085	\$118
Barnegat Township	5/1/2014	Current	6	309	\$42,327	\$137
Bay Head Borough	10/1/1993	Current	7	608	\$107,531	\$177
Beach Haven Borough	10/1/1991	Current	5	1,719	\$396,935	\$231
Beachwood Borough			N/A – Not Part of CRS			
Berkeley Township	10/1/2008	Current	6	2,034	\$289,620	\$142
Brick Township	5/1/2017	Current	6	3,500	\$572,602	\$164
Eagleswood Township			N/A – Not Part of CRS			
Harvey Cedars Borough	10/1/1991	Current	8	756	\$71,540	\$115
Island Heights Borough			N/A – Not Part of CRS			
Jackson Township			N/A – Not Part of CRS			
Lacey Township	10/1/1992	Rescinded	10	-	\$0	\$0
Lakehurst Borough			N/A – Not Part of CRS			
Lakewood Township			N/A – Not Part of CRS			
Lavallette Borough	5/1/2004	Current	7	1,759	\$228,197	\$130
Little Egg Harbor Township	5/1/2018	Current	6	1,649	\$195,979	\$119
Long Beach Township	10/1/1992	Current	7	1,759	\$228,197	\$130
Manchester Township			N/A – Not Part of CRS			
Mantoloking Borough	10/1/1992	Current	7	361	\$59,299	\$564
Ocean Gate Borough			N/A – Not Part of CRS			
Ocean Township	4/1/2023	Current	6	631	\$108,518	\$172
Pine Beach Borough			N/A – Not Part of CRS			
Plumsted Township			N/A – Not Part of CRS			
Point Pleasant Beach Borough	5/1/2009	Current	6	1,456	\$239,622	\$165
Point Pleasant Borough	10/1/1993	Current	7	1,548	\$157,482	\$102
Seaside Heights Borough	5/1/2017	Rescinded	10	-	\$0	\$0
Seaside Park Borough	10/1/2006	Current	7	1,005	\$169,042	\$168
Ship Bottom Borough	10/1/1992	Current	7	1,187	\$168,297	\$142
South Toms River Borough			N/A – Not Part of CRS			
Stafford Township	10/1/1991	Current	5	2,463	\$415,483	\$169
Surf City Borough	10/1/1992	Current	8	1,218	\$120,303	\$99
Toms River Township	10/1/1992	Current	7	6,973	\$847,917	\$122
Tuckerton Borough	10/1/1993	Rescinded	10	-	\$0	\$0

5.5 PLAN INTEGRATION

This section discusses how Ocean County is currently integrating their plans and regulations with hazard mitigation and their strategy to integrate this HMP update with other community planning initiatives.

County Integration Activities

Subregional Studies Program: Ocean County Coastal Evacuation Plan Improvements Study

The Subregional Studies Program (SSP) is a reoccurring grant through North Jersey Transportation Planning Authority (NJTPA). The goal was to apply for the FY 2025-2026 funding round; however, Ocean County did not have the capacity to continue in the application process last year. It hopes to reapply with the same proposal in the next funding round (tentatively due in FY 2026-2027).

The study description is as follows: The study follows one of the recommendations of the Ocean County Long Term Community Recovery Plan (OCLTRP); to improve and strengthen the County coastal evacuation policies and practices by incorporating elements of sustainable evacuation route improvements by using transportation planning and scientific data. This would include fuel management and access, re-entry plans, and addressing special needs population needs, including elderly and people without access to vehicles and post-storm information. The study would aim to utilize records and data from past storms to evaluate specific issues and vulnerabilities within the current plan and routes, to include every type of flooding scenario, and would include factors such as sea level rise and weather pattern alterations. The study would also incorporate ideas and recommendations to ensure the evacuation routes' sustainability and the evacuation events' plans.

Public Safety Tower Plan

The development of wireless communication towers within the Pinelands Area is regulated by the Pinelands Comprehensive Management Plan (CMP). Within the more conservation-oriented management areas, any proposed tower over 35' must align with an existing comprehensive local communication facility plan approved by the Commission (in addition to meeting other tower siting and environmental standards). If the proposed location does not align with one of the approved plans, then the wireless provider (public or private) would need to seek a tower plan amendment.

Ocean County participated in the 2012 [Public Safety Tower Plan](#) prepared by NJOIT which provided a future build out of public safety towers for the seven counties within the Pinelands Area. In 2017, Ocean County proposed a modification of that plan that allowed the County to build a new tower at a more suitable site further away from the originally proposed site in Jackson Township.

Ocean County Transportation Model 2017 Update

The [Ocean County Transportation Model 2017 Update](#) lists future roadway improvement projects to increase safety and reduce the risk of flooding, including several roadways on Long Beach Island. To reduce frequent flooding along Rt.72 and the intersections, the plan recommended the installation of a new storm drainage system and a pump station along with a sand filter. The project also includes the installation of bicycle and pedestrian accommodations, ITS improvements, highway lighting and utility relocations. This plan also includes recommended bridge replacements and intersection reconfigurations. The projects listed in the Ocean County Transportation Model Update were included in the County's mitigation strategy.

Local Integration Activities

Table 5.5-1 details how each municipality is currently integrating their plans and regulations with hazard mitigation and their strategy to integrate this HMP update with other community planning initiatives.

Table 5.5-1 Ongoing Planned Municipal Integration Activities

Municipality	Ongoing Planned Integration Activities
Barnegat Light Borough	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.</p> <p><u>Emergency Operations Plan:</u> EOP will be updated to reflect the hazards discussed in the HMP, especially with regard to probability, impact, and extent.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Coastal Vulnerability Assessment, Resilient NJ Planning Documents.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> Code 94-68 No building permits shall be issued for new construction on any lands west of Central Avenue unless said land is raised to elevation 5.0 in NAVD 1988 Datum or a maximum of 20 inches above the edge of pavement street grade, measured at the midpoint of the lot. Should the property be above elevation 5.0, the fill required will be eight inches above the edge of pavement street grade. Associated drainage also required.</p>
Barnegat Township	<p><u>Floodplain management:</u> Community will use the HMP to support future floodplain management.</p>
Bay Head Borough	<p><u>Comprehensive/Master Plan:</u> Document addresses flooding but will be reviewed with the up-to-date flood vulnerability and instances described in the HMP.</p>
Beach Haven Borough	<p><u>Stormwater Management Plan:</u> As a part of the next Stormwater Management Plan Update, the HMP will act as a resource to identify areas of flooding, and flood mitigation activities will be incorporated as appropriate.</p> <p><u>School Emergency Operations Plan:</u> Plan components will be supported by data in HMP.</p> <p><u>Current/recent redevelopment plans or studies:</u> Numerous redevelopment plans have been adopted in recent years for infill development within the Business District.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Coastal Vulnerability Assessment, Resilient NJ.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> The Borough has 60% maximum impervious requirement for new development. Variances for use of porous pavement is being seen and usually approved.</p>
Beachwood Borough	<p><u>Emergency Operations Plan:</u> EOP will be updated to reflect the hazards discussed in the HMP, especially with regard to probability, impact, and extent.</p> <p><u>Substantial Damage/Improved Structures Response:</u> The community identifies substantially damaged/improved structures and ensures they are brought into compliance via review of permits by construction official and code/zoning official.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Yes.</p>
Berkeley Township	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas and to provide for future mitigation projects.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Berkeley Hazard Mitigation Plan adopted October 2015, Emergency Management Plan adopted March 2024.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> Yes.</p>

Municipality	Ongoing Planned Integration Activities
Brick Township	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas. Zoning ordinance in particular can be improved by zoning flood prone areas as Conservation and Open Space.</p> <p><u>Comprehensive/Master Plan:</u> Document will be revisited to ensure it adequately discourages development in known hazard areas. Plan will also be revisited to explore CRS participation.</p> <p><u>Repetitive Loss Plan:</u> Identifies RLAA Area and outlines policy and procedure.</p> <p><u>Community Wildfire Protection Plan:</u> 5-Year plan for Wildfire Protection.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Hazard Mitigation Plan 3/30/2016.</p>
Eagleswood Township	<p><u>Emergency Operations Plan:</u> EOP will be updated to better reflect the mitigation actions selected in the HMP.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> Airport Safety Zone.</p>
Harvey Cedars Borough	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.</p> <p><u>Emergency Operations Plan:</u> EOP will be updated to reflect the hazards discussed in the HMP, especially with regard to probability, impact, and extent.</p>
Island Heights Borough	<p><u>Comprehensive/Master Plan:</u> Document does not currently address hazards. At next update, the HMP will be reviewed and discussion of hazard-prone areas will be added as appropriate.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> Yes.</p>
Jackson Township	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas, especially the deficiencies identified related to the Township’s steep slope ordinance.</p> <p><u>Coordination with private dam owners:</u> Township will work with private dam owners to identify future risks and mitigation activities to reduce flooding risks related to dam failures.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Community Wildfire Protection Plan is under development.</p>
Lacey Township	<p><u>Comprehensive/Master Plan:</u> Document does not currently address hazards. At next update, the HMP will be reviewed and discussion of hazard-prone areas will be added as appropriate.</p>
Lakehurst Borough	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.</p>
Lakewood Township	<p><u>Comprehensive/Master Plan:</u> Document currently minimally addresses hazards (terrorism and severe weather). At next update, the HMP will be reviewed and discussion of hazard-prone areas will be added as appropriate.</p>
Lavallette Borough	<p><u>Comprehensive/Master Plan:</u> Document does not currently address hazards. At next update, the HMP will be reviewed and discussion of hazard-prone areas will be added as appropriate.</p>
Little Egg Harbor Township	<p><u>Floodplain management:</u> Community has adopted the ABFE maps and will use the HMP to support future floodplain management.</p> <p><u>Community education and outreach:</u> Community has police and fire outreach programs in schools; HMP will be used as a resource for developing program in the future.</p> <p><u>GIS and mapping capability:</u> Community will work with County OEM to obtain GIS data used in HMP to improve local mapping program.</p>

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Municipality	Ongoing Planned Integration Activities
Long Beach Township	<u>Building code:</u> At time of next update, code will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate.
Manchester Township	<u>Hazard identification and documentation:</u> A joint effort between Emergency Services and the Bureau of Inspections identifies and documents hazards. HMP data sources and findings will be used to supplement local identification efforts.
Mantoloking Borough	<p><u>Comprehensive/Master Plan:</u> HMP will be used to support Master Plan updates and flooding resiliency goals and objectives.</p> <p><u>Evacuation planning:</u> Community will use HMP community flood vulnerability and sea level rise mapping to improve evacuation plans with alternative routes and/or alternative re-entry strategies.</p> <p><u>Substantial Damage/Improved Structures Response:</u> A substantially damaged structure is identified after a natural disaster or house fire by the Flood Plain Manager with the assistance of the Construction Code Official. During the permit application process, the Flood Code Administrator reviews the proposed improvements to identify a Substantially Improved Structure. All structures require permit approvals prior to construction including improvements for flood damage prevention code compliance. All permits require inspections for permit close-out.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Flood Mitigation for Back Bay Flooding Plan (2020).</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> Dune areas are regulated by local ordinances and NJDEP regulations.</p>
Ocean Gate Borough	<u>Acquisition of land for open space and public recreation:</u> Community has a precedent of purchasing land for open space. HMP will be used to identify acquisition sites that may also help alleviate risks.
Ocean Township	<p><u>Floodplain management:</u> Community will use the HMP to support future floodplain management.</p> <p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.</p> <p><u>Current/recent redevelopment plans or studies:</u> Waretown Town Center Economic Redevelopment Plan.</p> <p><u>Other Plans that discuss hazard mitigation:</u> Township of Ocean Vulnerability Assessment & Resilience Action Items.</p>
Pine Beach Borough	<u>Floodplain management:</u> Community has adopted the ABFE maps with one foot of freeboard and will use the HMP to support future floodplain management.
Plumsted Township	<p><u>Hazard identification and documentation:</u> Community will use information in the HMP to continue their evaluation of the risk and vulnerability of erosion and sinkholes.</p> <p><u>Commodity Flow Study:</u> Community will use HMP as a basis for evaluating its vulnerability to hazardous materials incidents and determining if a Commodity Flow Study would assist in reducing risk.</p>
Point Pleasant Beach Borough	<p><u>Floodplain management:</u> Community has adopted the ABFE maps with one foot of freeboard and will use the HMP to support future floodplain management.</p> <p><u>Local land use codes:</u> Local OEM will look into creating a natural hazard ordinance to assist in reducing risk using the Risk Assessment section of the HMP to guide which hazards should be addressed.</p>
Point Pleasant Borough	<u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.
Seaside Heights Borough	<u>Comprehensive/Master Plan, Capital Improvement Plan, Economic Development Plan, EOP, Continuity of Operations Plan:</u> Community is reviewing these planning mechanisms post-Sandy. HMP will be used to assist in the review and any appropriate updates stemming from hazard events.

Municipality	Ongoing Planned Integration Activities
Seaside Park Borough	<p><u>Comprehensive/Master Plan</u>: This master plan re-examination has resiliency and sustainability goals and objectives; discusses the Ocean County HMP 2020; and a Climate Change-Related Hazard Vulnerability Assessment.</p> <p><u>Emergency response protocols</u>: Community has emergency response protocols for a number of hazards. Protocols will be reviewed with the HMP risk assessment to identify any appropriate changes.</p>
Ship Bottom Borough	<p><u>Floodplain management</u>: Community has adopted the ABFE maps with one foot of freeboard and will use the HMP to support future floodplain management.</p> <p><u>Current/recent redevelopment plans or studies</u>: LBI Grade School Redevelopment Plan (2024).</p> <p><u>Other Plans that discuss hazard mitigation</u>: Coastal Vulnerability Assessment, Resilient LBI Plan.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards</u>: The Borough maintains a lot fill requirement for new construction and substantial improvements within certain areas.</p>
South Toms River Borough	<p><u>Building code, floodplain ordinance, and/or local land use codes</u>: Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.</p>
Stafford Township	<p><u>Floodplain management</u>: Community has adopted the ABFE maps and will use the HMP to support future floodplain management.</p> <p><u>Comprehensive/Master Plan</u>: Document currently minimally addresses hazards. At next update, the HMP will be reviewed and discussion of hazard-prone areas will be added as appropriate.</p> <p><u>Other Plans that discuss hazard mitigation</u>: Sustainability Plan (2023), Resilient Stafford Plan (2023), Mud City Climate Resilience and Ecological enhancement Study (2023), Bathymetric Study for Stafford Township (2020).</p>
Surf City Borough	<p><u>Floodplain management</u>: Community has adopted the ABFE maps and will use the HMP to support future floodplain management.</p> <p><u>Evacuation planning</u>: Community will use HMP community flood vulnerability and sea level rise mapping to improve evacuation plans with alternative routes and/or alternative re-entry strategies.</p> <p><u>Substantial Damage/Improved Structures Response</u>: The Borough has adopted a 10-year look back for a cumulative total. If that total exceeds fifty percent of the structure, substantial improvement rules apply.</p> <p><u>Current/recent redevelopment plans or studies</u>: Any development/redevelopment in Surf City Borough is residential. The Borough is entirely in the Special Flood Hazard Area.</p>

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Toms River Township	<p><u>Building code, floodplain ordinance, and/or local land use codes:</u> Codes will be reviewed with the approved HMP to incorporate findings of the HMP risk assessment as appropriate to address hazard-prone areas.</p> <p><u>Comprehensive/Master Plan:</u> Document addresses the conservation of open space to develop greenways. HMP will be used to identify other natural systems whose conservation would address both open space and hazard risk reduction.</p> <p><u>Floodplain Development Ordinance:</u> The Floodplain Ordinance (Chapter 313 of Twp. Code) was adopted on March 12, 2013. The Variance procedure for appeals was modified on February 27, 2018, and again on February 9, 2022. The fees section was updated February 9, 2022.</p> <p><u>Disaster Debris Management Plan:</u> Toms River Township Debris Management Plan.</p> <p><u>Post-Disaster Recovery Plan:</u> ESF Long Term Community Recovery.</p> <p><u>Community Wildfire Protection Plan:</u> ESF Firefighting.</p> <p><u>Other ordinance and regulation that mitigate the impacts of natural hazards:</u> The Township Land Use and Development Regulations of the Township Code (Chapter 348).</p>
Tuckerton Borough	<p><u>Critical facilities/critical infrastructure protection:</u> Community will use the HMP to support mitigation of community facilities and infrastructure. This process will be led by the community flood vulnerability analysis and mapping from the HMP.</p>

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6.0 MITIGATION STRATEGY



6.0 MITIGATION STRATEGY

6.1 PROCESS SUMMARY

Ocean County’s mitigation strategy is the blueprint for reducing potential future losses from hazards. The mitigation strategy provides information to guide county and municipal decision making regarding the protection of people and property. The Ocean County HMP includes goals, objectives, and actions identified by municipal, county and other stakeholders. Mitigation goals are general guidelines that explain what the County wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. Actions provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve prescribed goals and objectives.

The steps involved in developing a mitigation strategy were introduced at the November 14, 2023, Steering Committee Kickoff Meeting and discussed in depth at meetings conducted with each individual municipality. The Planning Team met with each municipality in the Summer of 2024 to review the current status of hazard mitigation planning and actions. Meetings occurred mostly in person, with a few conducted virtually, depending on the preference of the municipality. Those invited included municipal officials, particularly those involved in emergency management and implementation of mitigation actions, as well as other stakeholders invited by the municipality. During these meetings, the Planning Team evaluated and discussed hazards of concern, significant events that have occurred since the last plan update, high risk areas, existing capabilities, and mitigation actions from the past five years and new actions to include in this plan update. The Project Team consolidated the notes from the meetings to draft a mitigation summary for each municipality. The local mitigation actions are included in Appendices V.I – Jurisdictional information.

The Ocean County 2025 mitigation strategy includes 104 new and 329 ongoing mitigation actions. Since 2020, a total of added 62 mitigation actions have been completed and added 34 have been withdrawn. The new actions were identified by each municipality based on their risk and capability. A variety of mitigation methods were used to address all hazards present in Ocean County.

6.2 MITIGATION GOALS AND OBJECTIVES

The Goals and Objectives from the 2020 County HMP are revised after evaluation with the Steering Committee during project kick off. The Steering Committee considered the goals and objectives from the New Jersey State Mitigation Plan (2024) and recent FEMA guidance when evaluating the 2020 mitigation goals. The **red text** displays the change in goals and objectives from the 2020 HMP.

Table 6.2-1 Ocean County Goals and Objectives

GOAL 1	Encourage sustainable development to protect people, property, community resources and the environment from natural and human-made disasters
Objective 1A	Apply stringent floodplain management standards and practices to reduce risk
Objective 1B	Leverage building codes, land use codes, floodplain development ordinances, comprehensive plans, and other planning mechanisms to prevent and mitigate the impact of disasters on people and property
Objective 1C	Improve information available for mitigation planning
Objective 1D	Coordinate and increase applications for Federal and State grant programs
Objective 1E	Integrate and leverage other planning mechanisms s from neighboring jurisdictions; local, county and regional organizations; and State partnerships to implement Ocean County HMP

Objective 1F	Improve regional shelter management
Objective 1G	Develop and maintain an understanding of increased risk from climate change impacts to natural hazards
Objective 1H	Reduce the risk of natural hazards for socially vulnerable populations and underserved communities
GOAL 2	Build and rebuild structures and infrastructure to protect people and to reduce impacts of future disasters
Objective 2A	Use elevations, acquisitions, and floodproofing to reduce flood exposure of residential properties
Objective 2B	Increase the number of community lifelines, critical facilities, and community assets protected from hazards
Objective 2C	Improve the ability of community lifelines , critical facilities and infrastructure to safely operate during storms and utility interruptions
Objective 2D	Improve evacuation capability
Objective 2E	Improve existing structures to resist back bay flooding
GOAL 3	Protect and restore the natural environment to support disaster resiliency
Objective 3A	Improve health of natural systems to safely and naturally accommodate flooding and wildfire
Objective 3B	Use nature-based solutions, where appropriate, to reduce risk to residential properties and other community resources
Objective 3C	Plan for increased open space in most vulnerable areas, including opportunities for marsh migration
Objective 3D	Promote appropriate urban-wild land interface for wildfire mitigation
GOAL 4	Promote education, awareness and outreach before, during and after disaster
Objective 4A	Improve and expand information and opportunities for input available by television, radio, websites, social media, newsletters, and meetings
Objective 4B	Increase participation in mitigation programs including CRS, StormReady, and FireWise
Objective 4C	Tailor timely messages for audiences including children, parents, community groups, universities, seniors and other groups
Objective 4D	Improve alert and warning systems
GOAL 5	Mitigate High Hazard Potential Dams* (new goal)
Objective 5A	Mitigate the eight High Hazard Potential Dams in the County to reduce the risk of dam failure

6.3 EVALUATION AND PRIORITIZATION OF MITIGATION ACTIONS

When the Project Team met with the municipalities and the County, each mitigation action was discussed and updated based on their current status. The status evaluation includes completed, ongoing, withdrawn, or new.

Completed: The County and each municipality established which mitigation actions were successfully completed over the previous five-year cycle. For these completed actions, the County or municipality identified action details that may have changed or expanded, such as scope, cost, and funding source. The 2025 HMP contains the most up-to-date information provided for these actions, and the action will not be included in the mitigation actions table in future plan updates.

Ongoing: The Planning Team worked with the County and each municipality to reflect progress in the HMP implementation. Ongoing mitigation actions are those that were started but not completed or not started. They are

carried forward from the 2014 and/or 2020 plan into this plan update. In each municipal appendix, the reasoning for the ongoing status is noted in the “Notes” column.

Withdrawn: The Planning Team also worked with the County and each municipality to pinpoint Withdrawn Mitigation Actions, those that were included in the previous HMP but are no longer feasible, practical, or necessary to implement. These typically are actions completed by another entity or actions combined with other actions but may also be actions that did not retain political or fiscal viability.

New: The Planning Team worked with the County and each municipality to identify New Mitigation Actions to include in the hazard mitigation planning process. These may be actions that were started but not discussed in previous HMPs or actions that the County or municipality intends to start in the coming five years.

Prioritization of Mitigation Actions

In addition to reviewing the status of each mitigation action, the Project Team worked with municipalities and the County to prioritize all ongoing and new actions using the New Jersey State Hazard Mitigation Plan’s (2024) Mitigation Action Prioritization Tool (MAP-T). Municipalities and the County reviewed their ongoing and new actions against MAP-T’s 14 criteria (Table 6.3-1) to evaluate the priority of the mitigation action. The more criteria that an action addresses, the higher its priority becomes. Action prioritization rankings are Low (action meets less than 6 criteria), medium (action meets between 7-11 criteria, and High (action meets above 11 criteria).

Table 6.3-1 MAP-T’s Criteria and Description

Criteria	Description
Life Safety	Protection of life and prevention of injury Consider adverse effects on one segment of the population.
Property Protection	Elimination and reduction of damage to structures and infrastructure. Consider development in the floodplain or high-risk areas.
Cost-Effectiveness	Commensurateness of cost of the action with the benefits achieved.
Political	Public support and political will in support of the action. Consider any conflict with development pressures.
Legal	Authority to implement the action.
Fiscal	Capability to fund under existing program budgets, obtain authorization for a new budget, or acquire funding from another source like a grant.
Environmental	Potential environmental impacts of the action, compliance with environmental regulations, and co-benefits of the action.
Social Vulnerability	Benefits to socially vulnerable populations and underserved communities.
Administrative	Personnel and administrative capabilities to implement the action and maintain it, capability to obtain outside help, and alignment of the project’s scope and scale with the entity’s capabilities.
Hazards of Concern	Mitigation of high-ranked hazards through the action.
Climate Change	Incorporation of climate change projections for the State into the action, designs to withstand/address long-term conditions, and consistency with the State’s climate resilience goals.
Timeline	Capability to complete the action in less than 5 years (within the planning horizon of the HMP).
Community Lifelines	Benefits that the action provides to community lifelines.
Other State and Local Objectives	Advancement of other entity objectives, like capital improvements, economic development, environmental quality, or open-space preservation, and support of policies of other plans and programs.

6.4 MUNICIPAL MITIGATION STRATEGY SUMMARY

This section provides a high-level summary for each municipality’s mitigation strategy. New to this plan is the “Overall Mitigation Strategy” statement, which summarizes what each municipality has prioritized through hazard mitigation planning since the last HMP in 2020 and their plan on what to prioritize for hazard mitigation in the next five years (2030). The Project Team worked with the municipalities to develop their mitigation strategy statement, which is included in Table 6.4-1. Additionally, the number of completed, ongoing, new, and withdrawn actions are also included in Table 6.4-1. For the full municipal mitigation strategy, refer to each municipal appendix (Appendices Vol. I – Jurisdictional Information).

Table 6.4-1 Municipal Mitigation Strategy Summary

Municipality	Overall Mitigation Strategy	# of Completed Actions	# of Ongoing Actions	# of New Actions	# of Withdrawn Actions
Barnegat Light Borough	Barnegat Light is home to many year-round and seasonal residents as well as home to primary Critical Lifeline Infrastructure including the United States Coast Guard Station - Barnegat Light and Viking Village Commercial Fishing Dock which provides docking and seafood packing and shipping service for up to 40 boats varying in size up to 110 FT long. These boats help support the American Seafood Industry ensuring reliable food security and healthy ecosystems and also provide a means of alternative transportation to the mainland. The Borough will continue to monitor best available data for future projects related to flooding and other hazards and will also prioritize the continued maintenance and access to, as well as the safety of the United States Coast Guard Station -Barnegat Light and the Viking Village Facility.	1	10	4	2
Barnegat Township	Since Superstorm Sandy, Township of Barnegat has focused mitigation strategy primarily towards ensuring non-residential properties and residential homes in flood prone areas become more resilient, through additional permit standards, freeboard elevation requirements, and flood education and awareness tools. Also, critical infrastructure is prioritized to ensure facilities operate during storm events or are able to recover quicker after events. Grant opportunities that promote climate change resilience are also pursued, with emphasis on flood protection and pre-disaster mitigation. With the western portion of the Township, various fire protection strategies continue, including the Firewise program, which continues to receive strong community support and involvement. Over the next five years, Township will prioritize roadway elevations, especially along evacuation routes. In addition, updated Ordinances regarding zoning and stormwater management will continue to be reviewed and implemented. Township will continue to assist homeowners regarding home elevations, flood mitigation strategies, forest fire protection strategies, and overall hazard mitigation and prevention.	4	6	7	1
Bay Head Borough	The Borough of Bay Head along, with the County, has upgraded some of the roads, raised the roads and storm drains to help with flooding. The five-year plan includes the Borough of Bay Head going after mitigation grants and funding to support the efforts of the flooding throughout town that included the County roads. As the five-year plan would also encourage residents and businesses to raise their properties if affected by future flooding.	1	11	1	2
Beach Haven Borough	Beach Haven Borough initiated mitigation actions directly after the entire community was significantly impacted by Superstorm Sandy in 2012 including the assessment of all critical facilities and Borough owned properties for flood hazard compliance and immediate outreach and education to residents. Since that time, the Borough has constructed a new Municipal Building, built new wells and a water treatment plant, replaced miles of water, sanitary sewer and stormwater drainage pipe, installed three pump stations and raised numerous bulkheads among many other projects to support resilience. Moving forward, Borough officials will continue to monitor hazard impact projections and prioritize mitigation actions accordingly with road elevation and stormwater management/flood control being the primary priorities as well as supporting the local community to elevate their homes if needed.	0	20	3	0

Municipality	Overall Mitigation Strategy	# of Completed Actions	# of Ongoing Actions	# of New Actions	# of Withdrawn Actions
Beachwood Borough	Beachwood borough works to maintain a mitigation strategy encompassing the review of potential hazards potentially affecting the municipality and the recovery of hazards including flooding, hurricane, and storm damage. a continued priority is to educate the community on preparedness and monitoring such events.	1	3	2	3
Berkeley Township	The Township of Berkeley is a community that actively works towards resilience measures and damage from natural disasters and adapt to future climate concerns. Since 2020, the Township has completed purchasing a maintaining critical facilities to continue community services during any interruptions during storm events, improve the Evacuation Plan for the residents and personal, establish a Debris Removal Plan for protection during a natural disaster, acquired properties to remove structures permanently out of the floodplain and to continue to review structures that are not compliant, to require these homeowners to demolish and raise to build to higher standards and elevation that will mitigate the impact of flood related hazards while maintaining residents in the community. Moving forward, Berkeley Township will be prioritizing and evaluating homes, structures, roadways, and critical infrastructure to be removed or raised and to coordinate with the state and local agencies on the best ways to achieve resiliency within these vulnerable areas of the Township.	10	13	11	1
Brick Township	Brick Township’s mitigation strategy includes incorporation of one roadway elevation project into its capital improvement plan annually to address minor flooding along developed communities during normal tidal cycles.	5	31	5	1
Eagleswood Township	The Township of Eagleswood seeks to address mitigation for all hazards throughout the waterfront and forested areas of the Township. The Township will focus on outreach to the public and coastline stabilization. The Township plans to continue to focus on public outreach, improving storm drainage systems, elevating roadways, and protecting public buildings and infrastructure.	0	3	2	1
Harvey Cedars Borough	The Borough is committed to the protection of life and property from natural hazards. Since 2020, the Borough of Harvey Cedars has made bayside flooding a priority. Further review and change of various ordinances (ex: for new construction) has helped new homes from sustaining flood damage. Adjusting zoning requirements and adding additional drainage has also aided in reducing some flooding on bay side street ends.	3	13	6	0
Island Heights Borough	Island Heights has made many improvements over the past few years to mitigate damages from future storms and other events. The overall strategy is to make infrastructure improvements to better handle localized flooding, to improve the water distribution system to help with firefighting effectiveness and to identify public buildings and utilities that need to be modified or raised to prevent future flooding. We continue to look 0 ways to design and finance a roadway improvement on one or more access roads that are prone to flooding. Raising any of these roadways may cause other localized issues that must be considered.	4	4	2	1
Jackson Township	Jackson Township’s mitigation strategy includes wildfire mitigation projects, target hardening critical infrastructure, and improving stormwater drainage from heavy rain events.	0	6	3	1
Lacey Township	Lacey Township’s mitigation strategy includes elevating roadways that experience high tide flooding, purchasing a railroad right-of-way for a new evacuation route, constructing a resilience park, replenishing and stabilizing the Bayside Beach shoreline, and target hardening Township parks.	2	4	6	2
Lakehurst Borough	The Borough’s plan is to focus on utility interruptions with installation of permeant generators at key locations specially for the use of a shelter. Mitigation of wildfires through planning and education. Reduce traffic accident due to environmental issues and implement additional signage.	1	6	7	1
Lakewood Township	Lakewood Township’s mitigation strategy is to improve drainage around Lake Carasaljo to reduce the risk of flooding and to purchase and install generators critical facilities.	1	4	1	0
Lavallette Borough	The overall mitigation strategy for the Borough of Lavallette is primarily focused on issues involving hurricane, high water/flooding, and coastal erosion. The hazard mitigation plan contains actions focused on improving resiliency in these problem areas.	0	7	3	0

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Municipality	Overall Mitigation Strategy	# of Completed Actions	# of Ongoing Actions	# of New Actions	# of Withdrawn Actions
Little Egg Harbor Township	The Township of Little Egg Harbor seeks to address hazard mitigation for all hazards throughout all portions of the Township, which include both forested and waterfront areas. The Township has focused on outreach to the public as well as security measures and coastline stabilization. The Township plans to continue to public outreach, improving storm drainage systems and elevating roadways, and protecting public buildings and infrastructure.	7	13	2	2
Long Beach Township	The Township of Long Beach Township seeks to address hazard mitigation for all hazards throughout all portions of the Township, which include waterfront areas. The Township has made many improvements over the past few years to mitigate damages from future storms and other events and focused on outreach to the public as well as security measures and coastline stabilization. The Township plans to continue to public outreach, improving storm drainage systems and elevating roadways, and protecting public buildings and infrastructure. The overall strategy is to make infrastructure improvements to better handle localized flooding, and to identify public buildings and utilities that need to be modified or raised to prevent future flooding. Resilient LBI Action Plan all which promote a flourishing community and further support the municipality's resiliency goals.	2	11	3	3
Manchester Township	Manchester Township's mitigation strategy for the next five years include implementing mitigation actions from the Wrangle Brook Dam Study, protect development in the Pine Barrens from wildfire through requiring defensive fencing for new development, and installing filters for wells to decrease PFAs.	1	7	4	3
Mantoloking Borough	Mantoloking is subject to the many hazards listed in the Hazard Identification section which requires an aggressive approach to successfully managing its infrastructure and maintaining health, safety and welfare of its residents and their property. This multi-faceted approach has been developed over many years and continues to improve over time with the implementation of various improvements through capital projects, the adoption of new municipal ordinances and resolutions and the purchase of appropriate equipment. Mantoloking will continue to do what is necessary to pursue and improve upon methods to mitigate damages to property and the environment within the Borough while protecting it from natural disasters by efficiently preparing for and recovering from such hazards.	2	19	1	0
Ocean Gate Borough	Ocean Gate's mitigation strategy for the next five years includes implementing mitigation actions form the Ocean Gate Beach Resilience Study, elevating homes and critical infrastructure in the Floodplain, coordinate with the County on evacuation plans, and dredging Jeffery's Creek.	0	14	3	1
Ocean Township	The Township of Ocean seeks to address hazard mitigation for all hazards throughout all areas of the Township. The Township has focused on outreach to the public and enforcement of all hazards related laws and regulations. The Township plans to continue to address security related issues as well as coastal erosion and flooding to protect residents and critical infrastructure.	2	5	3	0
Pine Beach Borough	The Borough of Pine Beach will continue its mitigation strategies that include the hazards that are present along the waterfront area and seek to improve them to the best of our ability. The Borough plans to continue the public outreach programs as well as to continue to look into better ways that we may be able to help raise houses in the flood area. We also need to promote updating and replacement of bulkheading to better control those flood prone areas as well as coastal erosion. The strategies also include the maintenance of the dune areas along with replacement of dune fencing and beach habitat, all to protect the waterfront community from flood related hazards. Together with local and state help we can continue to better protect our waterfront.	1	8	2	1

Municipality	Overall Mitigation Strategy	# of Completed Actions	# of Ongoing Actions	# of New Actions	# of Withdrawn Actions
Plumsted Township	The Township of Plumsted is able to address hazards mitigation internally and with or mutual aid agreements with our surrounding communities. The township plans to continue informing the public about our improving the township roadways, drainage systems to protect township residents and businesses buildings. The township addressed it in our EOP that we handed into the county. Plumsted Township has also added a full-service OEM canine unit for missing persons adopting a local team Central Jersey K9 Search and Rescue to include live find area search and human remains detection K9's. We are also the only OEM Coordinator Certified and Graduate of the Cape May County Sheriff's K9 Academy with his Bloodhounds and are all vetted by the State of New Jersey and utilized by surrounding counties and the state regularly.	1	8	1	0
Point Pleasant Beach Borough	The Borough of Point Pleasant Beach's mitigation strategy includes more public outreach on home elevations in flood prone areas and elevating and improving drainage on the Borough's lowest streets.	0	8	5	0
Point Pleasant Borough	The State of New Jersey will be adding five feet to the flood inundation zone maps by early November 2024; therefore, the Borough will work with the State on communicating this regulatory change with residents. Barnegat Bay Partnership will be purchasing a nine-acre tract around Nellie Bennett Salt March for about \$1.25 million which is part of a larger proposal for a total of 22 acres for a total cost of \$4-5 million.	0	11	2	1
Seaside Heights Borough	The Borough of Seaside Heights wants to focus their mitigation strategy on reducing the risk of high tide flooding from the Barnegat Bay. This includes new pumping stations and cleaning, repairing, and upgrading stormwater piping and catch basins.	3	7	6	0
Seaside Park Borough	The Borough of Seaside Park is a community that actively works towards resilience to damage from natural disasters and adapt to future climate concerns. The Borough has actively completed many elevations of homes, critical facilities, and structures since 2020 and continues to bring structures into compliance based on local ordinances and FEMA regulations. Moving forward Seaside Park will prioritize structures, roadway and critical infrastructure elevation and coordinate with state and local agencies on the best ways to achieve resiliency.	3	20	4	2
Ship Bottom Borough	Since the impacts of Superstorm Sandy in 2012, the Borough of Ship Bottom has prioritized resiliency and future climate change impacts in all decision-making ranging from development of capital budgets to ordinance preparation and initiation of infrastructure projects so as to best be prepared at the time of another significant and damaging storm. This commitment to risk planning has ensured that the Borough is better positioned to be more resilient and will be able to resume normal day-to-day operations in a shorter amount of time than in 2012. The Borough will continue to assess and plan critical infrastructure improvements as well as coordinate with support teams on obtaining the funding necessary to complete these projects and to assist residents with implementation of hazard mitigation strategies, such as home elevation or lot fill, that will be beneficial to the individual and the community.	1	7	2	0
South Toms River Borough	Based on stakeholder input, identified risks, and available capabilities, the Borough of South Toms River Office of Emergency Management has updated this Hazard Mitigation Plan's goals and objectives as part of a strategy for mitigating hazard-related losses with a focus on flood-prone areas of the Borough due to our proximity to several natural waterways. We have also added an item related to a location that stores bulk fuel and are developing a method to protect the facility from hazards both natural and manmade. Our overall strategy is to implement mitigation activities that are cost-effective, technically feasible, and environmentally sound as well as allowing strategic investment of limited resources.	0	7	2	1
Stafford Township	The Township of Stafford is a sustainable community that actively works to fuse scientific evidence with proactive policy and aims to improve Stafford's resilience to damage from natural disasters and adapt to future climate concerns. Since 2020, the Township has completed a Community Wildlife Protection Plan, the Southern Barnegat Bay Watershed Protection and Restoration Plan, and the Resilient Stafford Action Plan all which promote a flourishing community and further support the municipality's resiliency goals. Moving forward, Stafford	6	19	25	2

Municipality	Overall Mitigation Strategy	# of Completed Actions	# of Ongoing Actions	# of New Actions	# of Withdrawn Actions
	Township will remain forward thinking and prioritize home, roadway and critical infrastructure elevation, continued upgrades to water, sewer and stormwater conveyance systems and coordinate with state and local agencies on the best ways to achieve resiliency within this vulnerable coastal community.				
Surf City Borough	The Borough of Surf City has maintained a pro-active approach to hazard mitigation and risk assessment by coordinating amongst department heads and outside agencies to levy resources for project development and implementation. Flood and erosion related impacts to both roadways and infrastructure remain a top priority for the municipality in the next five years.	0	10	6	1
Toms River Township	Hazard mitigation planning has the potential to produce long-term and recurring benefits by breaking the cycle of loss. Mitigation practices will also enable residents, businesses and industries to re-establish themselves in the aftermath of a disaster and get back to normal sooner with less interruption. Life safety is always top priority followed by property protection. Other priorities continue to be elevation of homes as necessary, floodplain management, dune and beach replenishment, construction of jetty(s) for beach protection and improvement of critical infrastructure.	0	5	4	0
Tuckerton Borough	Tuckerton Borough is still seeking funding to build up the marsh that protects the properties and infrastructure in the Tuckerton Beach Area, which is our main priority for the next five years. With that there are other areas of concern within Tuckerton Borough where dredging needs to be done before lagoons are choked off in the Paradise Cove section.	1	8	3	1

6.5 OCEAN COUNTY MITIGATION STRATEGY

The Planning Team met with Ocean County’s Engineering and Planning Departments on August 14, 2024, at the County offices located at 129 Hooper Avenue in Toms River. In attendance were three representatives from each department. On August 28, 2024, the Planning Team met with three representatives from Ocean County OEM at the County offices on County Road 530 in Manchester Township. In both meetings, the Planning Team and County personnel discussed hazards of concern, significant events that have occurred since the last plan update, high risk areas, existing capabilities, and mitigation actions from the past five years and new actions to include in this plan update. Each department provided information on updates, changes and/or additions to incorporate in the coming HMP update. The Project Team also coordinated virtually with other County Departments and stakeholders (e.g., County Parks Department and Ocean County Municipal Utility Authority) on their strategy and included any new mitigation projects they wanted to see developed within the next five years.

7.0 PLAN MAINTENANCE



7.0 PLAN MAINTENANCE

7.1 PROCESS SUMMARY

Monitoring, evaluating, and updating this plan, is critical to maintaining its value and success in Ocean County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis.

7.2 MONITORING IMPLEMENTATION AND EVALUATING EFFECTIVENESS

Monitoring implementation and evaluating effectiveness of the mitigation strategy are tasks effectively accomplished together. Monitoring implementation involves tracking progress and reasons for lack of progress. It is important to document successes on a regular basis. For instance, it is typically difficult to list all public outreach activities conducted over a five-year period unless you have a log to monitor outreach. Recognizing lack of progress provides the opportunity to change the approach and evaluate the mitigation strategy. Evaluating effectiveness complements monitoring because it is a chance for evaluating both progress and lack of progress. When projects are accomplished, it is helpful to consider whether they were successful in accomplishing the intended goal and objective. For instance, did grant related outreach increase the number of residents gaining access to mitigation project funding. If so, the action might be continued and if not a new or revised action may be considered. Evaluating lack of progress provides the chance to consider whether new resources might be needed or if the action might be discontinued because it is not feasible or a current priority.

Ocean County intends to monitor implementation and evaluate effectiveness of the mitigation strategy through a combination of efforts by both the Ocean County Office of Emergency Management and municipal representatives. The Ocean County Office of Emergency Management will host an annual meeting to review the plan inviting municipal representatives and key stakeholders. Prior to the meeting, the Ocean County Office of Emergency Management will distribute the Annual Progress Report (Appendix D), to complete and submit prior to or at the meeting. Appendix D also include an Annual Progress Log for the County to use to track the responses from the municipalities. As part of this plan update, the Annual Progress Report was consolidated to align with the discussions the Project Team held with each municipality in the summer of 2024. The Report asks the following questions:

1. Did any significant hazard events occur within the past year? Any changes to your hazards of concern?
2. Have there been any reports, studies, or documentation of change in potential hazards, that you are aware of?
3. Have there been any major changes in growth or development?
4. Are there any mitigation projects underway or completed? Any actions that no longer are applicable or needed?
5. Are there any new projects you would like to add to your mitigation strategy?
6. Have you engaged the public on hazard mitigation? If so, how?

Issues that arise during monitoring and evaluation which require changes to the risk assessment, mitigation strategy and other components of the plan will be used in two ways. First, they will be used to improve implementation between plan updates and may warrant amendments to the plan components dependent on their urgency. Second, new information will be incorporated during future plan updates. If there is information provided in relation to an action the community would like to take during the five-year period, that would be more time sensitive than informing future plan updates and would require an amendment.

7.3 UPDATING THE PLAN

The Ocean County Multi-Jurisdictional HMP will be updated every five years, as required by the Disaster Mitigation Act of 2000. Ocean County may also select to update the plan following a disaster event that impacts how the county and municipalities want to implement the mitigation strategy. All plan updates will be led by Allen Mantz, Ocean County Office of Emergency Management.

Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available, specifically from the Annual Progress Reports. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness the Ocean County HMP.

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the Plan?
- Should additional local resources be committed to address identified hazards?
- Has the HMP mitigation strategy been integrated into other planning mechanisms to further progress?

7.4 CONTINUED PUBLIC INVOLVEMENT

The public will have access to an electronic copy of the current HMP through the website: <https://sheriff.co.ocean.nj.us/frmHazardMitigationPlan>. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, and mailings and on the website. A summary of the annual meeting to monitor and evaluate progress will be posted to the plan website.

All municipalities selected to continue or begin actions for Education and Awareness Programs. The following is a summary of actions that provide the opportunity to both inform and engage the public for input and to provide outreach that furthers the implementation of the HMP:

- Continue Junior Police Academy Program.
- Continue or develop CERT program.
- Continue outreach through local radio station and television station.
- Continue Police and/or Fire outreach programs in schools.
- Continue “Pathways to Preparedness” Program, Ocean County’s new meeting for senior citizens program.
- Maintain and improve information on website and social media.
- Participate in National Night Out.
- Support and share information on grant programs that support residential, business and natural resource mitigation projects with appropriate local stakeholders.
- Continue “Ready Set Go” Program which teaches individuals who live in high-risk wildland fire areas how to prepare themselves, their families, and their properties against outdoor fire threats.
- Continue access to the County’s Mobile Ambulatory Bus (MAB) at events to perform child ID services. The idea is to collect biometrics and photos of children so that, in the event they are lost or kidnapped, they may be more easily identified.
- Continue the “ReGROUP” Program, which is a mass notification and outreach text for the public as well as CERT team volunteers.
- Continue leading and attending every long-term care facility and nursing home evacuation drills.

- Continue providing Ocean County distributes emergency preparedness literature to public-facing services and places like libraries to help educate the public on hazards and preparedness initiatives.
- Ocean County Community Rating System (CRS) Assistance Program: The County helps municipalities that may not have access to knowledge or technical capability to participate successfully and/or advance in the NFIP CRS program. Several components of the CRS program include increasing public awareness of hazard mitigation.
- Municipal representatives will gather and incorporate public comments to improve mitigation strategy.

These activities support the HMP in various ways, from helping children be identified more easily if separated from their guardians to distribution of emergency preparedness information to helping jurisdictions participate in federal programs around hazard mitigation. Community participation at all levels and by various means strengthens the implementation of the HMP and overall preparedness.

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8.0 PLAN ADOPTION



8.0 PLAN ADOPTION

The Plan was submitted to the New Jersey State Hazard Mitigation Officer on [date]. It was forwarded to FEMA for final review on [date]. FEMA granted approval-pending-adoption on [date]. **Full approval from FEMA was received on [date].**

Once FEMA granted approval-pending-adoption on [date], the Project Team coordinated with Ocean County and each of the 33 municipalities to adopt a resolution of the Ocean County HMP. The Project Team provided a resolution template to each municipality to streamline the adoption process. The Resolution Template is included in Appendix B. Adopted resolutions passed by each of the 33 municipalities is located in Appendix E.

This section of the plan includes a copy of the resolution passed by Ocean County and a copy of FEMA's notice of plan approval.

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[Placeholder for Ocean County's Resolution]

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[Placeholder for FEMA's notice of plan approval]

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