COUNTY OF ESSEX

HAZARD MITIGATION PLAN

2025 UPDATE



VOLUME 1

APRIL 2025

BLACK & VEATCH

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Executive Summary

Hazard mitigation involves implementing cost-effective and sustainable measures to minimize the risk to human life, property, and infrastructure from potential hazards. Through mitigation planning, Essex County and its participating jurisdictions can develop a framework to lessen the impacts of natural disasters and create a more resilient community.

Hazard Mitigation Overview

Essex County has updated its hazard mitigation plan (HMP) to continue its commitment to reducing risk of natural hazards for the residents, assets, and community lifelines within the County. This update aims to safeguard the people and essential services provided throughout the planning area.

The HMP update forms the foundation for the County's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repetitive damage. This plan aligns with federal and state hazard mitigation planning regulations and requirements to ensure the County and participating jurisdictions are eligible for pre- and post-disaster mitigation funding through the Federal Emergency Management Agency (FEMA).

Planning Process

The planning process section of the mitigation plan highlights how the plan came together, who was a part of the process, and what data and information were utilized to create or revise the plan. A successful planning endeavor involves engaging with community leaders, stakeholders, and the public to ensure their input and support throughout the process. For this update, Section 1 (Planning Process) documents the process the Planning Partnership followed to update and develop the Essex County HMP.

Figure ES-1. Essex County HMP Planning Process



Building the Planning Team

Essex County brought together a diverse and inclusive group of individuals to participate, develop, and implement the HMP update. A Core Planning Team, Steering Committee, and Planning Partnership oversaw the planning process and were responsible for coordinating, overseeing, and executing the planning process.

CORE PLANNING TEAM

The Core Planning Team was made up of key personnel from the County and disciple leads from the County's contract consultant (Black & Veatch).

STEERING COMMITTEE

The Steering Committee consisted of a variety of personnel from county departments and agencies, local jurisdictions, and stakeholders that guided the County and participating jurisdictions through the process of updating the HMP.

PLANNING PARTNERSHIP

The Planning Partnership was made up of Steering Committee members and jurisdictional representatives seeking DMA 2000 compliance. They were responsible for participating throughout the process, reviewing information and providing input, informing the risk assessment, developing mitigation strategies, and adopting the HMP.

Outreach Strategy

Figure ES-2. Example Public Outreach, Township of Livingston Message Board Posting



Stakeholders and the public were asked to contribute throughout the planning process.

Stakeholders

Stakeholders were invited to take part in the planning process through a stakeholder survey, neighboring communities survey, a stakeholder workshop, invitations to the public meeting, and requests for comment during the public review period. Special emphasis was made to reach out to stakeholder groups that work with or support socially vulnerable populations and underserved communities.

Public

The public was shared information about the plan update through social media, lawn signs posted at major County events, and fact sheets made available in person and electronically. In addition, the public was invited to take part in the planning process through public surveying, a public meeting, and requests for comment during the public review period.

In total, the public survey yielded 200 responses. Flooding was ranked as the main hazard of concern from the majority of respondents. The majority of respondents receive information concerning a disaster from the internet (57%), followed by municipal email (53%) and television news (47%). 54% of respondents reported their home had previously been damaged by a hazard event, with only 33% of those damages being reported to the local municipality. Only 71% of respondents reported knowing their evacuation routes with 12% noting they would need assistance in the event of an evacuation. 30% of respondents noted their home was located in a floodplain but the majority (58%) of respondents did not know if their home was located in a hazard area. Of those in the floodplain, only one third had flood insurance. 4% of respondents noted they rely on services from the local government or non-profits. 3% of respondents spoke a language other than English. The majority of respondents (45%) have lived in Essex County more than 20 years. 90% reporting owning their place of residence and 10% reported renting.

Risk Assessment

Risk assessments describe the risks associated with each identified natural hazard of concern. A general profile of the hazard as it may impact Essex County and its jurisdictions was updated, and an assessment was performed to determine the effects and the potential damages of the hazard. For this plan update, total and socially vulnerable populations were also considered in the risk assessment.

The Steering Committee updated the HMP hazard groupings based on the similarity of hazard events, typical concurrence or impacts, consideration of how hazards have been grouped in FEMA guidance documents (FEMA 386-2 Understanding Your Risks, Identifying Hazards and Estimating Losses; Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy; Local Mitigation Planning Handbook), and consideration of updated hazard groupings in the State of New Jersey HMP. The 2025 HMP includes nine hazards (Table ES-1).

Table ES-1. Hazards of Concern in Essex County

Hazard of Concern		Included in Previous Essex County HMP?
	Disease Outbreak	The Disease Outbreak hazard addresses diseases, including West Nile Virus, Eastern Equine Encephalitis, St. Louis Encephalitis, La Crosse Encephalitis, Lyme Disease, Influenza, Ebola, Measles, Tuberculosis, Hepatitis A, Coronavirus, Monkey Pox, RSV, and Bird Flu.
	Drought	The Drought hazard addresses meteorological, hydrological, agricultural, socioeconomic, and ecological drought.
	Earthquake	The Earthquake hazard addresses earthquakes epicentered in the County and those epicentered outside the County that result impacts in the County.
	Extreme Temperature	The Extreme Temperature hazard addresses extreme heat and extreme cold events.
	Flood	The Flood hazard addresses coastal (erosion, storm surge, tidal, and sea level rise), flash, riverine, and stormwater/urban flooding. The flood hazard includes new mapping to inform recently adopted and proposed climate change informed flood mapping.
	Geological Hazards	The Geological Hazards hazard addresses landslide and subsidence/sinkhole.
	Severe Weather	The Severe Weather hazard addresses high wind events, tornadoes, thunderstorms and lightning, hailstorms, tropical storms, and hurricanes.
	Severe Winter Weather	The Severe Winter Weather hazard addresses blizzards, heavy snow, ice storms, and nor'easters.
	Wildfire	The Wildfire hazard addresses wildfire events including those ignited naturally or non-naturally.

Capability Assessment

Existing laws, ordinances, plans and programs at the federal, state, and local level can support or impact hazard mitigation actions identified in this plan. During the 2025 plan update process, all participating jurisdictions were tasked with updating their capability assessment, paying particular attention to evaluating the effectiveness of these capabilities in supporting hazard mitigation, and identifying opportunities to enhance local capabilities to integrate hazard mitigation into their plans, programs, and day-to-day operations.

Mitigation Strategy

The Planning Partnership noted that 78 actions from the previous HMP have been completed or are newly established ongoing capabilities.

The Steering Committee reviewed and updated the mitigation goals from the prior plan to reflect the current focus of Essex County and its jurisdictions. This included modifying Goal 4 to focus on climate change impacts and the development of a new Goal 7 to provide focus on socially vulnerable populations and underserved communities:

- Goal 1: Protect Life
- Goal 2: Protect Property
- Goal 3: Increase Public Preparedness and Awareness
- Goal 4: Develop and Maintain an Understanding of Increased Risk from Climate Change Impacts to Natural Hazards
- Goal 5: Enhance County and Local Mitigation Capabilities to Reduce Hazard Vulnerabilities
- Goal 6: Support Continuity of Operations Pre-, During and Post-Hazard Events
- Goal 7: Reduce the Risk of Natural Hazards for Socially Vulnerable Populations and Underserved Communities

These goals guided the development of each jurisdiction's mitigation actions to solve potential problems identified during the risk assessment and capability assessment.

Each jurisdiction reviewed the results of the risk and capability assessments, previous mitigation strategy, mitigation goals, catalogs of mitigation alternatives and selected actions to be included in their mitigation strategy in their jurisdictional annexes.

The 2025 plan includes the follow action types:

- Prevention: Preventive activities are intended to keep hazard problems from getting worse and are typically administered through programs or regulatory actions that influence the way land is developed and assets are built.
- Property Protection: Property protection activities involve the modification of existing buildings, assets, and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations.
- Public Education and Awareness: Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property.
- Natural Resource Protection: Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions.
- Emergency Services: Although not typically considered a "mitigation" technique, emergency service activities do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event.
- Structural Projects: Structural mitigation activities are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by jurisdiction staff.
- Climate Resiliency: Climate resiliency actions incorporate methods to mitigate or adapt to the impacts of the changing climate.

- Community Capacity Building: These actions increase local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences of hazards.

The mitigation strategy for each participating jurisdiction includes actions to address each of the identified hazards of concern for the 2025 update. Opportunities to increase integration of the HMP have been included as mitigation actions. Each participating jurisdiction has identified actions to develop Substantial Damage Response Plans and Watershed Management Plans. All jurisdictions with repetitive loss properties in the National Flood Insurance Program included actions to address repetitive flood losses. Jurisdictions continued to identify actions to protect critical facilities and lifelines such as establishing back up power.

In total, the updated Essex County HMP mitigation strategy includes 223 actions.

Adoption

Upon FEMA Approval Pending Adoption (APA) status of the 2025 HMP update, Essex County and each municipality will adopt the plan by resolution of local governing body.

Maintaining the Plan

Procedures for the monitoring, evaluation, and updating of the HMP were established to support it continuing to be a living document to guide resilience. The County will convene the Planning Partnership annually to review the plan and update the plan as appropriate. A complete update to the HMP will be completed prior to the end of the five-year effective planning horizon for the 2025 update.

1 INTRODUCTION

1.1 WHY PREPARE THIS PLAN?

Essex County and its participating jurisdictions (the Planning Partnership) prepared this HMP update to better protect the residents, property, and assets throughout Essex County from the effects of natural hazards.

Hazard mitigation plays a crucial role in emergency management by working to reduce the impacts of disasters on individuals, communities, and important assets. By implementing mitigation measures, we can help prevent the same areas from being repeatedly impacted by disasters. Mitigation is part of the emergency management cycle, which is divided into four phases:

- **Preparedness** is when we develop or update activities, programs and systems before an event happens. These activities are often tested (or exercised) in non-emergency situations. This tests their effectiveness. Emergency managers also assess potential risks, hazards, and vulnerabilities in this phase.
- **Response** focuses on the immediate and short-term effects of a disaster. It is usually focused on life safety and preventing immediate damage.
- **Recovery** is a long-term phase that looks to return a community to normal, or to a more resilient state, after a disaster.
- **Mitigation** focuses on building (or rebuilding) in ways that reduce the risk more permanently. It is an activity that can occur at any point in the emergency management cycle. For example, communities can undertake mitigation actions before a disaster (the preparedness phase) or while rebuilding after a disaster (the recovery phase) (FEMA 2023).



This hazard mitigation plan (HMP) update highlights the County's dedication to reducing risk from hazards, enhancing overall resilience, and providing a practical tool for decision-makers to incorporate mitigation into daily operations.

1.1.1 Federal Eligibility

1.1.1.1 Disaster Mitigation Act

Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from hazards.

FEMA defines a **Hazard Mitigation Plan** as a community-driven process to help state, local, tribal, and territorial governments plan for hazard risk. By planning for risk and setting a strategy for action, governments can reduce the negative impacts of future disasters.

In an effort to reduce the Nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of DMA 2000 emphasizes the need for state and local government entities to closely coordinate on mitigation planning activities and requires a hazard mitigation plan for any local government applying for federal mitigation grant funds. These funds primary fall under the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance (HMA) program. Grant programs under HMA include the following:

- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA)
- Hazard Mitigation Grant Program (HMGP)
- HMGP Post Fire

Entities with an adopted and federally-approved hazard mitigation plan are pre-positioned to receive available mitigation funds before and after the next disaster strikes. The plan was developed to make the Planning Partnership eligible for pre- and post-disaster FEMA grants.

1.2 Plan Updates

An HMP is a living document that jurisdictions use to reduce vulnerability to natural hazards. It serves as the groundwork for a jurisdiction's long-term plan to lessen disaster impacts and establishes a framework for decision-making to mitigate harm to individuals, assets, and the economy from future natural disasters. Mitigation projects include stormwater actions, substantial damage management planning, hazard mitigation integration in master planning and emergency operation planning, outreach improvements, and backup power support, to name a few. These measures help reduce vulnerability, allowing jurisdictions to bounce back more quickly from disasters.

1.2.1 Previous Plans

The Planning Partnership has shown dedication to reducing disaster impacts in Essex County by creating its initial HMP in 2010, followed by updates in 2015 and 2020. This ongoing effort ensures that the Planning Partnership has the necessary information to create and implement a successful mitigation strategy, reducing the impacts of natural disasters, and enhance overall resilience.

1.2.2 Why Update

Throughout the planning process, the entire plan was updated with a focus on assessing changes in vulnerability caused by hazard events, evaluating capabilities and their utilization in implementing hazard

mitigation measures, reviewing the mitigation strategy, and identifying new initiatives to enhance overall resilience within Essex County.

1.2.2.1 Federal and State Requirements

The 2020 HMP expired on June 3, 2025. In response to the requirements of the DMA 2000, which requires local governmental agencies to develop and update its HMP every five years, this plan serves as the 2025 update to the Essex County Hazard Mitigation Plan. The Essex County HMP update is in alignment with FEMA's Local Mitigation Planning Policy Guide (April 2023), FEMA's Local Mitigation Planning Handbook (May 2023), and the State of New Jersey planning requirements.

1.2.2.2 Changes in Hazards

For this HMP update, the Steering Committee adjusted the hazards of concern list from the previous plan. After noting that non-natural hazards are not eligible for traditional FEMA hazard mitigation funding grant programs and are adequately addressed in other planning efforts, non-natural hazards were removed from this update. Information on these non-natural hazards is preserved in Appendix E (Risk Assessment Supplement). Coastal erosion and sea level rise were identified as being best discussed with the Flood hazard. Coastal Storms (tropical cyclones and nor'easters) were determined to be best discussed with the existing hazard groupings within the Severe Weather and Severe Winter Weather hazards respectively.

1.2.2.3 Changes in Development and Population

Local Plan Requirement E1—44 CFR Part 201.6(d)(3)

A local jurisdiction must review and revise its plan to reflect changes in development.

Data from the 2020 U.S. Census and the 2023 American Community Survey have been used to provide updated demographic data. While Essex County is largely built out, each participating jurisdiction provided information on recent and anticipated development in their jurisdictional annexes in Volume II.

1.2.3 The Updated Plan - What Has Changed?

The overall planning process and the Essex County HMP have been improved and revised for this 2025 HMP update in response to changes in HMP requirements, a newly released State of New Jersey HMP in 2024, and overall improvements. Key changes are outlined as follows:

- Expansion of participation opportunities for neighboring counties and communities, and stakeholders
- The hazards of concern have been adjusted to focus on natural hazards.
- Best available data, recent hazard event occurrences, and recent and future development have been incorporated into the County Profile, hazard profiles, and annexes.
- The structure of sections of the plan have been updated to improve the organization and readability of the HMP.

- Each jurisdiction's mitigation strategy includes at least one mitigation action to address each of the hazards of concern identified for this HMP update unless they have demonstrated that they do not have any exposure to geographically limited hazards.
- Proposed mitigation strategies have been updated to reflect new actions or updated details on previously identified actions.
- Socially vulnerable populations' hazard mitigation needs were assessed and incorporated into mitigation strategies.

The following table indicates the changes between the 2020 and the 2025 HMP as they relate to federal requirements for local hazard mitigation plans.

Table 1-1. Essex County HMP Changes Since the Last HMP

44 CFR Requirement (April 2023)	2020 HMP	2025 Updated Plan
Element A: Planning Process		
Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (44 CFR § 201.6(c)(1))	The 2020 HMP documented the planning process in Section 2.	The 2025 HMP documents the planning process in Section 2.
Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (44 CFR § 201.6(b)(2))	The 2020 planning process identified key stakeholders and coordinated with them throughout the process.	The 2025 planning process expanded the invited stakeholders from the 2020 planning process. The invited stakeholders included all neighboring municipalities and counties and stakeholders from academic, business/commerce, community/non-profit organizations, emergency services, hospital/medical, infrastructure, land use/development, natural/cultural resources, public works, and social equity sectors. Stakeholders were coordinated with throughout the process and provided multiple opportunities to participate including a virtual meeting, in-person meeting, surveying, and requests to review and comment on the draft plan. Jurisdictions were tasked with inviting any special service districts that are contained within or include their jurisdictional boundaries as potential planning partners.
Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (44 CFR § 201.6(b)(1))	The 2020 planning effort deployed an enhanced public engagement methodology: • Multi-lingual informational materials and news release • Use of social media. • Web-deployed survey • All meetings open to the public • Attending a well-trafficked County event to engage residents • Stakeholder focus group sessions were held	The 2025 planning process continued upon the success of the 2020 HMP with a multi-media campaign to involve the public. In addition to similar efforts deployed for the 2020 plan, enhanced multi-lingual outreach materials, social media, public survey, a public meeting, and lawn signs advertising the planning process and asking for input at major County events.

44 CFR Requirement (April 2023)	2020 HMP	2025 Updated Plan
Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (44 CFR § 201.6(b)(3))	A comprehensive review of relevant plans and programs was performed by the planning team.	An updated comprehensive review of relevant plans and programs was performed by the Planning Partnership.
Element B: Risk Assessment		
Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (44 CFR § 201.6(c)(2)(i))	New, updated data, was deployed for the 2020 plan update. A new hazard, economic collapse was included, and the flood hazard was expanded to include urban flooding (or flooding outside of the floodplain). The hazard ranking methodology was expanded to include adaptive capacity and climate change.	Man-made hazards were removed from the 2025 HMP or discussed as cascading impacts of natural hazards of concern. Updated information on occurrences and other best available information was incorporated.
Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (44 CFR § 201.6(c)(2)(ii))	A summary of NFIP insured properties including an analysis of repetitive loss property locations was included in the plan.	Updated NFIP statistics, including repetitively damaged structures, are included in the 2025 plan.
Element C: Mitigation Strategy		
Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (44 CFR § 201.6(c)(3))	An updated comprehensive review of authorities, policies, programs and resources was performed by each participating jurisdiction in each jurisdictional annex.	An updated comprehensive review of authorities, policies, programs and resources was performed by each participating jurisdiction in each jurisdictional annex. Opportunities to improve capabilities was established for each jurisdiction in the jurisdictional annexes.
Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (44 CFR § 201.6(c)(3)(ii))	Jurisdictional participation in the NFIP was discussed in each jurisdictional annex.	Jurisdictional participation in the NFIP is discussed in each jurisdictional annex.
Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (44 CFR § 201.6(c)(3)(i))	The 2020 HMP maintained the goals from the 2015 HMP.	The 2025 HMP updated goals and objectives includes a goal to "Develop and Maintain an Understanding of Increased Risk from Climate Change Impacts to Natural Hazards" with corresponding new objectives.

44 CFR Requirement (April 2023)	2020 HMP	2025 Updated Plan
Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (44 CFR § 201.6(c)(3)(ii))	A comprehensive list of mitigation actions was established, prioritizing those hazards ranked as high hazards of concern.	A comprehensive list of mitigation actions was established. Each jurisdiction developed at least one mitigation action that addresses each hazard of concern.
Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (44 CFR § 201.6(c)(3)(iv)); (§201.6(c)(3)(iii))	Each jurisdictional annex included the jurisdiction's proposed hazard mitigation strategies for the 2020 HMP. Action worksheets are prepared for each mitigation action that was FEMA HMA eligible.	Each jurisdictional annex includes the jurisdiction's proposed hazard mitigation strategies for the 2025 HMP (Section X.4.2). Estimated costs and benefits are included in the detailed discussion of each proposed mitigation action. Action worksheets are prepared for each mitigation action.
Element D: Plan Maintenance		
Is there discussion of how each community will continue public participation in the plan maintenance process? (44 CFR § 201.6(c)(4)(iii))	Section 7 discussed plan maintenance.	Section 18.3 discusses ongoing public participation following plan approval.
Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (44 CFR § 201.6(c)(4)(i))	Section 7 discussed monitoring, evaluating, and updating the mitigation plan.	Section 18.4 discusses the procedures for the monitoring of the plan, including tracking of the progress/status of actions. Section 18.5 discusses the procedures for the updating of the plan.
Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (44 CFR § 201.6(c)(4)(ii))	Section 7 discussed integration of the HMP into other planning mechanisms.	Section 18.1 documents how the Planning Partners will integrate this hazard mitigation plan into relevant decision-making processes, plans, or mechanisms, where feasible. Each jurisdictional annex documents current integration of hazard mitigation, including the HMP, in Section X.2 Jurisdictional Capability Assessment. Jurisdictions that had specific integration actions in place included these actions in their mitigation strategy.
Element E: Plan Update		
Was the plan revised to reflect changes in development? (44 CFR § 201.6(d)(3))	Major development was identified in each municipal annex.	Section 1.2.2 discusses how changes in development and population are incorporated

44 CFR Requirement (April 2023)	2020 HMP	2025 Updated Plan
		into the plan. Each jurisdictional annex documents recent and expected future development.
Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (44 CFR § 201.6(d)(3))	The 2020 HMP included goals and objectives.	The 2025 update was reorganized to increase readability and organization. Goals and objectives have been updated. Each jurisdiction's mitigation strategy has been updated to reflect progress in previous mitigation actions and new local priorities.
Element F: Plan Adoption		
For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (44 CFR § 201.6(c)(5))	N/A	N/A
For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (44 CFR § 201.6(c)(5))	The 2020 plan achieved DMA compliance for Essex County and all municipalities. Resolutions for each partner adopting the plan was included in Appendix A.	The 2025 plan achieved DMA compliance for Essex County and all municipalities. Resolutions for each partner adopting the plan is included in Appendix A.
Element G: High Hazard Potential Dams (optional)		
Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?	Not included	Not included
Did the plan address HHPDs in the risk assessment?	Not included	Not included
Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?	Not included	Not included
Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?	Not included	Not included

1.3 How to Use This Plan

The Essex County HMP is organized for accessibility and clarity, building off the previous versions of the plan, consisting of two volumes and appendices:

Volume I

- Section 1: Introduction
- Section 2: Planning Process
- Section 3: County Profile
- Section 4: Hazards of Concern
- Section 5: Risk Assessment Methodology and Tools
- Section 6: Disease Outbreak
- Section 7: Drought
- Section 8: Earthquake
- Section 9: Extreme Temperatures
- Section 10: Flood
- Section 11: Geological Hazards
- Section 12: Severe Weather
- Section 13: Severe Winter Weather
- Section 14: Wildfire
- Section 15: Hazard Ranking
- Section 16: Capability Assessment
- Section 17: Mitigation Strategy
- Section 18: Maintaining the Hazard Mitigation Plan

Volume II

- Section 1: Essex County
- Section 2: Township of Belleville
- Section 3: Township of Bloomfield
- Section 4: Borough of Caldwell
- Section 5: Township of Cedar Grove
- Section 6: City of East Orange
- Section 7: Borough of Essex Fells
- Section 8: Township of Fairfield
- Section 9: Borough of Glen Ridge
- Section 10: Township of Irvington
- Section 11: Township of Livingston
- Section 12: Township of Maplewood
- Section 13: Township of Millburn
- Section 14: Township of Montclair

- Section 15: City of Newark
- Section 16: Borough of North Caldwell
- Section 17: Township of Nutley
- Section 18: Township of the City of Orange
- Section 19: Borough of Roseland
- Section 20: Village of South Orange
- Section 21: Township of Verona
- Section 22: Township of West Caldwell
- Section 23: Township of West Orange

Appendices

- Appendix A: Plan Adoption
- Appendix B: Participation Documentation
- Appendix C: Meeting Documentation
- Appendix D: Public and Stakeholder Outreach
- Appendix E: Risk Assessment Supplement
- Appendix F: Mitigation Strategy Supplement
- Appendix G: Plan Maintenance Tools
- Appendix H: Linkage Procedures
- Appendix I: Critical Facility Inventory (non-public facing)

2 PLANNING PROCESS

Local Plan Requirement A1 – 44 CFR Part 201.6(c)(1)

The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

2.1 INTRODUCTION

The following section describes the overall process of updating the HMP, including how it was prepared, who was involved, and how stakeholders and the public participated. To adhere to the requirements of the DMA 2000 and ensure that the planning process received wide and robust support from the participating jurisdictions, regional and local stakeholders, and the public, the approach to the planning process and plan documentation included the following:

1) The Essex County HMP is a multi-jurisdictional plan and considers all natural hazards that pose a threat to the county. This satisfies the natural hazards requirements specified in DMA 2000 and Element B of FEMA's *Local Mitigation Planning Policy Guide* (April 2023).

   Essex County invited all jurisdictions located within the county to participate in the HMP update. The County and 22 municipalities agreed to participate and meet participation expectations, where appropriate, as shown in Table 2-1 .

2) This HMP was developed and updated following the process outlined by DMA 2000, FEMA's *Local Mitigation Planning Policy Guide* (April 2023), and the State of New Jersey's local planning requirements. Following these processes ensures that all requirements have been met and supports state and federal reviews of the HMP.

The planning process for this HMP update, as shown in Figure 2-1, consisted of seven steps: (1) Organize Resources; (2) Outreach Strategy; (3) Risk Assessment; (4) Community Capabilities; (5) Mitigation Strategy; (6) Keep Plan Current; and (7) Review and Adopt Plan.

Figure 2-1. Essex County HMP Update Planning Process



2.2 Defining the Planning Area

The planning area was defined as Essex County, which includes 22 municipalities. Section 3 includes a map of the planning area boundary and a description of characteristics.

2.3 Funding

This HMP update was funded through the HMGP grant program. The County was awarded $199,995.30 under HMGP DR_4614_0003 with a federal share of $199,995.30 and a non-federal share of $0,00. The period of performance was from January 25, 2023 to March 4, 2026.

2.3.1 Contract Consultant

Black & Veatch Corporation (Black & Veatch) was selected as a contract consultant to assist Essex County and its planning team through the HMP update planning process. A contract between Black & Veatch and Essex County was executed in October 2024. Black & Veatch was tasked with developing a comprehensive HMP in accordance with the Disaster Mitigation Act of 2000 and FEMA guidelines. Black & Veatch was responsible for the following:

- Project Management and Coordination
  - Conduct regular meetings with the County's project management team
  - Provide monthly progress reports
  - Ensure adherence to the project timeline
- Risk Assessment
  - Identify and profile hazards of concern
  - Assess the County's vulnerability to these hazards
  - Develop hazard maps and risk assessments
- Mitigation Strategy Development
  - Collaborate with stakeholders to identify and prioritize mitigation actions
  - Evaluate participant capabilities

  - Develop a comprehensive mitigation strategy
  - Provide cost-benefit analysis of proposed mitigation actions
- Plan Preparation
  - Draft the Hazard Mitigation Plan in accordance with FEMA guidelines
  - Facilitate public and stakeholder engagement throughout the planning process
  - Incorporate feedback and finalize the plan
- Plan Adoption and Approval
  - Assist with the plan adoption process
- Submit the plan for review and approval by the New Jersey Office of Emergency Management (NJOEM) and FEMA

2.4 Formation of the Planning Team

A successful planning effort includes active participation and buy-in from the whole community – individuals and communities, all levels of government, private and non-profit sectors, faith-based organizations, non-governmental establishments, community lifelines, and members of the public. This HMP update Planning Team was made up of a Core Planning Team, Steering Committee, and a Planning Partnership.

2.4.1 Core Planning Team

The Core Planning Team was made up of discipline leads from the County's contract consultant (Black & Veatch) and key personnel from the County.

Table 2-1 lists the County's Core Planning Team members. The Core Planning Team was responsible for the overall coordination of the plan update process.

2.4.2 Steering Committee

The Steering Committee consisted of a variety of personnel from county departments and agencies, local jurisdictions, and stakeholders that guided the County and participating jurisdictions through the process of updating the HMP. The following stakeholders were invited to serve on the Steering Committee:

- County Departments and Agencies
  - County OEM (participated)
  - Office of Public Information (participated)
  - Office of the County Administrator (participated)
  - County Engineering (participated)
  - County EMS Coordinator (participated)
  - Division of Roads & Transportation, Superintendent
  - Parks Department
  - Department of Citizen Services
  - Department of Health & Rehabilitation (participated)
  - Essex County Utilities Authority

- Municipalities
    - Township of Fairfield
    - Township of Millburn (participated)
    - City of Newark
    - Township of Livingston (participated)
    - Township of Verona (participated)
- Stakeholders
    - NJIT's Center for Community Systems (participated)
    - Rutgers Cooperative Extension
    - Rutgers Bloustein School (participated)
    - NY/NJ Baykeeper
    - Essex County Superintendent of Elections & Commissioner of Registration
- Essex County Community Organizations Active in Disaster
- New Jersey Local Information Network
    - NJOEM Mitigation Unit (participated)
    - FEMA Region 2 Planning

Table 2-1 lists the Steering Committee members. Members of the Steering Committee were responsible for the following:

- Monitoring planning progress
- Identifying input needs for the Planning Partnership
- Selecting hazards of concern
- Establishing goals and objectives
- Identifying socially vulnerable populations and underserved communities in Essex County
- Identifying outreach opportunities
- Assisting with outreach
- Reviewing draft Plan sections when requested and provide comment and input as appropriate.

2.4.3 Planning Partnership

The Planning Partnership was made up of Steering Committee members and jurisdictional representatives seeking DMA 2000 compliance. They were responsible for participating throughout the process, reviewing information and providing input, informing the risk assessment, developing mitigation strategies, and adopting the HMP.

In November 2024, the County notified all its municipalities and special service districts of the planning process and invited them to participate. Invitations were sent digitally by email, and physically by mail. They were asked to formally notify the County by letter of intent to participate and to identify points of contact to represent the municipality and participate throughout the planning process. Additionally, each municipality that participates in the NFIP provided contact information for their designated NFIP floodplain administrator. The contacts each municipality identified in the letter of intent to participate were informed of the planning process, attended meetings, provided direct input, and reviewed plan documents.

Table 2-1 lists the Planning Partnership members and Appendix B (Participation Documentation) identifies the individuals who represented their jurisdictions during the planning effort. Members of the Planning Partnership were responsible for the following:

- Supporting the Steering Committee selected to oversee the development of this plan.
- Providing representation at Planning Partnership meetings
- Providing data and information about their community
- Identifying mitigation activity in their community in the last five years, including progress on previously identified mitigation actions.
- Supporting public outreach efforts in their community
- Assisting with the identification of stakeholders within their community that should be informed and potentially involved with the planning process.
- Identifying specific mitigation actions to address each of the natural hazards posing significant risk to their community.
- Involving the local NFIP Floodplain Administrator in the planning process.
- Reviewing draft Plan sections when requested and provide comment and input as appropriate.
- Adopting the Plan by resolution of their governing body after FEMA conditional approval.

Jurisdictional involvement is demonstrated through the completion of an annex of the HMP (Volume II). Each annex was developed with input gathered during the planning process and includes points of contact, risk assessments for relevant hazards, evaluation of capabilities for mitigation, identification and prioritization of mitigation measures, and ultimately, adoption of the updated plan through a resolution.

Table 2-1. Essex County Hazard Mitigation Planning Participation

Jurisdiction / Organization	Name	Title	Core Planning Team Member	Steering Committee Member	Planning Partnership Member
Essex County	Sergeant Ryan Peter	Sheriff's Office, County OEM	X	X	X
Essex County	Detective Denise Teague	Sheriff's Office, County OEM	X	X	X
Essex County	Detective Mark Steinberg	Sheriff's Office, County OEM	X	X	X
Essex County	Sanjeev Varghese	County Engineer/Director of DPW		X	
Essex County	Richard Fernandez	Principal Engineer		X	
Essex County	Luke Yee	Systems Analyst		X	
Essex County	James Simpson	County EMS Coordinator		X	
Essex County	Frank J. Del Gaudio	Director, Department of Health & Rehabilitation		X	

Jurisdiction / Organization	Name	Title	Core Planning Team Member	Steering Committee Member	Planning Partnership Member
Essex County	Maya Harlow	Essex County Health Officer, Department of Health & Rehabilitation		X	
Rutgers Bloustein School	Ashlyn Spector	Senior Research Specialist		X	
NJIT	Carrie Martin	Center for Community Systems/TARP		X	
NJOEM	Jordan Siegel	Assistant Unit Head		X	
NJOEM	Alyssa Meredith	Mitigation Planner		X	
Township of Belleville	Gerard Corbo	OEM Coordinator/Deputy Chief of Police			X
Township of Bloomfield	Anthony G. DeZenzo	Township Administrator			X
Borough of Caldwell	Mark Guiliano	OEM Coordinator/Zoning			X
Township of Cedar Grove	Jeffrey McElroy	OEM Coordinator			X
City of East Orange	David Williams	OEM Coordinator			X
Borough of Essex Fells	Jim Egan	OEM Director			X
Township of Fairfield	RJ Casedino	Lieutenant/OEM Coordinator			X
Borough of Glen Ridge	Erik DeLine	Deputy Administrator, Director of Planning			X
Township of Irvington	John Brown	Deputy Director of Public Safety/OEM Coordinator			X
Township of Livingston	Christopher Mullin	Fire Chief/ OEM Coordinator		X	X
Township of Maplewood	Patrick Wherry	Business Administrator / OEM Coordinator			X
Township of Millburn	Robert Echavarria	Fire Chief/EMC		X	X
Township of Montclair	Carmine Davino, Jr.	Deputy Coordinator			X
City of Newark	John S. James	OEM Coordinator			X
Borough of North Caldwell	Glenn Domenick	Administrator			X
Township of Nutley	Don Santangelo	OEM Coordinator, Fire Captain			X

Jurisdiction / Organization	Name	Title	Core Planning Team Member	Steering Committee Member	Planning Partnership Member
Township of the City of Orange	Elvin Padilla Jr	OEM Coordinator			X
Borough of Roseland	John Matheis	OEM Coordinator			X
Village of South Orange	Scott Egelberg	OEM Coordinator			X
Township of Verona	Joel Martin	VPD/ OEM Coordinator		X	X
Township of West Caldwell	Lawrence Peter	OEM Coordinator			X
Township of West Orange	Zayibeth Carballo	Municipal Engineer			X
Black & Veatch Corporation	Alison Miskiman	Project Manager	X		
Black & Veatch Corporation	Christopher Huch Jr	Lead Planner	X		

Notes: Additional points of contact for each jurisdisction are included in the jurisdictional annexes in Volume II.

2.5 Planning Activities

Figure 2-2. February 2025 Risk Assessment Meeting



Table 2-2 summarizes the planning process activities, efforts, and key milestones conducted to update the HMP. Additionally, it identifies which FEMA requirement each activity addresses. Meeting documentation

(e.g., presentations, agendas, sign-in sheets, meeting minutes) are located in Appendix C (Meeting Documentation). The table below only identifies formal meetings held during the plan update; it does not reflect all planning activities conducted by individuals and groups throughout the planning process.

Table 2-2. Mitigation Planning Activities and Efforts for the Essex County HMP Update

Date	FEMA Local Mitigation Planning Policy Requirement*	Activity	Participants
November 2024	A1	Municipalities invited to participate in the update of the Essex County Hazard Mitigation Plan and provided with template Letters of Intent to Participate	Core Planning Team, Planning Partnership
November 2024	A1, A2	County department, stakeholders, and municipal representatives invited to participate as members of the Steering Committee	Core Planning Team, Steering Committee
December 4, 2024	A4, B1, B2	Planning Partnership Kickoff Meeting	Planning Partnership
December 5, 2024	A2, A4, B1, B2, C3	Steering Committee Kickoff Meeting	Steering Committee
December 17, 2024, through February 5, 2025	A3	Public Survey posted and advertised	Core Planning Team, Steering Committee, Planning Partnership
January 8, 2025	A2	Invites distributed to participate in Stakeholder Survey	Core Planning Team, Steering Committee
January 8, 2025	A2	Invites distributed to participate in Neighboring Communities Survey	Core Planning Team
January 8 – February 24, 2025	A2	Stakeholder Survey and Neighboring Community Survey open for input	Core Planning Team, Steering Committee
February 4, 2025	A2, A4, B1, B2	Stakeholder Workshop	Core Planning Team, Stakeholders
February 18, 2025	A2, A4, B1, B2, C2	Risk Assessment Meeting for Steering Committee and Planning Partnership	Steering Committee, Planning Partnership
February 18, 2025	A2, C1, C2, C3, C4, C5	Mitigation Strategy Workshop for Steering Committee and Planning Partnership	Steering Committee, Planning Partnership
February 18, 2025	A2, A3	Public and Stakeholder Meeting	Core Planning Team, Public, Stakeholders
February 25, 2025	D1, D2, D3	Steering Committee Draft Plan Review and Plan Maintenance Meeting	Steering Committee
December 4, 2024 - February 28, 2025	A1, A2, A3, A4, B1, B2, C1, C2, C3, C4, C5, E1, E2	Jurisdictional annex meetings and annex development, complete Draft Volume II	Planning Partnership
December 4, 2024 – February 28, 2025	A1, A2, A3, A4, B1, B2, C1, C2, C3, C4, C5, D1, D2, D3, E1, E2	Develop and complete Draft Volume I	Core Planning Team, Steering Committee

Date	FEMA Local Mitigation Planning Policy Requirement*	Activity	Participants
March 4 – April 3, 2025	A2, A3	Public Review Period	Public, Stakeholders
Spring 2025	F1	Local adoptions	Planning Partnership

**Identifies specific FEMA Local Mitigation Planning Policy requirements:*

A1 – Planning Process – Documentation
A2 – Planning Process – Stakeholder Input
A3 – Planning Process – Public Involvement
A4 – Planning Process – Existing Plans Incorporation
B1 – Risk Assessment – Identify Hazards
B2 – Risk Assessment – Hazard Vulnerabilities
C1 – Mitigation Strategy – Existing Capabilities
C2 – Mitigation Strategy – NFIP Participation
C3 – Mitigation Strategy – Mitigation Goals
C4 – Mitigation Strategy – Identify Mitigation Actions
C5 – Mitigation Strategy – Develop Action Plan
D1 – Plan Maintenance – Continued Public Participation
D2 – Plan Maintenance – Keeping Plan Current
D3 – Plan Maintenance – Plan Integration
E1 – Plan Update – Changes in Development
E2 – Plan Update – Changes in Priorities
F1 – Plan Adoption

2.6 Stakeholder Coordination and Involvement

Local Plan Requirement A2 – 44 CFR Part 201.6(b)(2)

The planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other non-profit interests to be involved in the planning process.

The HMP update incorporates feedback and information from stakeholders as deemed relevant, as referenced within. Outreach to stakeholders was conducted in a timely manner and maintained throughout the planning process. This section outlines the stakeholders who were involved in the creation of this HMP update and outlines their participation.

2.6.1 Types of Stakeholders

Stakeholders consist of individuals and groups that mitigation actions or policies affect. For this HMP update, businesses, private organizations, non-profits, and community groups were identified and invited to participate. The County made conscientious efforts to ensure diverse regional, county, and local stakeholder representation in the update of this HMP.

2.6.2 Identifying Stakeholders

Stakeholders identified in the previous HMP were once again requested to participate in the planning process. Additional identification of new stakeholders was conducted by the Core Planning Team, Steering Committee, and Planning Partnership throughout the planning process as described below.

2.6.3 Stakeholder Participation

Below is a summary of the stakeholders' involvement in the planning process, demonstrating the extensive outreach efforts made by the County. For further details on stakeholder involvement, please refer to Appendix D (Public and Stakeholder Outreach). Key elements of stakeholder outreach include:

- Requests to assist in distribution of the public survey
- Stakeholder survey
- Neighboring community survey
- Invitation to attend a stakeholder workshop
- Invitation to attend a public meeting
- Invitation to review the draft HMP
- Several key stakeholders were invited to participate as members of the Steering Committee.

2.6.3.1 Federal Agencies

Table 2-3 describes how federal agencies and departments participated in the Essex County HMP update. Those listed in the table below were directly or indirectly involved in the process and provided crucial information to update the HMP. Refer to Appendix B (Participation Documentation) for further details.

Table 2-3. Federal Agencies and Departments

Agency/Department	Participation
FEMA Region 2	FEMA provided updated planning guidance; provided summary and detailed NFIP data for the planning area; presented preliminary regulatory flood products to municipalities and the public; attended meetings; participated in a mitigation strategy workshop; and conducted plan review
NOAA National Centers for Environmental Information (NCEI)	NCEI's online tools were accessed to obtain information regarding hazard identification, hazard details, and risk assessments to incorporate into the HMP update.
NOAA National Hurricane Center (NHC)	Information accessed to support risk assessment.
NOAA Storm Prediction Center (SPC)	Information accessed to support risk assessment.
U.S. Army Corps of Engineers (USACE)	Information accessed to support risk assessment.
U.S. Census Bureau	Information accessed to support county profile and risk assessment.
U.S. Department of Agriculture (USDA)	Information accessed to support risk assessment.
U.S. Department of Health and Human Services (USDHSES)	Information accessed to support risk assessment.
U.S. Environmental Protection Agency (USEPA)	Information accessed to support risk assessment.
U.S. Geological Survey (USGS)	Information accessed to support risk assessment.

2.6.3.2 State Agencies

Table 2-4 describes how state agencies and departments participated in the Essex County HMP update. Those listed in the table below were directly or indirectly involved in the process and provided crucial information to update the HMP. Refer to Appendix B (Participation Documentation) for further details.

Table 2-4. State Agencies and Departments

Agency/Department	Participation
New Jersey Office of Emergency Management	Invited to attend meetings and was the state reviewer of the HMP update.
New Jersey Department of Environmental Protection	Information accessed to support risk assessment. Invited to provide information to support the risk assessment, including data on dams. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.
New Jersey Department of Transportation	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.
NJ State Climatologist	Information from the State Climatologist was used to support the risk assessment. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.
Workforce Development Board (Office of Workforce Development)	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.
New Jersey Turnpike Authority	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.

2.6.3.3 County Agencies

Table 2-5 describes how county agencies and departments participated in the Essex County HMP update. Those listed in the table below were invited to participate in the planning process. Refer to Appendix B (Participation Documentation) for further details.

Table 2-5. County Agencies and Departments

Agency/Department	Participation	Provides Support to Socially Vulnerable Populations?
Essex County Airport	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Department of Citizen Services	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Department of Corrections	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Department of Health and Rehabilitation	Frank J. Del Gaudio, Director, and Maya Harlow, Essex County Health Officer, served on the Steering Committee. Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Department of Parks, Recreation, And Cultural Affairs	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Department of Public Works	Sanjeev Varghese, County Engineer/Director and Richard Fernandez, Principal Engineer, served on the Steering Committee. Provided status updates of previous mitigation actions and contributed to	

Agency/Department	Participation	Provides Support to Socially Vulnerable Populations?
	development of mitigation strategy. Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Division of Community Action	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Division of Community Health	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Division of Family Assistance and Benefits	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Division of Training and Employment	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Division of Youth Services	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Environmental Center	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Hospital Center	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Medical Reserve Corp (MRC)	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County OCSE (Child Support)	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Office of County Counsel	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Office of Emergency Assistant	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Office of Public Health Management	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Office of Public Information	Luke Yee, Systems Analyst, served on Steering Committee. Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Office of Senior Services	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes

Agency/Department	Participation	Provides Support to Socially Vulnerable Populations?
Essex County Office of Small Business Development	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Planning Board	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Sherriff's Office	Sergeant Ryan Peter, Detective Denise Teague, and Detective Mark Steinberg served on the Steering Committee. Member of Core Planning Team and coordinated County department participation in the Planning Process.	Yes
Essex County SNAP Office	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Superintendent of Schools	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex County Utilities Authority	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Essex County Youth Detention Facility	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Essex Regional Health Commission	Notified of planning process and asked to contribute. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes

2.6.4 Regional and Local Stakeholders

Each participating jurisdiction was tasked with coordinating with their local emergency management staff and local utilities. In addition, roughly 25 non-governmental stakeholders were directly invited to participate in the HMP update process and are listed in the table below. Those that served on the Steering Committee or Planning Partnership and those that completed the stakeholder survey are noted accordingly.

Table 2-6. Regional and Local Stakeholders

Agency/Department	Participation	Provides Support to Socially Vulnerable Populations?
Monmouth University Urban Coast Institute	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Rutgers University, Bloustein School	Ashlyn Spector, Senior Research Specialist, served on the Steering Committee. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	

Agency/Department	Participation	Provides Support to Socially Vulnerable Populations?
New Jersey Institute of Technology (NJIT) Center for Community Systems	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting. NJIT's Center for Community Systems operates technical assistance programs, including NJIT Technical Assistance to Brownfield Communities (TAB) and Technical Assistance for Resiliency Program (TARP). TAB provides free technical assistance to state, regional, county, tribal, and local government entities and nonprofit organizations interested in learning about, identifying, assessing, cleaning up, and redeveloping brownfield sites in EPA Regions 2 & 4. TARP provides free technical assistance to New Jersey local governments to help them develop FEMA Hazard Mitigation Assistance grant applications and build capacity to become more resilient to natural hazards. Carrie Martin served on the Steering Committee, attended the stakeholder workshop, and completed the stakeholder survey.	
Stevens Institute of Technology	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Rutgers Climate and Energy Institute	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting. Ashlyn Spector, Senior Research Specialist, served on the Steering Committee.	
Rutgers Cooperative Extension	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Girl Scouts of America	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
ANJEC	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Boy Scouts of America, Garden State Council	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
New Jersey Cultural Alliance for Response (NJCAR)	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	Yes
Port Authority of New York and New Jersey (PANYNJ)	Staff from PANYNJ attended the stakeholder workshop and completed the stakeholder survey. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting. The Port Authority of New York and New Jersey (PANYNJ) operates five airports, the bridges and tunnels that connect NY and NJ, a seaport, the PATH commuter rail system, and the World Trade Center campus. PANYNJ is responsible for Newark International Airport and Port Newark in Essex County. PANYNJ attended the stakeholder workshop and completed the stakeholder survey.	

Agency/Department	Participation	Provides Support to Socially Vulnerable Populations?
North Jersey Transportation Planning Authority (NJTPA)	Information on mitigation actions was taken from recent planning reports from NJTPA. Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting.	
Maplewood Library	Invited to participate via stakeholder surveys, stakeholder workshop, and public meeting. The Maplewood Library serves as a warming and cooling shelter during extreme temperature events. Representatives of the Maplewood Library the stakeholder workshop and public meeting.	Yes
Seton Hall University	Attended Planning Partnership kickoff meeting.	

2.6.5 Neighboring Communities

All contiguous county and municipal governments of Essex County were invited to provide input to the planning process. A request to complete a neighboring community survey and invitations to attend the February 4, 2025 stakeholder workshop and the February 18, 2025 public meeting were distributed to neighboring county and municipal contacts on January 8, 2025. The neighboring community survey was open from January 8, 2025 through February 24, 2025.

The emergency management coordinators for the Township of Little Falls in Passaic County and the Township of Florham Park in Morris County provided input through the neighboring community survey. Both noted flood risk along the County borders of the Passaic River and Peckman River as a mitigation need. As a result, Essex County municipalities have developed mitigation actions that include multi-jurisdictional approaches to flood mitigation with their neighbors.

Union County participated in the stakeholder workshop on February 4, 2025. Part of the outcome of this attendance was the identification of shared wildfire risk and the development of an Essex County mitigation action to work collaboratively on wildfire planning with Union County.

2.7 Public Involvement

Local Plan Requirement A3 – 44 CFR Part 201.6(b)(1)

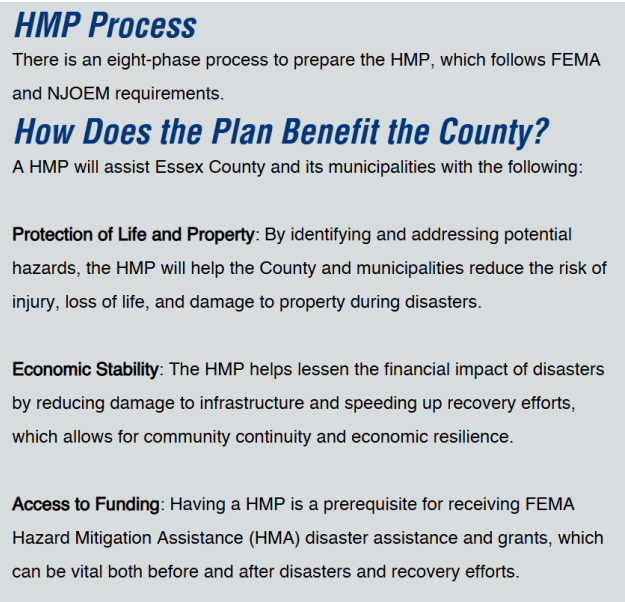
The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

Federal regulations for mitigation plan approval require that the general public are given opportunities to be involved in the plan's development process. Input from community members can strengthen the content and outcomes of the mitigation plan. This section describes the outreach strategy the County implemented to meet this requirement and involve the public throughout the planning process.

2.7.1 Hazard Mitigation Plan Webpage

At the beginning of the planning process, the County established a hazard mitigation website (https://www.essexsheriff.com/oem-category/2020-mid-plan-update/) to provide information about the process. The website was used to keep the public informed about milestones and public participation opportunities and to solicit input. During the public review period, links to the draft plan and instructions on how to provide feedback were provided. The website will be maintained to host the final version of the plan.

Figure 2-3. Excerpt from Essex County Sherriff's Office HMP webpage



HMP Process

There is an eight-phase process to prepare the HMP, which follows FEMA and NJOEM requirements.

How Does the Plan Benefit the County?

A HMP will assist Essex County and its municipalities with the following:

Protection of Life and Property: By identifying and addressing potential hazards, the HMP will help the County and municipalities reduce the risk of injury, loss of life, and damage to property during disasters.

Economic Stability: The HMP helps lessen the financial impact of disasters by reducing damage to infrastructure and speeding up recovery efforts, which allows for community continuity and economic resilience.

Access to Funding: Having a HMP is a prerequisite for receiving FEMA Hazard Mitigation Assistance (HMA) disaster assistance and grants, which can be vital both before and after disasters and recovery efforts.

2.7.2 Social Media

The Steering Committee and Planning Partnership used Facebook, Instagram, and X (formerly known as Twitter) accounts to promote the planning effort, including announcing the kickoff of the planning process, requests for public input through the public survey, the announcement of the public comment period, and announcement of the February 18, 2025 public meeting.

Figure 2-4. Example Social Media Post: Belleville Facebook Page



2.7.3 Print Media

A flyer and brochure were made available to the Steering Committee and Planning Partnership for printing and posting at facilities and distribution at meetings. A focus was made on distribution at events or locations that support socially vulnerable populations. The brochure was made available in three languages (English, Spanish, and Portuguese).

Figure 2-5. HMP Brochures; English, Spanish, and Portuguese Translations



2.7.1 Public Meetings

Figure 2-6. February 2025 Public Meeting



A public meeting was held on February 18th, 2025 at the Essex County Emergency Operations Center. This meeting was publicly posted and held in accordance with the Open Public Meetings Act (OPMA). The meeting presented the concepts of hazard mitigation, the planning process for the 2025 HMP update, and the draft results of the risk assessment. Attendees were asked to provide input on problem areas and potential solutions they would like considered in the County and municipal mitigation strategies. Stakeholder groups were also invited to attend.

Figure 2-7. February 2025 Public Meeting, Problems and Solutions Exercise



2.7.2 Public Survey

A public survey was developed and distributed at the onset of the planning process. The survey was designed to capture data and information from members of the public, especially those who might not be able to attend public meetings or participate through other means in the planning process. The survey was posted from December 17, 2024, through February 5, 2025. The County posted the survey on the planning website and social media platforms. The Planning Partnership announced the availability of the survey on municipal social media accounts and electronic signage where available. A link to the electronic public survey was also shared with Steering Committee members and stakeholders. Examples of planning process announcements and requests for input through the public survey can be found in Appendix D (Public and Stakeholder Outreach).

2.7.2.1 Summary of Survey Results

Despite a faster planning process that took place over the busy holiday season, the 2025 HMP Update's public survey doubled the number of responses received during the 2020 HMP process.

In total, the public survey yielded 200 responses. Flooding was ranked as the main hazard of concern from the majority of respondents. The majority of respondents receive information concerning a disaster from the internet (57%), followed by municipal email (53%) and television news (47%). 54% of respondents reported their home had previously been damaged by a hazard event, with only 33% of those damages being reported to the local municipality. Only 71% of respondents reported knowing their evacuation routes with 12% noting they would need assistance in the event of an evacuation. 30% of respondents noted their home was located in a floodplain but the majority (58%) of respondents did not know if their home was located in a hazard area. Of those in the floodplain, only one third had flood insurance. 4% of respondents noted they rely on services from the local government or non-profits. 3% of respondents spoke a language other than English. The majority of respondents (45%) have lived in Essex County more than 20 years. 90% reporting owning their place of residence and 10% reported renting.

2.7.3 Additional Outreach Approaches

Lawn signs were deployed around Essex County, requesting public input on impacts from natural hazards and directing interested parties to complete a short survey via QR code link. Lawn signs were deployed at the following locations:

- Turtle Back Zoo: Lawn signs were deployed at the entrance to the Turtle Back Zoo in West Orange to coincide with the Holiday Lights Spectacular, a free event that draws thousands of County residents and regional visitors.
- Essex County Tournament 2025: Lawn signs were deployed at the entrance to the Essex County Wrestling Tournament from January 22-23, 2025, one of the largest high school sporting events in the region.

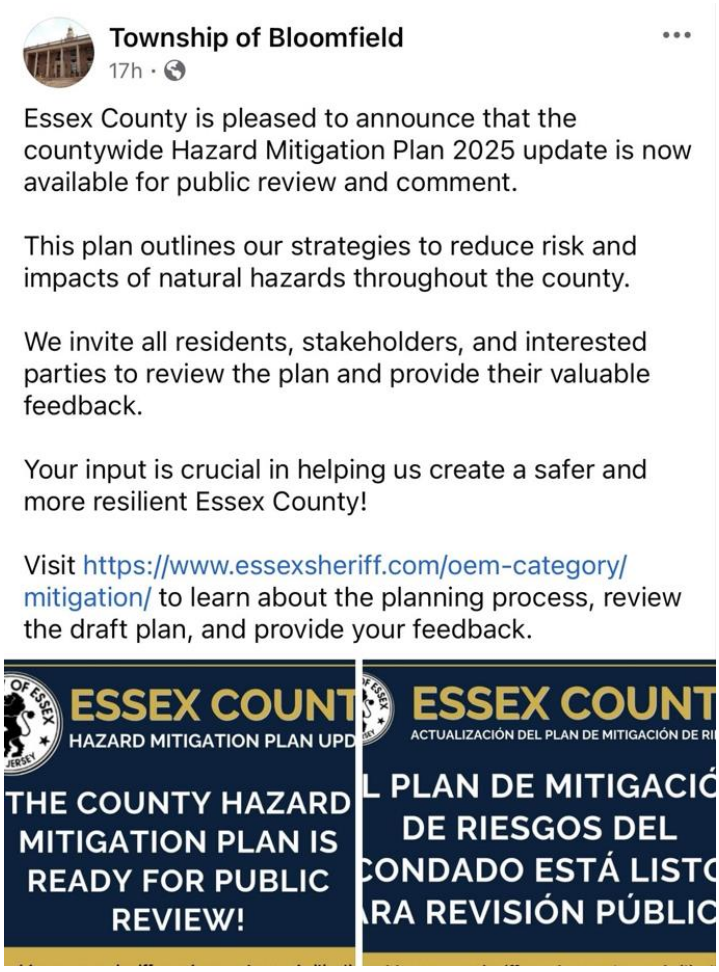
Figure 2-8. Lawn Signs Posted at Turtle Back Zoo Holiday Lights Spectacular Entrance



2.7.4 Public Review Period

The draft HMP was posted on the County website for a period of 30 days beginning in early March 2025. Comments on the draft were collected via an online form and reviewed for inclusion into the final plan. Jurisdictions announced the availability of the draft HMP for public review.

Figure 2-9. Example Social Media Announcement of Public Review Period



2.8 Identification and Outreach to Socially Vulnerable Populations and Underserved Communities

The Planning Partnership and Steering Committee were asked to identify socially vulnerable and underserved communities in Essex County during the kickoff meetings on December 4th and 5th. Following discussion, it was determined that socially vulnerable populations included the following:

- Population over the age of 65 years of age
- Population under the age of 5 years of age
- Population below the federal poverty threshold
- Population below the cost-of-living threshold
- Population with physical or mental disabilities
- Non-English speakers
- Population lacking personal transportation/reliant on public transportation

To reach these groups, the previously mentioned outreach techniques were deployed to provide multiple avenues for education and outreach of socially vulnerable populations and underserved committees. The recruitment of assistance from stakeholder groups that work with, represent, and serve these populations was particularly valuable to champion outreach efforts and has been identified in Table 2-5.

The Planning Partnership and Steering Committee identified additional local socially vulnerable populations and underserved communities within individual municipalities in Essex County. These populations have been identified in the municipal annexes in Volume II. The jurisdictional hazard mitigation teams coordinated targeted outreach to these identified populations and communities.

2.9 Review and Incorporation of Existing programs

Local Plan Requirement A4 – 44 CFR Part 201.6(b)(3)

Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Essex County utilized the most current technical information, plans, studies, and reports during the planning process to assist in hazard profiling, risk and vulnerability assessment, reviewing mitigation capabilities, and identifying, developing, and prioritizing mitigation strategies at the County and local levels.

- Risk Assessment – Asset and inventory data collected was used to complete the risk assessment of the HMP update. Details of the data used, along with how the data was used, is presented in Section 5 (Risk Assessment Methodology and Tools) and throughout the hazard profiles (Sections 6 through 14).
- Capability Assessment - Numerous plans, reports, regulations, codes, and technical information were obtained from the Planning Partnership and stakeholders involved in the planning process, as well as through independent research conducted by the planning consultant. Participating

jurisdictions were responsible for updating the inventory of their Planning and Regulatory capabilities in Volume II (Annexes) and submitting relevant planning and regulatory documents as needed.

- Mitigation Strategy – Numerous local, county, regional, and state plans with mitigation strategies that were applicable to Essex County were obtained from the Steering Committee, Planning Partnership, and stakeholders involved in the planning process. These mitigation strategies were incorporated into applicable annexes in Volume II.

2.10 Plan Adoption

Local Plan Requirement F1 – 44 CFR Part 201.6(c)(5)

The plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan.

DMA compliance and its benefits can only be achieved after the HMP is adopted. This plan was submitted for a preadoption review to NJOEM and FEMA prior to adoption. After pre-adoption was provided, each jurisdiction formally adopted the plan. Copies of the FEMA approval and the adoption resolution of each participating jurisdiction are provided in Appendix A (Plan Adoption).

2.11 Integration with Planning Programs

The assessment of capabilities identified areas where the previous mitigation plan is currently integrated into other plans and programs. This includes transportation plans, local master plans, and emergency operation plans.

The assessment looked for opportunities to integrate this mitigation plan with the legal/regulatory capabilities identified during the Capability Assessment (Section 16). Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. Planning partners considered actions to implement this integration as described in their jurisdictional annexes.

3 County Profile

This section provides general information about Essex County, including its historical information, physical setting, general building stock, land use, population, demographics, population trends, and community lifelines. Analyzing this information leads to an understanding of the study area, including economic, structural, and population assets at risk, and of concerns that could be related to hazards analyzed in this plan (e.g., low-lying areas prone to flooding, high percentage of vulnerable persons in an area).

3.1 Overview

3.1.1 Historical Overview

The recorded history of Essex County begins in 1666, when 30 Connecticut families headed by Robert Treat arrived to establish settlement along the banks of the Passaic River in what is now the City of Newark. The following year the settlers purchased the land from the Lenni Lenape Indians for $800.00. Essex County was officially established in 1682 by the East Jersey Legislature as one of the four original counties of present-day New Jersey. By the time of the American Revolution, Essex County had become quite prosperous. After the war, the County entered into a period of unprecedented industrial growth. This was due in part to the completion of the New Jersey Railroad, the Morris Canal, and the establishment of the Morris and Essex Railroad. Factories that grew up around the rail and canal arteries drew waves of immigrants from Europe and the population began to swell (Essex County 2019).

In 1895, Essex County became the first County in the United States to create a countywide park system. The "roaring 20's" was a decade of growth and prosperity, particularly with the construction of Newark's first skyscrapers and the development of the building trades industry. Newark Airport was opened, Port Newark came into being, and the Newark City Subway was under construction. It was also at this time that many of the County's boroughs and townships experienced major development and expansion and that early suburban shopping centers were begun (Essex County 2019).

The central section of the County, once known as the "trolley car suburbs", grew rapidly after the turn of the century when trolley lines were built to carry workers from industrial Newark to the less crowded outlying towns of Irvington, East Orange, Orange, and Bloomfield. Commuter railroads which passed through Newark carried commuters to Manhattan from suburban towns such as South Orange, Maplewood, Millburn, Glen Ridge, and Montclair (Essex County 2019).

Development of the western section of the County was slowed because of the difficulty and expense of crossing First and Second Mountains. However, the demand for modern industrial development and new residential spaces forced development to the west. With the completion of Route 280, communities such as Livingston, Fairfield, Roseland, Cedar Grove, Essex Fells, and the Caldwells become the County's fastest growing communities (Essex County 2019).

Since its inception, Essex County has been the industrial and financial hub of New Jersey. With Newark International Airport and Port Newark located within its borders, Essex County is a major national

transportation hub with a superior network of rail, highway, air, and sea transportation and is home to one of the world's largest containerized shipping ports (Essex County 2019).

Today Essex County, with 22 municipalities ranging over 127 square miles and a total population of 863,728, is New Jersey's second most populous County.

3.1.2 Municipalities

Essex County consists of 22 municipalities. It is an urban county with outlying suburban communities. Essex County includes the City of Newark, the largest municipality in the state by population. The Borough of Caldwell is the smallest municipality in the County in terms of land area, and Essex Fells has the lowest population in the County. Generally, the eastern portion of the County is more urban compared to the more suburban western portion of the County.

Table 3-1. Municipalities in Essex County

Essex County		
Township of Belleville	Township of Irvington	Township of the City of Orange
Township of Bloomfield	Township of Livingston	Borough of Roseland
Borough of Caldwell	Township of Maplewood	Village of South Orange
Township of Cedar Grove	Township of Millburn	Township of Verona
City of East Orange	Township of Montclair	Township of West Caldwell
Borough of Essex Fells	City of Newark	Township of West Orange
Township of Fairfield	Borough of North Caldwell	
Borough of Glen Ridge	Township of Nutley	

3.1.3 Government

Essex County follows the county executive plan form of government. There is one elected County Executive and a nine-member board of County Commissioners. The County seat is the City of Newark (Essex County 2019).

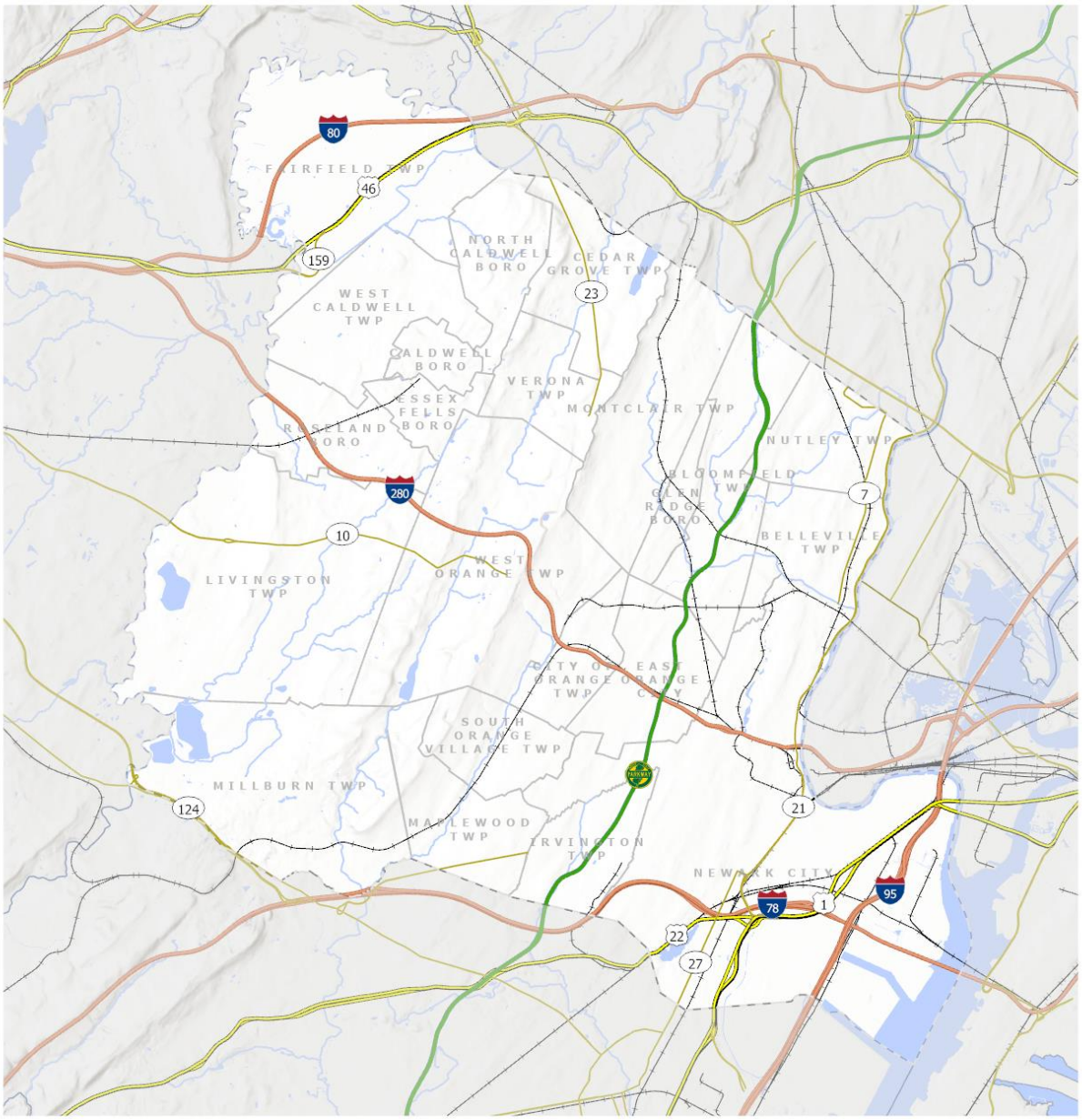
3.2 Physical Setting

This section describes the geography, land use, and land cover of Essex County.

3.2.1 Location

Essex County is located in northern New Jersey, approximately 20 miles south of the New York State border, and 10 miles west of Manhattan. The County is bordered by Passaic County to the north, Bergen County to the east-northeast, Hudson County to the east, Union County to the south and Morris County to the west. The eastern and western borders of Essex County are defined by the Passaic River. The County is separated from Morris County by the eastern branch of the Passaic River. The southeast border of the County is situated on the Newark Bay with approximately 3.5 miles of shoreline. The County land area is 127 square miles and the water area is 3.3 square miles.

Figure 3-1. Essex County Planning Area



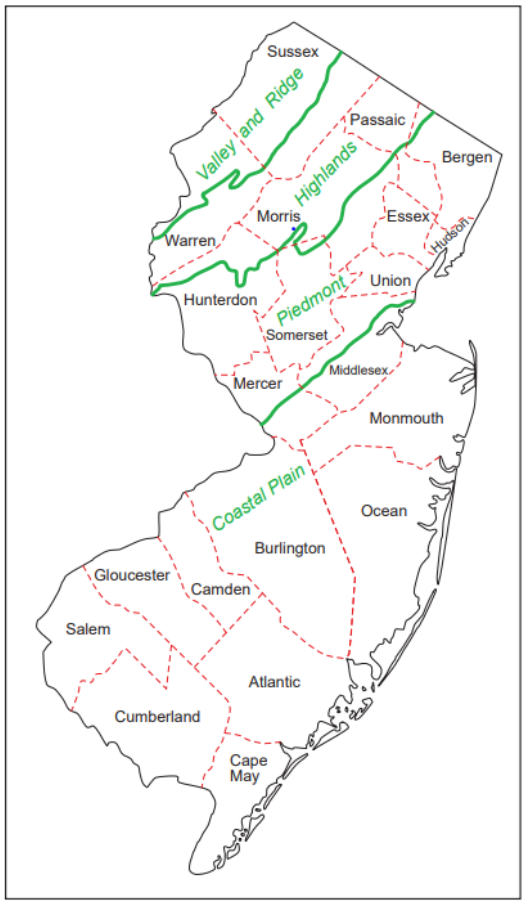
Sources: NJ Office of GIS

Base Map Credits: Esri, NASA, NGA, USGS

3.2.2 Geography and Topography

The County's topography is flat in the east and slowly rises toward the west upon the approach of the Watchung Mountains. The Watchung Mountains run roughly north south through the center of Essex County. To the west of the Watchung Mountain, the slope gently declines back to a flatter topography as it approaches the western branch of the Passaic River. The highest elevations in the County are located in three municipalities within the Watchung Mountain range: Essex Fells, North Caldwell and Verona, with the highest point of 691 feet above sea level. The lowest point in the County is located at Newark Bay in the City of Newark. The average elevation of the County is 300 feet above sea level (Dalton 2003).

Figure 3-2. Physiographic Provinces of New Jersey



Source: (NJ Geological Survey 2006)

Essex County is located within the Piedmont Province, which is one of the four major physiographic regions of New Jersey. The Piedmont Province has an area of approximately 1,600 square miles and makes up about one fifth of the State. The Piedmont Province is mainly underlain by slightly folded and faulted sedimentary rocks of the Triassic and Jurassic age and igneous rocks of the Jurassic age (Dalton 2003).

According to the New Jersey Geological Survey (NJGS), the Piedmont Province is a low rolling plain divided by a series of higher rides. The width varies from approximately 16 miles near the New York border to over

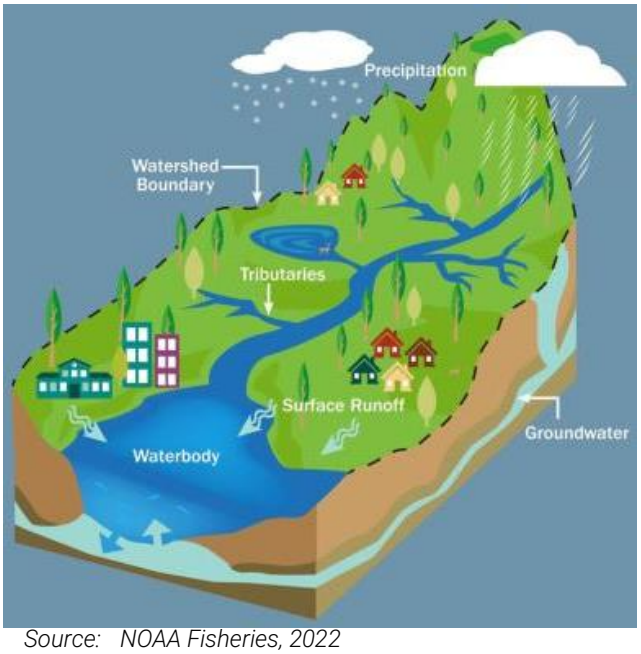
30 miles at the Delaware River. The most prominent feature of the eastern portion of the province is the Palisades, which has a maximum elevation of 547 feet near Closter and provides views of the Hudson River and New York City. Near the Newark Bay, toward its boundary with the Coastal Plain Province, the elevation is at sea level (Dalton 2003).

3.2.3 Watersheds and Surface Waters

A watershed is a geographical area that directs precipitation and snowmelt towards creeks, streams, rivers, and ultimately outflow locations such as reservoirs, bays, and the ocean. Watersheds vary in size and configuration, encompassing anything from a small body of water or county to vast regions covering thousands of square miles with numerous waterways (National Ocean Service 2024). Figure 3-3 depicts the general makeup of a watershed.

Twenty watersheds make up the State of New Jersey. Essex County is located in three of the 20 watersheds: Arthur Kill (Watershed Management Area 7); Lower Passaic, Saddle River (Watershed Management Area 4); and the Upper and Mid Passaic, Whippany, Rockaway (Watershed Management Area 6). These are represented in Figure 3-4 as Watershed Management Areas. Most of the Essex County land in the watershed has been developed. None of the streams or the Lower Passaic River itself is currently being used for drinking water supplies (Essex County Park, Recreation and Open Space Master Plan 2003).

Figure 3-3. Watershed Diagram



Source: NOAA Fisheries, 2022

Figure 3-4. Watershed Management Areas of Essex County

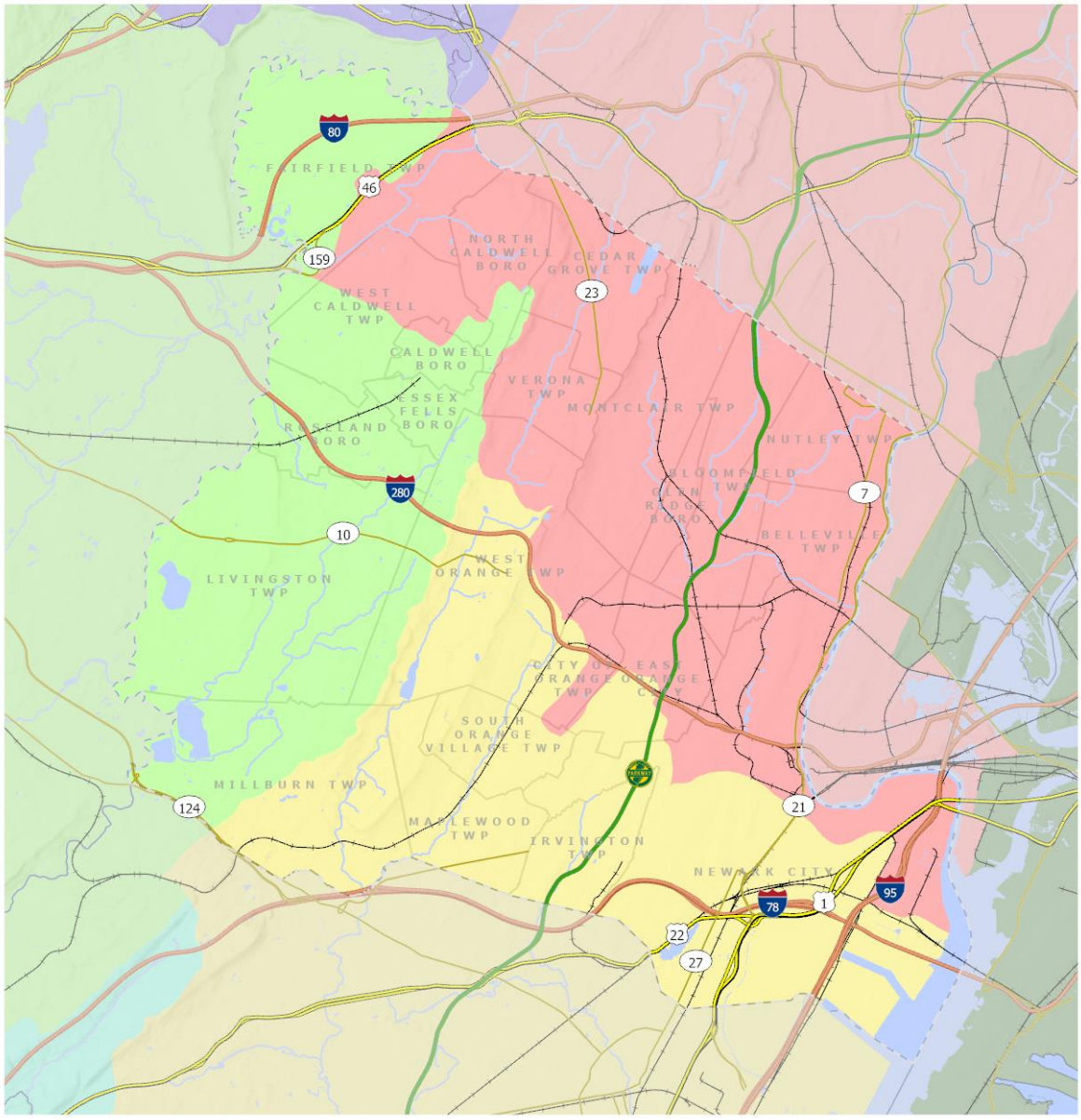


Table 3-2. Watershed Details

Watershed Name	Description
Arthur Kill (Watershed Management Area 7)	Watershed Management Area 7 (WMA 7) is represented by large portions of Essex, Union, and Middlesex Counties. The mainstem of the Rahway River is 24 miles long, flowing from Union into the Arthur Kill near Linden. It is tidal from the Pennsylvania Railroad Bridge at Rahway down to the mouth. Key tributaries include the East Branch Rahway River, Woodbridge River, and Robinson's Branch. Key problems in this watershed include point source pollution, habitat destruction, and flood control. The sources of nonpoint pollution that have been identified include construction activities, storm sewers, urban surfaces, roads, and combined sewer overflows.
Lower Passaic, Saddle River (Watershed Management Area 4)	Watershed Management Area 4 includes the Lower Passaic River (from the Pompton River confluence downstream to the Newark Bay) and its tributaries, including the Saddle River. The drainage area is about 180 square miles and lies within the portions of Passaic, Essex, Hudson, Morris, and Bergen Counties.
Upper and Mid Passaic, Whippany, Rockaway (Watershed Management Area 6)	Watershed Management Area 6 (WMA 6) represents the area drained by waters from the upper reaches of the Passaic River Basin. This includes the Passaic River from its headwaters in Morris County to the confluence of the Pompton River. Extensive suburban development and reliance upon ground water sources for water supply characterize this watershed. The Upper Passaic River represents a significant source of drinking water for a large portion of northeastern New Jersey. About one half of the land in this watershed is undeveloped or vacant with the rest primarily residential and commercial.

Source: (NJOEM 2014)

The largest wetland areas in Essex County are Great Piece Meadows and Hatfield Swamp, both of which are associated with the Passaic Meadows complex in northwestern Essex County. Forested wetland floodplains are mapped along the Passaic River in southwestern Essex County south of Hatfield Swamp from Willow Brook to the area around Canoe Brook Reservoir. Within southwest Essex County, wetlands are associated with Passaic River tributaries including Slough Brook, Canoe Brook, and Taylor Brook in Millburn Township. In central Essex County, wetlands are primarily limited to smaller areas following creek corridors with some more extensive patches in Eagle Rock Reservation Mapped wetlands within eastern Essex County are generally limited to small, isolated patches (Amy S. Greene Environmental Consultants, Inc. 2007).

Much of the wetland hydrology in Essex County is due to groundwater discharge to the surface or surface water runoff, in the form of sheet flow or flooding from adjacent open waters. Water tables are usually highest in the late winter and into early spring. During this period, water may pond or flood the wetlands for variable periods. In May or June, the water table usually begins to drop to its lowest levels, which occur in September or October. Fluctuations relate mainly to rainfall patterns, temperatures, and rates of evapotranspiration (the rate of water uptake from vegetation) (Amy S. Greene Environmental Consultants, Inc. 2007).

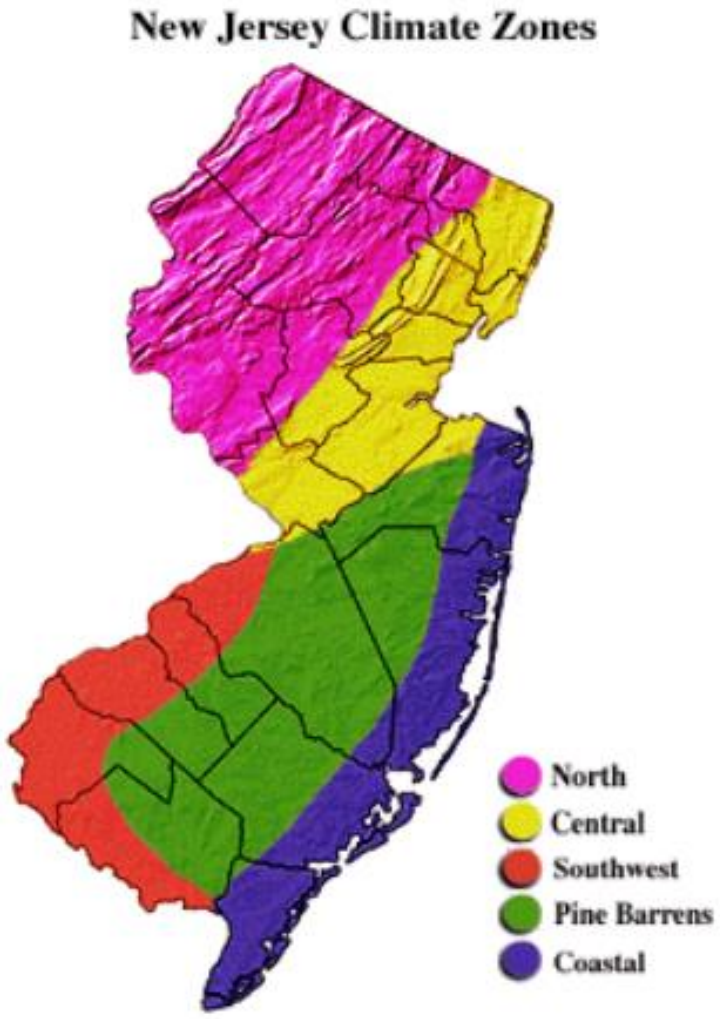
3.2.4 Climate

The State of New Jersey is located approximately halfway between the equator and the North Pole, resulting in a climate that is influenced by wet, dry, hot, and cold airstreams, making a highly variable environment. The southern portion of New Jersey tends to be more temperate than the north. The

dominant feature of the atmospheric circulation over North America, including New Jersey, is the broad, undulating flow from west to east across the middle latitudes of the continent. This pattern exerts a major influence on the weather throughout the State (ONJSC n.d.).

Average annual precipitation ranges from approximately 40 inches along the southeast coast to 51 inches in the north-central portion of the State. Most areas in New Jersey average between 43 and 47 inches of precipitation annually. Snow typically falls from around November 15 to April 15 in the southern counties. Most locations in New Jersey receive between 25 and 30 thunderstorms each year, with fewer storms near the coast than inland. New Jersey experiences measurable precipitation; approximately 120 days each year. The fall months are typically the driest, with an average of eight days of measurable precipitation. Other seasons average between nine and 12 days each month with measurable precipitation. New Jersey also has approximately five tornadoes each year, which generally tend to be weak (ONJSC n.d.).

Figure 3-5. Climate Zones of New Jersey



Source: (ONJSC n.d.)

The State of New Jersey is divided into five distinct climate zones. Distinct variations in the day-to-day weather between each of the climate zones is due to the geology, distance from the Atlantic Ocean, and prevailing atmospheric flow patterns. Essex County is located in the Central Climate Zone (ONJSC n.d.).

The Central Zone has a northeast to southwest orientation, running from New York Harbor and the Lower Hudson River to the great bend of the Delaware River in the vicinity of Trenton. This region has many urban locations with large amounts of pollutants produced by the high volume of automobile traffic and industrial processes. The concentration of buildings and paved surfaces serve to retain more heat, thereby affecting the local temperatures. Because of the asphalt, brick, and concrete, the observed nighttime temperatures in heavily developed parts of the zone are regularly warmer than surrounding suburban and rural areas. This phenomenon is often referred to as a "heat island" (ONJSC n.d.).

The northern edge of the Central Zone is often the boundary between freezing and non-freezing precipitation during wintertime. In summer, the northern reaches often mark the boundary between comfortable and uncomfortable sleeping conditions. Areas to the south of the Central Zone tend to have nearly twice as many days with temperatures above 90 degrees F than the 15-20 commonly observed in the central portion of the state (ONJSC n.d.).

In Essex County, the average annual temperature is 54 degrees F. January is typically the coldest month of the year with an average high temperature of 38 degrees F and an average low of 24 degrees F. July is typically the warmest month of the year with an average high temperature of 86 degrees F and an average low of 69 degrees F. The average annual precipitation in Essex County is 44-48 inches with roughly 111 days of precipitation per year (Essex County 2019).

3.3 Population and Demographics

Those that live in the County are one of the most important assets and this HMP update will assess risk to people and identify mitigation strategies to protect them, including underserved and socially vulnerable populations.

3.3.1 General Population

3.3.1.1 Current and Historical Population

Essex County experienced a steady and continuing population growth rate of about 2.5 percent per year over 160 years from 1790 to the 1940s and 1950s. During the post – World War II period, growth slowed substantially to a period of flat growth from 1950 and into the 1970s and 1980s. Starting during the 1970s and through at least 2010, Essex experienced an extended period of population decline, dropping more than 154,000 from the high point in 1970 to the low point in 1990. The 2010s reversed this trend of flat growth and decline, as evidenced by the 10 percent increase in population recorded by the 2020 U.S. Census, and overall population growth of more than 142,000 since the low point of the 1990 Census (NJTPA 2023).

Table 3-3. Recent Population by Jurisdiction

Jurisdiction	2010 Population (U.S. Census)	2020 Population (U.S. Census)	2023 Population (American Community Survey)
Township of Belleville	35,926	38,203	37,756
Township of Bloomfield	47,315	53,105	52,974
Borough of Caldwell	7,822	9,027	8,898
Township of Cedar Grove	12,411	12,980	13,252
City of East Orange	64,270	69,526	69,183
Borough of Essex Fells	2,113	2,244	2,320
Township of Fairfield	7,466	7,872	7,712
Borough of Glen Ridge	7,527	7,802	7,827
Township of Irvington	53,926	61,146	60,334
Township of Livingston	29,366	31,330	31,128
Township of Maplewood	23,867	25,684	25,406
Township of Millburn	20,149	21,710	21,793
Township of Montclair	37,669	40,921	39,873
City of Newark	277,140	311,510	307,188
Borough of North Caldwell	6,183	6,694	6,622
Township of Nutley	28,370	30,143	29,767
Township of the City of Orange	30,134	34,431	33,973
Borough of Roseland	5,819	6,275	6,211
Village of South Orange	16,198	18,484	18,299
Township of Verona	13,332	14,506	14,441
Township of West Caldwell	10,759	11,012	10,897
Township of West Orange	46,207	48,843	48,276
Essex County	**783,969**	**863,448**	**854,130**

Source: (U.S. Census 2010) (U.S. Census 2020) (U.S. Census 2023)

Figure 3-6. Population Distribution (2020 U.S. Census)

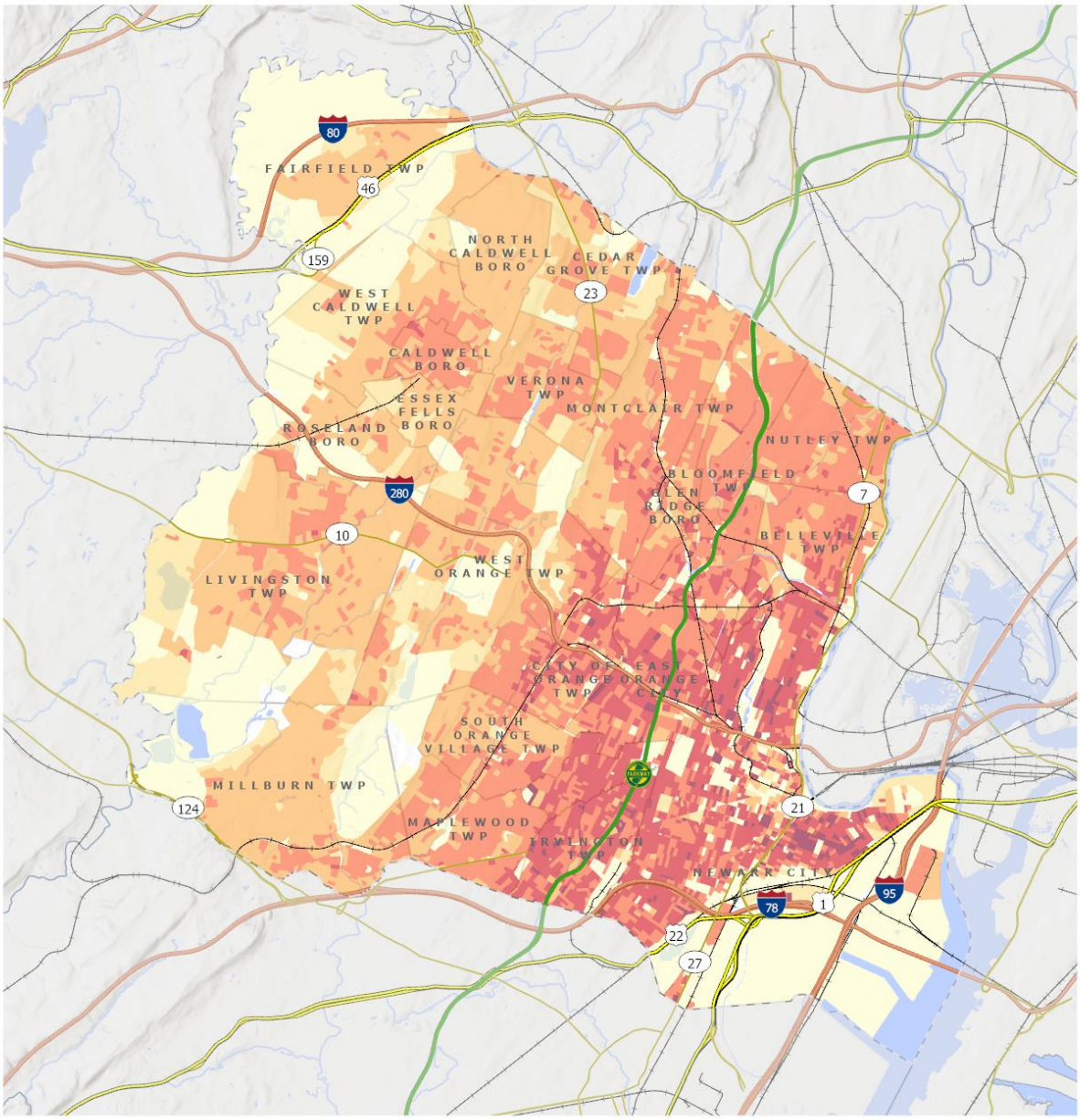
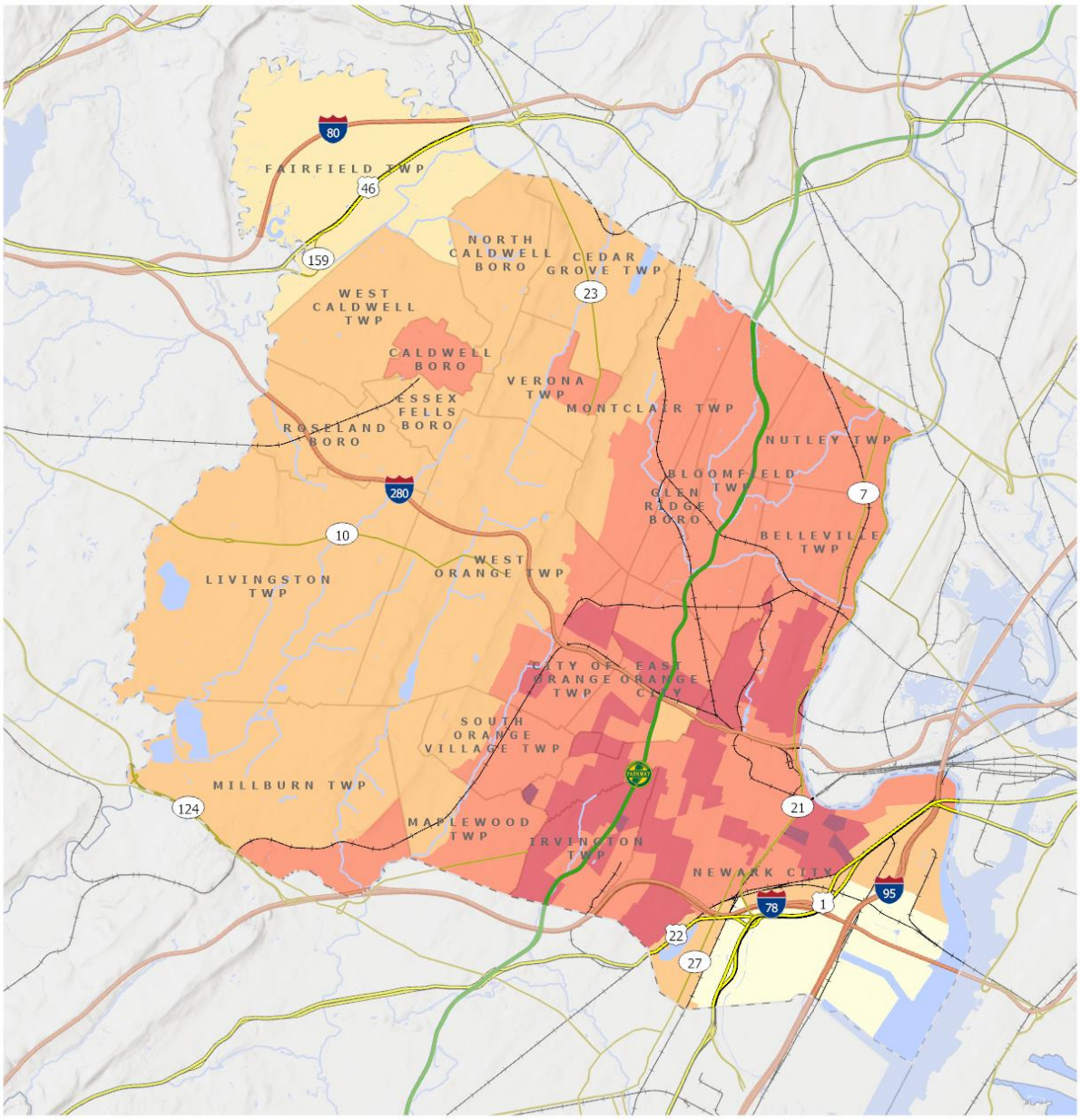


Figure 3-7. Population Distribution (2023 American Community Survey)



Total Population (2023 American Community Survey)

N

0 0.5 1 2 Miles

Population/Square Mile
- 0 - 500
- 500 - 1,000
- 1,000 - 5,000
- 5,000 - 20,000
- 20,000 - 50,000
- 50,000 +

Municipality
Essex County

Sources: NJ Office of GIS; U.S. Census Bureau
Base Map Credits: Esri, NASA, NGA, USGS

3.3.1.2 Future Population Projections

The New York Metropolitan Transportation Council developed socioeconomic and demographic forecasts for the region. Essex County is expected to experience steady population growth for several decades.

Table 3-4. Essex County Population Projections

2020 Population (U.S. Census)	2023 Population (ACS)	2030 Population Projection	2035 Population Projection	2040 Population Projection	2045 Population Projection	2050 Population Projection	2055 Population Projection
863,448	854,130	822,081	856,747	879,863	900,211	920,335	940,458

Source: (NYMTC 2020) (U.S. Census 2020) (U.S. Census 2023)

3.3.2 Vulnerable Populations

Underserved communities are populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. Social vulnerability is the potential for loss within an individual or social group. The term recognizes that some traits influence an individual's or group's resilience; or their ability to prepare, respond, cope, or recover from an event (FEMA 2023).

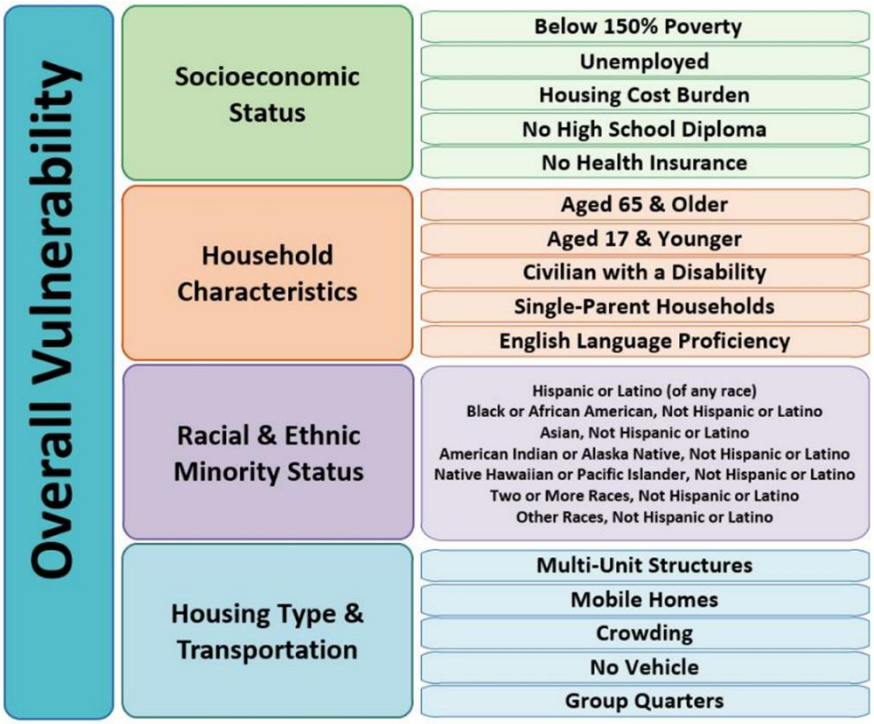
FEMA requires that HMPs include underserved communities and socially vulnerable populations located within the jurisdictions. These demographics may be more at-risk during hazard events due to a variety of factors, such as their physical and financial capacity to react or respond effectively, as well as the location and quality of their housing. Those with greater vulnerability may experience more severe impacts during emergencies or disasters. It is essential for public officials to consider the distinct needs of vulnerable populations in order to ensure their safety.

Although efforts continue to address underserved and socially vulnerable populations, disparities continue to exist within the County. For example, the 2024 Essex County Disparity Study found that significant marketplace discrimination exists for minority and women owned businesses operating in the private sector in Essex County (County of Essex 2024).

3.3.2.1 Social Vulnerability Index

The Centers for Disease Control and Prevention (CDC) and Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI) is a place-based index, database, and mapping application designed to identify and quantify communities experiencing social vulnerability. The current CDC/ATSDR Social Vulnerability Index uses 16 U.S. census variables from the 5-year American Community Survey (ACS) to identify communities that may need support before, during, or after disasters. The factors include economic data as well as data regarding education, family characteristics, housing, language ability, ethnicity, and vehicle access. These variables are combined into a single measure of overall social vulnerability (CDC/ATSDR 2024).

Figure 3-8. CDC/ARSDR Social Vulnerability Index

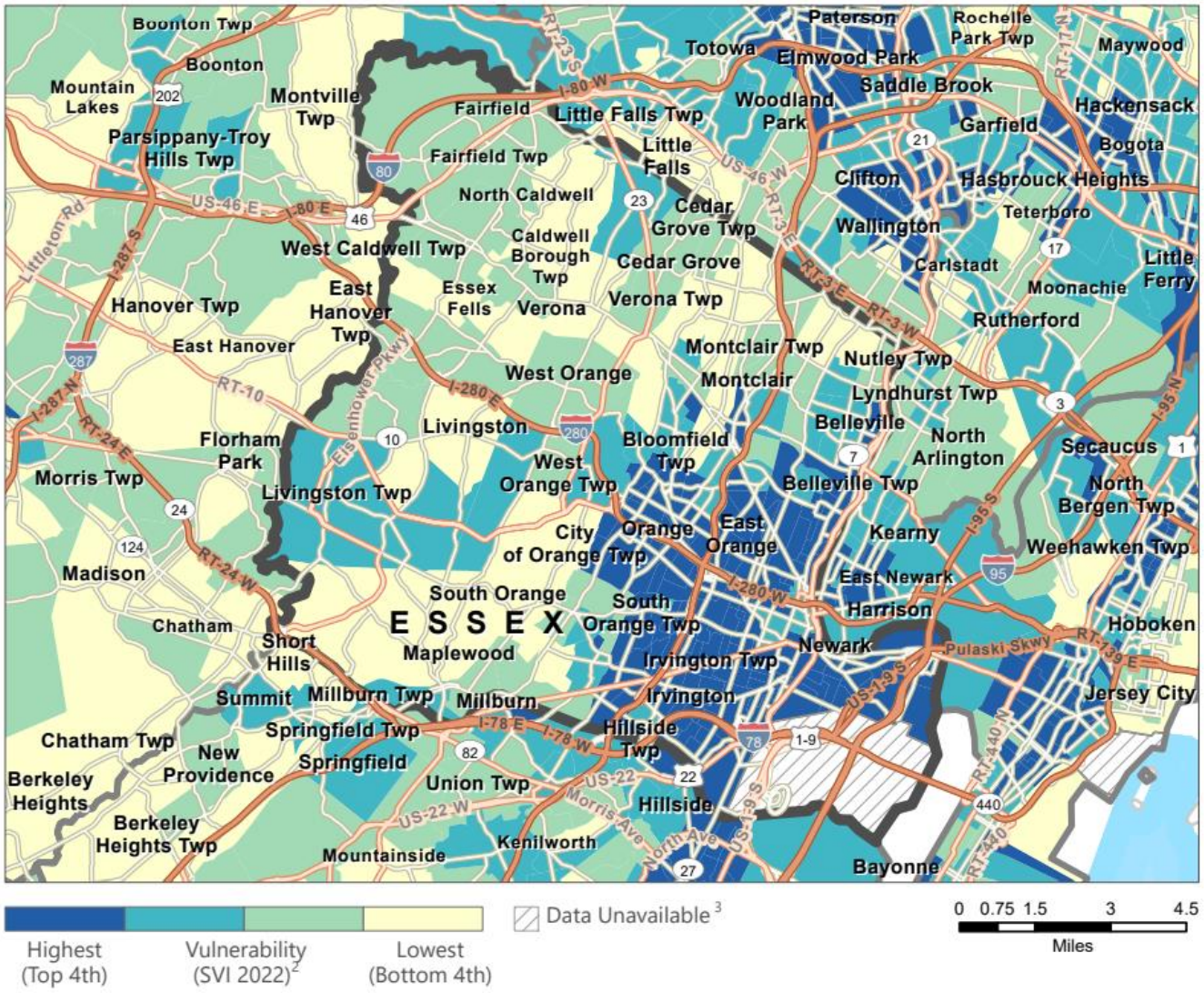


Source: (CDC/ATSDR 2024)

FEMA integrates the CDC/ATSDR Social Vulnerability Index into its National Risk Index (NRI) dataset. The NRI is discussed in Section 4.

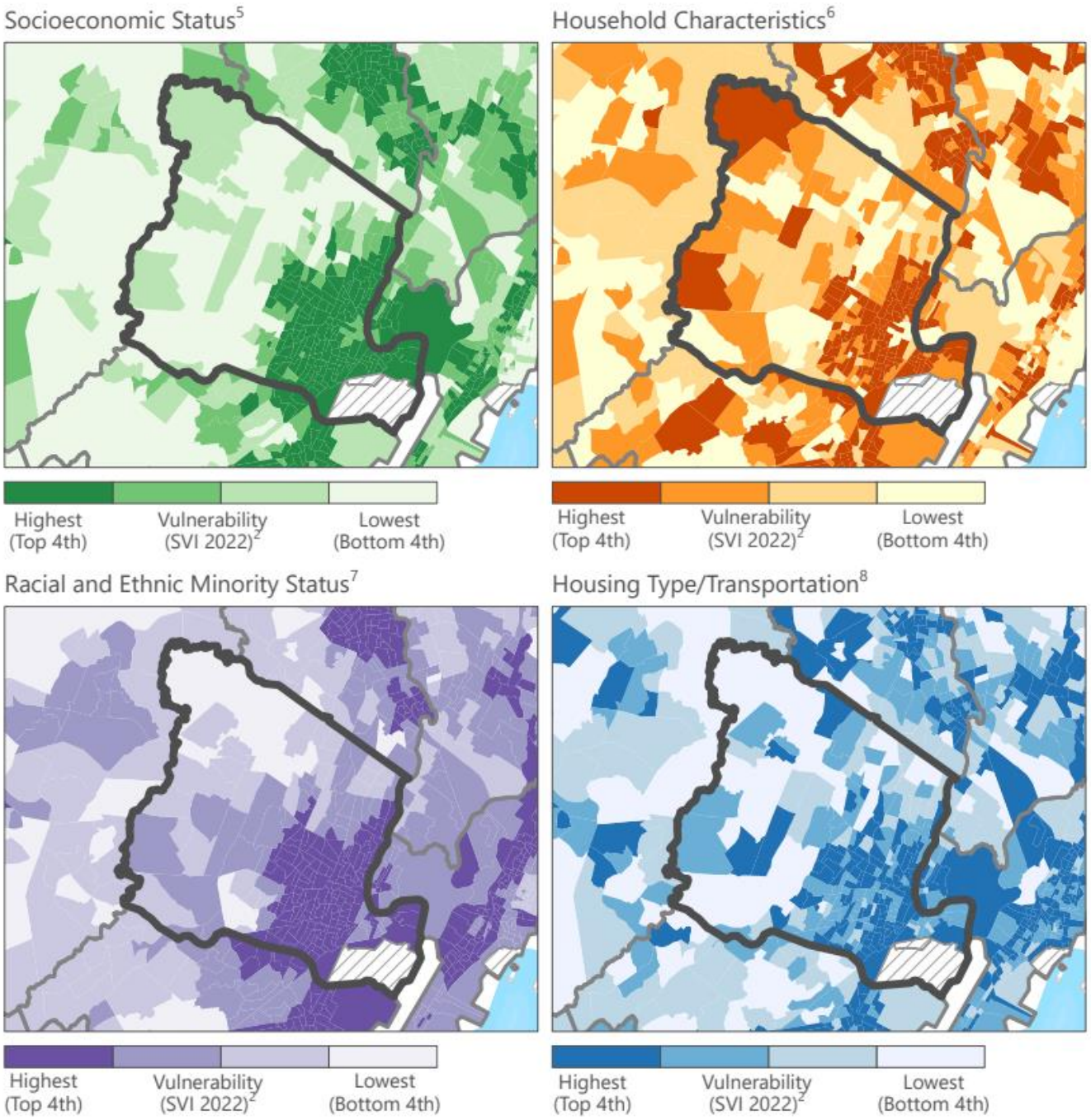
The CDC/ATSDR Social Vulnerability Index 2022 for Essex County indicates a high degree of overall social vulnerability. On a scale from 0 (lowest vulnerability) to 1 (highest vulnerability), Essex County has an SVI score of 0.9415. Areas of greatest social vulnerability are focused in the southeastern portion of the County, including the City of East Orange, Township of Irvington, City of Newark, and Village of South Orange. These municipalities also have the greatest social vulnerability according to socioeconomic status, household characteristics, racial & ethnic minority status, and housing type & transportation (CDC/ATSDR 2022).

Figure 3-9. CDC/ARSDR Social Vulnerability Index 2022, Essex County, New Jersey



Source: (CDC/ATSDR 2022)

Figure 3-10. CDC/ARSDR 2022 SVI Themes, Essex County, New Jersey



Source: (CDC/ATSDR 2022)

3.3.2.2 Identified Vulnerable Populations

The identification of socially vulnerable populations and underserved communities within the planning area was emphasized throughout the planning process. This was completed through public and stakeholder surveying and outreach, review of available data and resources, and the input of local officials. See Section

2 for more information on how vulnerable communities were identified and included in the planning process.

The Planning Partnership identified the following socially vulnerable populations and underserved communities within Essex County and prioritized understanding risk and the development of mitigation strategies to support these groups. Jurisdictions also were tasked with identifying vulnerable populations specific to their jurisdiction. Discussion of localized social vulnerability is included in the jurisdictional annexes in Volume II.

Table 3-5. Socially Vulnerable Populations by Jurisdiction, 2023 American Community Survey

Jurisdiction	Total Population	Population 65+	% Population 65+	Population Under 5	% Population Under 5	Total Households	Low-Income Households	% Low-Income Households	Physical/ Mental Disabilities	% Physical/ Mental Disabilities	Population That Speaks English Less Than Very Well	% Population That Speaks English Less Than Very Well
Belleville (T)	37,756	5,496	14.6%	1,748	4.6%	14,176	2,219	15.7%	4,337	11.5%	8,131	21.5%
Bloomfield (T)	52,974	7,749	14.6%	3,381	6.4%	21,096	2,917	13.8%	5,125	9.7%	5,566	10.5%
Caldwell (B)	8,898	1,693	19.0%	575	6.5%	3,797	464	12.2%	795	8.9%	630	7.1%
Cedar Grove (T)	13,252	3,312	25.0%	947	7.1%	4,942	527	10.7%	1,101	8.3%	629	4.7%
East Orange (C)	69,183	10,300	14.9%	4,559	6.6%	28,188	7,721	27.4%	9,892	14.3%	4,659	6.7%
Essex Fells (B)	2,320	382	16.5%	103	4.4%	724	31	4.3%	69	3.0%	28	1.2%
Fairfield (T)	7,712	2,397	31.1%	467	6.1%	3,003	350	11.7%	1,152	14.9%	565	7.3%
Glen Ridge (B)	7,827	1,050	13.4%	419	5.4%	2,488	74	3.0%	389	5.0%	282	3.6%
Irvington (T)	60,334	7,477	12.4%	4,232	7.0%	22,166	6,080	27.4%	6,974	11.6%	8,723	14.5%
Livingston (T)	31,128	5,841	18.8%	1,533	4.9%	10,425	437	4.2%	1,917	6.2%	3,064	9.8%
Maplewood (T)	25,406	3,058	12.0%	1,794	7.1%	8,659	497	5.7%	1,520	6.0%	673	2.6%
Millburn (T)	21,793	2,863	13.1%	1,231	5.6%	6,999	345	4.9%	812	3.7%	1,709	7.8%
Montclair (T)	39,873	5,433	13.6%	2,310	5.8%	15,118	1,637	10.8%	3,211	8.1%	1,220	3.1%
Newark (C)	307,188	33,493	10.9%	20,256	6.6%	113,748	37,814	33.2%	49,938	16.3%	71,362	23.2%
North Caldwell (B)	6,622	1,439	21.7%	469	7.1%	2,220	121	5.5%	571	8.6%	379	5.7%
Nutley (T)	29,767	4,949	16.6%	1,727	5.8%	11,558	1,270	11.0%	2,142	7.2%	2,384	8.0%
City of Orange (T)	33,973	4,615	13.6%	2,384	7.0%	12,592	3,735	29.7%	4,436	13.1%	7,405	21.8%
Roseland (B)	6,211	1,443	23.2%	471	7.6%	2,445	191	7.8%	503	8.1%	519	8.4%
South Orange (V)	18,299	2,365	12.9%	1,049	5.7%	5,932	644	10.9%	1,504	8.2%	627	3.4%
Verona (T)	14,441	3,130	21.7%	889	6.2%	5,840	690	11.8%	1,490	10.3%	399	2.8%

Jurisdiction	Total Population	Population 65+	% Population 65+	Population Under 5	% Population Under 5	Total Households	Low-Income Households	% Low-Income Households	Physical/ Mental Disabilities	% Physical/ Mental Disabilities	Population That Speaks English Less Than Very Well	% Population That Speaks English Less Than Very Well
West Caldwell (T)	10,897	1,931	17.7%	667	6.1%	3,917	248	6.3%	876	8.0%	467	4.3%
West Orange (T)	48,276	8,967	18.6%	2,567	5.3%	17,440	2,281	13.1%	4,276	8.9%	4,747	9.8%
Essex County (Total)	**854,130**	**119,383**	**14.0%**	**53,778**	**6.3%**	**317,473**	**70,293**	**22.1%**	**103,030**	**12.1%**	**124,168**	**14.5%**

Source: (U.S. Census 2023)

3.3.2.3 Age

As a group, the elderly are more apt to lack the physical and economic resources necessary for response to hazard events and are more likely to suffer health-related consequences. They are more likely to be vision, hearing, and/or mobility impaired, and more likely to experience mental impairment or dementia. Additionally, the elderly are more likely to live in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. These facilities are typically identified as "critical facilities" by emergency managers because they require extra notice to implement evacuation. Elderly residents living in their own homes may have more difficulty evacuating their homes and could be stranded in dangerous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to isolation caused by the event. Specific planning attention for the elderly is an important consideration given the current aging of the American population. According to the 2023 American Community Survey, 14% of the County's population is 65 years of age or older (U.S. Census 2023).

Children under 16 are particularly vulnerable to disaster events because of their young age and dependence on others for necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can become worse during a natural disaster because they may not understand the measures that need to be taken to protect themselves from the flood hazard According to the 2023 American Community Survey, 6.3% of the County's population is 5 years of age or younger (U.S. Census 2023).

Figure 3-11. Population 65 Years and Older, Essex County, New Jersey

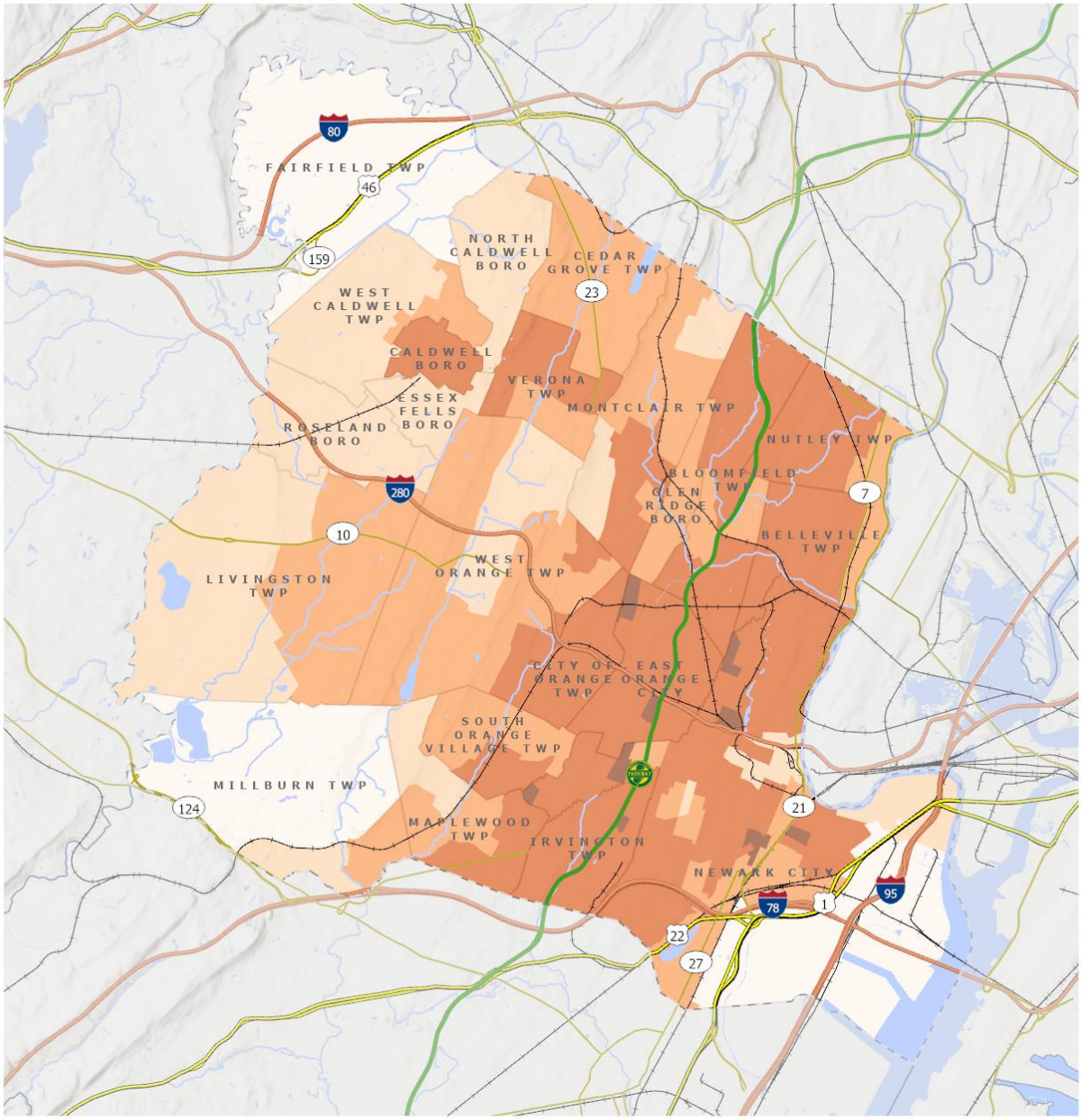
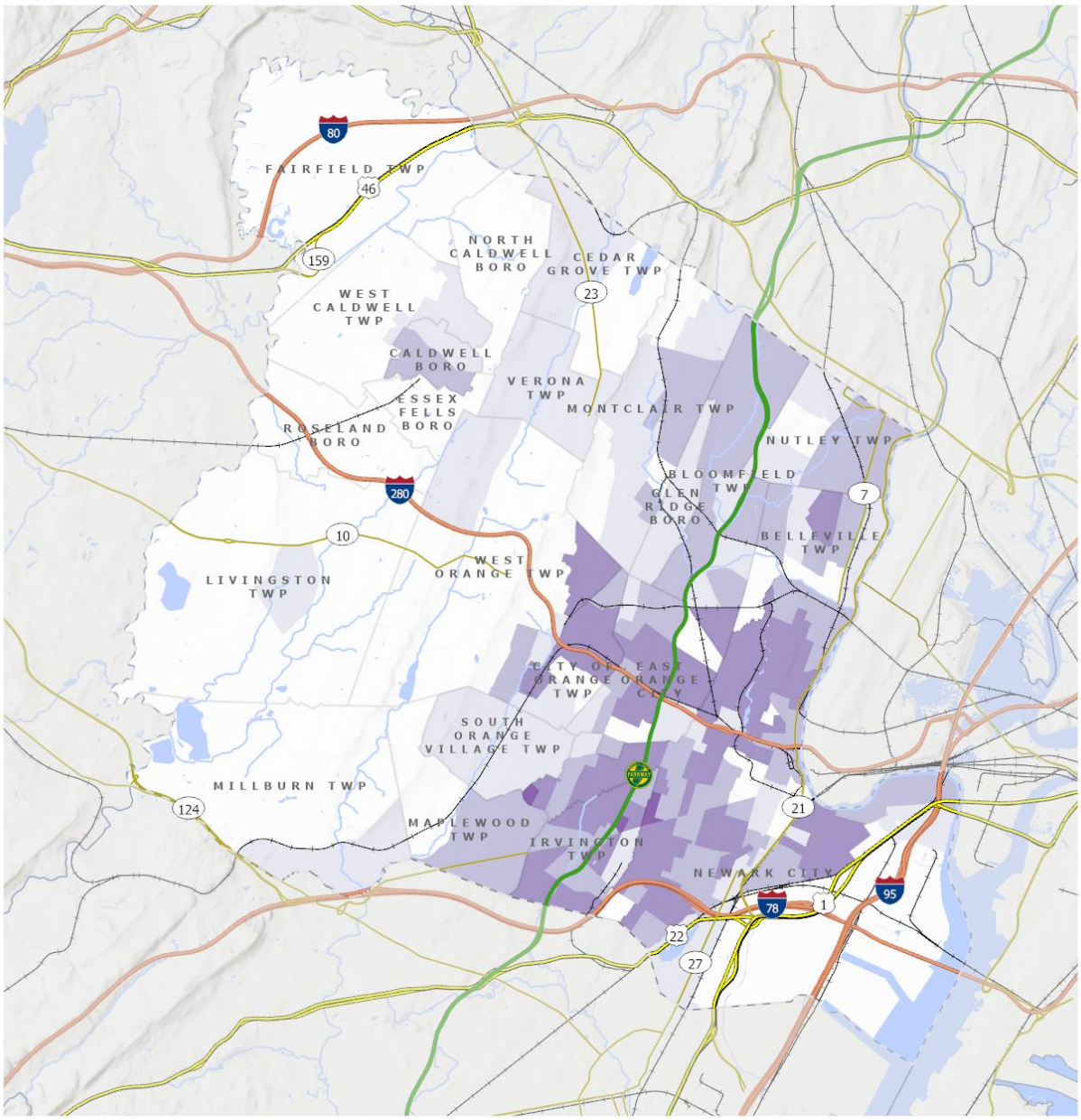


Figure 3-12. Population Under the Age of 5 Years, Essex County, New Jersey



Population Under the Age of 5
(2023 American Community Survey)

N

0 0.5 1 2
Miles

Population/Square Mile
0 - 250
250 - 500
500 - 1,000
1,000 - 5,000
5,000+

Municipality
Essex County

Sources: NJ Office of GIS; U.S. Census Bureau
Base Map Credits: Esri, NASA, NGA, USGS

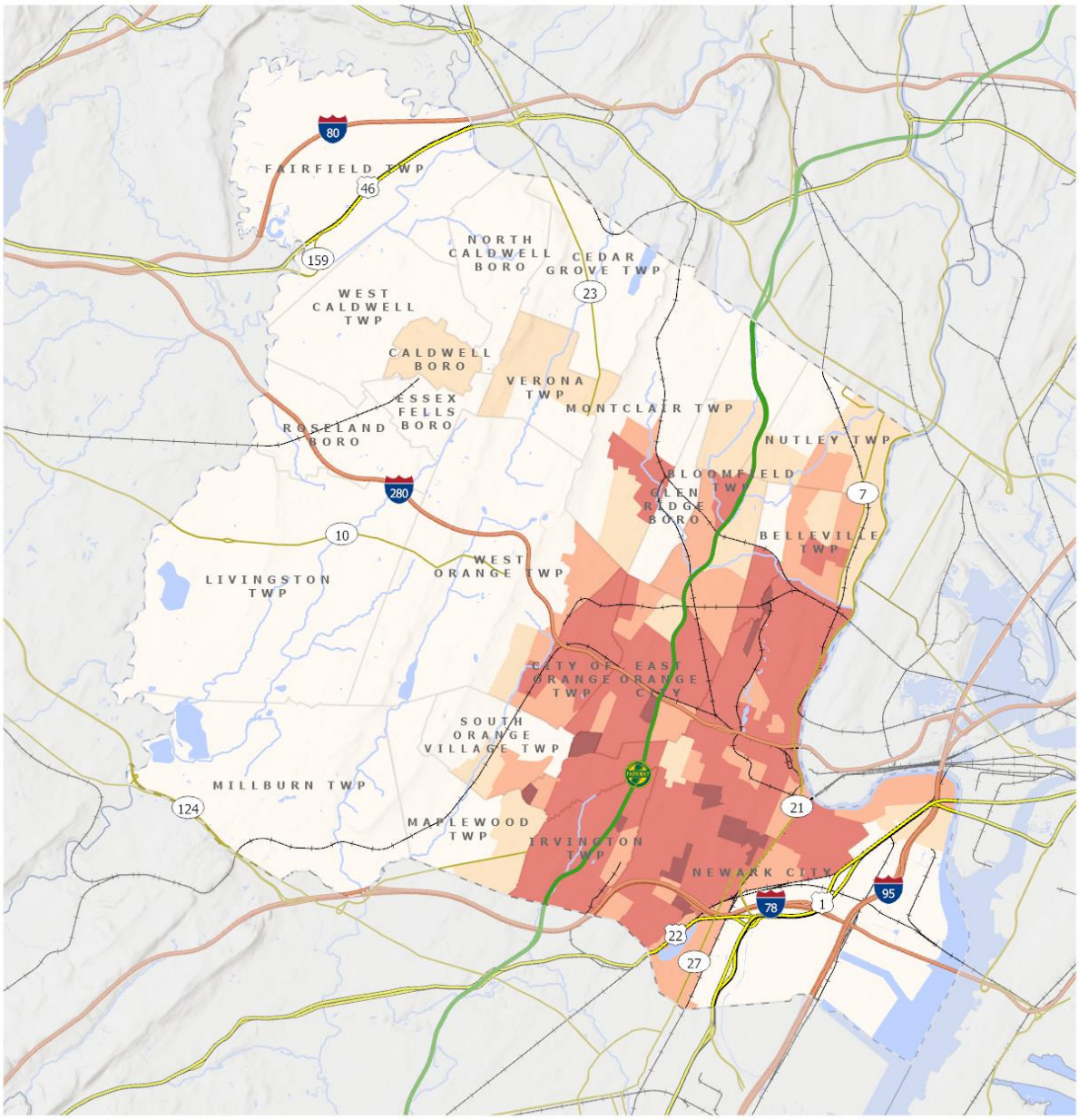
3.3.2.4 Income

In the United States, individual households are expected to use private resources to prepare for, respond to and recover from disasters to some extent. This means that households living in poverty are automatically disadvantaged when confronting hazards such as flooding. Additionally, the poor typically occupy more poorly built and inadequately maintained housing. In addition, mobile or modular homes, are more susceptible to damage in floods than other types of housing. Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level have a great deal to lose during an event and are the least prepared to deal with potential losses. The events following Hurricane Katrina in 2005 illustrated that personal household economics significantly impact people's decisions on evacuation. Individuals who cannot afford gas for their cars will likely decide not to evacuate. According to the 2023 American Community Survey, 22.1% of the County's householders are considered low income and below the poverty threshold (U.S. Census 2023).

According to United for ALICE (Asset Limited, Income Constrained, Employed), households in the United States that are above the poverty threshold but remain below the cost-of living threshold are also vulnerable. When these households are included to those below the poverty threshold, 45% of households were considered low income in 2021. These households live paycheck to paycheck and can be severely impacted by hazard events (ALICE 2023).

It is important to note that individuals who are homeless are not counted within population statistics. A point-in-time study in January 2024 found that Essex County had 2,451 homeless individuals, a 43.2% increase from the same survey in 2023 (Monarch Housing Associates 2024). The homeless are at the highest risk for many hazard events due to lack of available sheltering. The County and local municipalities have worked and are continuing to address this issue through the development of warming and cooling shelters in recent years.

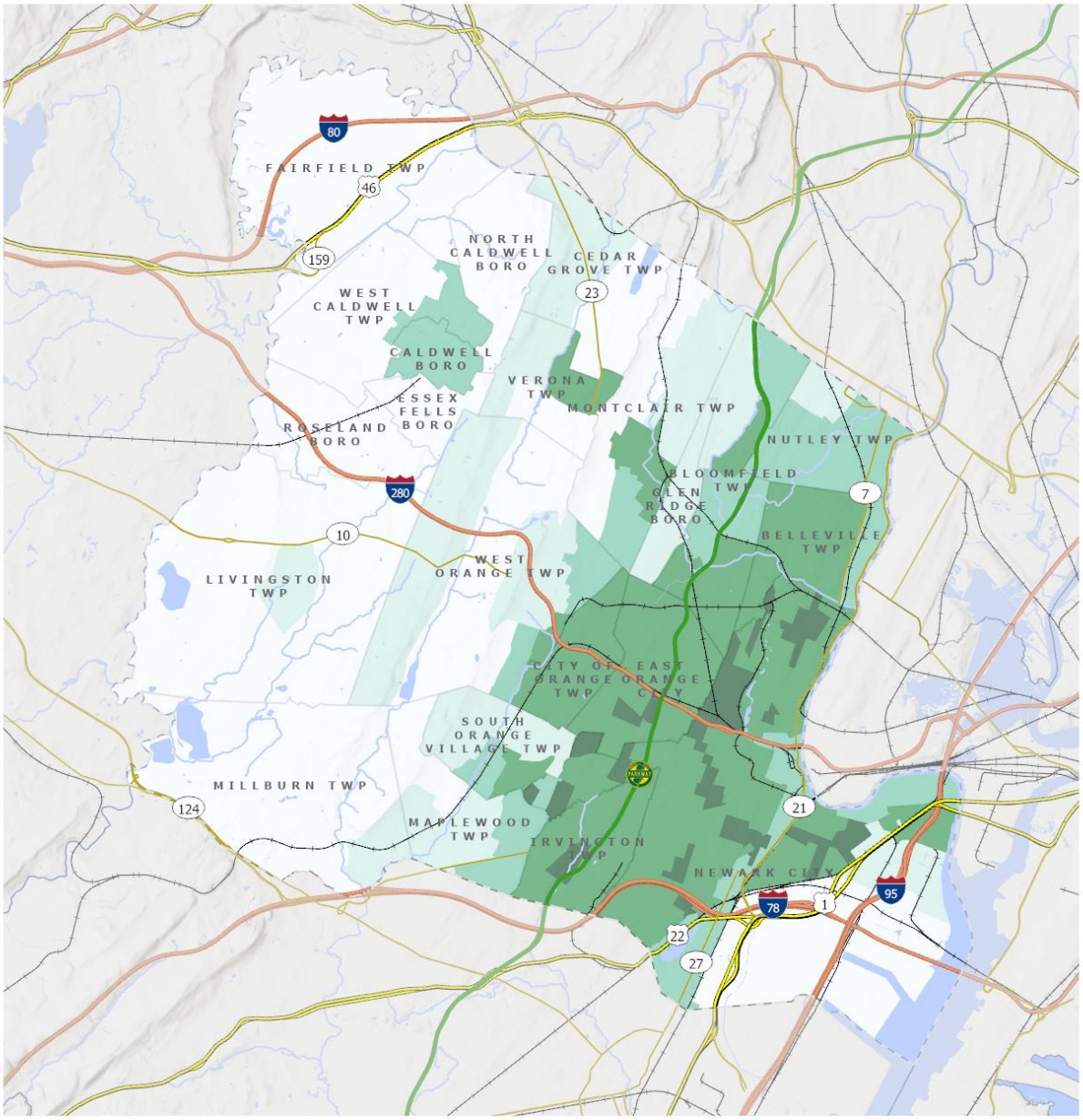
Figure 3-13. Low Income Households, Essex County, New Jersey



3.3.2.5 Physical or Mental Disability

Persons with disabilities or others with access and functional needs are more likely to have difficulty responding to a hazard event than the general population. Local municipal government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs. According to the 2023 American Community Survey, 12.1% of the County's population are considered mentally or physically disabled (U.S. Census 2023).

Figure 3-14. Population Mentally/Physically Disabled, Essex County, New Jersey



Population Mentally/Physically Disabled
(2023 American Community Survey)

Population/Square Mile
- 0 - 250
- 250 - 500
- 500 - 1,000
- 1,000 - 5,000
- 5,000+

- Municipality
- Essex County
- Counties

N

0 0.5 1 2 Miles

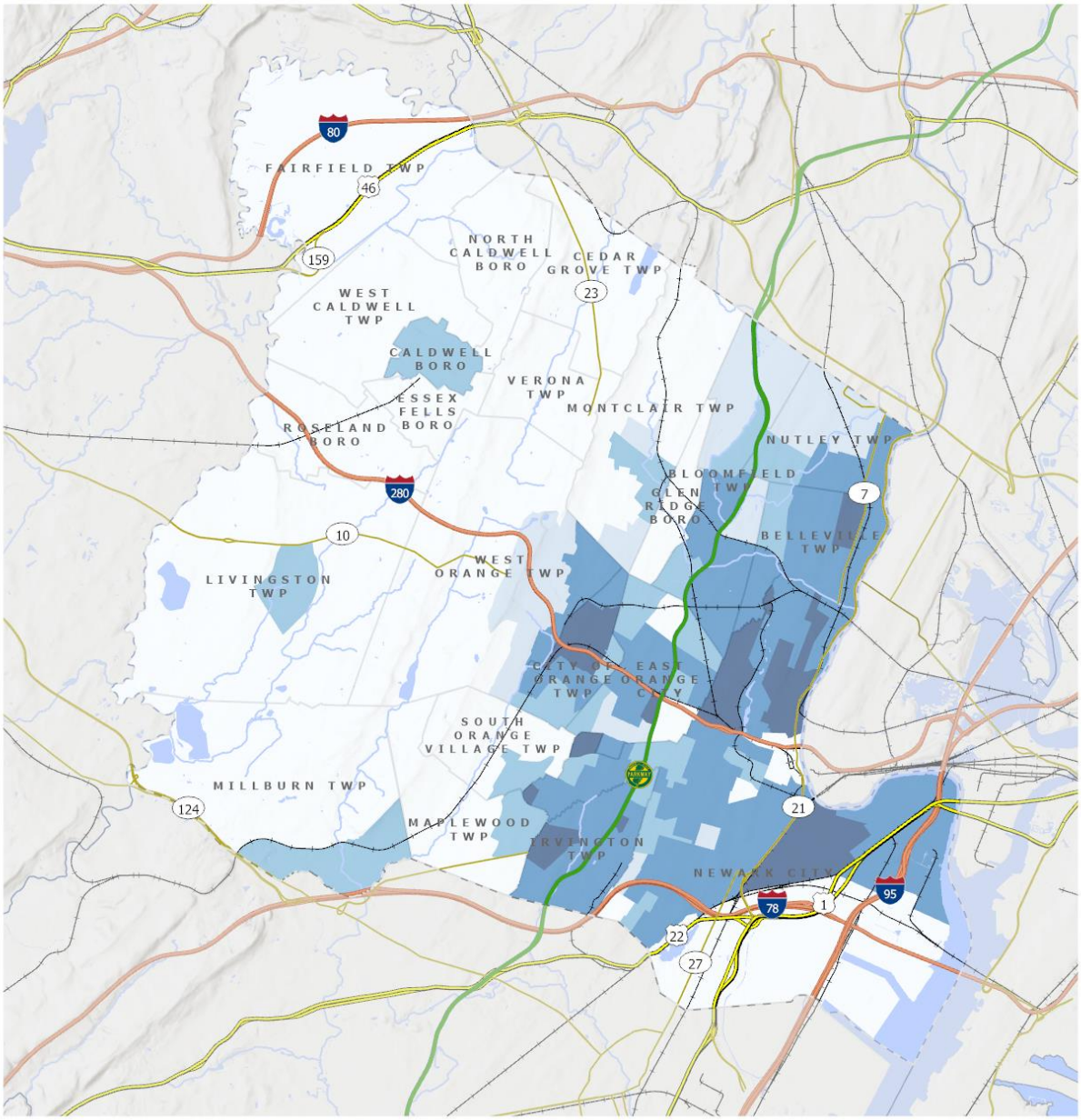
Sources: NJ Office of GIS; U.S. Census Bureau
Base Map Credits: Esri, NASA, NGA, USGS

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3.3.2.6 Non-English Speakers

Non-English speakers may struggle to receive important emergency messaging, education outreach, and information on mitigation opportunities unless messaging and outreach is translated. Haitian immigrants represent a large portion of the population in several municipalities in Essex County. According to the U.S. Census, about 40,850 Haitian Americans live in New Jersey with most residing in the Township of Irvington, Township of the City of Orange, City East Orange, and City of Newark (New Jersey Senate Democrats 2024). Haitian Creole is the main language spoken by this population. Essex County's Brazilian-born population, represents 4.2% of the total foreign-born population, is more than twice that the state (1.4%). Similarly, 3.8% of the population originates from Portugal, approximately double the percentage in the state (1.6%). According to the 2023 American Community Survey, 14.5% of the County's population speak English less than very well (U.S. Census 2023).

Figure 3-15. Population 65 Years and Older, Essex County, New Jersey



3.3.2.7 Reliance on Public Transportation

Residents that rely on public transportation may need additional assistance during evacuation from severe hazard events. NJTPA's 2050 Long Range Transportation Plan found that 25 percent of Essex County households do not have access to an automobile with 22.6 percent of commuters using public transit (NJTPA 2021).

3.4 Development Profile

Local Plan Requirement B2— 44 CFR Part 201.6(c)(2)(ii)(C)	Local Plan Requirement E1— 44 CFR Part 201.6(d)(3)
The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	***A local jurisdiction must review and revise its plan to reflect changes in development.***

3.4.1 Land Use

Land use describes the human use of land. It represents the economic and cultural activities (e.g., agricultural, residential, industrial, mining, and recreational uses) that are practiced at a given place. Public and private lands frequently represent very different uses (U.S. EPA 2024). Local zoning and planning authority are provided for under the New Jersey Municipal Land Use Law, which gives municipalities zoning and planning authority.

Land cover describes how much of an area is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types. Water types include wetlands or open water (National Ocean Service 2024).

Land use varies from land cover in that certain uses may not always be immediately apparent (e.g., land utilized for timber production without harvest for an extended period and wooded areas designated as wilderness may both appear as forested areas but serve different purposes) (U.S. EPA 2024).

Essex County is a highly developed and diverse area with a mix of urban, suburban, and limited rural land uses. The county contains densely populated cities like the City of Newark and City of East Orange, as well as more suburban municipalities such as the Township of Montclair and Township of Livingston.

The majority of Essex County consists of residential zoning, ranging from high-density multi-family housing in cities like the City of Newark, City of East Orange, and Township of Irvington to single-family suburban neighborhoods in towns like the Township of Verona, Township of Millburn, and Township of Cedar Grove. Many suburban areas have strict zoning laws favoring single-family homes, while urban centers allow for mixed-use and high-rise residential developments.

Major commercial districts are concentrated in the City of Newark, Township of West Orange, and Township of Livingston. Retail corridors exist along highways such as State Route 10, State Route 46, and Bloomfield Avenue.

Mixed-use developments are increasingly being promoted in areas near transit hubs, particularly in the Township of Montclair and City of Newark. Industrial zoning is concentrated in areas like the City of Newark's Ironbound District, where shipping, warehousing, and manufacturing are dominant due to proximity to Port Newark and major highways. Other industrial zones exist along the Passaic River and in parts of Belleville and East Orange.

Government buildings, hospitals (like University Hospital in Newark), and educational institutions (such as Seton Hall University and NJIT) have designated zoning regulations. Transit-oriented development is a growing focus, especially around Newark Penn Station and NJ Transit rail stops.

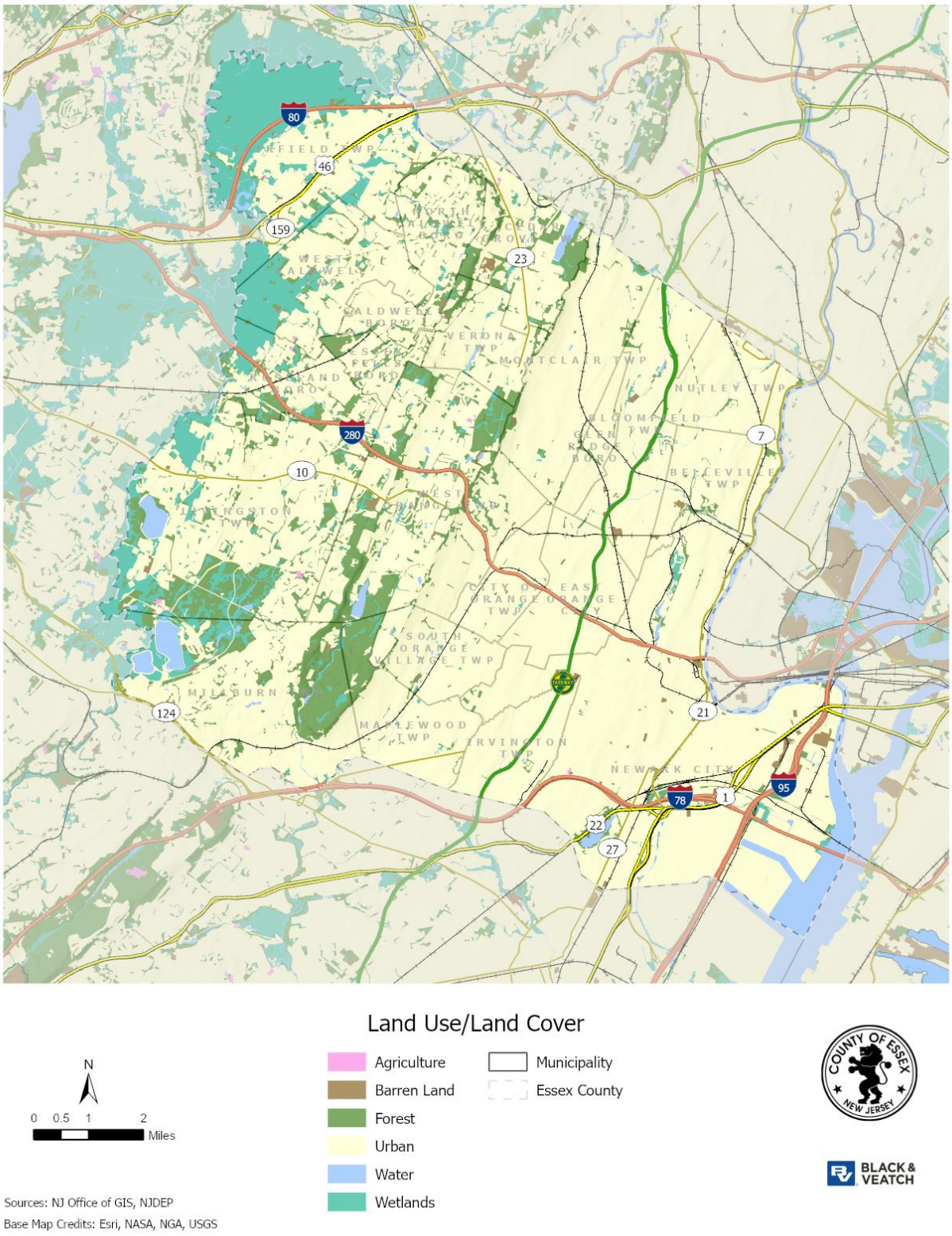
Very little agricultural land remains, but some preserved natural areas exist, particularly in the western part of the county near the Watchung Mountains.

Many municipalities in Essex County are adopting more flexible zoning regulations to encourage mixed-use development and smart growth. Redevelopment of old industrial areas into residential and commercial spaces is increasing, especially in the City of Newark and the Township of the City of Orange. Affordable housing requirements and sustainability initiatives are becoming more common in zoning updates.

The eastern portion of Essex County is primarily classified as urban with pockets of wetland area. Central Essex County has a concentration of forested land in addition to the urban areas. Western Essex County is comprised of urban, forest, and wetland land cover classifications. Wetlands cover a significant portion of the Township of Fairfield, Township of West Caldwell, Borough of Roseland, Township of Livingston Township, and some of the northwestern edges of the Township of Millburn

The Essex County Park System includes 20 parks, five reservations, and various facilities, covering nearly 6,000 acres (Essex County 2019)

Figure 3-16. Land Use and Land Cover in Essex County (2020)



3.4.1.1 Land Use and Land Cover Trends

Development throughout the County was guided by the development of alternate forms of travel in the 1930's and 1940's to help workers commute from industrial Newark to less crowded outlying towns. Towns such as Irvington, East Orange, Orange, and Bloomfield created trolley lines to facilitate workers commuting into and out of Newark. South Orange, Maplewood, Millburn, Glen Ridge, and Montclair developed a commuter railcar system to transport its residents into and out of New York City. Development of the western portion of the County in towns such as Livingston, Fairfield, Roseland, Cedar Grove, Essex Fells, and the Caldwells, remained slow until the construction of Route 280, which provided an easier transportation route to and from eastern and western Essex County. This new access to the western portion of the County lead to the development of new industrial and professional office parks, hi-tech centers, and luxury homes, condominiums, and townhouses (Essex County OEM 2013).

Although there has been a slight decrease in the County's population since 2000, there has been growing demand for housing in urban centers spurred by the emergence of the millennia's demand for housing. This has led to the redevelopment of many of the urban cores and revitalization of many of the State's older cities. Successful redevelopment projects in sections of the County including, the Ironbound section of Newark, downtown South Orange and downtown Montclair have facilitated mixed use growth, inclusive of residential development. This trend of urbanized living with proximity to a diversity of cultural activities and public transportation options has also enticed older generations to relocate to urban centers further increasing the demand for housing in these areas. The continued redevelopment in the urban areas of the County proximate to public transportation will likely remain an important component of the future development of the County (Essex County OEM 2020).

3.4.2 General Building Stock

The 2023 American Community Survey identified 317,473 total households in Essex County (U.S. Census 2023). For the risk assessment for this 2025 HMP update, a building inventory was used to understand the number of structures exposed and vulnerable to the natural hazards evaluated. In total, Essex County's building stock is comprised of an estimated 162,388 buildings with a total replacement cost value of $152.3 billion.

Table 3-6. Number of Buildings and Improvement Value in Essex County

Jurisdiction	Total Number of Buildings	Total Replacement Cost Value
Belleville (T)	7,910	$5,440,939,832
Bloomfield (T)	11,720	$7,149,452,578
Caldwell (B)	1,738	$1,437,101,129
Cedar Grove (T)	3,944	$3,664,877,018
East Orange (C)	7,908	$7,298,495,889
Essex Fells (B)	766	$624,599,485
Fairfield (T)	3,121	$7,708,467,384
Glen Ridge (B)	2,256	$1,311,356,144
Irvington (T)	7,934	$6,543,152,214
Livingston (T)	9,795	$9,227,217,608
Maplewood (T)	6,738	$4,279,929,361
Millburn (T)	6,437	$6,236,661,855
Montclair (T)	9,436	$7,012,741,670
Newark (C)	43,085	$50,617,106,841
North Caldwell (B)	2,095	$2,103,919,331
Nutley (T)	7,945	$4,550,682,627
City of Orange (T)	3,890	$4,186,194,813
Roseland (B)	1,794	$2,338,671,996
South Orange (V)	4,188	$3,553,949,814
Verona (T)	4,113	$2,639,752,949
West Caldwell (T)	3,730	$4,439,689,868
West Orange (T)	11,845	$9,974,739,027
Essex County (Total)	162,388	$152,339,699,431

Source: (Essex County 2019); (FEMA 2020)

3.4.3 Community Lifelines

FEMA released initial guidance on the community lifelines concept in 2019 to describes the assets that enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. When a lifeline is affected by a disaster, survivors may experience disruptions which reduce their ability to receive critical services and recover from the effects of the incident. When disrupted, decisive intervention (e.g., rapid service re-establishment or employment of contingency response solutions) is required (FEMA 2023a).

The Planning Partnership identified lifelines that support Essex County before, during, and after hazard events in their 2020 HMP and again for the 2025 HMP update. Since the 2020 HMP, FEMA separated an eighth lifeline focused on 'water systems' and renamed the 'Food, Water, Shelter' lifeline to 'Food, Hydration, Shelter', For this plan update, water system lifelines were reclassified to include components related to water systems.

Table 3-7. Community Lifelines in Essex County

Jurisdiction	Safety and Security	Food, Hydration, Shelter	Health and Medical	Energy	Communications	Transportation	Hazardous Materials	Water Systems	Other	Total
Belleville (T)	28	3	1	13	0	1	0	1	0	47
Bloomfield (T)	33	2	5	0	0	5	0	1	1	47
Caldwell (B)	13	5	3	0	0	0	0	0	0	21
Cedar Grove (T)	12	0	6	1	0	0	0	2	0	21
East Orange (C)	39	0	17	0	0	2	0	0	0	58
Essex Fells (B)	6	1	0	0	0	0	0	16	0	23
Fairfield (T)	12	2	2	7	0	2	0	4	0	29
Glen Ridge (B)	16	6	2	0	0	0	0	0	1	25
Irvington (T)	28	1	4	16	8	1	0	0	0	58
Livingston (T)	19	2	11	0	2	0	0	5	1	40
Maplewood (T)	15	4	2	5	2	3	0	0	0	31
Millburn (T)	21	4	1	0	2	2	0	17	1	48
Montclair (T)	33	4	14	9	3	6	6	8	0	83
Newark (C)	195	21	27	9	2	29	3	2	5	293
North Caldwell (B)	9	0	0	1	1	0	0	6	0	17
Nutley (T)	20	9	4	1	0	1	2	2	0	39
City of Orange (T)	26	3	6	13	0	3	0	3	0	54
Roseland (B)	5	1	1	0	0	0	0	10	1	18
South Orange (V)	19	6	2	0	0	3	0	0	0	30
Verona (T)	21	1	1	0	0	0	0	11	0	34
West Caldwell (T)	12	2	7	2	0	0	2	5	0	30
West Orange (T)	38	3	14	1	4	0	0	12	0	72
Essex County (Total)	620	80	130	78	24	58	13	105	10	1,118

Source: Essex 2025

3.4.3.1 Safety and Security

Every municipality maintains its own police department, fire department and emergency operations center (EOC). The two exceptions are the Borough of Glen Ridge whose fire services are provided through the Township of Montclair's Fire Department and the South Essex Fire Department which is a consolidation of municipal fire protection services covering the Village of South Orange and Township of Maplewood In addition, municipalities offer their services to neighboring communities in times of emergency. In addition to the facilities discussed, county and municipal buildings, department of public works facilities and public health departments are essential to the continuity of operations pre-, during and post-disasters.

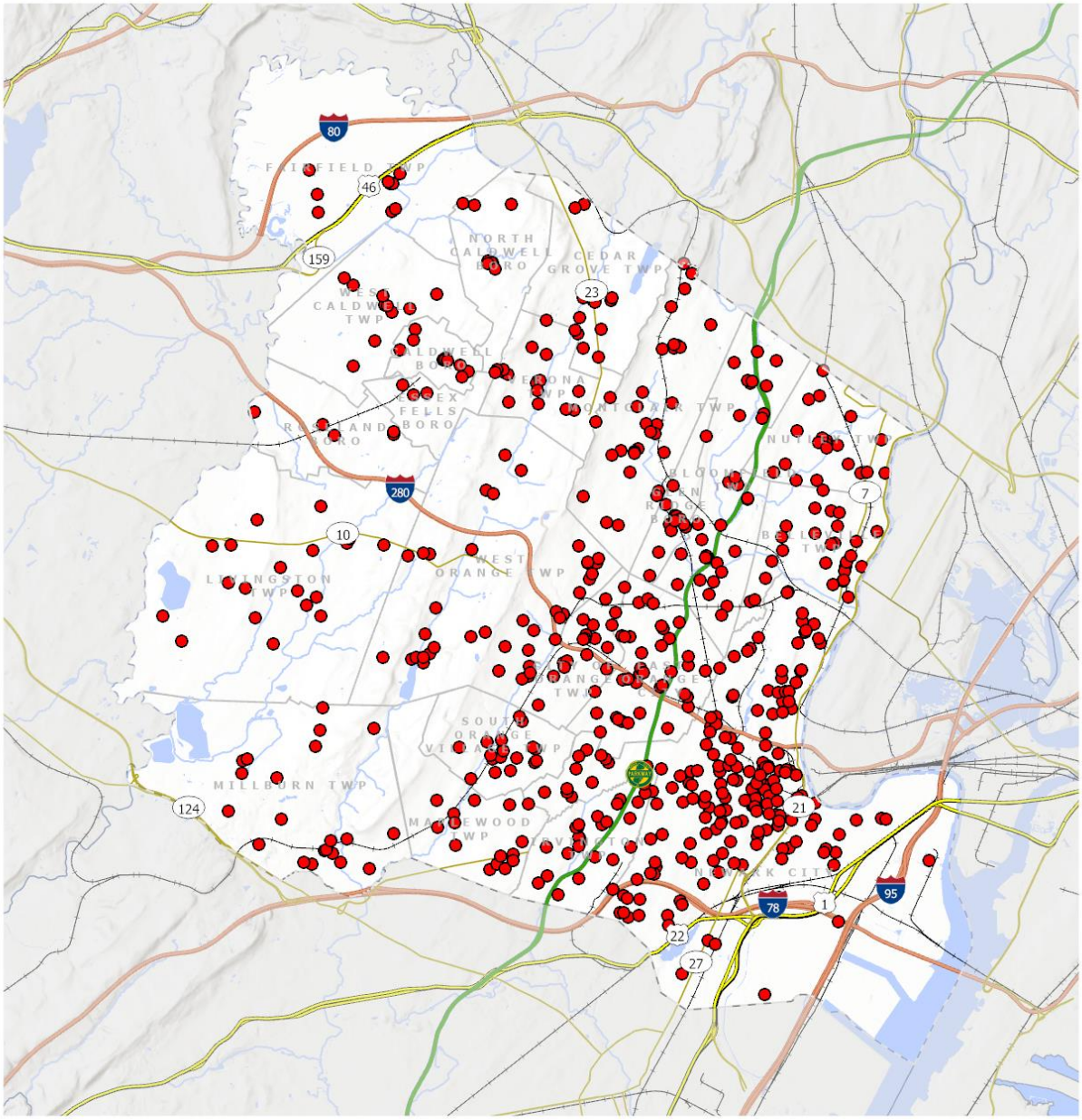
In the case of an emergency, the Essex County Office of Emergency Management (OEM) can coordinate response activities with the County's network of civil services, healthcare, utility, education, and transportation facilities relative to the emergency issue.

The Essex County Department of Corrections maintains one prison facility and one juvenile detention center, both located in the City of Newark.

Educational facilities such as schools and universities provide a vital service for the County but also can serve as shelters in times of need. Essex County is home to 23 public school districts and close to 400 schools, ranging from elementary to post-secondary education. The County has 29 charter schools and 10 major colleges and universities.

Dams and levees are also included in the Safety and Security Lifeline per FEMA guidance. According to the USACE National Inventory of Dams, Essex County has 13 dams, of which 8 are high hazard and 5 are significant hazard dams (USACE 2024). According to the USACE National Levee Database, Essex County has two levees operated by the Village of South Orange on the East Branch of Rahway River. The North levee protects one building valued at $1 million and the South levee protects two buildings valued at $240,000, though neither levee protects residents (USACE n.d.).

Figure 3-17. Safety and Security Lifelines, Essex County, New Jersey

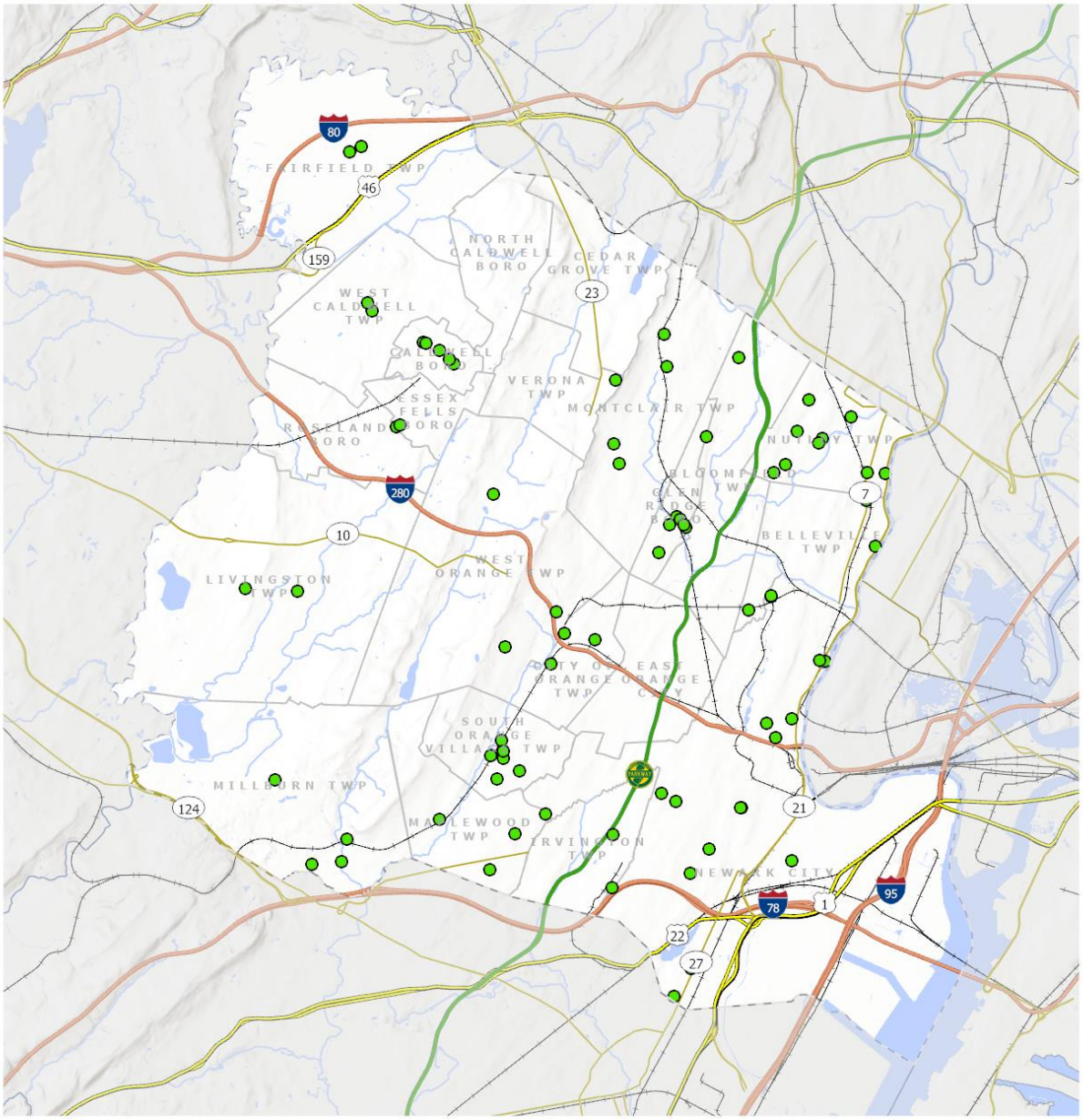


Sources: NJ Office of GIS, 2020 Essex Co. HMP
Base Map Credits: Esri, NASA, NGA, USGS

3.4.3.2 Food, Hydration, Shelter

The food component of this lifeline category includes commercial food distribution, food banks, and the commercial food supply chain. Hydration includes the commercial water supply chain. Shelter includes homes and commercial facilities (such as hotels). Agriculture is also included under the food, hydration, shelter lifeline. Essex County has limited farming with 22 farms and a $4.2 annual market value of products sold (USDA 2022).

Figure 3-18. Food, Hydration, Shelter Lifeline, Essex County, New Jersey



Sources: NJ Office of GIS, 2020 Essex Co. HMP
Base Map Credits: Esri, NASA, NGA, USGS

3.4.3.3 Health and Medical

There are 15 major medical and hospital centers located in the County. The County is also home to more than 50 senior care facilities.

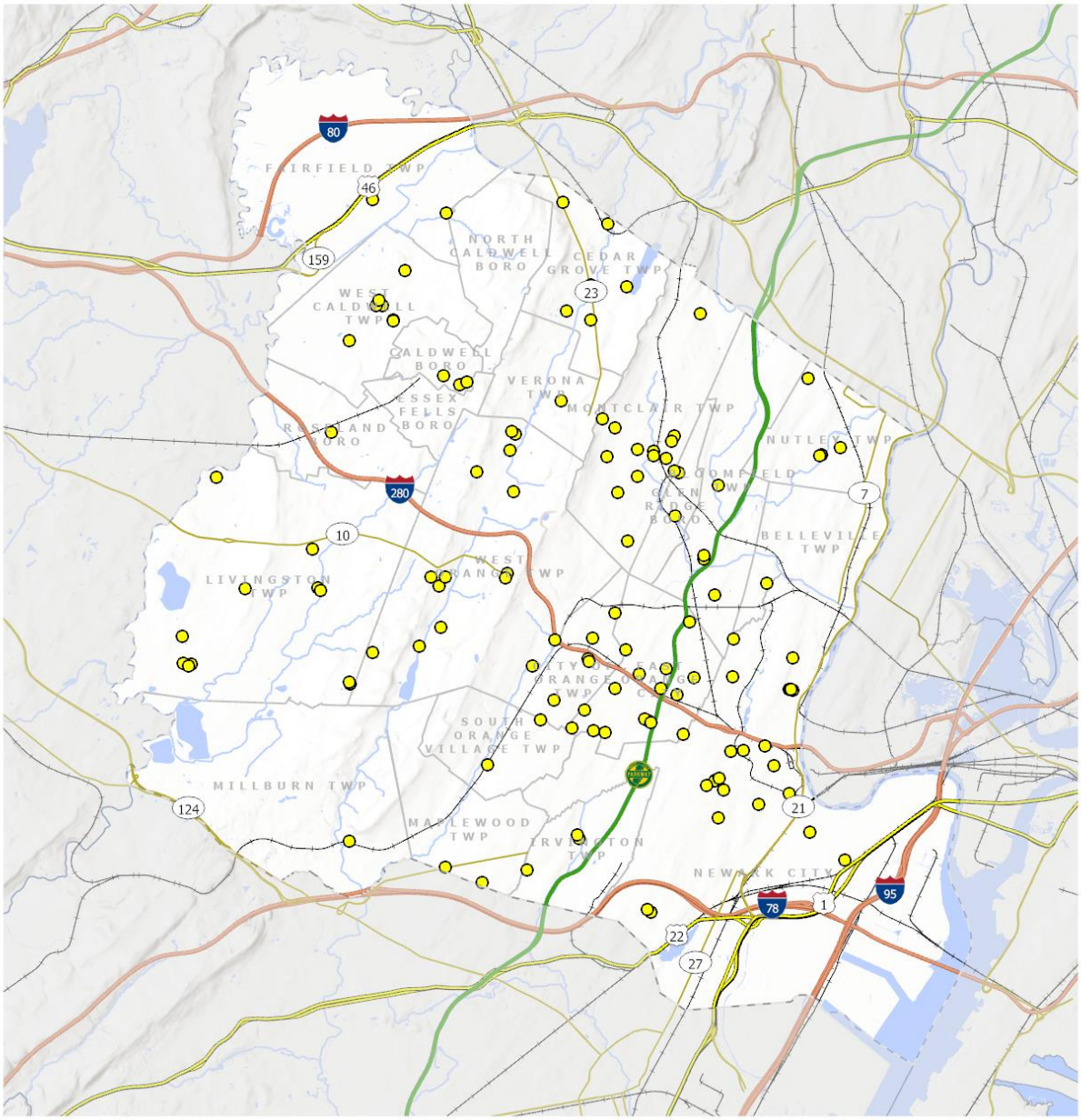
3.4.3.4 Energy (Power & Fuel)

Jersey Central Power and Light (JCP&L) and Public Service Electric and Gas (PSE&G) are the primary electric and gas utility companies in Essex County. Other energy suppliers include Constellation New Energy (natural gas and electricity), Direct Energy Services, LLC (Electricity), Sun Pipeline Company and Tidewater Oil (oil), and Algonquin Gas Transmission Company and Texas Eastern Transmission Company (natural gas) (Essex County OEM 2020).

3.4.3.5 Communication

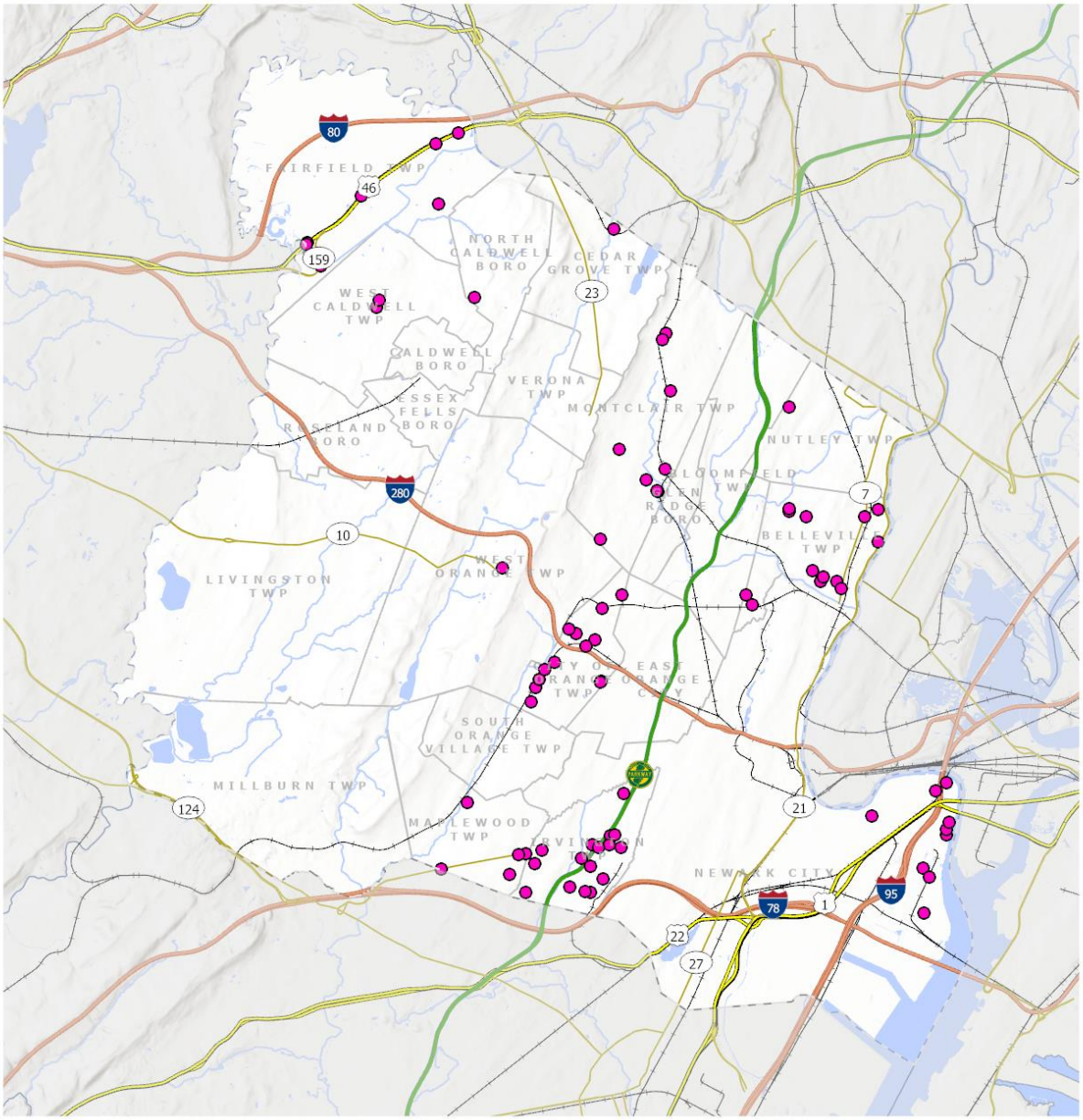
Essex County has a network of radio and cell towers that are considered critical infrastructure and essential for emergency services. Communication utility providers include Comcast, Cablevision, Verizon, AT&T, Sprint, and IDT (Essex County OEM 2020).

Figure 3-19. Health and Medical Lifeline, Essex County, New Jersey



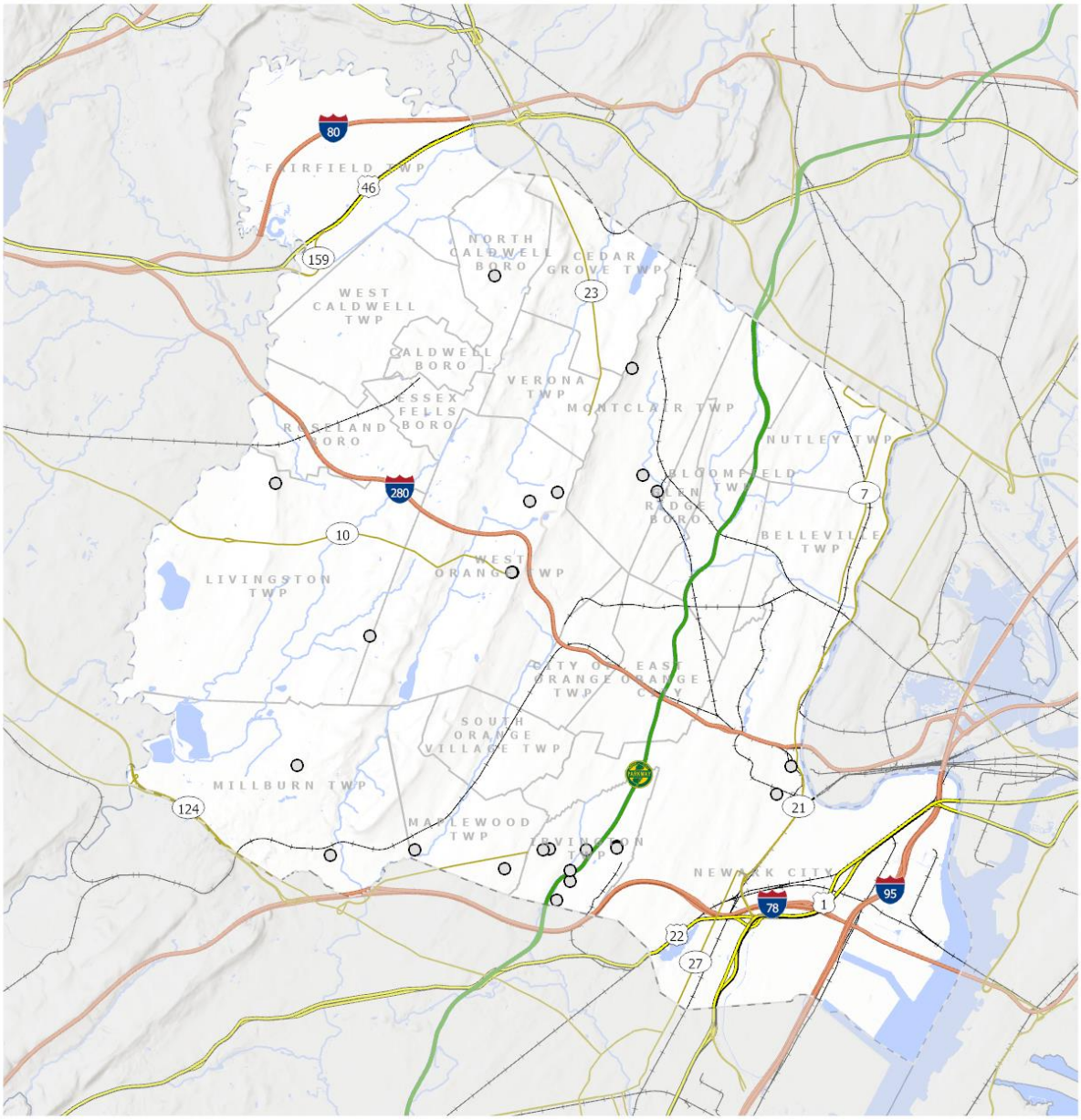
Sources: NJ Office of GIS, 2020 Essex Co. HMP
Base Map Credits: Esri, NASA, NGA, USGS

Figure 3-20. Energy Lifeline, Essex County, New Jersey



Sources: NJ Office of GIS, 2020 Essex Co. HMP
Base Map Credits: Esri, NASA, NGA, USGS

Figure 3-21. Communication Lifeline, Essex County, New Jersey



3.4.3.6 Transportation

Essex County lies at the crossroads of commerce, travel, and activity for New Jersey and the Northeast Corridor. Its makeup – densely populated, regional employment hub, and center of freight and goods movement – creates a substantial demand for the movement of people and goods. Much of the region's principal infrastructure – rail service, bus lines, Newark International Airport, the Port of Newark and Port Newark Container Terminal, toll roads, and numerous interstate, state, county, and municipal roadways – call Essex County home. Freight and goods movement are a critical economic engine for the region, and its success is essential for continued prosperity and competitiveness in the global economy (NJTPA 2023).

Major state roadways include the Garden State Parkway which bisects the County and provides access to New Jersey shore destinations to the south and the New York Thruway to the north. Interstate (I)-280 provides access across the County. I-280, which is approximately 18 miles long, is a spur from I-80 in Parsippany-Troy Hills, Morris County to the City of Newark, and I-95 (the New Jersey Turnpike) in Kearny. I-80 crosses the northwest corner of the County and I-78 crosses the southeast corner of the County. Overall, the total mileage of roadways is 1,673 miles, including 27 miles of interstate, 59 miles of state highways, 233 county roads, and 1,330 municipal roads.

NJ TRANSIT has 22 rail stations in Essex County. Newark Penn Station is the largest hub. Six NJ TRANSIT commuter lines that travel through Essex County serving many trip origins and destinations both local and regional. Amtrak service in New Jersey operates on the Northeast Corridor which is Amtrak's busiest passenger route. Amtrak trains stop in Newark Penn Station and Newark Liberty International Airport Station. Essex County has two stops at Newark Penn Station and Newark Liberty International Airport. The Northeast Regional and Keystone routes stop at the Newark Airport station. Newark Penn is served by nine regional and national service routes including the Acela express service from Boston to Washington, DC via New York City and Philadelphia. Additional regional and national routes provide wide ranging connectivity through Newark and along the East Coast from Boston to Florida and west to Chicago (NJTPA 2023).

The Newark City Subway connects Newark Penn Station with Newark Broad Street Station. The Newark Light Rail connects Newark Penn Station with Grove Street in Bloomfield. The Newark Subway travels west through downtown Newark and then north along Branch Brook Park, with a total of 18 stations, 16 in Newark, and one each in Belleville and Bloomfield. Port Authority Trans-Hudson (PATH) The PATH system run by the Port Authority, has four lines serving 13 stations and connecting Newark, Hoboken, Jersey City, Lower Manhattan, and Midtown Manhattan (NJTPA 2023).

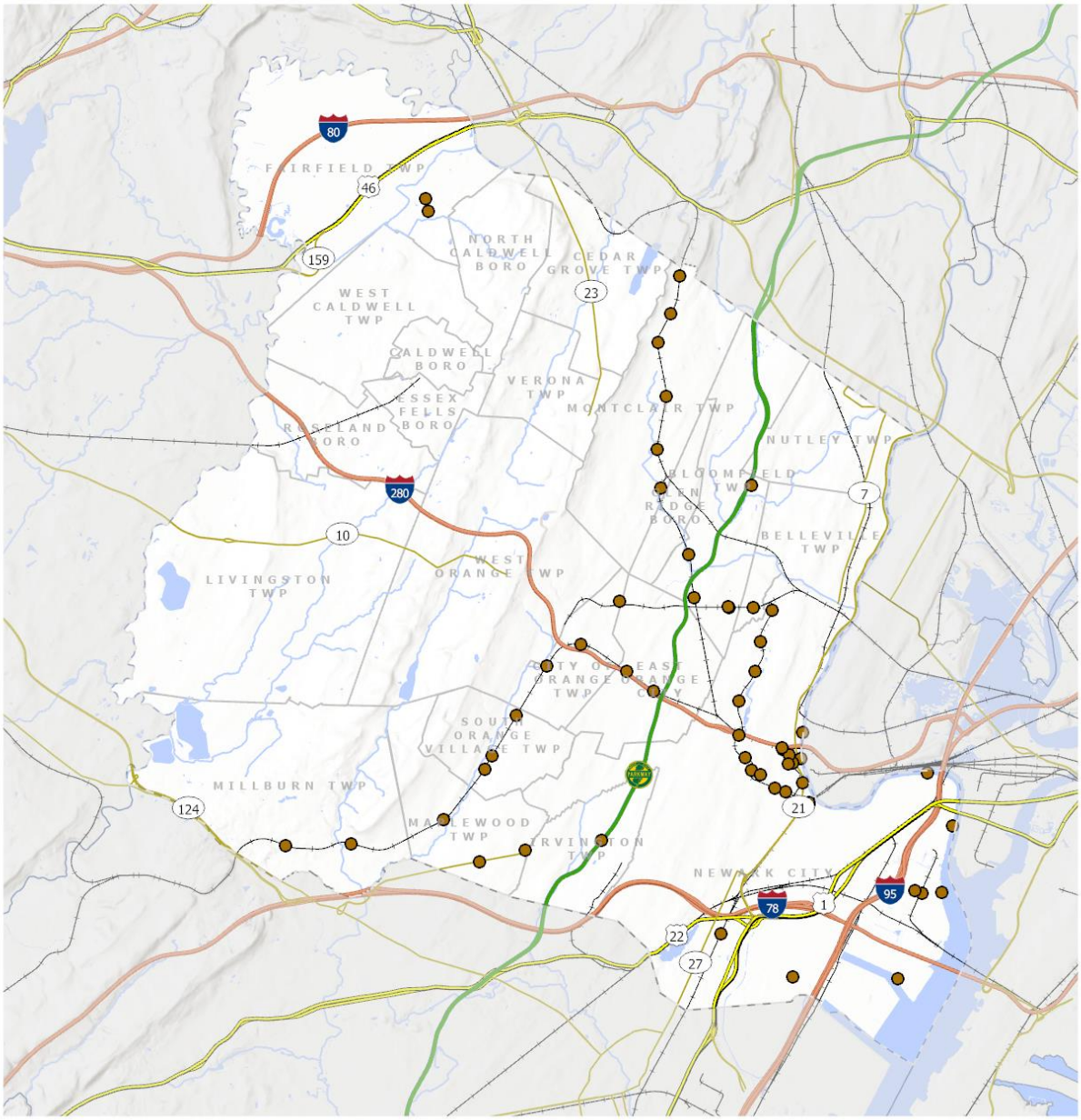
The primary rail freight operators are CSX, Norfolk Southern, and Conrail. This area includes four railway yards; Portside Yard, Oak Island Yard, Garden Yard, and Waverly Yard. The Conrail Lehigh Line is a main east-west rail corridor serving the region and one of the busiest rail lines in the U.S. The Lehigh runs parallel to the Raritan Valley Line and terminates at Oak Island Yard in Newark, the largest classification yard in the state. Conrail's Passaic & Harsimus Line serves as an alternative for freight traffic to the largely passenger-train-based Northeast Corridor. Trains come from the Northeast Corridor and Lehigh Line through Newark and head northeast and east to Jersey City on the Passaic & Harsimus Line. The Chemical Coast Secondary serves the Port of New York and New Jersey with ExpressRail connections to GCT (Global

Terminal Container) New York at Staten Island, Port Elizabeth, Port Newark, and Port Jersey in Bayonne. A flyover connection between Port Newark Container Terminal and Portside allows direct transfer from ship to rail without having to access city streets. Running north from Oak Island are the Brills Lead and the Bay Shore Lead serving the intermodal transfer activities in Brills Yard and various industries along Doremus Avenue (NJTPA 2023).

There are 52 NJ TRANSIT bus routes that stop in Essex County and 3,990 bus stops. Private operators offer limited stop service to New York City. Community Coach offers commuter service from the City of East Orange, Township of Livingston, and Township of West Orange to New York City. They also have an airport express bus from Newark Liberty International Airport to Manhattan. DeCamp Bus Lines offers three commuter routes to and from NYC. Transportation services for seniors and disabled adults are offered by Essex County, EZ Ride, and municipalities. Essex County offers rides to non-emergency medical and therapy appointments for seniors 60 and older and disabled adults (NJTPA 2023).

The area maintains two commercial airports: Newark Liberty International Airport in Newark and Essex County Airport in Fairfield. Newark Liberty International Airport (EWR) EWR is the 12th largest air cargo airport facility in North America. The Essex County Airport (DCW) is a small general aviation airport, located on 278 acres in Fairfield Township, is owned and operated by the Essex County Improvement Authority. CDW is designated as a general aviation reliever airport for the New York/New Jersey region by the Federal Aviation Administration (NJTPA 2023).

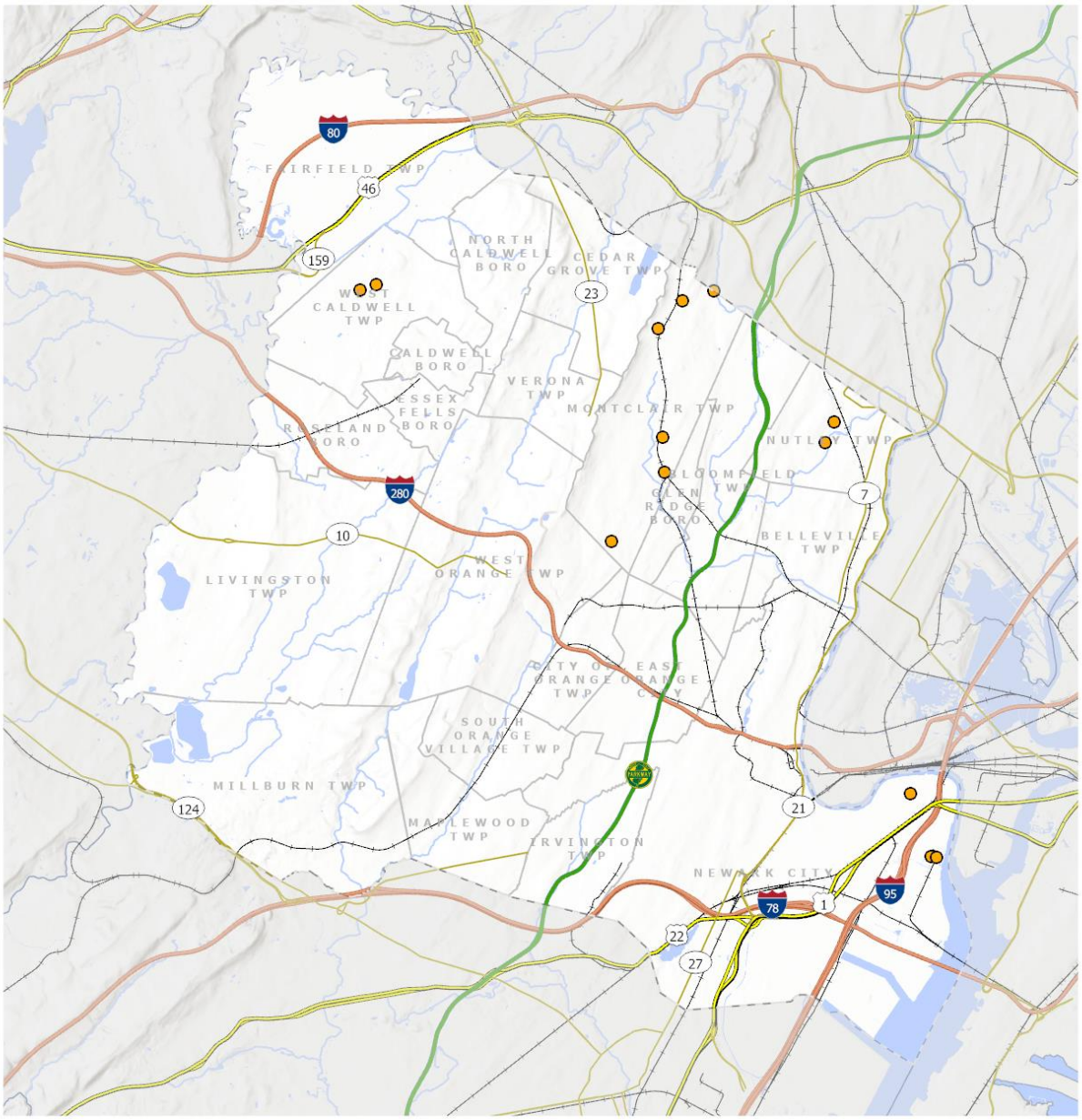
Figure 3-22. Transportation Lifeline, Essex County, New Jersey



3.4.3.7 Hazardous Materials

Hazard events often result in conditions that make the release of hazardous materials more likely, either at the facility they are housed at or while in transit. Hazardous materials are substances that are considered severely harmful to human health and the environment, as defined by the United States Environmental Protection Agency (USEPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund Law). Many are commonly used substances which are harmless in their normal uses but are quite dangerous if released. If released or misused, hazardous substances can cause death, serious injury, long-lasting health effects, and damage to structures and other properties, as well as the environment. Many products containing hazardous substances are used and stored in homes and these products are shipped daily on highways, railroads, waterways, and pipelines.

Figure 3-23. Hazardous Materials Lifeline, Essex County, New Jersey



3.4.3.8 Water Systems

Public community water supply systems serve 91 percent of the total County area and approximately 99 percent of the total County population. The water supply for Essex County comes from a combination of groundwater wells and surface water. Several large public and private water systems provide water for much of Essex County through extensive water supply networks and interconnections. Each municipality in Essex County has its own water department. Some municipalities own and operate their own groundwater wells and some supplies are purchased from the large water systems by a contract agreement (or a combination of municipal-owned wells and purchased water) (Essex County 2014).

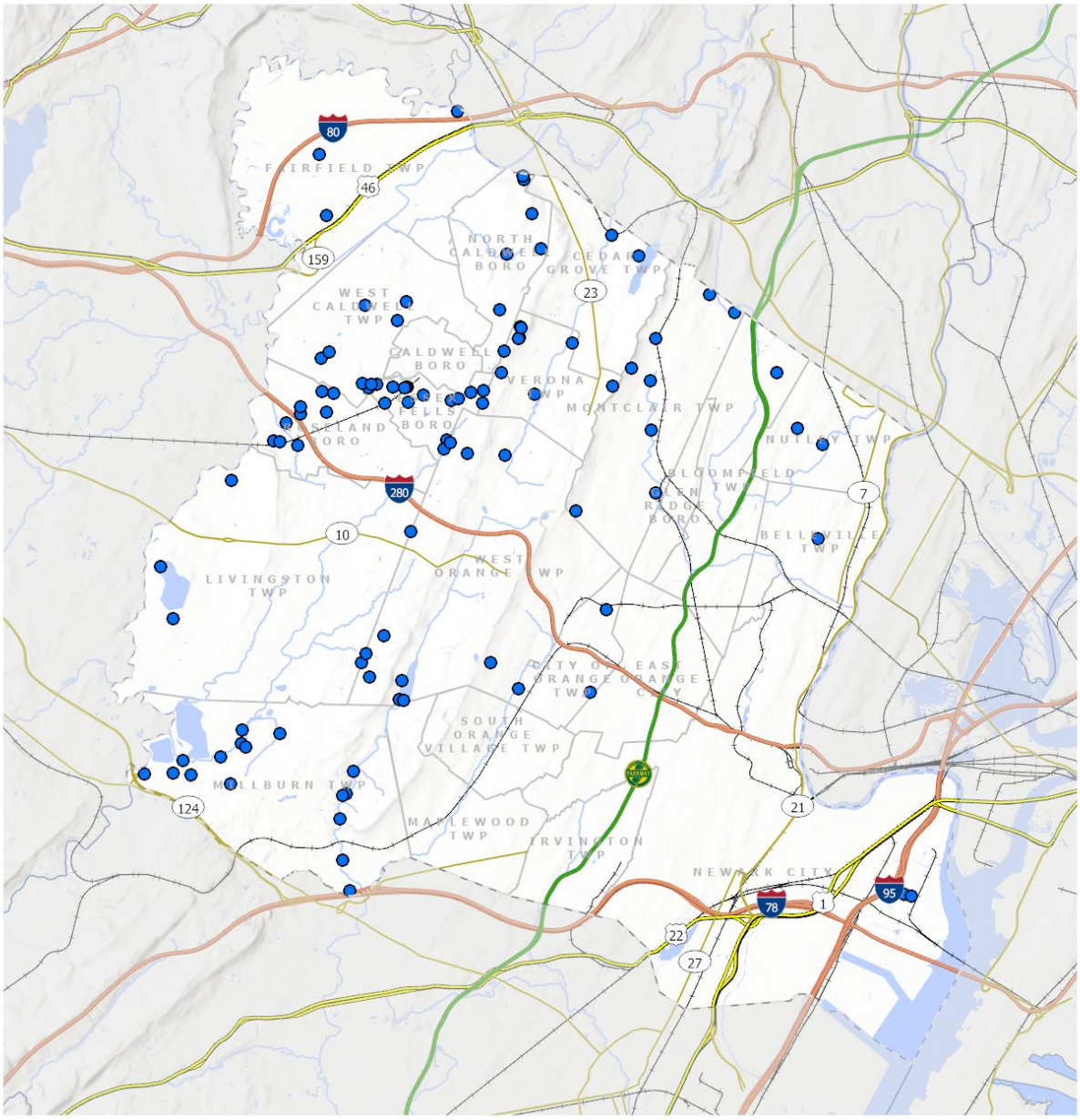
The County includes community wastewater systems that serve 91 percent of the total County area and 99 percent of the total County population. Sewer service areas (SSAs) do not necessarily follow municipal boundaries and may include industrial businesses that discharge process wastewater to the collection system for treatment by a facility not owned by that business. Essex County comprises mostly older development patterns and contains some of the oldest sewerage facilities in the state and region. Since the existing infrastructure is older, particularly within the PVSC and JMEUC sewered areas, there are existing Combined Sewer Overflows (CSO's). These facilities are regulated by the state. Within the unconsolidated portion of Essex County, there are no known CSO's (Essex County 2014).

Major sewer and water utilities include Passaic Valley Sewer Commission and New Jersey American Water.

3.4.3.9 Other Identified Facilities

Although not considered as lifelines, other identified facilities included in the risk assessment included major commerce and retail facilities.

Figure 3-24. Water Systems Lifeline, Essex County, New Jersey



Sources: NJ Office of GIS, 2020 Essex Co. HMP
Base Map Credits: Esri, NASA, NGA, USGS

3.4.1 Development Trends

3.4.1.1 Future Trends

The County's twenty-two municipalities are all at or nearing full build-out (Essex County 2014). This means the majority of development occurring or planned in the County is infill or redevelopment efforts. Anticipated major developments are identified in each jurisdictional annex in Volume II.

3.4.1.2 Planning Framework

The fully developed character places the majority of the planning focus on improving or replacing existing infrastructure and preserving the little available land to serve as parks and open space for a growing population (Essex County 2014).

3.5 Economy

3.5.1 Industry, Businesses, and Institutions

The Essex County economy continues to shift from a manufacturing base to a service-oriented economy and many corporate giants as PSE&G, Bell Atlantic, ADP, and Prudential have their headquarters located in Essex County (Essex County CEAS 2019).

The Port of New York and New Jersey (which includes terminals in Newark, Elizabeth, and Bayonne in New Jersey and Red Hook and Staten Island in New York) is the third largest cargo port in the United States, and the largest port on the East Coast, handling over seven million TEUs of cargo in 2021, according to data from the American Association of Port Authorities. In 2020, the Port handled more than 4.25 million containers, 32.4 percent of total market share. Port Newark (excluding Port Elizabeth) supports more than 13,000 jobs, $1.1 billion in wages, and $3.25 billion in business income. The port also generates more than $364 million in annual state and local tax revenues. (NJTPA 2023).

Newark Liberty International Airport (EWR) EWR, the 12th largest air cargo airport facility in North America, is a major hub for air freight cargo carriers, including FedEx, UPS, and DHL. EWR directly employs thousands of workers and indirectly supports many more jobs in related industries such as air cargo transportation, logistics, and manufacturing. The airport is estimated to support over 22,000 jobs in the New York/New Jersey region, and is a key hub for international trade, handling a large volume of air cargo imports and exports. In 2020, EWR handled over 413,000 tons of cargo, valued at over $10 billion (NJTPA 2023).

Agriculture accounts for a small component of the economy in Essex County. The 2022 Census of Agriculture for Essex County identified 32 farms with a total market value of $4.2 million in annual sales. The major crops are nursery, greenhouse, floriculture, and sod (USDA 2022).

Essex County has four municipalities with Urban Enterprise Zones; the City of Newark, Township of the City of Orange, City of East Orange, and the Township of Irvington (Essex County 2019). An Urban Enterprise Zone (UEZ) is a distressed area within a New Jersey municipality or group of municipalities that

offers business and customer benefits to help stimulate local economic activity. The State provides qualified businesses within UEZs with several forms of tax relief incentives (NJ Treasury 2023).

4 Hazards of Concern

4.1 What Is a Hazard of Concern?

Defining the hazards that present the greatest risk to the planning area is the first step in assessing overall risk to the community. The Planning Partnership and Steering Committee reviewed available information to determine what types of hazards may affect the planning area, how often they can occur, and their potential severity.

Natural hazards are eligible for FEMA HMA grant funding and generally occur because of natural processes. Some natural hazards may also be caused by humans, such as dam failure and wildfire. Human intentional caused hazards are not reviewed by FEMA for plan approval and are not eligible for FEMA HMA grant funding. For this HMP update, the Steering Committee adjusted the hazards of concern list from the previous plan. After noting that non-natural hazards are not eligible for traditional FEMA hazard mitigation funding grant programs and are adequately addressed in other planning efforts, non-natural hazards were removed from this update. Information on these non-natural hazards is preserved in Appendix E (Risk Assessment Supplement).

4.2 Federal Disaster Declarations

Federal disaster declarations are typically issued for hazard events that cause more damage state and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. A presidential disaster declaration puts federal recovery programs into motion to help disaster victims, businesses, and public entities. Some of the programs are matched by state programs. There are two types of disaster declarations provided for in the Stafford Act: Emergency Declarations and Major Disaster Declarations. Both declaration types authorize the President to provide supplemental federal disaster assistance (FEMA 2011).

- Emergency Declaration: An Emergency Declaration can be declared for any occasion or instance when the President determines federal assistance is needed. Emergency Declarations supplement State and local efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.
- Major Declaration: The President can declare a Major Disaster Declaration for any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion, that the President believes has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work.

Review of presidential disaster declarations helps establish the probability of reoccurrence for each hazard and identify targets for risk reduction. Table 4-1 summarizes the federal disaster declarations that included Essex County since 1954.

Table 4-1. Federal Disaster Declaration History in Essex County

Disaster Number	Event Date(s)	Declaration Date	Title
DR-205-NJ	August 18, 1965	August 18, 1965	New Jersey Water Shortage
DR-245-NJ	June 18, 1968	June 18, 1968	New Jersey Heavy Rains, Flooding
DR-310-NJ	September 4, 1971	September 4, 1971	New Jersey Heavy Rains, Flooding
DR-402-NJ	August 7, 1973	August 7, 1973	New Jersey Severe Storms, Flooding
DR-477-NJ	July 23, 1975	July 23, 1975	New Jersey Heavy Rains, High Winds, Hail, Tornadoes
EM-3083-NJ	October 19, 1980	October 19, 1980	New Jersey Water Shortage
DR-701-NJ	March 28 - April 8, 1984	May 12, 1984	New Jersey Coastal Storms, Flooding
DR-973-NJ	December 10 - 17, 1992	December 18, 1992	New Jersey Coastal Storm, High Tides, Heavy Rain, Flooding
EM-3106-NJ	March 13 - 17, 1993	March 17, 1993	New Jersey Severe Blizzard
DR-1088-NJ	January 7 - 12, 1996	January 13, 1996	New Jersey Blizzard
EM-3148-NJ	September 16 - 18, 1999	September 17, 1999	New Jersey Hurricane Floyd
DR-1295-NJ	September 16 - 18, 1999	September 18, 1999	New Jersey Hurricane Floyd
EM-3156-NJ	May 30 - November 1, 2000	November 1, 2000	New Jersey Virus Threat
EM-3169-NJ	September 11, 2001	September 19, 2001	Terrorist Attack Emergency Declaration in New Jersey
EM-3181-NJ	February 16 - 17, 2003	March 20, 2003	New Jersey Snowstorm
EM-3188-NJ	August 14 - 16, 2003	September 23, 2003	New Jersey Power Outage
DR-1588-NJ	April 1 - 3, 2005	April 19, 2005	New Jersey Severe Storms and Flooding
EM-3257-NJ	August 29 - October 1, 2005	September 19, 2005	Hurricane Katrina Evacuation in New Jersey
DR-1694-NJ	April 14 - 20, 2007	April 26, 2007	Severe Storms and Inland and Coastal Flooding in New Jersey
DR-1897-NJ	March 12 - April 15, 2010	May 2, 2010	Severe Storms and Flooding in New Jersey
DR-1954-NJ	December 26 - 27, 2010	February 4, 2011	Severe Winter Storm and Snowstorm in New Jersey
EM-3332-NJ	August 27 - September 5, 2011	August 27, 2011	Hurricane Irene in New Jersey
DR-4021-NJ	August 27 - September 5, 2011	August 31, 2011	Hurricane Irene in New Jersey
DR-4048-NJ	October 29, 2011	November 30, 2011	Severe Storm in New Jersey
EM-3354-NJ	October 26 - November 8, 2012	October 28, 2012	New Jersey Hurricane Sandy
DR-4086-NJ	October 26 - November 8, 2012	October 30, 2012	New Jersey Hurricane Sandy
DR-4264-NJ	January 22 - 24, 2016	March 14, 2016	New Jersey Severe Winter Storm and Snowstorm
DR-4368-NJ	March 6 - 7, 2018	June 8, 2018	New Jersey Severe Winter Storm and Snowstorm

Disaster Number	Event Date(s)	Declaration Date	Title
EM-3451-NJ	January 20, 2020 - May 11, 2023	March 13, 2020	New Jersey Covid-19
DR-4488-NJ	January 20, 2020 - May 11, 2023	March 25, 2020	New Jersey Covid-19 Pandemic
DR-4574-NJ	August 4, 2020	December 11, 2020	New Jersey Tropical Storm Isaias
3573-EM-NJ	September 1 - 3, 2021	September 2, 2021	New Jersey Remnants of Hurricane Ida
4614-DR-NJ	September 1 - 3, 2021	September 5, 2021	New Jersey Remnants of Hurricane Ida

Source: FEMA 2024

4.3 National Risk Index

FEMA's National Risk Index (NRI) is a dataset and online tool developed to help illustrate risk for 18 natural hazards. The NRI leverages available source data for natural hazard and community risk factors to develop a baseline risk measurement for each county in the United States (FEMA 2024a). The NRI risk ratings for Essex County are listed below.

Table 4-2. National Risk Index for Essex County

Hazard	Risk Index
Avalanche	Not Applicable
Coastal Flooding	Relatively Moderate
Cold Wave	No Rating
Drought	Very Low
Earthquake	Relatively Low
Hail	Very Low
Heat Wave	Relatively High
Hurricane	Relatively Moderate
Ice Storm	Relatively Moderate
Landslide	Relatively Moderate
Lightning	Relatively Moderate
Riverine Flooding	Relatively Moderate
Strong Wind	Very High
Tornado	Relatively High
Tsunami	Insufficient Data
Volcanic Activity	Not Applicable
Wildfire	Very Low
Winter Weather	Relatively High

Source(s): (FEMA 2024a)

4.4 Evaluation of Hazards

The Steering Committee evaluated the various hazards that Essex County is exposed to, reviewed previous disaster declarations, the NRI, the hazards of concern in the 2024 State of New Jersey All-Hazards Mitigation Plan, the hazards of concern in the 2020 Essex County HMP, recent hazard events/changes in

exposure, changes in hazard mapping, and current FEMA HMP guidance. The Steering Committee discussed which hazards are natural or non-natural and identified which hazards are cascading impacts of other hazard events before finally determining which hazards of concern should be included in this HMP update.

Table 4-3. Identification of Hazards of Concern for Essex County

Hazard	Included in State Hazard Mitigation Plan?	Included in Previous Essex County HMP?	Comments	To Be Included in Essex County HMP?
Coastal Erosion	Yes	Yes (Coastal Erosion and Sea Level Rise)	Coastal erosion is fairly limited in Essex County along tidal waterways due to shoreline hardening. Erosional events may occur as the result of coastal flooding events in major coastal storms.	Yes, included as a cascading impact of Flood, Severe Weather, Severe Winter Weather Hazards; Profile included in the Flood Hazard
Dam and Levee Failure	Yes	No	According to the USACE National Dam Inventory, Essex County has 13 total dams, with 8 high hazard dams and 5 significant hazard dams. According to the USACE National Levee Database, Essex County has two levees protecting several buildings but no population.	Included in the Flood Hazard
Drought	Yes	Yes	The State of New Jersey was experiencing a significant drought during the writing of this HMP update. The County remains exposed to droughts.	Yes
Earthquake	Yes	Yes	The largest earthquake in the State of New Jersey's recent history took place on April 5, 2024. The County remains exposed to earthquakes.	Yes
Extreme Temperature	Yes	Yes	Extreme heat and cold events continue to occur in the County. Property damage is rare but impact to human health remains significant. The County remains exposed to the extreme temperatures.	Yes
Flood	Yes	Yes	Flooding in and out of the floodplain continues in Essex County with significant flooding events occurring since the last HMP. The County remains exposed to flooding.	Yes
Geological Hazards	Yes	Yes	The County remains exposed to the landslide in limited locations. Risk	Yes

Hazard	Included in State Hazard Mitigation Plan?	Included in Previous Essex County HMP?	Comments	To Be Included in Essex County HMP?
			of subsidence/sinkhole is low but can still occur.	
Hurricane, Nor'easter, Tropical Storm	Yes	Yes (Coastal Storm)	Since the last HMP, remnant tropical systems caused flooding and wind damage in Essex County. Nor'easters have resulted in flooding, wind, and heavy snow. The County remains exposed to coastal storms.	Yes, tropical systems are included in the Severe Weather hazard. Nor'easters are included in the Severe Winter Weather hazard. Flooding impacts from coastal storms are included in the Flood hazard.
Severe Weather	Yes	Yes	Essex County continues to be impacted by various severe weather events.	Yes
Severe Winter Weather	Yes	Yes	Essex County continues to be impacted by various severe winter weather events.	Yes
Wildfire	Yes	Yes	Essex County experienced the largest wildfire in recent history in Livingston in October 2024. Essex County continues to be exposed to wildfire.	Yes
Animal Disease	Yes	No	Mosquito and tick-borne illnesses continue to impact Essex County. Bird flu is an emerging threat.	No. This hazard is discussed in the Disease Outbreak hazard, relative to animal diseases that may spread to humans.
Civil Unrest	Yes	Yes (Civil Disorder)	This hazard has been identified as a non-natural hazard and is better addressed through other planning efforts.	No
Cyber Attack	Yes	Yes	This hazard has been identified as a non-natural hazard and is better addressed through other planning efforts.	No
Crop Failure	Yes	No	This hazard has been identified as a non-natural hazard and is better addressed through other planning efforts. Crop failure related to post-disaster events is noted as a potential cascading impact of numerous hazards of concern.	No. Crop failure is discussed as a potential cascading impact of various hazards of concern.
Economic Collapse	Yes	Yes	This hazard has been identified as a non-natural hazard and is better addressed through other planning	No. Economic collapse is discussed as a potential cascading

Hazard	Included in State Hazard Mitigation Plan?	Included in Previous Essex County HMP?	Comments	To Be Included in Essex County HMP?
			efforts. Economic collapse related to post-disaster events is noted as a potential cascading impact of numerous hazards of concern.	impact of various hazards of concern.
Fishing Failure	Yes	No	This hazard has been identified as a non-natural hazard and is better addressed through other planning efforts.	No
Harmful Algal Blooms	Yes	No	This hazard has been identified as a potential cascading impact of drought, extreme heat, and flood.	No, discussed as a potential cascading impact of Drought, Extreme Temperature, and Flood hazards.
Hazardous Substances	Yes	Yes	This hazard has been identified as a potential cascading impact of various hazards of concern.	No, discussed as a potential cascading impact of various hazards of concern.
Nuclear Hazards	Yes	No	This hazard has been identified as a non-natural hazard and is better addressed through other planning efforts.	No
Pandemic	Yes	Yes (Disease Outbreak)	Since the last HMP, the global coronavirus pandemic heavily impacted Essex County. Emerging disease outbreak risks from monkeypox, RSV, and bird flu have also been identified since the last HMP.	Yes, this hazard is discussed in the Disease Outbreak hazard, relative to animal diseases that may spread to humans.
Terrorism	Yes	Yes	This hazard has been identified as a non-natural hazard and is better addressed through other planning efforts.	No
Transportation Failure	No	Yes	Transportation failure has been identified as a potential cascading impact of various natural hazards of concern.	No, though discussed as a potential cascading impact of various hazards of concern.
Utility Interruption	No	Yes	Utility interruption has been identified as a potential cascading impact of various natural hazards of concern.	No, though discussed as a potential cascading impact of various hazards of concern.

Source(s): (NJOEM 2024); (USACE 2024); (USACE 2024)

4.5 HAZARDS OF CONCERN FOR THE 2025 ESSEX COUNTY HMP

Based on input from the Planning Partnership, nine hazards were identified as hazards of concern affecting the overall Planning Partnership and will be addressed in this HMP update.

The Steering Committee updated the HMP hazard groupings based on the similarity of hazard events, typical concurrence or impacts, consideration of how hazards have been grouped in FEMA guidance documents (FEMA 386-2 Understanding Your Risks, Identifying Hazards and Estimating Losses; Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy; Local Mitigation Planning Handbook), and consideration of updated hazard groupings in the State of New Jersey HMP.

Table 4-4. Hazards of Concern in Essex County

Hazard of Concern		Description
	Disease Outbreak	The Disease Outbreak hazard addresses diseases, including West Nile Virus, Eastern Equine Encephalitis, St. Louis Encephalitis, La Crosse Encephalitis, Lyme Disease, Influenza, Ebola, Measles, Tuberculosis, Hepatitis A, Coronavirus, Monkey Pox, RSV, and Bird Flu.
	Drought	The Drought hazard addresses meteorological, hydrological, agricultural, socioeconomic, and ecological drought.
	Earthquake	The Earthquake hazard addresses earthquakes epicentered in the County and those epicentered outside the County that result impacts in the County.
	Extreme Temperature	The Extreme Temperature hazard addresses extreme heat and extreme cold events.
	**Flood**	The Flood hazard addresses coastal (erosion, storm surge, tidal, and sea level rise), flash, riverine, and stormwater/urban flooding.
	Geological Hazards	The Geological Hazards hazard addresses landslide and subsidence/sinkhole.
	Severe Weather	The Severe Weather hazard addresses high wind events, tornadoes, thunderstorms and lightning, hailstorms, tropical storms, and hurricanes.
	Severe Winter Weather	The Severe Winter Weather hazard addresses blizzards, heavy snow, ice storms, and nor'easters.
	Wildfire	The Wildfire hazard addresses wildfire events including those ignited naturally or non-naturally.

Other natural and non-natural (e.g., human-caused) hazards have not occurred in Essex County, have little to no risk to the County and its municipalities, or are covered in other plans that specifically address technological, intentional, and other non-natural hazards. Therefore, these hazards are not further

addressed in this HMP. If deemed necessary by the County, these hazards may be considered in future versions of the HMP.

4.5.1 Changes from the 2020 HMP

For this HMP update, the Steering Committee adjusted the hazards of concern list from the previous plan. After noting that non-natural hazards are not eligible for traditional FEMA hazard mitigation funding grant programs and are adequately addressed in other planning efforts, non-natural hazards were removed from this update. Information on these non-natural hazards is preserved in Appendix E (Risk Assessment Supplement). Coastal erosion and sea level rise were identified as being best discussed within the Flood hazard. Coastal Storms (tropical cyclones and nor'easters) were determined to be best discussed with the existing hazard groupings within the Severe Weather and Severe Winter Weather hazards respectively. Other hazards from the previous HMP including hazardous materials release, transportation failure, and utility interruption are now discussed as potential cascading impacts of other hazards of concern.

5 Risk Assessment Methodology and Tools

5.1 Assessing Risk

In hazard mitigation planning, risk is the potential for damage or loss when natural hazards interact with people or assets, such as buildings, infrastructure, and resources. A risk assessment is a process used to identify potential hazards and analyze what could happen if a disaster or hazard occurs. It involves a data-driven analysis to identify potential hazards, what could happen if hazards occur, and determine vulnerabilities to hazards (FEMA 2023).

The risk assessment process focuses on three main elements – hazard identification, exposure identification, and vulnerability identification and loss estimation. The risk assessment for this HMP evaluates the risk of natural hazards prevalent in the County and meets FEMA and State of New Jersey requirements.

5.2 Risk Assessment Approach

This plan evaluated risks associated with each identified hazard for the County. Each hazard was profiled using the following steps:

- *Description of the Hazard:* Defining the hazard and a discussion of potential impacts
- *Location:* Geographic areas most affected by the hazard
- *Extent:* Measuring the intensity of the hazard, warning time for preparations, and the reasonable worst-case scenario
- *Previous Occurrences:* Summary of past events that have impacted the planning area
- *Future Conditions:* Probability estimates, including potential frequency and intensity shifts caused by climate change and population and development trends

For each hazard, one of the following assessment approaches was used, depending on the type of information available for the hazard:

- *Quantitative assessment*—Performed when numerical data are available to define risk. Available numerical hazard data may include financial impact and probability.
- *Qualitative assessment*—Uses words to describe and categorize the likelihood and consequences of a risk when numerical data are unavailable.

Vulnerability of exposed structures and infrastructure was evaluated by estimating the probability of occurrence of each event and assessing structures, facilities, and systems that are exposed to each hazard.

- Impact on Life, Health, and Safety
- Impact on General Building Stock
- Impact on Community Lifelines

- Impact on the Economy
- Impact on Historic and Cultural Resources
- Impact on Ecosystems and Natural Resources
- Change in Vulnerability Since the Previous HMP

5.3 Risk Assessment Tools

Local Plan Requirement A4 – 44 CFR Part 201.6(b)(3)

Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

For this HMP, GIS and FEMA's Hazus software were used to conduct the risk assessment for hazards with geographic boundaries otherwise a qualitative analysis was conducted.

5.3.1 Mapping

GIS tools provide a mechanism to perform quantitative analysis. Hazards that have specified geographic boundaries permit analysis using GIS. These hazards include the following:

- Earthquake
- Flood
- Geological Hazards
- Severe Weather
- Wildfire

5.3.2 Modeling

FEMA's Hazus model version 6.1 was used to evaluate the following hazards:

- Flood—A Level 2 user-defined analysis was performed for general building stock, and critical facilities and infrastructure, in flood areas. Effective flood mapping for the planning area was used to estimate potential losses from the 1%-annual-chance flood event. To estimate damage that would result from a flood, Hazus uses pre-defined relationships between flood depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting flood depth data and known property replacement cost values, dollar-value estimates of damage were generated.
- Earthquake—A Level 2 analysis was performed to assess earthquake exposure and vulnerability for three probabilistic events: 500-, 1,000-, and 2,500-year. The Hazus methodology uses ground motion and ground failure fragility curves to estimate damage state probabilities which are then used to estimate losses at the Census tract level.
- Hurricane Wind—A Level 2 analysis was performed to assess hurricane wind exposure and vulnerability for the 100- and 500-year probabilistic events.

5.3.2.1 Overview

FEMA developed the Hazards U.S., or Hazus, model in 1997 to estimate losses caused by earthquakes and identify areas that face the highest risk and potential for loss. Hazus was later expanded into a multi-hazard methodology with new models for estimating potential losses from hurricanes and floods. The use of Hazus for hazard mitigation planning offers numerous advantages:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Hazus is a GIS-based software program used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, community lifelines, transportation and utility lifeline, and multiple models to estimate potential losses from natural disasters. The program can be used to map hazard data and the results of damage and economic loss estimates for buildings and infrastructure.

5.3.2.2 Level of Detail for Evaluation

Hazus provides default data for inventory, vulnerability and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the planning area:

- Level 1—All of the information needed to produce an estimate of losses is included in the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of the planning area.
- Level 2—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- Level 3—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

5.4 Sources of Data Used in Risk Assessment

Hazard information and data were collected for all hazards from a variety of sources, described in the sections below.

5.4.1 Building and Cost Data

The building stock inventory developed for the 2020 HMP was utilized. The structural and content replacement cost values (RCV) were updated to reflect RS Means 2024 values; a regional location factor for Essex County was applied (1.15 for single-family residential structures; 1.14 for all other structures). Replacement cost value is the current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials. Total replacement cost value consists of both the structural cost to replace a building and the estimate value of contents of a building. The occupancy classes available in Hazus v6.1 were condensed into the following categories (residential, commercial, industrial, agricultural, religious, governmental, and educational) to facilitate the analysis and the presentation of results. Residential loss estimates address both multi-family and single-family dwellings.

5.4.2 Community Lifelines

The essential facilities, utilities, transportation features and user-defined facilities in the 2020 HMP critical facility inventory were re-categorized into FEMA's Community Lifelines: Safety and Security; Food, Hydration, Shelter; Health and Medical; Energy; Communications; Transportation; Hazardous Material; and Water Systems. An additional category, Other, was used for commercial facilities that did not align with the Community Lifelines definitions but were identified by planning partners as economic centers important post-disaster. To protect individual privacy and the security of assets, information is presented in aggregate, without details about specific individual properties or facilities.

5.4.3 Population

Total population statistics from the 2019-2023 American Community Survey (ACS) 5-year estimate were used to estimate the exposure of and potential impacts to the County's population. Population counts at the Census tract level were averaged among the residential structures in the tracts to estimate the population at the structure level. Limitations of these analyses are recognized, and thus the results are used only to provide a general estimate for planning purposes.

As discussed in the County Profile section, research has shown that some populations are at greater risk from hazard events because of decreased resources or physical abilities. Vulnerable populations in Essex County included in the risk assessment are children, elderly, population below the poverty level, the physically or mentally disabled, and non-English speakers. The ACS data for these vulnerable populations at the tract-level does not have a sufficient level of detail to support hazard area exposure analyses. 2020 Census block-level data in Hazus includes population 65 or older and low-income households ($30,000 or less). This block data was intersected with the hazard areas to determine an approximate percentage of these vulnerable populations exposed to hazards. This analysis can result in an over-estimation of population exposed as the whole block that intersects a hazard area is considered exposed.

5.4.4 Hazus Data Inputs

The following hazard datasets were used for the Hazus analyses conducted for the risk assessment:

- Flood—The effective FEMA Digital Flood Insurance Rate Map (DFIRM), and the flood depth grid developed for the New Jersey State Hazard Mitigation Plan risk assessment, were used to estimate the potential losses from the 1%-annual-chance flood event.
- Earthquake—Probabilistic ground motion data developed by the USGS as part of the 2014 update of the National Seismic Hazard Maps, and supplied in Hazus, were used for the analysis of this hazard. Liquefaction susceptibility and National Earthquake Hazard Reductions Program (NEHRP) soils information from NJDEP/NJGWS were also incorporated into the Hazus model to replace the default data. Groundwater was set at a depth of five feet (default setting). The default assumption is a magnitude 7.0 earthquake for all return periods.
- Hurricane—Hurricane probabilistic data provided in Hazus were used for the analysis of this hazard.

5.4.5 Other Local Hazard Data

Local sources used in the risk and vulnerability assessment include the following:

- Earthquake – Ground shaking is the primary cause of earthquake damage to man-made structures and soft soils amplify ground shaking. One contributor to the site amplification is the velocity at which the rock or soil transmits shear waves (S-waves). NEHRP has developed five soil classifications defined by their shear-wave velocity that impact the severity of an earthquake. The soil classification system ranges from A to E, where A represents hard rock that reduces ground motions from an earthquake and E represents soft soils that amplify and magnify ground shaking and increase building damage and losses. An exposure analysis was conducted using the liquefaction susceptibility and NEHRP soils data from NJDEP/NJGWS. NEHRP soils classes D and E, and liquefaction susceptibility class 4 were used to represent the areas most susceptible to seismic activity.
- Flood – Exposure analyses were conducted for the 1%-annual-chance and 0.2%-annual-chance flood events using the effective DFIRM data. To prepare for future conditions, analyses were also conducted using two datasets that have added additional flood water heights to coastal and inland Special Flood Hazard Area base flood elevations – Tidal Climate Adjusted Flood Elevation for New Jersey (BFE plus 5 feet) and NJ Inland Design Flood Elevation (BFE plus 3 feet).

  For assessing coastal storm surge, NOAA's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) data was used. The SLOSH model represents potential flooding from worst-case combinations of hurricane direction, forward speed, landfall point, and high astronomical tide. The inundation boundaries do not include riverine flooding caused by hurricane surge or inland freshwater flooding. The model, developed by the NOAA National Hurricane Center to forecast surges that occur from wind and pressure forces of hurricanes, considers only storm surge height and does not consider the effects of waves. The SLOSH spatial data includes inundation boundaries for Category 1 through Category 4 hurricane events.

- Geological Hazards – An exposure analysis was conducted using landslide susceptibility data from NJDEP/NJGWS. This data differentiates areas based on the ground surface and slope. Categories are defined as follows:

- Class A
  - AI – Strongly cemented rock; slope angle of 15-20 degrees
  - AII – Strongly cemented rock; slope angle of 20-20 degrees
  - AIV – Strongly cemented rock; slope angle of 30-40 degrees
  - AVI – Strongly cemented rock; slope angle of greater than 40 degrees
- Class B
  - BIII – Weakly cemented rock and sandy soil; slope angle of 10-15 degrees
  - BIV – Weakly cemented rock and sandy soil; slope angle of 15-20 degrees
  - BV – Weakly cemented rock and sandy soil; slope angle 20-30 degrees
- Class C
  - CVI – Shales and clayey soil; slope angle of 10-15 degrees
  - CVII – Shales and clayey soil; slope angle of 15-20 degrees
  - CIX – Shales and clayey soil; slope angle of 20-40 degrees if dry or 10-15 degrees if groundwater at surface
  - CX – Shales and clayey soil, groundwater at surface; slope angle greater than 15 degrees

- Wildfire – An exposure analysis was conducted using wildfire hazard potential data from the Northeast-Midwest State Foresters Alliance's Northeast-Midwest Wildfire Portal. The wildfire hazard potential dataset represents an index that quantifies the relative potential for wildfire that may be difficult to control. The data is categorized from 1 (low) to 8 (high). For the purposes of the exposure analysis, the categories were grouped as low to moderate (values 1 – 4) and moderate to high (values 5 – 8).

5.4.6 Data Source Summary

Table 5-1 describes the data used for spatially-based exposure and vulnerability assessments.

Table 5-1. Data Source Summary

Data	Source	Date(s)	Format(s)
County Boundaries of NJ	NJ Office of GIS	12/2023	Digital (GIS) format
Municipal Boundaries of NJ	NJ Office of GIS	12/2023	Digital (GIS) format
2020 Essex Co. HMP general building stock inventory	Essex Co.	8/2019	Digital (GIS) format
Building replacement costs	RS Means	2024	Digital (GIS and tabular) format
2020 Essex Co. HMP critical facilities inventory	Essex Co.	8/2019	Digital (GIS) format
2020 Population data	FEMA Hazus version 6.1	2024	Digital (GIS) format
Total population: 2019-2023 American Community Survey 5-year Estimate at the Census tract level, Total Population (Table B01003)	U.S. Census Bureau	Downloaded 1/2025	Digital (tabular) format
Population Under 5 or Over 65: 2019-2023 American Community Survey 5-year	U.S. Census Bureau	Downloaded 1/2025	Digital (tabular) format

Data	Source	Date(s)	Format(s)
Estimate at the Census tract level, Sex by Age (Table B01001)			
Low Income Households: 2019-2023 American Community Survey 5-year Estimate at the Census tract level, Household Income in the Past 12 Months (in 2023 Inflation-Adjusted Dollars) (Table B19001)	U.S. Census Bureau	Downloaded 1/2025	Digital (tabular) format
Disabled Population: 2019-2023 American Community Survey 5-year Estimate at the Census tract level, Sex by Age by Disability Status (Table B18101)	U.S. Census Bureau	Downloaded 1/2025	Digital (tabular) format
Non-English Speaking Population: 2019-2023 American Community Survey 5-year Estimate at the Census tract level, Language Spoke at Home for the Population 5 Years and Over (Table C16001)	U.S. Census Bureau	Downloaded 1/2025	Digital (tabular) format
Land Use/Land Cover of New Jersey 2020	NJDEP	12/2023	Digital (tabular) format
FEMA Effective Digital Flood Insurance Rate Map (dated 4/3/2020 with latest LOMR dated 9/25/2020)	FEMA	9/2020	Digital (tabular) format
Essex County SFHA depth grid created for the 2024 NJ State Hazard Mitigation Plan	Michael Baker International	Provided 12/2024	Digital (GIS) format
NJ Inland Design Flood Elevation (FEMA 1% Chance Annual Flood Plus 3 Feet)	Rutgers University	7/2023	Digital (GIS) format
Tidal Climate Adjusted Flood Elevation for New Jersey	NJDEP	3/2022	Digital (GIS) format
NOAA SLOSH Hurricane Storm Surge Categories 1 - 4	Rutgers University	Provided 12/2024	Digital (GIS) format
Hazus v6.1 probabilistic earthquake data	FEMA	Hazus v6.1 released 11/2023	Digital (GIS) format
Liquefaction Susceptibility	NJDEP/NJGWS	2016	Digital (GIS) format
Soil Susceptibility (NEHRP Soils)	NJDEP/NJGWS	2016	Digital (GIS) format
Landslide Susceptibility	NJDEP/NJGWS	2016	Digital (GIS) format
Hazus v6.1 probabilistic hurricane data	FEMA	Hazus v6.1 released 11/2023	Digital (GIS) format
Northeast-Midwest Wildfire Portal, Wildfire Hazard Potential	Northeast-Midwest State Foresters Alliance	Hazus v6.1 released 11/2023	Digital (GIS) format

5.5 Data Limitations

Loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment.

Uncertainties also result from the following:

1) Approximations and simplifications necessary to conduct such a study
2) Incomplete or dated inventory, demographic, or economic parameter data
3) The unique nature, geographic extent, and severity of each hazard
4) Mitigation measures already employed by the participating municipalities
5) The amount of advance notice residents have to prepare for a specific hazard event
6) Uncertainty of climate change projections

Hazus currently represents the industry best management practice for assessing risk in support of hazard mitigation planning. However, the Hazus model is limited by the availability of data to support its working components. The model makes assumptions where firm data are not available. Assumptions are used, for example, to estimate ground deformation caused by liquefaction. These model limitations can lead to an understatement or overstatement of risk.

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Essex County will collect additional data to update and refine existing inventories to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock utilizing best available data. The County acknowledges significant impacts may occur to critical facilities and infrastructure as a result of these hazard events causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure, and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industry such as tourism and the real-estate market were not analyzed.

6 Disease Outbreak

6.1 Hazard Profile

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

6.1.1 Description of the Hazard

Defining the Hazard

An outbreak or 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. Pandemic is defined as a disease occurring over a wide geographic area and affecting a high proportion of the population. A pandemic can cause sudden, pervasive illness in all age groups on a local or global scale. A pandemic is a novel virus to which humans have no natural immunity that spreads from person-to-person. A pandemic will cause both widespread and sustained effects and is likely to stress the resources of both the State and federal government (NJOEM 2024).

Arboviruses

Of particular concern in Essex County are arthropod-borne viruses (arboviruses), which are viruses that are maintained in nature through biological transmission between susceptible hosts (mammals) and blood feeding arthropods (mosquitos and ticks). More than 100 arboviruses can cause disease in humans; over 30 have been identified as human pathogens in the western hemisphere (Health 2008). Arboviruses that have impacted or have the potential to impact Essex County include:

- West Nile Virus (WNV) is an infection that is spread by the bite of an infected mosquito. It was first confirmed in the United States in 1999 and is seen most often during the summer and early fall months. Mild symptoms are flu-like and may include fever, headache, body aches and sometimes a rash. Severe symptoms can include high fever, stiff neck and swelling of the brain (New Jersey Department of Health 2024). According to New Jersey Department of Health, there have been 20 reported human cases of WNV in Essex County between 2010 and 2025 (New Jersey Department of Health 2024).
- Eastern Equine Encephalitis (EEE) is a virus disease of wild birds that is transmitted to horses and humans by mosquitoes. It is a rare but serious viral infection. EEE is most common in the eastern half of the U.S. and is spread by the bite of an infected mosquito. EEE can affect humans, horses, and some birds. The risk of getting this virus is highest from late July through early October (New Jersey Department of Health 2024). According to New Jersey Department of Health, there have not been any reported human cases of EEE in Essex County between 2010 and 2025 (New Jersey Department of Health 2025).

- St. Louis Encephalitis (SLE) is transmitted to humans by the bite of an infected mosquito. Most cases of SLEV disease have occurred in eastern and central states. Most persons infected with SLEV have no apparent illness. Initial symptoms of those who become ill include fever, headache, nausea, vomiting, and tiredness. Severe neuroinvasive disease (often involving encephalitis, an inflammation of the brain) occurs more commonly in older adults. In rare cases, long-term disability or death can result (New Jersey Department of Health 2024). According to the CDC, there have been no human-reported cases of SLE in Essex County (CDC 2024a).
- La Crosse Encephalitis (LAC) is transmitted to humans by the bite of an infected mosquito. Most cases of LAC occur in the upper Midwestern, mid-Atlantic and southeastern states. Many people infected with LAC have no apparent symptoms. Among people who become ill, initial symptoms include fever, headache, nausea, vomiting, and tiredness. Some of those who become ill develop severe neuroinvasive disease (CDC, La Crosse Virus 2024). According to the CDC, there have been no human-reported cases of LAC in Essex County (CDC 2024c).
- Lyme Disease is an illness caused by infection with the bacterium Borrelia burgdorferi, which is carried by ticks. The infection can cause a variety of symptoms and, if left untreated, can be severe. Lyme disease is spread to people by the bite of an infected tick (New Jersey Department of Health 2024). According to New Jersey Department of Health, there have been 2,323 reported human cases of Lyme disease in Essex County between 2010 and 2025 (New Jersey Department of Health 2025).

Respiratory Viruses

Respiratory viruses are viruses that cause illnesses in the respiratory system. The following describes the viruses of concern in Essex County.

- Influenza (flu) is a contagious respiratory illness caused by influenza. It can cause mild to severe illness. Serious outcomes of flu infection can result in hospitalization or death. Some people, such as older people, young children, and people with certain health conditions are at high risk for serious flu complications (New Jersey Department of Health 2025).
- Avian influenza (bird flu) refers to the disease caused by infection with avian influenza A viruses that naturally spread among wild aquatic birds worldwide. These viruses can infect domestic poultry and other bird and animal species. Bird flu viruses do not normally infect humans, however, sporadic human infections with bird flu viruses after close contact with infected birds or animals have occurred (New Jersey Department of Health 2025). The first hospitalized severe case of avian influenza A(H5N1) virus was confirmed by the CDC on Friday, December 13 in Louisiana. Since April 2024, there have been a total of 66 reported human cases of H5 bird flu reported in the United States. No cases have been confirmed in the state of New Jersey as of 2024 (CDC 2024).
- Coronavirus Disease 2019 (COVID-19) is a very contagious disease caused by the virus SARS-CoV-2. When a person infected with COVID-19 breathes, droplets and very small particles that contain the virus can spread and infect other around them. COVID-19 can also spread through droplets and particles that land on people's eyes, nose, or mouth or when people touch contaminated surfaces (CDC 2024).

- Respiratory Syncytial Virus (RSV) is a common respiratory virus that usually causes mild, cold-like symptoms such as coughing, sneezing, wheezing, fever, runny nose, and decrease in appetite. Infants/young children and older adults are most at risk for severe disease that may require hospitalization. RSV can also cause severe symptoms in people with weakened immune systems or chronic heart and lung diseases (New Jersey Department of Health 2025).

Ebola

Ebola is a severe, often fatal disease that can occur in humans and some animals. It is caused by an infection with a virus. Ebola is spread through direct contact with the blood or body fluids of an infected, symptomatic person. It is also spread through exposure to objects (such as needles) that have been contaminated with infected secretions. Ebola is not transmitted through the air, food, or water. It can also spread when people have direct contact with dead bodies of people who dies from Ebola or with infected bats, rodents, or primates. Symptoms may include fever, headache, joint and muscle aches, weakness, diarrhea, vomiting, rash, red eyes, and bleeding outside the body. There is no specific medicine that cures people infected with Ebola (New Jersey Department of Health 2025).

Measles

Measles is a very contagious respiratory disease caused by a virus. Ninety percent of people with close contact with an infected person will get measles if they are not vaccinated. Before the measles vaccine became available, measles was a common childhood disease. Measles is considered the deadliest of all childhood rash/fever illnesses. Symptoms may include high fever, cough, runny nose, red watery eyes, rash. Measles can have serious complications such as ear infections, pneumonia, swelling of the brain, and miscarriage in pregnant women. For every 1,000 children who get measles, one or two will die (New Jersey Department of Health 2025).

Tuberculosis

Tuberculosis (TB) is caused by a bacterium (or germ) called *Mycobacterium tuberculosis*. In the United States, the majority of TB disease cases in people are caused by *Mycobacterium tuberculosis*. TB usually affects the lungs. TB can also affect other parts of the body, such as the brain, the kidneys, or the spine. TB can also affect multiple parts of the body at the same time. For example, TB can affect both the lungs and lymph nodes (CDC 2024).

Hepatitis A

Hepatitis A is a vaccine-preventable, communicable disease of the liver caused by the hepatitis A virus (HAV). It is usually transmitted person-to-person through the fecal-oral route or consumption of contaminated food or water. Hepatitis A is a self-limited disease that does not result in chronic infection. Most adults with hepatitis A have symptoms, including fatigue, low appetite, stomach pain, nausea, and jaundice, that usually resolve within 2 months of infection; most children less than 6 years of age do not have symptoms or have an unrecognized infection (CDC 2024).

Monkey Pox

Monkey pox (mpox) is a viral disease caused by the monkeypox virus. The virus was discovered in 1958, when two outbreaks of a pox-like disease occurred in colonies of monkeys kept for research. The first human case of monkeypox was recorded in 1970, in what is now the Democratic Republic of the Congo. In 2022, mpox spread around the world. Before that, cases of mpox in other places were rare and usually linked to travel or to animals being imported from regions where mpox is endemic (CDC 2024).

The disease causes fever, swollen lymph nodes, and rash, along with other symptoms. Transmission can be spread through close contact with infected people or animals. The source of the disease remains unknown. Scientists suspect African rodents and non-human primates (like monkeys) might harbor the virus and infect people. There are two types of mpox: clade I and clade II. Historically, clade I caused higher numbers of severe illnesses than clade II, with up to 10% of people dying from it (CDC 2024). From 2020 to 2024, no cases of clade I mpox were reported in Essex County (New Jersey Department of Health 2024).

Cause of the Hazard

Arboviruses

Mosquito-borne diseases are diseases that are spread through the bite of an infected female mosquito. The three most common mosquito-borne diseases in New Jersey and Essex County are WNV, EEE, and SLE. These diseases rely on mosquitos to spread. Mosquitos become infected by feeding on birds carrying the virus; and then spread to humans and other animals when the mosquito bites them (New Jersey Department of Health 2024).

Tick-borne diseases are bacterial illnesses that spread to humans through infected ticks. In Essex County, Lyme disease is the most common tick-borne disease which is transmitted by infected deer ticks. Ticks become infected by micro-organisms when feeding on small, infected mammals (mice and voles). Anyone who is bitten by an infected tick may get a tick-borne disease. People who spend a lot of time outdoors have a greater risk of becoming infected (New Jersey Department of Health 2024).

Respiratory Illnesses

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 (NJOEM 2024).

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 (NJOEM 2024).

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, Influenza (Flu) 2024).

Avian influenza

Bird flu spreads through direct contact with infected birds, their droppings, or contaminated surfaces. It can also spread through inhalation of aerosolized particles from infected birds. Bird flu continues to cause outbreaks in poultry and wild birds worldwide. Human cases are rare but can occur, especially among people who have close contact with infected birds (CDC, Avian Influenza (Bird Flu) 2024).

COVID-19

When a person infected with COVID-19 breathes, droplets and very small particles that contain the virus can spread and infect other around them. COVID-19 can also spread through droplets and particles that land on people's eyes, nose, or mouth or when people touch contaminated surfaces (CDC, COVID-19 2024). Once infected, people may first notice symptoms 2-14 days being exposed to the virus. 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, COVID-19 2024). COVID-19 cases were tracked in New Jersey through May 2023. At that time, Essex County had 293,825 confirmed cases of COVID-19 and 3,250 deaths attributed to COVID-19 (NY Times 2024).

Respiratory Syncytial Virus (RSV)

RSV spreads in the fall and winter along with other respiratory viruses. It usually peaks in December and January. RSV does not usually cause severe illness in healthy adults and children. However, some people with RSV infection, especially older adults and infants younger than 6 months of age, can become very sick and may need to be hospitalized (CDC 2024).

Ebola

Ebola is spread through direct contact with the blood or body fluids of an infected, symptomatic person. It is also spread through exposure to objects (such as needles) that have been contaminated with infected secretions. Ebola is not transmitted through the air, food, or water. It can also spread when people have direct contact with dead bodies of people who dies from Ebola or with infected bats, rodents, or primates (New Jersey Department of Health 2025).

Measles

Measles virus can live for up to two hours in an airspace where the infected person coughed or sneezed. If other people breathe the contaminated air or touch the infected surface, then touch their eyes, noses, or mouths, they can become infected. Measles is so contagious that if one person has it, 90% of the people close to that person who are not immune will also become infected (CDC 2024).

Tuberculosis

TB bacteria are spread through the air from one person to another. The TB bacteria are put into the air when a person with TB disease of the lungs or throat coughs, speaks, or sings. People nearby may breathe in these bacteria and become infected (CDC 2024).

Hepatitis A

Hepatitis A is usually transmitted person-to-person through the fecal-oral route or consumption of contaminated food or water. Hepatitis A is a self-limited disease that does not result in chronic infection. Antibodies produced in response to hepatitis A infection last for life and protect against reinfection (CDC 2024).

Monkey Pox

Transmission of monkey pox can be spread through close contact with infected people or animals. The source of the disease remains unknown. Scientists suspect African rodents and non-human primates (like monkeys) might harbor the virus and infect people (CDC 2024).

Summary of Potential Impacts

Disease outbreaks can be hazardous due to their potential to disrupt the economy, affecting workforce productivity, supply chains, and consumer behavior. Businesses may close temporarily or permanently, leading to job losses and economic instability. Public services, including transportation, education, and utilities, may also be disrupted, impacting daily life and community functions. An increase in patients at healthcare facilities can lead to shortages of medical supplies, staff, and hospital beds. Healthcare facilities may not be adequately prepared, resulting in delayed or inadequate care for both outbreak-related scenarios and other medical conditions.

Cascading Hazard Impacts

Disease outbreak can occur as a cascading impact of other hazards such as flood, but does not traditionally result in other cascading natural hazards.

6.1.2 Location

Disease outbreaks can occur throughout Essex County. Factors like population density, tourism, and the duration of public presence in specific areas significantly influence the spread of infectious diseases. COVID-19 and the flu are more likely to spread in locations where people are in close contact. Mosquito-borne diseases, such as West Nile Virus (WNV), are influenced by environmental conditions like standing

water, which serves as breeding grounds for mosquitoes. The nature and transmission methods of diseases that can infect humans vary widely.

Essex County's population density and the presence of Newark Liberty International Airport in the County serving as a hub for international travel makes the County more susceptible to contagious diseases from other countries, like Ebola and monkey pox.

6.1.3 Extent

The exact size 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. The transmission rates of pandemic illnesses are often higher in more densely populated areas. The transmission rate of infectious diseases will depend on the mode of transmission of a given illness.

The extent and location of disease outbreaks depends on the preferred habitat of the species, as well as the species' ease of movement and establishment. The magnitude of disease outbreaks species ranges from nuisance to widespread. The threat is typically intensified when the ecosystem or host species is already stressed, such as periods of drought. The already weakened state of the ecosystem causes it to more easily be impacted to an infestation. The presence of disease-carrying mosquitoes and ticks has been reported throughout most of New Jersey and Essex County.

6.1.3.1 Measuring Intensity

In 1999, the WHO Secretariat published guidance for pandemic influenza and defined the six phases of a pandemic. Updated guidance was published in 2005 to redefine these phases. This schema is designed to provide guidance to the international community and to national governments on preparedness and response for pandemic threats and pandemic disease. Compared with the 1999 phases, the new definitions place more emphasis on pre-pandemic phases when pandemic threats may exist in animals or when new influenza virus subtypes infect people but do not spread efficiently. Because recognizing that distinctions between the two interpandemic phases and the three pandemic alert phases may be unclear, the WHO Secretariat proposes that classifications be determined by assessing risk based on a range of scientific and epidemiological data (WHO 2009). The WHO pandemic phases are outlined in Table 6-1.

Table 6-1. WHO Global Pandemic Phases

Phase	Description
Preparedness	
Phase 1	No viruses circulating among animals have been reported to cause infections in humans.
Phase 2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when

Phase	Description
	there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.
Response and Mitigation Efforts	
Phase 4	Human infection(s) are reported with a new subtype, but no human-to-human spread or at most rare instances of spread to a close contact.
Phase 5	is characterized by human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.
Phase 6	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.

Source: WHO 2009

In New Jersey, health and supporting agency responses to a pandemic are defined by the WHO phases and federal pandemic influenza stages, and further defined by New Jersey pandemic situations. The State's situations are similar, but not identical to the United States Department of Homeland Security federal government response stages. Transition from one situation to another indicates a change in activities of one or more New Jersey agencies. Table 6-2 compares the federal and New Jersey pandemic influenza phases and situations.

Table 6-2. Federal and New Jersey Pandemic Phases and Situations

Federal Pandemic Influenza Stage		New Jersey Situations	
0	New domestic outbreak in at-risk country (WHO Phase 1, 2, or 3)	1	Novel (new) influenza virus in birds or other animals outside the U.S.
		2	New Jersey Covid-19 Pandemic
1	Suspected human outbreak overseas (WHO Phase 3)	3	Human case of novel (new) influenza virus outside of the U.S.
2	Confirmed human outbreak overseas (WHO Phase 4 or 5)	4	Human-to-human spread of novel (new) influenza outside the U.S. (no widespread human transmission)
3	Widespread human outbreak in multiple locations overseas (WHO Phase 6)	5	Clusters of human cases outside the U.S.
4	First human case in North America (WHO Phase 6)	6	Human case of novel (new) influenza virus (no human spread) in the U.S./NJ
5	Spread in the U.S. (WHO Phase 6)	7	First case of human-to-human spread of novel (new) influenza in the U.S./NJ
6	Recovery and preparation for subsequent waves (WHO Phase 5 or 6)	8	Clusters of cases of human spread in the U.S./NJ
		9	Widespread cases of human-to-human spread of novel (new) influenza outside the U.S./N
		10	Reduced spread of influenza or end of pandemic

Source: Homeland Security Council 2006; NJDOH 2012

Warning Time

Typical warning times for disease outbreaks may vary based on the effectiveness of current systems and the disease. Rapid onset diseases such as norovirus have quick outbreaks with little warning. Some diseases, such as influenza, have predictable seasonal patterns. Public health officials often issue warnings and encourage vaccinations ahead of the flu season. For new or emerging diseases, warning time may take longer as it may take time to identify the disease and understand its transmission.

Worst Case Scenario

An example of a worst-case scenario for disease outbreak may involve a highly contagious and deadly pathogen spreading rapidly through a population with limited immunity. A simultaneous occurrence of a natural hazard alongside a disease outbreak may strain resources, making it difficult to manage both effectively.

6.1.4 Previous Occurrences

Many sources provided historical information regarding previous occurrences and losses associated with disease outbreak events throughout New Jersey and Essex County. With so many sources reviewed for the purpose of this HMP, loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP. The following sections provide a review of previous disease outbreak occurrences in Essex County.

6.1.4.1 Declarations

Federal Declarations

Between 1954 and 2024, the state of New Jersey was included in two disease outbreak-related emergency (EM) declarations and one major disaster (DR) declaration.

Table 6-3. FEMA Disease Outbreak Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
EM-3156-NJ	May 30, 2000 – November 1, 2000	November 1, 2000	New Jersey Virus Threat
EM-3451-NJ	January 20, 2020 – May 11, 2023	March 13, 2020	New Jersey Covid 19
DR-4488-NJ	January 20, 2020 – May 11, 2023	March 25, 2020	New Jersey Covid-19 Pandemic

Source: FEMA: Disaster Declarations 1954-2024

USDA Declarations

Between 1954 and 2024, Essex County was not included in any disease outbreak-related agricultural disaster declarations.

Table 6-4. USDA Disease Outbreak Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
None identified			

Source: (USDA 2025a)

6.1.4.2 Summary of Significant Events

The most significant disease outbreak event in Essex County in recent history has been the COVID-19 pandemic. 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. Through May 2023, Essex County had 293,825 confirmed cases of COVID-19 and 3,250 deaths attributed to COVID-19 (NY Times 2024). The pandemic resulted in business and government office closures and masking and social distancing requirements.

6.1.4.3 Recent Events

For the 2025 HMP update, disease outbreak events that impacted Essex County between January 2020 and December 2024 are listed in Table 6-5 . For events prior to January 2020, refer to the 2020 HMP.

Table 6-5. Recent Disease Outbreak Hazard Events

Date (s) of Event	Disease Type	Declaration Number	Description
2020	Hepatitis A	N/A	In 2021, there were confirmed 18 cases of Hepatitis A in Essex County.
2020	Lyme Disease	N/A	In 2020, there were confirmed 92 cases of Lyme Disease in Essex County.
2020	West Nile Virus	N/A	In 2020, there was 1 confirmed case of West Nile Virus in Essex County.
January 20, 2020 – May 11, 2023	COVID-19	DR-4488-NJ, EM-3451-NJ	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 24, 2023, there have been 2,588,728 confirmed cases of COVID-19 in New Jersey. During that period, 172,973 people have been hospitalized with confirmed cases and 36,242 have died in deaths associated with COVID-19. Through May 2023, Essex County had 293,825 confirmed cases of COVID-19 and 3,250 deaths attributed to COVID-19 (NY Times 2024).
2021	Hepatitis A	N/A	In 2021, there were confirmed 10 cases of Hepatitis A in Essex County.
2021	Lyme Disease	N/A	In 2021, there were confirmed 148 cases of Lyme Disease in Essex County.
2021	West Nile Virus	N/A	In 2021, there was 4 confirmed cases of West Nile Virus in Essex County.
2022	Hepatitis A	N/A	In 2022, there were confirmed 9 cases of Hepatitis A in Essex County.
2022	Lyme Disease	N/A	In 2022, there were confirmed 197 cases of Lyme Disease in Essex County.

Date (s) of Event	Disease Type	Declaration Number	Description
2023	Hepatitis A	N/A	In 2023, there were confirmed 3 cases of Hepatitis A in Essex County.
2023	Lyme Disease	N/A	In 2023, there were confirmed 225 cases of Lyme Disease in Essex County.

Source: (New Jersey Department of Health 2024); (NJOEM 2024); (FEMA 2024)
Note: 2024 statistics were unavailable for this plan update.

6.1.5 Future Conditions

It is difficult to predict when the next disease outbreak will occur and how severe it will be because viruses are always changing. 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 (NJOEM 2024).

6.1.5.1 Probability

In Essex County, the probability for a future disease outbreak event is dependent on several factors. One factor that influences the spread of disease is population density. Populations that live close to one another are more likely to spread diseases. As population density increases in the County, so too will the probability of a disease outbreak event occurring.

All of the critical components necessary to sustain the threat of mosquito-borne disease in Essex County have been clearly documented. Instances of the WNV have been generally decreasing because of aggressive planning and eradication efforts, but some scientists suggest that as global temperatures rise and extreme weather conditions emerge from climate change, the range of the virus in the United States will grow (Epstein 2001). While instances of Zika have decreased since the outbreak in 2016, there is still the possibility of an outbreak occurring in the future. Therefore, based on all available information and available data regarding mosquito populations, it is anticipated that mosquito-borne diseases will continue to be a threat to Essex County.

Disease-carrying ticks will continue to inhabit the northeast, including Essex County, creating an increase in Lyme disease and other types of infections amongst the county population if not controlled or prevented. Ecological conditions favorable to Lyme disease, the steady increase in the number of cases, and the challenge of prevention predict that Lyme disease will be a continuing public health concern. Personal protection measures, including protective clothing, repellents or acaricides, tick checks, and landscape modifications in or near residential areas, may be helpful. However, these measures are difficult to perform regularly throughout the summer. Attempts to control the infection on a larger scale by the eradication of deer or widespread use of acaricides, which may be effective, have had limited public acceptance. New methods of tick control, including host-targeted acaricides against rodents and deer, are being developed and may provide help in the future (Allen C Steere 2004).

Currently and in the future, control of Lyme disease will depend primarily on public and physician education about personal protection measures, signs and symptoms of the disease, and appropriate antibiotic therapy. Based on available information and the ongoing trends of disease-carrying tick populations, it is anticipated that Lyme disease infections will continue to be a threat to Essex County.

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for disease outbreak in the County is considered 'occasional' (between 10 and 100% annual probability of a hazard event occurring).

6.1.5.2 Climate Change

The relationship between climate change and increase in infectious diseases is difficult to predict with certainty, however there are scientific linkages between the two. Changing rain patterns are expanding vectors' range and their active periods. Shorter, warmer winters and longer summers are also linked to more vector-borne diseases. For example, diseases caused by ticks (like Lyme disease) are now occurring in the winter too and are being found in regions farther west and north than in the past. Zoonotic diseases, such as plague (carried by rodents), are also showing changes in incidence and location due to changes in animal migration patterns and natural ranges. Due to their habitat loss, wild animals are coming closer to humans. With that comes a higher risk of animal diseases spilling over to humans and for new pathogens to develop (UC Davis Health 2024).

6.1.5.3 Potential Future Impacts

Areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the disease outbreak hazard because the entire planning area is exposed and vulnerable. As the population increases or decreases, the entire planning area remains exposed and susceptible to such hazards.

6.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

6.2.1 Summary of Vulnerability

To understand the potential impacts and risk drought can have on Essex County, a qualitative assessment was done to evaluate what assets are exposed or vulnerable to disease outbreaks. The following discusses Essex County's vulnerability to disease outbreaks.

6.2.2 Impact on Life, Health, and Safety

The entire population of Essex County is vulnerable to the disease outbreak hazard. Due to a lack of quantifiable loss information, a qualitative assessment was conducted to evaluate the assets exposed to this hazard and the potential impacts associated with this hazard. Healthcare providers and first responders have an increased risk of exposure due to their frequent contact with infected populations. Areas with a higher population density also have an increased risk of exposure or transmission of disease to do the closer proximity of population to potentially infected people.

6.2.2.1 Socially Vulnerable Populations

Vulnerable populations, including the young and elderly, are at higher risk during disease outbreaks. Many socially vulnerable individuals have higher rates of chronic illnesses, which can worsen the effects of infectious diseases. Outbreaks often lead to widespread job losses, especially in sectors where vulnerable populations are overrepresented, such as service industries. This financial strain can make it difficult for these individuals to afford necessities like food and shelter. Additionally, vulnerable populations are more likely to live in overcrowded housing, which can facilitate the spread of infectious diseases. Furthermore, groups such as the elderly or those with disabilities may face additional barriers to communication and accessing information about disease outbreaks, further isolating them.

6.2.3 Impact on General Building Stock

No structures are anticipated to be directly affected by disease outbreaks.

6.2.4 Impact on Community Lifelines

Disease outbreaks have the potential to impact all community lifelines, with significant impacts primarily in food, hydration, and shelter; health and medical; water systems. Supply chains for food can be disrupted, leading to shortages and increased prices. Quarantine measures can also impact the availability of shelter, especially for vulnerable populations. Public safety services, including law enforcement and emergency response, can be strained as personnel fall ill or are required to quarantine. This can lead to increased crime rates and slower response times. Outbreaks can overwhelm healthcare systems, leading to shortages of medical supplies, staff, and facilities. This was evident during the COVID-19 pandemic, where hospitals faced critical shortages of ventilators and personal protective equipment.

6.2.5 Impact on the Economy

The impact disease outbreaks have on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with the activities and programs implemented to conduct surveillance and address disease outbreaks have not been quantified in available documentation. Instead, activities and programs implemented by the County to address this hazard are described below, all of which could impact the local economy.

In Essex County, the Department of Public Works has the responsibility for the Mosquito Control Program (Mosquito Division). This Division utilizes an integrated pest management program which provides a balanced approach to controlling mosquitos and reducing the annoyance and threat of disease carried by

this insect. The County uses pesticides to control nuisance and vector-carrying mosquitoes (Essex County 2025a).

In 2012 a study was conducted on the economic impacts of seasonal influenza by county, titled "Annual economic impacts of seasonal influenza on U.S. counties: Spatial heterogeneity and patterns" (Liang Mao 2012). The study estimates over 57,000 annual cases of seasonal influenza in Essex County costing more than $65.5 million in direct and indirect costs.

Economic recession has been a secondary impact of the coronavirus pandemic. To control the spread of the disease, businesses were forced to close and, eventually, to reopen on a phased plan that emphasized curbside pickup. In April 2020, New Jersey lost over 750,000 jobs, with nearly a million jobs lost in March and April 2020 combined. By August 29, 2020, over 1.5 million unemployment insurance claims were filed in New Jersey, which is almost 40% of New Jersey's workforce. Over the summer of 2020, there was a rebound in employment as coronavirus-related restrictions lifted, and more than 40% of the jobs lost were recovered (New Jersey Department of Labor and Workforce Development 2020).

6.2.6 Impact on Historic and Cultural Resources

Disease outbreaks can significantly impact historic and cultural resources in various ways. Staffing shortages due to illness or quarantine measures hinder the ability to maintain and protect resources. Historic buildings and artifacts may suffer physical damage due to neglect, reduced maintenance, and lower conservation efforts during outbreaks, leading to deterioration. Restrictions on travel and public gatherings result in decreased tourism, affecting the revenue generated from historic sites, which is crucial for their upkeep.

With fewer visitors and staff around, historic sites may experience increased vandalism and theft. In some cases, historic buildings may be repurposed as temporary healthcare facilities or shelters, leading to alterations or damage. However, disease outbreaks can accelerate efforts to digitally document and preserve historic resources, making them accessible to a wider audience online. During the COVID-19 pandemic, virtual tours and online exhibits became more common, enhancing accessibility to sites. For example, New Jersey Division of Travel and Tourism's New Jersey in the House! provided digital hub that included virtual tours of museums (VisitNJ 2020).

6.2.7 Impact on Ecosystems and Natural Resources

The type of virus outbreak will determine the severity of any effect on the environment. Diseases which are transmitted from man to animals or animals to man (zoonotic) may have agricultural impacts. Sixty percent of emerging infection diseases that affect humans are zoonotic, originating in animals. Livestock and poultry populations could also be at risk. If there is a high death toll due to pandemic, the necessity for mass burials of animals or humans may impact the environment as well (CDC, 2013).

6.2.8 Change in Vulnerability Since the Previous HMP

Since the 2020 HMP, Essex County has experienced the COVID-19 pandemic. While impactful, the pandemic also resulted in development of new capabilities and better preparedness. Overall, Essex County remains vulnerable to disease outbreak events.

6.3 Mitigation Opportunities

A range of potential opportunities for mitigating the disease outbreak hazard have been identified and considered by plan participants:

- Manipulate the hazard:
  - None identified
- Reduce exposure and vulnerability to the hazard:
  - PPE
  - Social distancing
  - Distanced work environment
  - Regular cleaning of work environment
- Build local capacity to respond to or prepare for the hazard:
  - Storage of PPE
  - Equipment for monitoring/treatment
  - Trainings for staff
  - Public outreach
  - Maintain strong health regulations
- Nature-based opportunities:
  - Restore systems to reduce standing water that can breed mosquitos.

7 DROUGHT

7.1 HAZARD PROFILE

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

7.1.1 Description of the Hazard

Defining the Hazard

Drought is defined as a deficiency in precipitation over an extended period of time, resulting in a water shortage. Drought can also occur as over shorter periods as "flash" events during warmer seasons. While drought can occur in virtually every climatic zone, its characteristics and effects vary from region to region. Four ways that drought can be defined are meteorological, agricultural, hydrological, and socioeconomic drought (NJOEM 2024).

Cause of the Hazard

Drought can be caused by various atmospheric conditions such as climate change, ocean temperature shifts, changes in the jet stream, and changes in the local landscape (NJOEM 2024).

Summary of Potential Impacts

Drought results in a decline of stream flows, lake levels, and reservoir levels and a decrease in water depth in wells. It can lead to problems such as crop losses, fish and wildlife losses, subsidence, saltwater intrusion, reduced water quality, and water supply shortages. The impacts of a drought increase as the drought continues (NJOEM 2024).

Cascading Hazard Impacts

The effects of a drought are largely shaped by the strength and duration of the event. The greater the strength and/or duration, the more devastation occurs. A notable impact of drought is its effect on water supply. Water restrictions may need to be put into place during droughts, affecting watering of lawns, washing cars, etc. In severe drought conditions, watering of crops may not be an option, leading to crop loss. This can lead to shortages, increasing the price of food.

Droughts can additionally exacerbate water pollution. The lack of rainwater during droughts decreases the potential dilution of water sources, causing contaminants to stagnate that otherwise would have been flushed by a rainfall event. These water supplies may be harmful to humans, plants, and animals.

If soils are not receiving water, the ground may become unstable. Especially on sloped land, unstable soil increases the risk of erosion and topsoil loss.

Drought can also affect public health through increasing the risk of heat-related illnesses, waterborne illnesses, recreational risks, limited food availability, and reduced living conditions. Financial stress may be experienced by individuals who rely on water for their livelihoods. Decreased quality and quantity of water during drought events have the potential to reduce the availability of electricity and other basic utilities (hydropower, coal-burning, and nuclear).

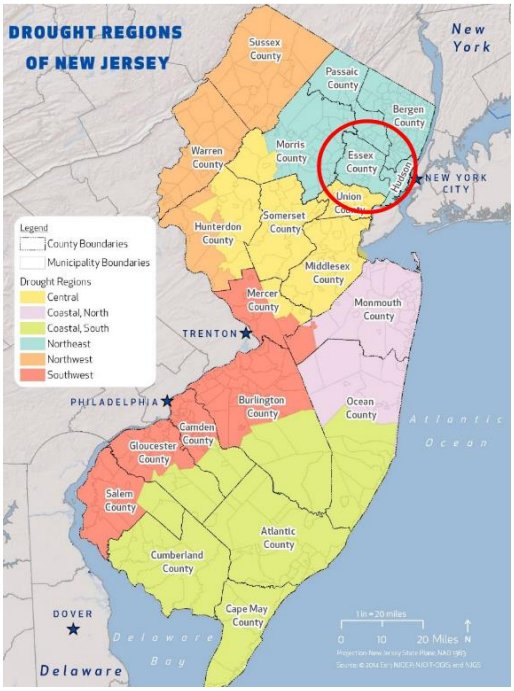
Drought, especially in combination with high winds and temperatures can also increase the wildfire risk through dry soils, increased evaporative demand, and large-scale tree death (NJOEM 2024).

7.1.2 Location

Climate divisions are defined by National Oceanic and Atmospheric Administration as regions within a state that are climatically homogenous. In New Jersey, these divisions typically coincide with county boundaries except in coastal areas. The State is divided into Northern, Southern, and Coastal divisions with Essex County being a part of the Northern climate division (NJOEM 2024).

The New Jersey Department of Environmental Protection (NJDEP) additionally divides New Jersey into six drought regions. These were developed based on hydro-geologic conditions, watershed boundaries, municipal boundaries, and water supply characteristics. Drought regions allow New Jersey to respond to changing conditions without imposing restrictions on areas not experiencing water supply shortages. Essex County is located in the Northeast Drought Region (NJOEM 2024).

Figure 7-1. Drought Regions of New Jersey



Source: (NJOEM 2024)
Note: The red circle shows the approximate location of Essex County. The County is located in the Northeast Drought Region.

The State has five water regions compiled from HUCH11 Watershed Management Areas), with Essex County located in the Passaic and Raritan water regions. Water supply sources within the county are largely from unconfined groundwater and surface water sources. The majority of water withdrawal is for potable water supply, followed by power generation, then commercial/industrial/mining. Water use trends vary per month and typically peak during summer months when irrigation demands are highest (NJOEM 2024).

7.1.3 Extent

Drought severity depends on the moisture deficiency, duration, and the size and location of the affected area. Severity increases with duration and size of the affected area. New Jersey uses a multi-index system to determine the severity of a drought or extended period of dry conditions (NJOEM 2024).

Measuring Intensity

The U.S. Drought Monitor (USDM) identifies areas of drought and labels them by intensity. It uses four categories of drought, from D1 (least intense) to D4 (most intense). Areas with no drought are given the D0 category to indicate abnormally dry areas that have the potential of entering or recovering from drought (U.S. Drought Monitor 2024). Table 7-1 presents the U.S. Drought Monitor and the potential impacts related to the different categories.

Table 7-1. U.S. Drought Monitor

Category	Description	Possible Impacts
D0	Abnormally Dry	• Short-term dryness slowing planting, growth of crops • Some lingering water deficits • Pastures or crops not fully recovered
D1	Moderate Drought	• Some damage to crops, pastures • Some water shortages developing • Voluntary water-use restrictions requested
D2	Severe Drought	• Crop or pasture loss likely • Water shortages common • Water restrictions imposed
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water creating water emergencies

Source: (National Weather Service 2024)

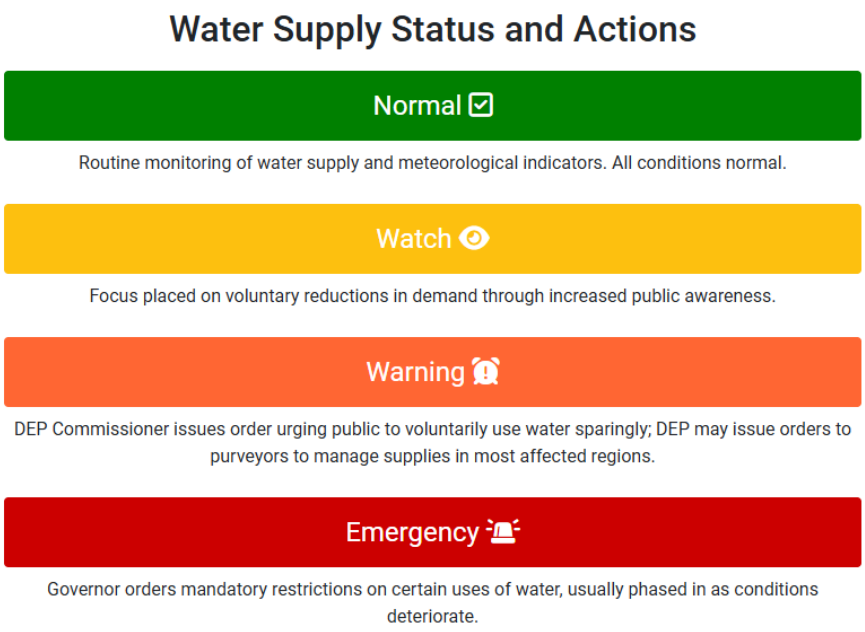
In addition to the U.S. Drought Monitor, the Standard Precipitation Index (SPI), Palmer Drought Severity Index (PDSI), and the Crop Moisture Index (CPI) are all used in determining the onset, severity, and end of droughts (National Drought Mitigation Center 2024).

- Standard Precipitation Index (SPI): The SPI shows the actual precipitation compared to the probability of precipitation for various time frames. The SPI is an index based on precipitation only. It can be used on a variety of time scales, which allows it to be useful for both short-term agricultural and long-term hydrological applications.

- Palmer Drought Severity Index (PDSI): The PDSI allows for a categorization of various levels of wetness and dryness that are prominent over an area. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil.
- Crop Moisture Index (CMI): The CMI looks at moisture supply in the short term for crop producing regions. The CMI monitors week-to-week crop conditions. Whereas the PDSI monitors long-term meteorological wet and dry spells, the CMI was designed to evaluate short-term moisture conditions across major crop-producing regions.

In New Jersey, NJDEP uses several drought indicators to assess the status of water supply and hydrogeologic conditions for each drought region. The indicators are precipitation, stream flow, shallow ground water levels, and reservoir storage. Each indicator is weighted according to its importance within the drought region and then the indicators are ranked according to the status of the current conditions related to the average. Each are then evaluated as either: near/above normal, moderately dry, severely dry, or extremely dry. NJDEP uses these factors to determine if a drought-related action is needed (NJDEP 2024).

Figure 7-2. NJDEP Water Supply Status and Actions



Source: (NJDEP 2024)

Warning Time

As discussed above, NJDEP uses several indicators to issue water supply statues and actions to the drought regions in the State. Figure 7-2 provides a summary of the four statuses (normal, watch, warning, and emergency). The following are additional details for drought watches, warnings, and emergencies in New Jersey (NJDEP 2024):

- A **Drought Watch** is used to alert the public about deteriorating conditions and to remind water suppliers to monitor conditions and update contingency plans in event the dry conditions worsen. Watches are designated by NJDEP when drought or other factors begin to adversely affect water supply conditions. Drought watches indicate that conditions are dry but not significantly so. During a drought watch, NJDEP closely monitors drought indicators (precipitation, stream flow, reservoir and ground water levels, and water demands) and consults with affected water suppliers.

- A **Drought Warning** represents a non-emergency phase of managing available water supplies during the developing stages of drought and falls between the watch and emergency levels of drought response. Under a drought warning, NJDEP may order water purveyors to develop alternative sources of water or transfer water between areas of the State with relatively more water to those with less. While mandatory water use restrictions are not imposed under a warning, the general public is strongly urged to use water sparingly in affected areas.
- A **Drought Emergency** is only declared by the governor. Efforts initiated under a drought emergency focus on reducing water demands. During a water emergency, a phased approach to restricting water consumption is typically initiated. Phase I water use restrictions typically target non-essential, outdoor water use. And while some indirect economic impacts may occur, the first phases of water use restrictions seek to avoid adverse impacts on the economy.

Worst Case Scenario

The worst-case scenario for a drought in Essex County would include a prolonged period of drought (D4) followed by high winds and extreme temperatures. This would not only cause typical impacts of water shortage, but high winds could increase the potential for wildfires and decrease the ability for the county to combat wildfires. Extreme temperatures could exacerbate the impacts of water shortage as well as increase the severity of potential wildfires (NJOEM 2024).

7.1.4 Previous Occurrences

The following sections provide a review of previous drought occurrences in Essex County.

7.1.4.1 Declarations

Federal Declarations

Between May 1954 and November 2024, FEMA included the State of New Jersey in 21 FEMA declarations for drought-related major disaster (DR) or emergency (EM) declarations. FEMA included Essex County in two of the declarations, as shown in Table 7-2.

Table 7-2. FEMA Drought Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
DR-205	August 18, 1965	August 8, 1967	Drought: Water Shortage
EM-3083	October 19, 1980	May 21, 1983	Drought: Water Shortage

Source: (FEMA 2024)

USDA Declarations

Between 2020 and 2024, the USDA included Essex County in two drought-related agricultural disaster declarations (Table 7-3).

Table 7-3. USDA Drought Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
S5305	August 9, 2022 – N/A	October 3, 2022	Drought-FAST TRACK

Disaster Number	Incident Period	Declaration Date	Description
S5345	July 1, 2022 – August 19, 2022	December 20, 2022	Drought and Excessive Heat

Source: *(U.S. Department of Agriculture 2024)*

7.1.4.2 Summary of Significant Events

The most significant state drought occurred from 1961-1966. Stream flow deficits were greatest in northern New Jersey which had a recurrence interval exceeding 50 years. Water conservation was widely practiced, and a state of emergency was declared by the governor on June 12, 1965, for most of northeastern New Jersey (NJOEM 2024). A federal disaster was later declared in August of 1967 (DR-205) (FEMA 2024).

7.1.4.3 Recent Events

For the 2025 HMP update, drought events that impacted Essex County between January 2020 and December 2024 are listed in Table 7-4. For events prior to January 2020, refer to the 2020 HMP.

Table 7-4. Recent Drought Hazard Events in Essex County (2020 to 2024)

Date (s) of Event	Designation Number	County Included	Description
July to December 2022	S5305 (USDA) S5345 (USDA)	Statewide	A statewide Drought Watch was instituted 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. The counties that experienced severe drought conditions were Atlantic, Bergen, Cape May, Cumberland, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, and Union. USDA declared seven different drought-related disaster declaration over the course of the year.
April 2023	N/A	Bergen, Essex, Morris, and Passaic Counties	Parts of northern counties experienced moderate drought for around 2 weeks.
September – December 2024	N/A	Statewide	In October, NJ DEP issued a drought watch and imposed a Stage 3 fire restriction throughout the state. This is the highest restriction, prohibiting open fires within or adjacent to wooded areas. The restrictions were lifted later in November. New Jersey declared a drought warning for November-December 2024. Wildfires continued to burn in areas of the State and reservoirs were depleting. In Essex County, New Jersey American Water issued a mandatory conservation notice for its customers.

Source: (NJOEM 2024); (Drought Impact Reporter 2024); (NOAA NCEI 2024); (FEMA 2024)

7.1.5 Future Conditions

The frequency of droughts is difficult to forecast as drought occurrences are cyclical in nature and will continue to occur in the future. Based on data from the Northeast Regional Climate Center, Essex County

experienced periods of severe drought for 3.1-percent of the time and extreme drought for 1.4-percent of the time (between 1895 and 2024) (Northeast Regional Climate Center 2024). Essex County will continue to experience periods of drought, of all severities, in the future.

7.1.5.1 Probability

It is likely that droughts can occur across Essex County in the future based on past occurrences. This probability will increase as projected temperatures rise, making it likely that future droughts of varied severity will occur in Essex County (NJOEM 2024).

Information from FEMA, USDA, U.S. Drought Monitor, and the New Jersey State HMP were used to identify the number of drought events that occurred between January 1965 and December 2024. Table 7-5 presents the probability of future events for drought in Essex County.

Table 7-5. Probability of Future Occurrences of Drought Events

Hazard Type	Occurrences Between 2012 and 2024	% Chance of Occurring in Any Given Year
Drought	6	46.2%

Source: (NJOEM 2024); (Drought Impact Reporter 2024); (NOAA NCEI 2024); (FEMA 2024)

Note: Disaster occurrences include federally declared disasters since the 1950 Federal Disaster Relief Act, and selected events since 1968.

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for drought in the County is considered 'occasional' (between 10 and 100% annual probability of a hazard event occurring).

7.1.5.2 Climate Change

According to the 2020 New Jersey Scientific Report on Climate Change, New Jersey is warming faster than the rest of the Northeast region and the world. Historically unprecedented warming is projected for the 21st century with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050. Annual precipitation in New Jersey is expected to increase by 4 percent to 11 percent by 2050. The intensity and frequency of precipitation events is anticipated to increase due to climate change (ONJSC Rutgers University n.d.).

Climate change is expected to increase the risk of drought across New Jersey, including Essex County, due to factors including changes in precipitation patterns and increases in temperature. Climate change is a major driver of changes in the frequency, duration, and geographic distribution of rainfall. Paradoxically, although New Jersey is becoming wetter overall, it is also projected to experience more frequent and severe droughts with the potential to seriously impact people's health and threaten food supplies (NJOEM 2024).

The state's 2020 Scientific Report on Climate Change makes clear that changes in precipitation patterns and particularly extended periods of low rainfall are likely to make droughts more frequent, adding stress

to local water supplies Climate models project that droughts lasting three to six months and longer may increase in frequency in the Northeastern United States. Also, short-term summer droughts could increase in frequency (NJDEP 2020).

7.1.5.3 Potential Future Impacts

Increases in population and continued development are likely to add additional stressors to the Essex County water supply. Climate change is likely to result in more severe drought events in the future.

7.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

7.2.1 Summary of Vulnerability

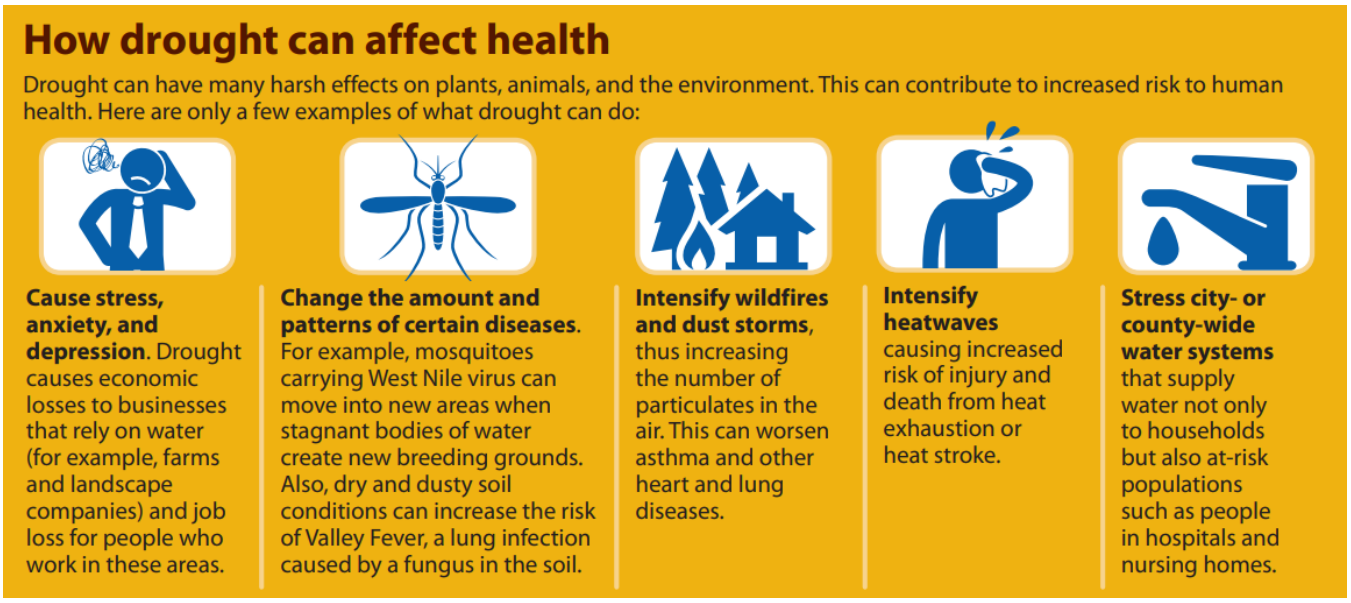
To understand the potential impacts and risk drought can have on Essex County, a qualitative assessment was done to evaluate what assets are exposed or vulnerable to drought. The following discusses Essex County's vulnerability to drought.

7.2.2 Impact on Life, Health, and Safety

During droughts, impacts are most severe on those most dependent on annual rainfall. These groups include but are not limited to agencies fighting forest fires, farmers growing crops, and small water systems lacking a reliable water source. Essex County's dependence on surface water and reservoirs make it especially vulnerable to the increased evaporation demand associated with drought.

The entire population of Essex County (851,117) is exposed to drought events (Annual Estimates of the Resident Population for Counties in New Jersey: April 1, 2020 to July 1, 2023 (CO-EST2023-POP-34) 2024). Some drought-related health effects are experienced in the short-term and can be directly observed and measured. However, the slow rise or chronic nature of drought can result in longer term, indirect health impacts that are not always easy to anticipate or monitor. Health impacts include drinking water quantity and quality, increased recreational risks, effects on air quality, compromised food and nutrition, and increased rate of illnesses and diseases (CDC 2024).

Figure 7-3. How Drought Can Affect Health



Source: CDC n.d.

7.2.2.1 Socially Vulnerable Populations

Vulnerable populations—people living in neighborhoods with social factors such as poverty, lack of vehicle access, or crowded housing—may be disproportionately affected by drought impacts (National Integrated Drought Information System 2024). According to the CDC's Social Vulnerability Index, socially vulnerable populations in Essex County have a very high susceptibility to the adverse impacts of drought, when compared to the rest of the United States. This designation is made based off of 15 U.S. census variables at tract level to help local officials identify communities that may need support in preparing for or recovering from hazards (NDIS 2025). As of January 2025, Essex County has a Social Vulnerability Index Score of 0.84 on a scale from 0 to 1.0 (NDIS 2025).

7.2.3 Impact on General Building Stock

There are no major structures in Essex County that are anticipated to be directly affected by a drought. Droughts increase wildfire risk, with the risk to life and property greatest where forests are adjacent to urbanized areas. All assets in and adjacent to this zone are considered vulnerable to wildfire. Refer to Section Error! Reference source not found. for the wildfire risk assessment (Essex County OEM 2020).

7.2.4 Impact on Community Lifelines

While drought events generally do not impact buildings, they can potentially impact critical facilities and community lifelines that are associated with potable water supplies and agriculture-related facilities. Additionally, a lack of water supply may disrupt the County's ability to generate and distribute electricity, further impairing the accessibility of utilities during a drought. The community lifelines most likely to be impacted by drought in Essex County include food, hydration, shelter; energy; and water systems.

Table 7-6. Lifelines Most Likely Impacted by Drought

Lifeline Categories	Notable Impacts
Food, Hydration, Shelter	Drought can pose a significant threat to the Food, Hydration, and Shelter Lifeline. Drought can have devastating impacts on agricultural production, impacting local and sometimes international food supply chains.
Energy	Drought can impact the Energy lifeline in regions that derive a significant amount of electrical supply from hydropower.
Water Systems	Drought can have an adverse impact on Water System lifelines. In cases where water demand exceeds supply, utilities may have to ration water. Severe drought may result in a loss of water pressure and water supply. Additionally, water quality may be impacted requiring additional treatment.

Source: (NJOEM 2024)

The County contains 20 active community water systems serving populations of Very Small (0-500) to Very Large (100,000+) size (EPA, List of Water Systems in SDWIS 2025).

Drought can reduce short term water sources, such as reservoir or lake levels, or affect longer-term storage, such as mountain snowpack. Drought can also increase drinking water treatment costs by concentrating contaminates in source waters and thereby diminishing source water quality (U.S. EPA 2024). Essex County water supplies are primarily sourced from surface water, as shown in Table 7-7.

Table 7-7. Drinking Water Suppliers in Essex County

Name	Counties Served	Municipalities Served	Population Served	Source Type
Belleville Water Dept	Essex	Belleville	35,129	Surface Water - Purchased
Bloomfield Water Department	Essex	Bloomfield	47,315	Surface Water - Purchased
Caldwell Water Dept	Essex	Caldwell	9,027	Surface Water - Purchased
Cedar Grove Water Dept	Essex	Cedar Grove	12,900	Surface Water - Purchased
East Orange Water Commission	Essex	East Orange	75,000	Surface Water - Purchased
Essex Fells Water Dept	Essex	Essex Fells	2,200	Surface Water - Purchased
Essex Fells Water Hilltop System	Essex	Verona	354	Surface Water - Purchased
Fairfield Water Dept	Essex	Fairfield	7,400	Surface Water - Purchased
Glen Ridge Water Dept	Essex	Glen Ridge	7,681	Surface Water - Purchased
Livingston Twp Div Of Water	Essex	Livingston	27,391	Surface Water - Purchased
Montclair Water Bureau	Essex	Montclair	37,669	Surface Water - Purchased
Newark Water Department	Essex	Belleville, Bloomfield, East Orange, Hillside, Irvington, Newark	294,274	Surface Water

Name	Counties Served	Municipalities Served	Population Served	Source Type
NJ American Water - Short Hills	Essex, Hunterdon, Morris, Passaic, Somerset, Union, and Warren	Irvington, Livingston, Maplewood, Millburn, North Caldwell, South Orange	217,230	Surface Water
North Caldwell - Hilltop	Essex	North Caldwell	208	Surface Water - Purchased
North Caldwell Water Dep	Essex	North Caldwell	6,000	Surface Water - Purchased
Nutley Water Dept	Essex	Nutley	29,500	Surface Water - Purchased
Orange Water Dept	Essex	Orange	30,134	Surface Water - Purchased
Roseland Water Dept	Essex	Roseland	5,300	Surface Water - Purchased
South Orange Water Department	Essex	South Orange	16,964	Surface Water - Purchased
Verona Water Department	Essex	Verona	13,641	Surface Water - Purchased
West Caldwell Water Department	Essex	West Caldwell	10,759	Surface Water - Purchased

Source: (EPA, List of Water Systems in SDWIS 2025)

7.2.5 Impact on the Economy

Water withdrawals are used not only for potable water but also for use in several industries such as the commercial/industrial/mining sectors and power generation. The NJDEP may impose mandatory water restrictions and require specific actions to be taken by water suppliers after the Governor declares a Water Emergency. While a water emergency seeks to cause as little disruption as possible to commercial activity and employment, disruption may be inevitable (NJOEM 2024).

A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity can result in shortages and higher costs for these resources. Even businesses that remain operational may be impacted aesthetically, which would be most significant within the recreation and tourism industry. Even if the drought is not in Essex County, droughts in other areas could impact food supply and price of food for residents within the county.

The economic effects of drought are most deeply felt by industries heavily dependent on water, such as the agricultural industry. As of 2022, there are 32 farms in the County. The industry brings in a market value of $4.17 million products sold and employs approximately 25,000 seasonal and year-round employees (NASS n.d.). Direct and indirect agricultural losses caused by drought include the following:

- Damage to crop quality and crop losses.
- Insect infestation leading to crop and tree losses.
- Plant diseases leading to loss of agricultural crops and trees.
- Reduction in outdoor activities.
- Increased risk of brush fires and wildfires due to dried crops, grasses, and dying trees.

7.2.6 Impact on Historic and Cultural Resources

Limited water supply and the cascading effects of drought (such as increased wildfire risk and decreased availability of electricity) can make the maintenance of important resources such as libraries and museums more difficult. People may not be able to access these resources during a drought due to the social effects of drought.

Droughts can directly affect lakes, rivers, and parks used for recreation within the County, limiting its access to residents. Higher risk of heat illnesses and other illnesses may also curtail the ability of individuals to utilize open spaces in the County (NJOEM 2024).

7.2.7 Impact on Ecosystems and Natural Resources

Drought can have profound impacts on ecosystems and natural resources by degrading habitat quality, as well as water supply and quality.

Drought leads to habitat degradation through vegetation and animal death. Of the different ecosystem types, wetlands are particularly vulnerable to drought. Prolonged drought has the potential to destroy wetlands, resulting in damage to fish habitat and loss from fishery production. Many species harvested by commercial fisheries rely on wetlands of all types for food or habitat. Wetland loss can also lead to losses in the recreational fisheries and tourism industry (NJOEM 2024).

Parks can also undergo habitat degradation during droughts. This is especially applicable to Essex County as there are 22 public parks and 5 reservations within the County, totaling to over 6,000 acres of open space and over 140 buildings for public use. These parks are also an important source of revenue for the County as certain parks such as the South Mountain Recreation Complex charge admission and other fees (Essex County Department of Parks 2025).

Drought can impact the State's water supply. New Jersey relies on reservoirs and groundwater as the main sources of water. Essex County in particular relies primarily on reservoirs and surface water. While surface water is more immediately impacted by drought, groundwater sources can take longer to replenish. Essex County gets its water from surface water (Table 7-7) (NJOEM 2024).

Drought can also degrade water quality through increased pollutant concentration in the waterbody. Decreased flow in the stream or river may cause the water body to stagnate, which reducing water quality and reducing dissolved oxygen levels.

7.2.8 Change in Vulnerability Since the Previous HMP

Overall, Essex County remains vulnerable to drought. The main changes in vulnerability to drought in Essex County relate to climate change. As temperatures warm and annual levels of rainfall continue to fluctuate, the risk of drought increases.

7.3 Mitigation Opportunities

A range of potential opportunities for mitigating the drought hazard have been identified and considered by plan participants:

- Manipulate the hazard:
  - Encourage better groundwater recharge through stormwater management, floodplain management
- Reduce exposure and vulnerability to the hazard:
  - Consider stored water/captured water techniques during dry seasons
  - Reduce private water system losses
  - Regularly check for leaks to minimize water supply losses
  - Install low-flow water saving showerheads and toilets
  - Turn water flow off while brushing teeth or during other cleaning activities
  - Adjust sprinklers to water the lawn and not the sidewalk or street
  - Run the dishwasher and washing machine only when they are full
  - Check for leaks in plumping or dripping faucets
  - Install rain-capturing devices for irrigation
  - Install graywater systems in homes to encourage water reuse
  - Identify alternate water supply sources
  - Identify and create groundwater back up sources
  - Create /identify new impounded water supply points
  - Developing new or upgrading existing water delivery systems to eliminate breaks and leaks
  - Water use conflict regulations
  - Distribute water saving kits
  - Encourage citizens to take water-saving measures
- Build local capacity to respond to or prepare for the hazard:
  - Practice active water conservation techniques.
  - Seek ways to operate wells in such a way to enhance their functional longevity and supply capability.
  - Develop a COOP
  - Create a water conservation plan
  - Public education on drought resistance
  - Identify alternative water supplies for time of drought
  - Mutual aid agreements with alternative suppliers
  - Develop a drought contingency plan
  - Develop criteria-"triggers" for drought related actions Improve accuracy of water supply forecasts
  - Provide incentives to influence active water conservation techniques such as water user rate reductions

- Establish protocol for saltwater de-salinization to be implemented during conditions of severe drought
- Consider providing incentives to property owners that utilize drought resistant landscapes in the design of their homes
- Use of water buffalo tankers
- Promote well usage techniques that strive to enhance functional longevity and supply capability of private water supply wells
- Develop an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc.

- Nature-based opportunities:
  - Identify sites ideally suited for ground water recharge
  - Promote and use reclaimed water supplies
  - Implement natural stormwater retention in regions ideally suited for groundwater recharges
  - Utilize drought resistant landscapes on private and community owned facilities

8 EARTHQUAKE

8.1 HAZARD PROFILE

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

8.1.1 Description of the Hazard

Defining the Hazard

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). Earthquakes usually occur when slowly accumulated strain within the Earth's crust is suddenly released along a fault. The energy from this movement travels as seismic waves along the ground surface and within the earth. The arrival of the released energy is felt as an earthquake (Dombroski 2005).

Earthquakes usually occur without warning and their effects can impact areas of great distance from the epicenter. The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates, also called the focus or hypocenter. The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter (NJOEM 2024). Hazards resulting from earthquakes include surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis, and seiches; each of these terms is defined below (NJOEM 2024):

- *Surface faulting*: Displacement that reaches the earth's surface during a slip along a fault. Commonly occurs with shallow earthquakes—those with an epicenter less than 20 kilometers.
- *Ground motion (shaking):* The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by a sudden slip on a fault or sudden pressure at the explosive source and travel through the Earth and along its surface.
- *Landslide:* A movement of surface material down a slope.
- *Liquefaction*: A process by which water-saturated sediment temporarily loses strength and acts as a fluid, like the wet sand near the water on a beach. Earthquake shaking can cause this effect.
- *Tectonic Deformation*: A change in the original shape of a material caused by stress and strain.
- *Tsunami:* A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major sub-marine slides, or exploding volcanic islands.
- *Seiche:* The sloshing of a closed body of water, such as a lake or bay, from earthquake shaking.

Cause of the Hazard

Most earthquakes occur where the Earth's tectonic plates meet (faults) although some also occur within plate interiors. As plates continue to move and plate boundaries change geologically over time, weakened

boundary regions become part of the interiors of the plates. These zones of weakness within the continents can cause earthquakes in response to stresses that originate at the edges of the plate or in the deeper crust. Less than 10% of earthquakes occur within plate interiors. New Jersey experiences both types of earthquakes (NJOEM 2024).

Summary of Potential Impacts

Ground shaking is the primary cause of earthquake damage to man-made structures. Soils influence damage in different ways. One way is that soft soils amplify the motion of earthquake waves, producing greater ground shaking and increasing the stresses on structures. Another way is that loose, wet, sandy soils may lose strength and flow as a fluid when shaken, causing foundations and underground structures to shift and break (NJOEM 2024).

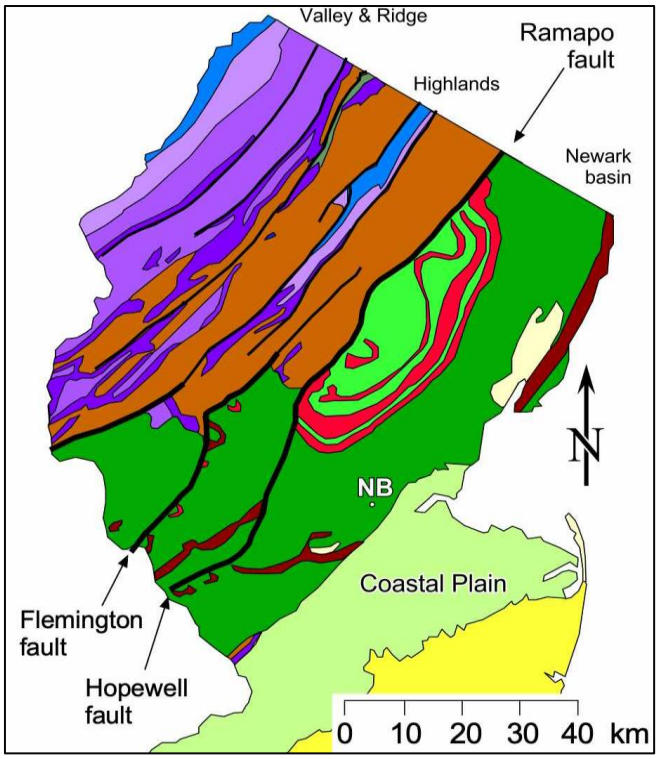
Cascading Hazard Impacts

Earthquakes can cause large and sometimes disastrous landslides and mudslides. Any steep slope is vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Landslides are discussed in Section 11 (Geological Hazards). Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Earthen dams and levees are highly susceptible to seismic events and the impacts of their eventual failures can be considered secondary risks for earthquakes (NJOEM 2024). Flooding caused by dam failure is discussed in Section 10 (Flood).

8.1.2 Location

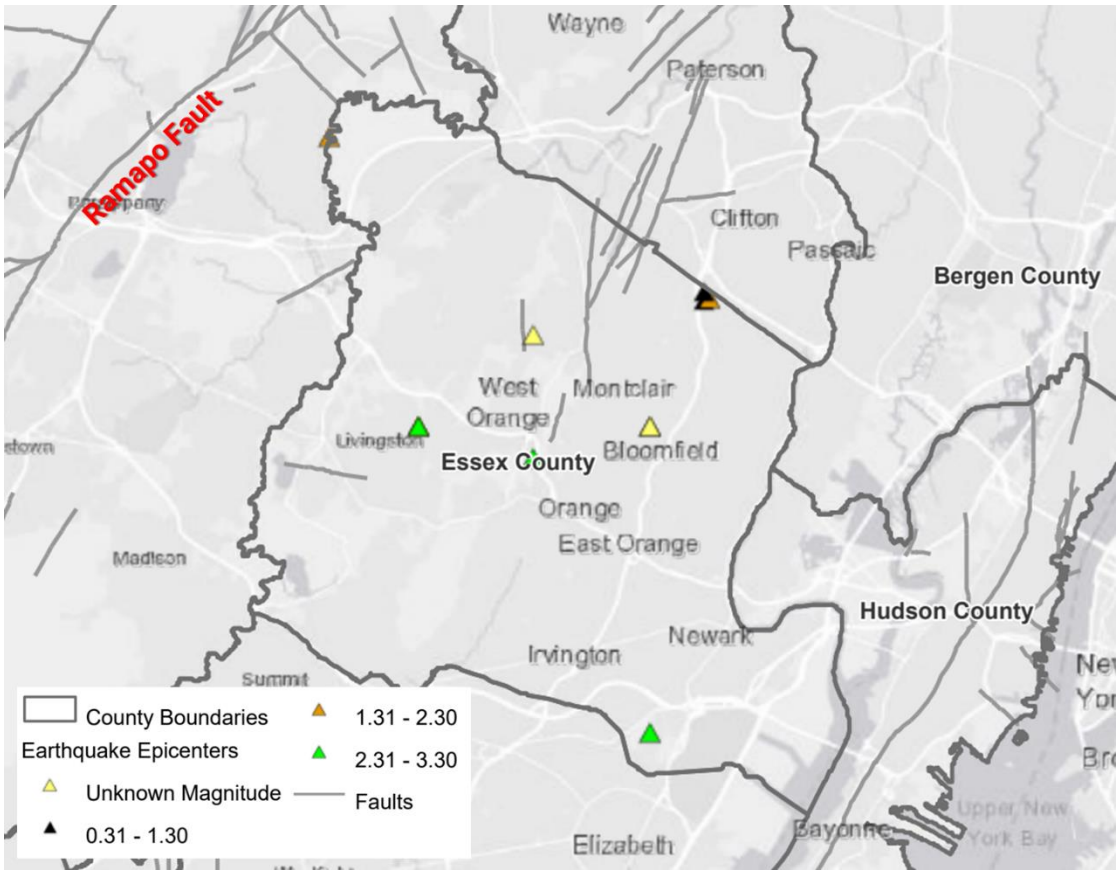
Earthquake epicenters generally occur on known faults. In New Jersey, they are most likely to occur in the northern parts of the State, including Essex County, which has a concentration of significant faults. Major faults in northern New Jersey include the Ramapo, Flemington, and Hopewell faults (Figure 8-1). Figure 8-2 shows the location of several unnamed fault lines in Essex County and earthquake epicenters in the County.

Figure 8-1. Fault Lines in Northern New Jersey



Source: (Rutgers University 2016)

Figure 8-2. Fault Lines and Earthquake Epicenters in Essex County



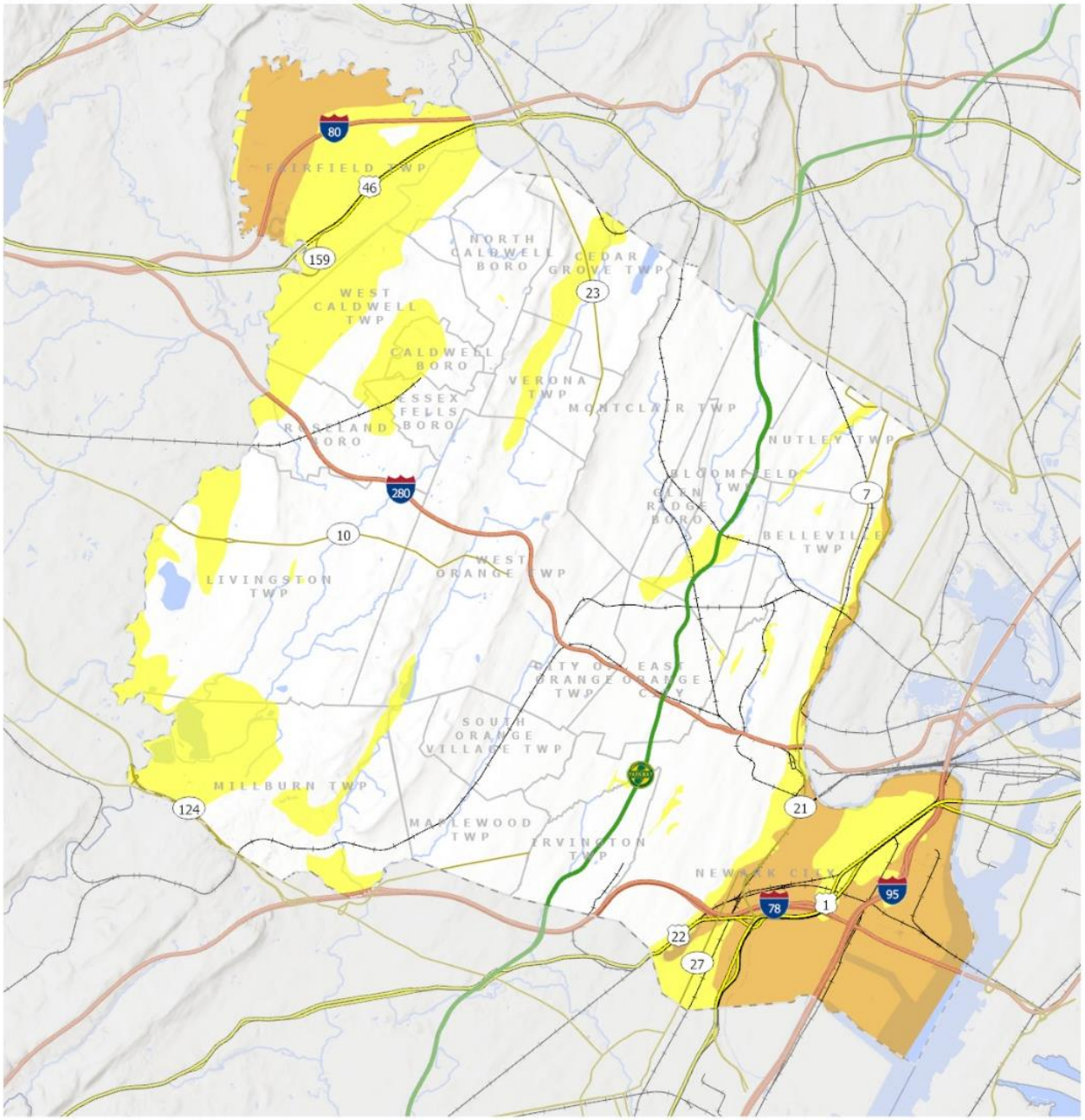
Source: (NJDEP 2023); (NJDEP 2024)
Note: The fault lines located within Essex County are unnamed.

The National Earthquake Hazard Reduction Program (NEHRP) developed five soil classifications defined by their shear-wave velocity that impact the severity of an earthquake. The soil classification system ranges from A to E, where A represents hard rock that reduces ground motions from an earthquake and E represents soft soils that amplify and magnify ground shaking and increase building damage and losses (NJOEM 2024).

- Class A – Hard rock
- Class B – Rock
- Class C – Very dense soil and soft rock
- Class D – Stiff soil
- Class E – Soft soil (FEMA n.d.)

Figure 8-3 illustrates the NEHRP soils in Essex County. The figure shows bands of Class D (stiff soils) located in northern, central, and southern portions of Essex County. Class E (soft soils) are located in the northern (Township of Fairfield) and southern (City of Newark) areas of the County. Population and buildings located within the Class D and E areas have the potential to feel earthquakes more and have an increased risk for damage and losses.

Figure 8-3. National Earthquake Hazard Reduction Program Soils of Essex County



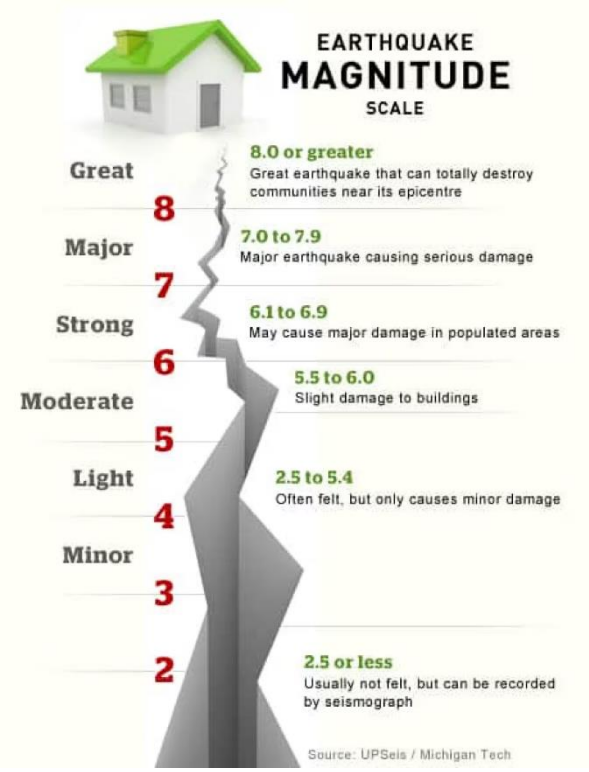
8.1.3 Extent

Measuring Intensity

Seismic waves are the vibrations from earthquakes that travel through the Earth. The magnitude or extent of an earthquake is a measured value of the earthquake size, or amplitude of the seismic waves (NJOEM 2024).

Magnitude measures the size of an earthquake. It is a single value that represents the energy released at the source of the earthquake. Magnitude is expressed in whole numbers and decimal fractions, and each whole number increase represents a tenfold increase in measured amplitude (U.S. Geological Survey n.d.). The most commonly known scale is the Richter Scale; however, it is not widely used except for small, local earthquakes. For larger earthquakes, the Moment Magnitude (Mw) scale is more accurate (U.S. Geological Survey n.d.).

Figure 8-4. Richter Magnitude Scale



Source: (The Associated Press 2015)

The intensity of an earthquake is based on the observed effects of ground shaking on people, buildings, and natural features, and varies with location. The Modified Mercalli Intensity (MMI) scale (Figure 8-5) is commonly used to describe the intensity of shaking and its effects on people, buildings, and the Earth's surface (U.S. Geological Survey n.d.).

Peak ground acceleration (PGA) is the most common physical measure of earthquakes. PGA expresses the severity of an earthquake and is a measure of how hard the earth shakes, or accelerates, in a given geographic area. PGA is expressed as a percent acceleration force of gravity (%g). For example, 1.0%g PGA in an earthquake (an extremely strong ground motion) means that objects accelerate sideways at the same rate as if they had been dropped from the ceiling. 10%g PGA means that the ground acceleration is 10% that of gravity (NJOEM 2024).

Figure 8-5. Modified Mercalli Intensity Scale

CIIM Intensity	People's Reaction	Furnishings	Built Environment	Natural Environment
I	Not felt			Changes in level and clarity of well water are occasionally associated with great earthquakes at distances beyond which the earthquakes felt by people.
II	Felt by a few.	Delicately suspended objects may swing.		
III	Felt by several; vibration like passing of truck.	Hanging objects may swing appreciably.		
IV	Felt by many; sensation like heavy body striking building.	Dishes rattle.	Walls creak; window rattle.	
V	Felt by nearly all; frightens a few.	Pictures swing out of place; small objects move; a few objects fall from shelves within the community.	A few instances of cracked plaster and cracked windows with the community.	Trees and bushes shaken noticeably.
VI	Frightens many; people move unsteadily.	Many objects fall from shelves.	A few instances of fallen plaster, broken windows, and damaged chimneys within the community.	Some fall of tree limbs and tops, isolated rockfalls and landslides, and isolated liquefaction.
VII	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction, but considerable in some poorly built or badly designed structures; weak chimneys broken at roof line, fall of unbraced parapets.	Tree damage, rockfalls, landslides, and liquefaction are more severe and widespread wiht increasing intensity.
VIII	Many find it difficult to stand.	Very heavy furniture moves conspicuously.	Damage slight in buildings designed to be earthquake resistant, but severe in some poorly built structures. Widespread fall of chimneys and monuments.	
IX	Some forcibly thrown to the ground.		Damage considerable in some buildings designed to be earthquake resistant; buildings shift off foundations if not bolted to them.	
X			Most ordinary masonry structures collapse; damage moderate to severe in many buildings designed to be earthquake resistant.	

Source: (U.S. Geological Survey n.d.)

Table 8-1. PGA Damage Levels

Ground Motion Percentage	Damages Expected
1-2%g	Motions are widely felt by people; hanging plants and lamps swing strongly, but damage levels, if any, are usually very low.
Below 10%g	Usually causes only slight damage, except in unusually vulnerable facilities.
10-20%g	May cause minor-to-moderate damage in well-designed buildings, with higher levels of damage in poorly designed buildings. At this level of ground shaking, only unusually poor buildings would be subject to potential collapse.
20-50%g	May cause significant damage in some modern buildings and very high levels of damage (including collapse) in poorly designed buildings.
≥50%g	May causes higher levels of damage in many buildings, even those designed to resist seismic forces.

Source: (NJOEM 2024)

Warning Time

Earthquakes usually occur without warning and their effects can impact areas of great distance from the epicenter and cannot be predicted (U.S. Geological Survey 2023). Some regions of the United States (Washington, Oregon, and California) have early warning systems in place that is triggered when earthquakes occur and transmits alerts; however, New Jersey does not have a dedicated systems in place (U.S. Geological Survey 2022).

Worst Case Scenario

For Essex County, a 2,500-year return period earthquake (2% probability of being exceed in 50 years) is considered worst-case. If an event like this were to occur in Essex County, Hazus projects 759 casualties and over 162,000 buildings damaged, totaling over $2 billion in damages. The City of Newark, Township of Fairfield, and Township of West Caldwell will experience the largest impact (Hazus v6.1 2023).

8.1.4 Previous Occurrences

The following sections provide a review of previous earthquake occurrences in Essex County.

8.1.4.1 Declarations

Federal Declarations

Between May 1954 and December 2024, FEMA has not included the State of New Jersey in any FEMA declarations for earthquake-related major disaster (DR) or emergency (EM) declarations (FEMA 2024).

USDA Declarations

Between 2020 and 2024, the USDA did not include Essex County in any earthquake-related agricultural disaster declarations (USDA 2025a).

8.1.4.2 Summary of Significant Events

Since 1841, ten earthquakes with epicenters in Essex County have been reported, the most recent occurring on July 31, 2016. Additionally, numerous earthquakes have occurred outside the county. One of the largest earthquakes in New Jersey's history occurred on April 5, 2024, near Whitehouse Station, with a magnitude of 4.8. The USGS received numerous reports of people feeling the earthquake, including residents of Essex County. While municipalities reported damages, no damages were reported in Essex County (U.S. Geological Survey 2025).

8.1.4.3 Recent Events

For the 2025 HMP update, earthquake events that impacted Essex County between January 2020 and December 2024 are listed in Table 8-2. For events prior to January 2020, refer to the 2020 HMP.

Table 8-2. Recent Earthquake Hazard Events

Date (s) of Event	Declaration Number	County Included	Magnitude	Description
September 9, 2020	N/A	N/A	3.1	A 3.1 earthquake with an epicenter in Marlboro, New Jersey was recorded by USGS. Over 4,000 people reported having felt the earthquake, including residents in Essex County (Belleville, Caldwell, Newark, Nutley, South Orange, and Verona). A majority of reports felt an intensity between I (not felt) and III (felt by several). No damages or losses were reported in the County associated with this earthquake.
May 19, 2023	N/A	N/A	2.2	A 2.2 earthquake with an epicenter in Hastings-on-Hudson, New York was recorded by USGS. Over 400 people reported having felt the earthquake, including residents in Essex County (Fairfield and Belleville). No damages or losses were reported in the County associated with this earthquake.
April 5, 2024	N/A	N/A	4.8	On April 5, 2024, a 4.8 earthquake occurred in New Jersey was recorded by USGS. This was the largest earthquake in the state in over 240 years. The epicenter was near Oldwick in Tewksbury Township, Hunterdon County. USGS received over 180,000 reports of people having felt the earthquake. Nearly every municipality in Essex County reported having felt the earthquake, with magnitudes ranging from III (felt by several) to IV (felt by many). A series of aftershocks occurred for several days following the initial earthquake, and residents in Essex County reported having felt the aftershocks. No damages or losses were reported in the County associated with this earthquake.
January 24, 2025	N/A	N/A	2.4	A 2.4 earthquake with an epicenter in Paramus, New Jersey was recorded by USGS. Over 900 people reported having felt the earthquake, including Essex County (Newark). Those that reported having felt the earthquake in the County were associated with a magnitude III (felt by several). No damages or losses were reported in the County associated with this earthquake.

Source: (NJOEM 2024); (NJDEP 2024); (U.S. Geological Survey 2025); (FEMA 2024)

8.1.5 Future Conditions

8.1.5.1 Probability

It is likely that Essex County will experience with the direct and indirect impacts of earthquakes in the future. Information from USGS, NJDEP, and the 2024 New Jersey State HMP were used to identify the number of earthquake epicenters in Essex County. Table 8-3 presents the probability of future events for earthquakes with epicenters in Essex County.

Table 8-3. Probability of Future Occurrences of Earthquakes Events

Hazard Type	Occurrences Between 1841 and 2024	% Chance of Occurring in Any Given Year
Earthquake	10	5.4%

Source: (NJOEM 2024); (NJDEP 2024); (U.S. Geological Survey 2025)

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for a significant earthquake in the County is considered 'rare' (between 1 and 10% annual probability of a hazard event occurring.).

8.1.5.2 Climate Change

Predicting the potential impacts of global climate change on earthquake probability is challenging. It is not well understood how change in the climate is or is not related to seismic activity. Some scientists believe melting glaciers could induce tectonic activity. As ice melts and water runs off, massive amounts of weight are shifted on the Earth's crust. As newly freed crust may alter shape, it could cause seismic plates to slip and stimulate volcanic activity (NJOEM 2024).

Scientists know earthquakes can be triggered or inhibited by changes in the amount of stress on a fault. Climate variables that could alter fault stress loads include rain and snowfall, drought, and groundwater depletion, although the potential magnitude of these variables is unclear. Additionally, secondary impacts of earthquakes could be magnified by future climate change. Soils saturated by repetitive storms or sea level rise could experience liquefaction during seismic activity because of the increased saturation. Dams storing increased volumes of water from changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts (NJOEM 2024).

8.1.5.3 Potential Future Impacts

Although climate change is unlikely to result in changes to earthquake risk, projected increases in development and population will increase risk to the earthquake hazard in Essex County.

8.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

8.2.1 Summary of Vulnerability

A probabilistic assessment was conducted for the 500-year, 1,000-year, and 2,500-year mean return period (MRP) events through a Level 2 analysis in Hazus to analyze the earthquake hazard and provide a range of loss estimates in Essex County. As earthquake intensity increases, impacts in Essex County also increase.

8.2.2 Impact on Life, Health, and Safety

All of Essex County can experience an earthquake; however, the degree of impact depends on many factors including the age and type of construction of buildings, the soil types buildings are located on, and the intensity of the earthquake. Those living and working in Essex County may experience direct and indirect impacts of earthquakes, from business and road closures isolating populations to disruptions in the operation of community lifelines, critical facilities, and utilities.

According to the 2019-2023 American Community Survey five-year estimate, Essex County has a population of 854,130. While the overall risk to public safety and potential loss of life from low-magnitude earthquakes in the county is minimal, there is an increased risk for individuals within buildings due to possible structural damage. Furthermore, individuals walking beneath building embellishments and chimneys face a heightened risk, as these elements may become dislodged and fall during an earthquake.

As a result of a significant earthquake event, residents may be displaced or require temporary to long term sheltering. The number of people requiring shelter is generally less than the number displaced as some displaced persons use hotels or stay with family or friends following a disaster event. Hazus estimates that there will be zero displaced households and zero persons seeking short-term sheltering caused by the 100-year MRP event. Table 8-4 summarizes the estimated number of displaced households and persons seeking short-term sheltering caused by the 500-year, 1,000-year, and 2,500-year MRP events.

Table 8-4. Estimated Displaced Households and Number of Persons Requiring Sheltering

Jurisdiction	500-year MRP		1,000-year MRP		2,500-year MRP	
	Displaced Household	Persons Seeking Short-Term Shelter	Displaced Household	Persons Seeking Short-Term Shelter	Displaced Household	Persons Seeking Short-Term Shelter
Belleville (T)	5	2	22	11	114	57
Bloomfield (T)	0	0	0	0	12	5
Caldwell (B)	0	0	0	0	2	1

Jurisdiction	500-year MRP		1,000-year MRP		2,500-year MRP	
	Displaced Household	Persons Seeking Short-Term Shelter	Displaced Household	Persons Seeking Short-Term Shelter	Displaced Household	Persons Seeking Short-Term Shelter
Cedar Grove (T)	1	0	4	2	19	8
East Orange (C)	0	0	2	1	30	18
Essex Fells (B)	0	0	0	0	0	0
Fairfield (T)	0	0	0	0	7	3
Glen Ridge (B)	0	0	0	0	0	0
Irvington (T)	0	0	0	0	13	8
Livingston (T)	0	0	0	0	1	1
Maplewood (T)	0	0	1	0	6	3
Millburn (T)	1	0	4	2	22	10
Montclair (T)	0	0	0	0	6	3
Newark (C)	28	20	135	97	853	631
North Caldwell (B)	0	0	0	0	0	0
Nutley (T)	0	0	0	0	5	2
City of Orange (T)	0	0	0	0	7	5
Roseland (B)	0	0	0	0	1	0
South Orange (V)	1	0	4	2	20	13
Verona (T)	0	0	0	0	1	1
West Caldwell (T)	1	0	3	1	14	6
West Orange (T)	2	1	9	5	47	24
Essex County (Total)	38	25	185	123	1,181	800

Source: (Hazus v6.1 2023)

According to the 1999-2003 summary report *Earthquake Risks and Mitigation in the New York / New Jersey / Connecticut Region*, a strong correlation exists between structural building damage and number of injuries and fatalities from an earthquake event. Further, the time of day also exposes different sectors of the community to the hazard. For example, Hazus considers the residential occupancy at its maximum at 2:00 a.m., where the educational, commercial, and industrial sectors are at their maximum at 2:00 p.m., with peak commute time at 5:00 p.m. Whether directly impacted or indirectly impact, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could prevent people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffered no direct damage from an event itself. The following table summarizes the casualties caused by the 500-year, 1,000-year, and 2,500-year MRP events in Essex County.

Table 8-5. Earthquake Impact to Population Based on Time of Day

	Casualties		
MRP	2:00 am	2:00 pm	5:00 pm
500-year	7	17	9
1,000-year	29	73	39
2,500-year	146	394	219

Source: (Hazus v6.1 2023)

8.2.2.1 Socially Vulnerable Populations

According to FEMA's National Risk Index, socially vulnerable populations in Essex County have a very high susceptibility to the adverse impacts of earthquakes, when compared to the rest of the United States (FEMA 2024).

Socially vulnerable populations considered most vulnerable to earthquake include the elderly (persons over the age of 65) and individuals living below the United States Census poverty threshold. These populations are most susceptible based on a number of factors including their physical and financial ability to react or respond during a hazard, the location and construction quality of their housing, and the ability to be self-sustaining for prolonged periods of time after an incident because of limited ability to stockpile supplies (NJOEM 2024). Populations considered most vulnerable are those located in/near the built environment, particularly those near unreinforced masonry construction. According to the 2019-2023 American Community Survey population estimates, 119,383 (14% of the total population) persons are over the age of 65, 53,778 (6.3% of the total population) persons are under the age of 5, 103,030 (12.1% of the total population) persons are living with a disability, 124,168 (14.5% of the total population) persons speak English less than very well, and 130,466 (15.3% of the total population) are living below the poverty threshold.

8.2.3 Impact on General Building Stock

The entire Essex County general building stock is considered at risk and exposed to earthquakes. A building's construction determines how well it can withstand the force of an earthquake. Unreinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward, whereas steel and wood buildings absorb more of the earthquake's energy. Additional attributes that affect a building's capability to withstand an earthquake's force include its age, number of stories, and quality of construction. Hazus considers building construction and age of building as part of the analysis. Because a custom general building stock was used for this Hazus analysis, the building ages and building types from the inventory were incorporated into the Hazus model.

Potential building damage was evaluated by Hazus across the following damage categories: none, slight, moderate, extensive, and complete. Table 8-6 provides definitions of these five categories of damage for a light wood-framed building. Definitions for other building types are included in the Hazus technical manual documentation.

Table 8-6. Example of Structural Damage State Definitions for a Wood, Light Frame Building

Damage Category	Description
Slight	Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations;

Damage Category	Description
	partial collapse of "room-over-garage" or other "soft-story" configurations; small foundations cracks.
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple wall failure or the failure of the lateral load-resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: (FEMA 2022)

Building damages as a result of the 500-year, 1,000-year, and 2,500-year MRP earthquakes were estimated for the County using Hazus (Table 8-7). For the 500-year MRP, no buildings will be completely destroyed; however, 11 buildings will be extensively damaged. For the 1,000-year MRP, 4 buildings will be completely destroyed and 54 will be extensively destroyed. For the 2,500-year MRP, 58 buildings will be completely destroyed and 433 will be extensively destroyed.

Table 8-7. Estimated Building Damage by Count by General Occupancy

Occupancy Class	Severity of Damage	Building Count		
		500-year	1,000-year	2,500-year
Agriculture	None	11	10	9
	Slight	0	0	1
	Moderate	0	0	0
	Extensive	0	0	0
	Complete	0	0	0
Commercial	None	8,572	8,294	7,440
	Slight	144	313	835
	Moderate	29	98	363
	Extensive	3	12	69
	Complete	0	1	12
Education	None	670	636	547
	Slight	15	38	90
	Moderate	4	14	44
	Extensive	0	2	9
	Complete	0	0	1
Government	None	6,714	6,579	6,082
	Slight	37	133	414
	Moderate	8	43	205
	Extensive	0	4	47
	Complete	0	1	12
Industrial	None	1,787	1,659	1,336
	Slight	64	148	316
	Moderate	20	57	166
	Extensive	2	9	47
	Complete	0	1	8
Religion	None	1,423	1,385	1,261
	Slight	14	45	137
	Moderate	2	9	36
	Extensive	0	1	5
	Complete	0	0	1
Other Residential	None	3,757	3,631	3,255

Occupancy Class	Severity of Damage	Building Count		
		500-year	1,000-year	2,500-year
	Slight	54	151	409
	Moderate	11	38	133
	Extensive	1	4	23
	Complete	0	0	3
Single Family	None	137,973	135,097	124,826
	Slight	994	3,493	11,777
	Moderate	101	460	2,215
	Extensive	1	22	233
	Complete	0	1	21
Total	None	160,907	157,291	144,756
	Slight	1,293	4,321	13,979
	Moderate	177	719	3,162
	Extensive	11	54	433
	Complete	0	4	58

Source: (Hazus v6.1 2023)

Building damage as a result of the 500-year, 1,000-year, and 2,500-year MRP earthquakes were estimated for each municipality using Hazus. Table 8-8 summarize estimated total building and content losses caused by the 500-year, 1,000-year, and 2,500-year MRP events by jurisdiction, respectively. Based on the Hazus results, less than 1% of the County's structures are impacted by the 500-year and 1,000-year MRP events. For 2,500-year MRP events, approximately 1.3% of the County's structures are impacted. The majority of the losses are estimated to occur in the City of Newark.

Table 8-8. Estimated Building Damages (Structure and Contents) from Earthquakes

Jurisdiction	Total Replacement Cost Value (RCV)	500-year MRP		1,000-year MRP		2,500-year MRP	
		Estimated Total Damage	% of RCV	Estimated Total Damage	% of RCV	Estimated Total Damage	% of RCV
Belleville (T)	$5,440,939,832	$3,090,084	0.1%	$14,755,671	0.3%	$65,547,167	1.2%
Bloomfield (T)	$7,149,452,578	$2,564,636	0.0%	$13,348,275	0.2%	$62,456,681	0.9%
Caldwell (B)	$1,437,101,129	$744,742	0.1%	$3,478,835	0.2%	$15,112,722	1.1%
Cedar Grove (T)	$3,664,877,018	$1,184,657	0.0%	$6,143,014	0.2%	$29,954,269	0.8%
East Orange (C)	$7,298,495,889	$2,347,320	0.0%	$12,533,471	0.2%	$59,916,826	0.8%
Essex Fells (B)	$624,599,485	$205,230	0.0%	$1,055,620	0.2%	$5,003,291	0.8%
Fairfield (T)	$7,708,467,384	$8,741,328	0.1%	$39,519,673	0.5%	$151,762,753	2.0%
Glen Ridge (B)	$1,311,356,144	$424,532	0.0%	$2,207,454	0.2%	$10,607,533	0.8%
Irvington (T)	$6,543,152,214	$2,204,956	0.0%	$11,844,756	0.2%	$57,192,412	0.9%
Livingston (T)	$9,227,217,608	$3,195,690	0.0%	$16,254,648	0.2%	$76,508,404	0.8%
Maplewood (T)	$4,279,929,361	$1,310,661	0.0%	$6,928,837	0.2%	$33,570,782	0.8%
Millburn (T)	$6,236,661,855	$2,817,642	0.0%	$13,522,175	0.2%	$61,259,406	1.0%
Montclair (T)	$7,012,741,670	$2,193,557	0.0%	$11,596,696	0.2%	$55,842,766	0.8%
Newark (C)	$50,617,106,841	$61,534,485	0.1%	$260,233,862	0.5%	$1,070,785,499	2.1%
North Caldwell (B)	$2,103,919,331	$481,772	0.0%	$2,597,153	0.1%	$13,308,953	0.6%
Nutley (T)	$4,550,682,627	$1,619,124	0.0%	$8,433,131	0.2%	$39,480,082	0.9%
City of Orange (T)	$4,186,194,813	$1,338,098	0.0%	$7,282,626	0.2%	$34,469,424	0.8%
Roseland (B)	$2,338,671,996	$900,085	0.0%	$4,619,944	0.2%	$21,130,610	0.9%
South Orange (V)	$3,553,949,814	$1,194,493	0.0%	$5,985,233	0.2%	$28,934,713	0.8%
Verona (T)	$2,639,752,949	$685,374	0.0%	$3,697,608	0.1%	$18,320,493	0.7%
West Caldwell (T)	$4,439,689,868	$2,545,173	0.1%	$12,245,368	0.3%	$55,546,069	1.3%

Jurisdiction	Total Replacement Cost Value (RCV)	500-year MRP		1,000-year MRP		2,500-year MRP	
		Estimated Total Damage	% of RCV	Estimated Total Damage	% of RCV	Estimated Total Damage	% of RCV
West Orange (T)	$9,974,739,027	$2,224,922	0.0%	$12,344,081	0.1%	$63,640,224	0.6%
Essex County (Total)	$152,339,699,431	$103,548,560	0.1%	$470,628,133	0.3%	$2,030,351,077	1.3%

Source: (Hazus v6.1 2023)

Historically, the Building Officials Code Administration (BOCA) regulations in the northeastern states were established to address local issues, such as heavy snow loads and wind. Seismic design criteria in this region are not as rigorous as those found on the west coast of the United States, which adhere to the more seismically oriented Uniform Building Code. Consequently, a relatively minor earthquake in the northeast may result in greater structural damage compared to one occurring in the west.

8.2.4 Impact on Community Lifelines

Earthquakes in New Jersey and Essex County, though less frequent and severe compared to other areas of the United States, can still have significant impacts on community lifelines. All community lifelines in Essex County could be impacted by earthquakes of any magnitude. Refer to Section 3 (County Profile) for a complete inventory of community lifeline sin the County.

Table 8-9. Earthquake Impacts on Community Lifelines

Community Lifeline	Potential Impacts
Safety and Security	Damage to police, fire, and EMS stations which will impact their abilities to respond to emergencies
Food, Hydration, Shelter	Damage to grocery stores and food distribution networks that can lead to food shortages; buildings used for shelters may be damaged or destroyed leaving people without shelter
Health and Medical	Hospitals and healthcare facilities may suffer structural damage, while being inundated with injured individuals. Additionally, interruptions to medical supply chains can further hinder their ability to provide care.
Energy	Damage to power plants, power grids, pipelines, and utility lines can lead to power outages and fuel shortages
Communications	Damage to cell towers, internet infrastructure, etc. can lead to disruption in services and impacts to emergency communication systems
Transportation	Damage to roads, bridges, railways, and airports can limit travel and access to major transportation routes, leading to delays in emergency response efforts. Additionally, these disruptions can impede the transportation of goods and services, causing significant interruptions to supply chains.
Hazardous Materials	Earthquakes leading go infrastructure damage can cause leaks or spills at facilities, posing significant environmental and health risks.
Water Systems	Damage or destruction of water systems that can lead to water shortages, flooding, and water contamination

Source: (NJOEM 2024)

8.2.5 Impact on the Economy

Earthquakes also have impacts on the economy, including loss of business function, damage to inventory, relocation costs, wage loss, and rental loss due to the repair/replacement of buildings. Hazus estimates

building-related economic losses, including income losses (wage, rental, and relocation losses) and capital stock losses (structural, non-structural, content, and inventory losses). Economic losses estimated by Hazus are summarized in Table 8-10 and capital stock losses are summarized in Table 8-11.

Table 8-10. Economic Losses for Earthquakes in Essex County

Mean Return Period	Wages	Capital Related	Rental Income	Relocation
500-year	$1,285,000	$414,000	$1,565,000	$4,286,000
1,000-year	$5,397,000	$1,588,000	$6,345,000	$17,642,000
2,500-year	$26,806,000	$7,636,000	$31,470,000	$87,187,000

Source: (Hazus v6.1 2023)

Table 8-11. Capital Stock Losses for Earthquakes in Essex County

Mean Return Period	Structural	Nonstructural	Contents	Inventory
500-year	$10,506,000	$60,322,000	$32,721,000	$4,052,000
1,000-year	$38,719,000	$268,553,000	$163,357,000	$20,268,000
2,500-year	$176,102,000	$1,128,593,000	$725,656,000	$85,138,000

Source: (Hazus v6.1 2023)

While the Hazus analysis did not provide damage estimates for specific roadway segments and railroad tracks, it is assumed that the County's infrastructure would suffer damage due to earthquakes, leading to disruptions in regional transportation and material distribution. The County could face losses from damage to lifelines that surpass the repair costs.

Earthquakes can also have a significant impact on bridges, many of which are the sole access points to certain jurisdictions. Since softer soils typically follow floodplain boundaries, bridges crossing watercourses are particularly vulnerable. Additionally, the age of facilities and infrastructure, which reflects the construction standards at the time, is a crucial factor in determining vulnerability.

Hazus estimates the volume of debris that may be generated as a result of an earthquake event to enable the study region to prepare and rapidly and efficiently manage debris removal and disposal. Debris estimates are divided into two categories: (1) reinforced concrete and steel that require special equipment to break it up before it can be transported, and (2) brick, wood, and other debris that can be loaded directly onto trucks with bulldozers (FEMA 2020). Table 8-12 summarizes the overall estimated debris generated as a result of these events for Essex County.

Table 8-12. Estimated Debris Generated by the 500-year, 1,000-year, and 2,500-year MRP Earthquake Events

Mean Return Period	Brick/Wood (tons)	Concrete/Steel (tons)
500-year	16,692	2,582
1,000-year	50,616	12,682
2,500-year	173,928	80,399

Source: (Hazus v6.1 2023)

8.2.6 Impact on Historic and Cultural Resources

Historic and cultural buildings in Essex County are vulnerable to structural damage from earthquakes. This damage can affect buildings, monuments, and other structures, with older buildings that do not meet modern building codes being particularly at risk. Artifacts, artwork, and historical documents housed within these buildings are also susceptible to damage or destruction. The costs of repair and restoration can be substantial, leading to significant economic impacts on the County.

8.2.7 Impact on Ecosystems and Natural Resources

According to USGS, earthquakes can cause damage to the surface of the Earth in various forms depending on the magnitude and distribution of the event. Surface faulting is one of the major seismic components to earthquakes that can create wide ruptures in the ground. Ruptures can have a direct impact on the landscape and natural environment because it can disconnect habitats for miles isolating animal species or tear apart plant roots (USGS n.d.).

Furthermore, ground failure as a result of soil liquefaction can have an impact on soil pores and retention of water resources. The greater the seismic activity and liquefaction properties of the soil, the more likely drainage of groundwater can occur which depletes groundwater resources. In areas where there is higher pressure of groundwater retention, the pores can build up more pressure and make soil behave more like a fluid rather than a solid increasing risk of localized flooding and deposition or accumulation of silt (USGS n.d.).

8.2.8 Change in Vulnerability Since the Previous HMP

Overall, Essex County remains vulnerable to earthquake events. Continued redevelopment results in gradual reduction of risk to structural damage from earthquakes as modern building code requirements will be used for parcels undergoing redevelopment.

8.3 Mitigation Opportunities

A range of potential opportunities for mitigating the earthquake hazard have been identified:

- Manipulate the hazard:
  - None
- Reduce exposure and vulnerability to the hazard:
  - Locate personal residences outside of hazard area (off soft soils)
  - Locate/relocate critical facilities or mission critical functions outside hazard area where possible
  - Retrofit structures (anchor house structure to foundation)
  - Secure household items that can cause injury or damage such as water heaters, bookcases, and other appliances
  - Build to higher design standards
  - Build redundancy for critical functions/facilities
  - Retrofit critical buildings/areas housing mission critical functions

- Harden infrastructure
- Provide redundancy for critical functions
- Adopt higher regulatory standards for structures
- Conduct "rapid screening" programs for critical facilities to identify facilities that may be particularly prone to EQ damage, then develop investigation/action plans to address such structures

- Build local capacity to respond to or prepare for the hazard:
  - Practice "drop, cover and hold"
  - Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 72 hr. self-sufficiency during an event
  - Increase capability by having cash reserves for reconstruction
  - Become informed on the hazard and risk reduction alternatives available.
  - Develop a post-disaster action plan for your household
  - Adopt higher standard for new construction – Consider "performance-based design' when building new structures
  - Increase capability by having cash reserves for reconstruction
  - Inform employees on the possible impacts of earthquake and how to deal with them at work facilities
  - Develop a Continuity of Operations Plan (COOP)
  - Provide better hazard maps
  - Provide technical information and guidance
  - Enact tools to help manage development in hazard areas: tax incentives, information
  - Include retrofitting/replacement of critical system elements in CIP
  - Develop strategy to take advantage of post disaster opportunities
  - Warehouse critical infrastructure components such as pipe, power line, and road repair material.
  - Develop and adopt a Continuity of Operations / Continuity of Government Plan (COOP/COG)
  - Initiate triggers guiding improvements such as: (< 50% substantial damage/improvements)
  - Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities
  - Develop a post disaster action plan that includes a grant funding and debris removal components
  - Utilize warning systems
  - Educate builders and developers on seismic construction standards
- Nature-based opportunities:
  - Adopt land use regulations and policies that restrict or prohibit development in areas with high liquefication susceptibility and preserve these areas for open space uses

9 Extreme Temperature

9.1 Hazard Profile

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

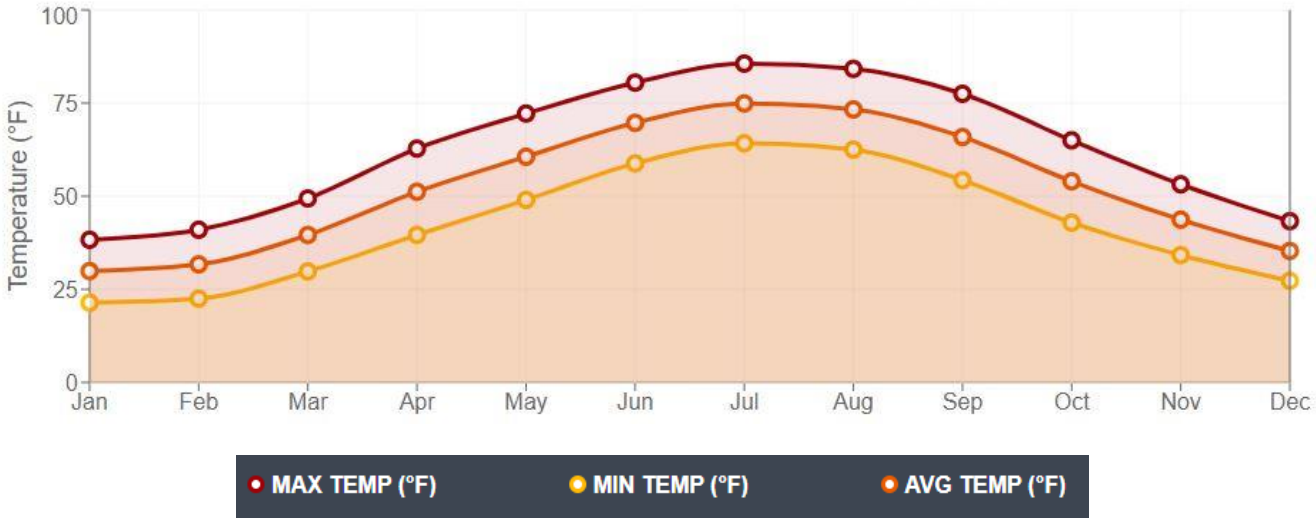
Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

9.1.1 Description of the Hazard

Defining the Hazard

Extreme temperature includes both heat and cold events that have significant direct impacts to human health and commercial/agricultural businesses and primary and secondar effects on infrastructure. (e.g., burst pipes and power failure). Distinguishing characteristics of "extreme cold" or "extreme heat" vary by location, based on the conditions to which the population is accustomed. Figure 9.1 shows the average, low, and high temperatures each month at the Essex Falls station in Essex County based on the latest 30-year period (1991-2020) (NOAA, U.S. Climate Normals Quick Access 2024).

Figure 9-1. Average Temperatures at Essex Falls



Source: (NOAA, U.S. Climate Normals Quick Access 2024)

Cause of the Hazard

Extreme cold events are when temperatures drop well below normal in an area. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." Extreme cold temperatures are generally characterized in temperate zones by the ambient air temperature dropping to approximately 0ºF or below (CDC n.d.).

Extreme heat is defined as temperatures which hover 10 degrees or more above the average high temperature for a region and that last for several weeks (CDC, Heat Health 2024).A heat wave is defined as a period of abnormally and uncomfortably hot and unusually humid weather. Typically, a heat wave lasts two or more days (NOAA, National Weather Service Glossary 2024). There is no universal definition of a heat wave because the term is relative to the usual weather in a particular area. The term heat wave is applied both to routine weather variations and to extraordinary spells of heat which may occur only once a century (Meehl and Tebaldi 2004).

Urbanized areas and urbanization create an exacerbated type of risk during an extreme heat event, compared to rural and suburban areas. As defined by the U.S. Census, urban areas are classified as all territory, population, and housing units located within urbanized areas and urban clusters. The term urbanized area denotes an urban area of 50,000 or more people. Urban areas under 50,000 people are called urban clusters. The U.S. Census delineates urbanized area and urban cluster boundaries to encompass densely settled territory, which generally consists of (U.S. Census 2024):

- A cluster of one or more block groups or census blocks each of which has a population density of at least 1,000 people per square mile at the time.
- Surrounding block groups and census blocks each of which has a population density of at least 500 people per square mile at the time.
- Less densely settled blocks that form enclaves or indentations or are used to connect discontinuous areas with qualifying densities.

As these urban areas develop and change, so does the landscape. Buildings, roads, and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist are now impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas. This forms an 'island' of higher temperatures (US EPA 2025).

The term 'heat island' describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with more than one million people can be between 1.8 ºF and 5.4ºF warmer than its surrounding areas. In the evening, the difference in air temperatures can be as high as 22ºF. Heat islands occur on the surface and in the atmosphere. On a hot, sunny day, the sun can heat dry, exposed urban surfaces to temperatures 50ºF to 90ºF hotter than the air. Heat islands can affect communities by increasing peak energy demand during the summer, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and death, and water quality degradation (US EPA 2025).

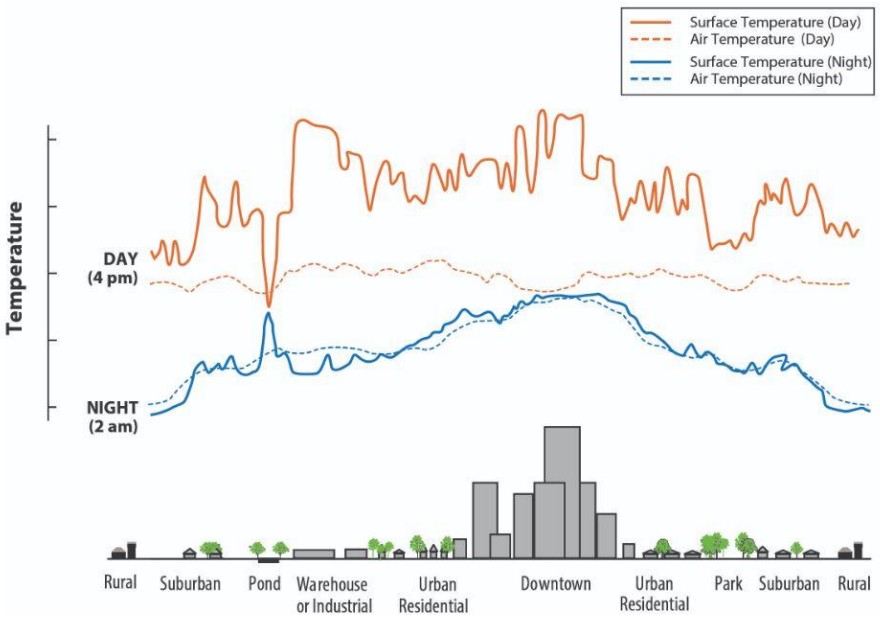
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Figure 9-2 below illustrates an urban heat island profile. The graphic demonstrates that heat islands are typically most intense over dense urban areas. Further, vegetation and parks within a downtown area may help reduce heat islands (U. EPA 2024).

Figure 9-2. Urban Heat Island Profile



Source: (US EPA 2025)

Summary of Potential Impacts

Extreme temperatures can have significantly impact health, infrastructure, and environment. Extreme heat can cause health issues like heat stress, increased mortality, cardiovascular, respiratory, and cerebrovascular diseases. It can also strain power grids, increase wildfire risks, and damage transportation infrastructure such as roads, rail lines, and airport runways. Extreme cold can lead to hypothermia, frostbite, cardiovascular strain, and increased mortality. It can also cause burst pipes, transportation disruptions, and damage to crops. Both extremes can affect agriculture, reducing crop yields and affecting livestock health.

Cascading Hazard Impacts

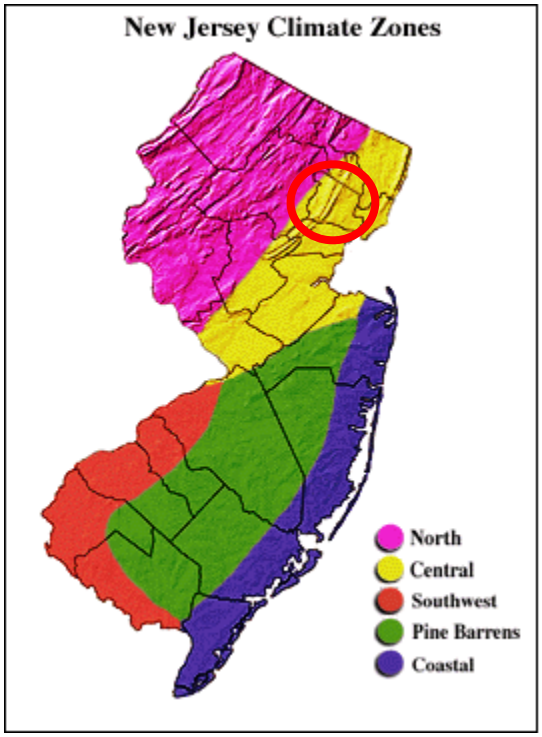
Extreme temperatures can trigger a cascade of other hazards. For example, extreme heat can lead to prolonged droughts, which dry out vegetation and increase the risk of wildfires. These wildfires can then cause soil erosion, making the land more susceptible to flooding when rains eventually come. Extreme

cold can cause pipes to burst, leading to water damage and potential flooding in buildings. Additionally, heavy snowfall followed by a rapid thaw can result in significant runoff, overwhelming rivers and causing floods. Flooding itself can lead to dam failures. When a dam is overwhelmed by excessive water from heavy rainfall or rapid snowmelt, it can fail, releasing a massive amount of water downstream. This can cause catastrophic flooding, endangering lives and critical infrastructure. Refer to the following hazard profiles: drought in Section 7, flood in Section 10, severe weather in Section 12, and Wildfire in Section 14.

9.1.2 Location

New Jersey has five distinct climate regions: Northern, Central, Pine Barrens, Southwest, and Coastal (ONJSC Rutgers University n.d.). Figure 9-2 depicts these regions. A majority of Essex County is located within the Central Climate Region with the northwestern corner located in the Northern Climate Region.

Figure 9-3. NWS Heat Index



Source: ONJSC Rutgers University, n.d.
Note: The circle indicates the approximate location of Essex County.

The Central Region has many urban locations with large amounts of pollutants produced by the high volume of traffic and industrial establishments. The concentration of buildings and impervious surfaces tend to retain more heat; thereby affecting the local temperatures. Observed nighttime temperatures in heavily developed areas of the Central region are typically warmer than surrounding suburban and rural areas due to the amount of asphalt, brick, and concrete. The northern edge of the Central Region is often the boundary between freezing and non-freezing precipitation during the winter months. Areas in the

southern part of this region tend to have nearly twice as many days with temperatures above 90°F than other locations in the central portion of the State (ONJSC Rutgers University n.d.).

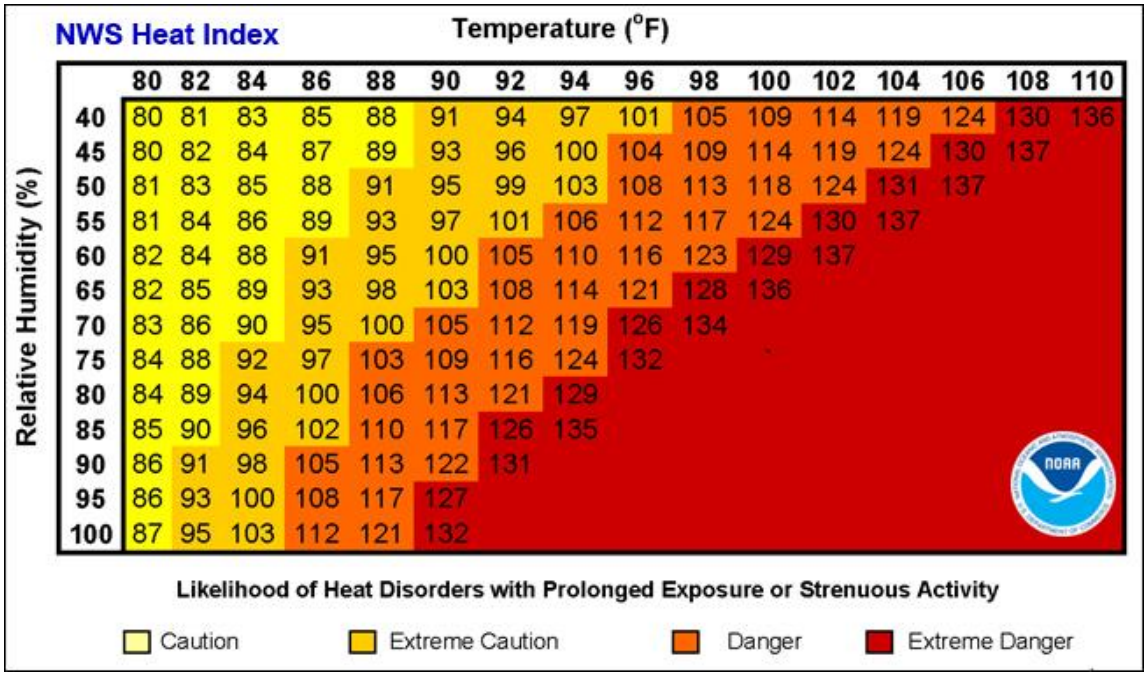
9.1.3 Extent

The State of New Jersey uses multiple index systems to determine the extent of extreme temperature.

Measuring Intensity

Extreme heat extent can be defined by local record highs and the National Weather Service (NWS) Heat Index. The NOAA NWS devised the "Heat Index" chart shown in Figure 9-4, which uses air temperature and humidity to determine the heat index or apparent temperature. In addition, information regarding the likelihood of health dangers by temperature range is presented.

Figure 9-4. NWS Heat Index



Source: (NWS n.d.)

Warning Time

The National Weather Service (NWS) is producing experimental forecasts called HeatRisk to assess the heat risk to local thresholds in California, Nevada, Utah, and Arizona. The NWS issues excessive heat watches, excessive heat warnings and heat advisories to warn of an extreme heat event (a "heat wave") within the 36 hours of the predicted event (National Weather Service 2023)

Table 9-1. NWS HeatRisk Threshold

Category	Risk of Heat-Related Impacts
Green 0	Little to no risk from expected heat.
Yellow 1	Minor - This level of heat affects primarily those individuals extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration.
Orange 2	Moderate - This level of heat affects most individuals sensitive to heat, especially those without effective cooling and/or adequate hydration. Impacts possible in some health systems and in heat-sensitive industries.
Red 3	Major - This level of heat affects anyone without effective cooling and/or adequate hydration. Impacts likely in some health systems, heat-sensitive industries and infrastructure.
Magenta 4	Extreme - This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries and infrastructure.

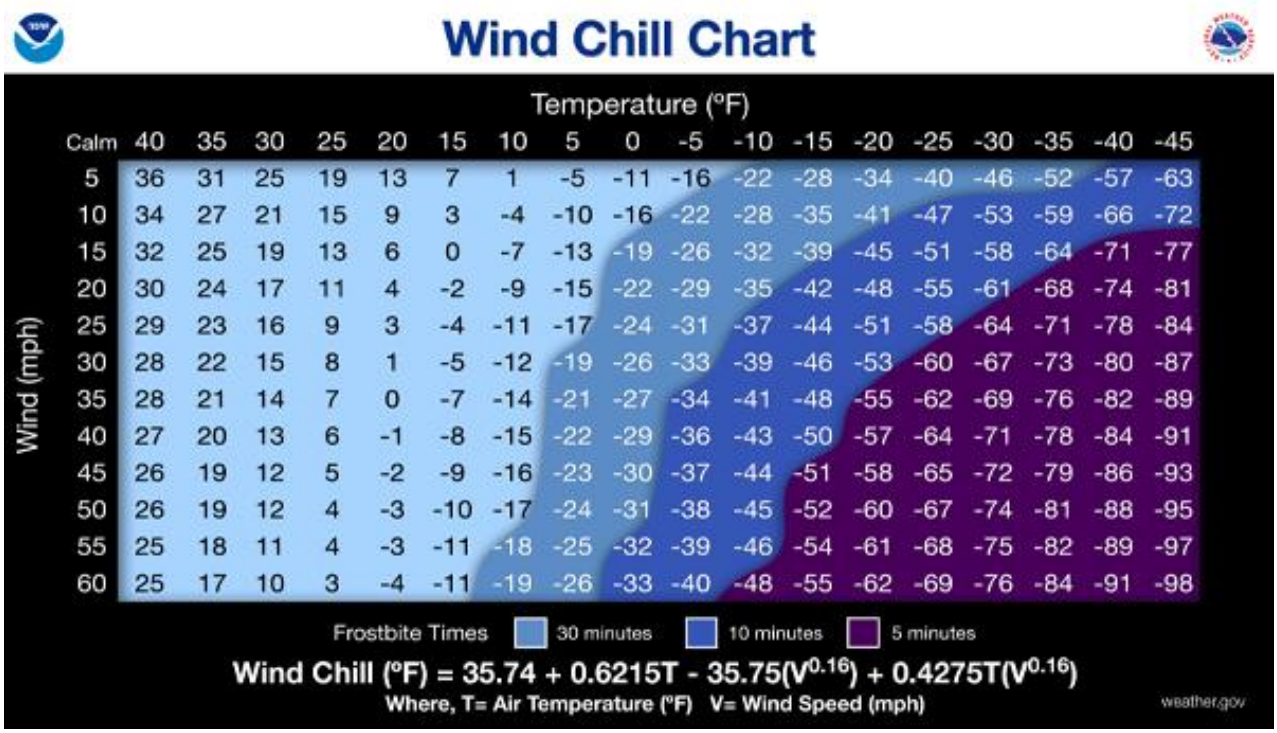
Source: (NWS n.d.)

The NWS will use the HeatRisk Framework (Table 9-1) to determine if an excessive heat watch/warning or heat advisory is warranted. The NWS issues the following types of heat-related advisories (National Weather Service 2023):

- Heat Advisory—HeatRisk category is on the orange/red (Level 2-3) thresholds.
- Excessive Heat Watch—HeatRisk category is on the red/magenta (Level 3-4) thresholds. An Excessive Heat Watch is a way to give the public and emergency officials a warning that extreme temperatures are expected.
- Excessive Heat Warning—HeatRisk category is forecast for 24 to 28 hours on the red/magenta (Level 3-4) thresholds.

The NWS states that the extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. Wind chill temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin's temperature to drop (NWS n.d.). The NWS chart in Figure 9-4 shows the "Wind Chill Index," illustrating the conditions where temperature, wind speed, and exposure time will produce frostbite to humans.

Figure 9-5. Wind Chill Chart



Source: NWS, n.d.

Worst Case Scenario

The worst-case scenario for extreme heat in Essex County would include a heat wave lasting longer than three days with an Excessive Heat Warning Level 4. This scenario would have temperatures near or above 100° F with no overnight cooling, especially in denser urban areas. A heat wave of this magnitude would impact a broad swath of the population, including those with air conditioning. Prolonged heat would put a strain on the county's energy grid, health system, and cause widespread damage to infrastructure. D4 drought followed by high winds and extreme temperatures.

The worst-case scenario for extreme cold in Essex County would include a long-lasting cold event with strong winds, leading to intense wind chills. This would result in dangerous outdoor conditions and potential water distribution failures.

9.1.4 Previous Occurrences

The following sections provide a review of previous extreme temperature occurrences in Essex County.

9.1.4.1 Declarations

Federal Declarations

Between 1954 and 2024, FEMA declared that Essex County experienced six disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types that may have had associated

extreme cold temperatures: severe winter storm, snowstorm, snow, ice storm, winter storm, and blizzard. Those events are listed in Table 9-2.

Table 9-2. FEMA Extreme Temperature Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
EM-3106	March 13 – 17, 1993	Marcy 17, 1993	Snow: Severe Blizzard
DR-1088	January 7 – 12, 1996	January 13, 1996	Snow: Blizzard of 1996 (Severe Snowstorm)
EM-3181	February 16 – 17, 2003	March 20, 2003	Snow: Snow
EM-1954	December 26 – 27, 2010	February 4, 2011	Snow: Severe Winter Storm and Snowstorm
DR-4264	January 22 – 24, 2016	March 14, 2016	Severe Storm(s): Severe Winter Storm and Snowstorm
DR-4368	March 6 – 7, 2018	June 8, 2018	Severe Storm(s): Severe Winter Storm and Snowstorm

Source: (FEMA 2024)

USDA Declarations

Between 2020 and 2024, the USDA declared that Essex County experienced 3 disasters (DR) relating to extreme temperature events. Those events are listed in Table 9-3-3.

Table 9-3. USDA Extreme Temperature Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
S4748	April 6 – May 15, 2020	August 28, 2020	Freeze and frost
S5345	July 1 – August 19, 2022	December 22, 2022	Drought and Excessive Heat
S5644	May 17 – 18, 2023	December 12, 2023	Freeze and frost

Source: (USDA 2025a)

9.1.4.2 Summary of Significant Events

Essex County has experienced significant extreme heat and cold events. However, the most significant extremes were 108 degrees F recorded at Newark International Airport in July 2011 and -14 degrees F recorded in Newark in February 1934 (NJ.com 2025).

9.1.4.3 Recent Events

For the 2025 HMP update, extreme temperature events that impacted Essex County between January 2020 and December 2024 were investigated. For events prior to January 2020, refer to the 2020 HMP.

Table 9-4. Recent Extreme Temperature Events

Date (s) of Event	Declaration Number	County Included	Description
December 23, 2022	N/A	N/A	An Arctic cold front swept through the region on December 23rd ushering in a very cold and dry airmass. Temperatures fell into

Date (s) of Event	Declaration Number	County Included	Description
			the single digits and teens with wind chills ranging from -5 to -20 degrees in New Jersey.

Source: (NJOEM 2024) (NOAA NCEI 2024); (FEMA 2024)

9.1.5 Future Conditions

Future hazard conditions, including frequency and severity of future events, is discussed in the sections below.

9.1.5.1 Probability

It is anticipated that Essex County will continue to experience extreme temperatures annually that may coincide with or induce secondary hazards such as snow, hail, ice or windstorms, thunderstorms, drought, human health impacts, and utility failures.

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for extreme temperatures in the County is considered 'frequent' (100% annual probability; a hazard event may occur multiple times per year.).

9.1.5.2 Climate Change

According to the 2020 New Jersey Scientific Report on Climate Change, New Jersey is warming faster than the rest of the Northeast region and the world. Historically unprecedented warming is projected for the 21st century with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050 (ONJSC Rutgers University n.d.). As the climate changes, the number of extreme cold events are expected to decrease, and extreme heat events are anticipated to increase in the State. Global and regional temperatures are expected to continue increasing, with New Jersey warming faster than the rest of the Northeast region and the global average (NJDEP 2020).

9.1.5.3 Potential Future Impacts

Climate change is likely to result in an increase in frequency and severity of extreme heat events, but a reduction in extreme cold events. Continued development may result in increased occurrence of urban heat island impacts that magnify extreme heat events.

9.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

9.2.1 Summary of Vulnerability

To understand risk, a community must evaluate what assets are exposed and vulnerable. For the extreme temperature hazard, the entire County is exposed. The following section discusses Essex County's vulnerability, in a qualitative approach, to the extreme temperature hazard.

9.2.2 Impact on Life, Health, and Safety

The entire population of Essex County is exposed to extreme temperature events. Extreme temperature events have potential health impacts including injury and death. According to the Centers for Disease Control and Prevention (CDC), populations most at risk to extreme cold and heat events include the following: 1) people aged 65 years or older; 2) infants and children; 3) individuals with chronic medical conditions (e.g., heart disease, high blood pressure), 4) people without proper air conditioning; and 5) the general public who may overexert during work or exercise during extreme heat events or experience hypothermia during extreme cold events (CDC, Heat Health 2024). Heat related illness disproportionately affects farmworkers and disadvantaged communities that lack access to air conditioning. Farm workers are most impacted by extreme heat and heat-related illness (Jackson and Rosenberg 2010)

9.2.2.1 Socially Vulnerable Populations

Extreme temperatures disproportionately affect the socially vulnerable populations and may exacerbate existing inequality. Groups, such as the elderly, children, and those with pre-existing health conditions, are at higher risk of heat-related illnesses such as heat stress, heat exhaustion, and heat stroke. According to the 2023 American Community Survey, 14% of the Essex County population is over the age of 65 years, 6.3% is under 5 years of age, and 12.1% are physically or mentally disabled.

Low-income households and individuals without shelter are at higher risk of cold-related illnesses such as hypothermia and frostbite due to inadequate heating. Extreme temperatures may become a financial strain. Energy costs typically increase for heating and cooling during extreme temperatures, which can disproportionately burden low-income households. Aging infrastructure in low-income areas may be less resilient to extreme heat and cold, leading to frequent power outages and poor quality of living. 22.1% of the population in Essex County is considered low income.

Extreme heat may impact schedules for outdoor workers. With increased high heat days, waste management workers may need to shift to work at night or take more break. Lower wage workers also tend to experience greater instances of injury due to the nature of the jobs they perform (NJ DEP 2022).

9.2.3 Impact on General Building Stock

All buildings are exposed to the extreme temperature hazard. Refer to Section 3 (County Profile), which summarizes the building inventory in Essex County. Extreme heat generally does not impact buildings; however, elevated summer temperatures increase the energy demand for cooling. Losses can be associated with the overheating of heating, ventilation, and air conditioning (HVAC) systems. Extreme cold temperature events can damage buildings through freezing/bursting pipes and freeze/thaw cycles, as well as increasing vulnerability to home fires. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities can have inadequate capabilities to withstand extreme temperatures.

9.2.4 Impact on Community Lifelines

All community lifelines could be impacted by extreme temperatures. See Table 9-5. Refer to Section 3 (County Profile) for a complete inventory of community lifeline sin the County.

Table 9-5. Extreme Temperature Impacts on Community Lifelines

Community Lifeline	Potential Impacts
Safety and Security	Schools fall under the safety and security lifeline and have had documented operational challenges related to extreme temperatures. Older facilities are not equipped with central air conditioners and may need to close during heat events
Food, Hydration, Shelter	Extreme temperatures can have adverse impacts on Food, Water, and Shelter lifelines. Agricultural operations may lose crops or livestock to extreme heat or cold impacting food availability and supply chains. Extreme cold can cause water to freeze and damage infrastructure such as pipes, extreme heat can lead to algal growth and other issues affecting drinking water quality and make hydration difficult for those exposed to the heat.
Health and Medical	Extreme temperature events will require medical care be administered in response and recovery and facilities themselves will require adequate heating and cooling infrastructure. In addition, potential issues with the power grid could lead to issues with hospital operations
Energy	Extreme temperatures can lead to a larger strain on the power grid due to increase demand for electricity because of usage of heating and cooling utilities in response. In addition to increased demand, power facilities may face supply problems caused by extreme temperatures possibly resulting in blackouts as extreme temperatures can impact electrical equipment and renewable energy production from solar panels and windmills, also impacting supply.
Communications	Power outages may occur due to increased energy demand during heat waves, leading to reduced telecommunications service.
Transportation	Extreme temperatures can damage roads, rail tracks, and bridges as well as the vehicles operating on that infrastructure. Rail and road buckling occurs with sustained high heat events; this has a secondary impact of disruption supply chains. Heatwaves can also impact flights as heat may reduce air density to the point where planes aren't provided with enough lift to take off. These impacts can have cascading effects on other community lifelines.
Hazardous Materials	Extreme temperatures can impact hazardous materials storage as the materials, especially if they are volatile, may react to extreme heat and undergo changes. Containers containing chemicals exposed to extreme heat could increase the internal pressure exerted on the container which could cause it to rupture and release the

Community Lifeline	Potential Impacts
	contents. This is especially a risk when transporting these materials during extreme heat.
Water Systems	Extreme cold temperatures can cause critical water infrastructure such as pipes to burst. Water expands when it freezes, bursting pipes that aren't adequately protected. Then when the temperature rises, those broken pipes start leaking. This affects water pressure impacting delivery of water to homes, businesses, and other community lifelines. Extreme heat could increase demand for water, therefore increase the potential for shortages if supply can't meet the demand, especially if the extreme heat is occurring in combination with drought.

Source: (NJOEM 2024)

9.2.5 Impact on the Economy

Extreme temperature events also have impacts on the economy, including loss of business function from power interruption and damage to and loss of inventory. Business-owners can be faced with increased financial burdens due to unexpected repairs caused to the building (e.g., pipes bursting), higher than normal utility bills, or business interruption due to power failure (i.e., loss of electricity, telecommunications). Disruptions in public transportation service will also impact the economy for both commuters and customers alike.

Extreme temperature events can also impact agriculture yields. Based on information from the 2022 Census of Agriculture, 32 farms were present in Essex County, encompassing 61 acres of total farmland. The total market value of agricultural products from Essex County farms was $4.2 million (USDA 2022)

9.2.6 Impact on Historic and Cultural Resources

Structural damage may occur due to extreme temperature on historic and cultural buildings extreme heat events. Extreme temperatures can accelerate the degradation of materials, making preservation efforts more difficult and costly. As an example, prolonged exposure to heat can cause building material such as wood, stone, and metal to expand and contract, leading to cracks and structural weakening. Cycles of freezing and thawing in extreme cold events may cause similar damage, such as water seeps into cracks, exacerbating deterioration of materials. Simultaneous hazards, such as drought conditions with extreme heat, may lead to wildfires that may destroy historic and cultural resources.

9.2.7 Impact on Ecosystems and Natural Resources

Extreme temperatures can have profound impacts on the ecosystem and natural resources, affecting biodiversity, habitat stability, and resource availability. Extreme temperatures can stress trees, making them more susceptible to pests and diseases. This can reduce forest productivity and increase the risk of wildfires. Extreme heat may cause rises in water temperatures, affecting fish populations and altering their distribution and breeding patterns. This can impact commercial and recreational fishing industries. Change in extreme temperatures can force species to migrate to cooler areas, disrupting existing ecosystems and potentially leading to the decline or extinction of species unable to adapt or move.

9.2.8 Change in Vulnerability Since the Previous HMP

Overall, the entire County remains vulnerable to extreme temperatures.

9.3 Mitigation Opportunities

A range of potential opportunities for mitigating the extreme temperature hazard have been identified and considered by plan participants:

- Manipulate the hazard:
  - None
- Reduce exposure and vulnerability to the hazard:
  - Insulate structure
  - Provide redundant power.
  - Air condition non-conditioned buildings
  - Install backup heat (e.g. wood burning stoves)
  - Air condition public buildings
  - Create redundancy to power supply to deal with power grid vulnerability during high demands
- Build local capacity to respond to or prepare for the hazard:
  - Be aware of impending heat and cold waves
  - Inform public on the do's and don'ts during heat and cold waves
  - Have fans available for use during peak demands in leu of air conditioning
  - Install back-up generators
  - Know the location of cooling and warming shelters
  - Inform employees of the seriousness of heat and cold waves
  - Monitor weather forecasts
  - Establish a COOP
  - Identify populations vulnerable to extreme heat and cold (elderly, poor) for early warning during potential heat and cold waves
  - Enhance weather forecasting capability
  - Distribute fans and heating sources to vulnerable populations
  - Promote selective approaches to cooling your residences and businesses during peak demands
- Nature-based opportunities:
  - Incorporate "green building" methods (e.g. green roofs)
  - Plant native vegetation and appropriate trees near home ("Right tree, right place" National Arbor Day Foundation Program)
  - Solutions that convert built environments to natural environments such as forests, wetlands, and vegetation

10 FLOOD

10.1 HAZARD PROFILE

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

10.1.1 Description of the Hazard

Defining the Hazard

Flooding occurs when water overflows onto land that is normally dry. They can happen during heavy rains, rapid snow melt, or when dams or levees break (NOAA National Severe Storms Laboratory 2023). Floods are one of the most frequent and costly natural disasters in the United States and the State of New Jersey. Essex County is typically exposed to the following flood types, with each further described below:

- Riverine (inland) flooding;
- Flash flooding including urban flooding;
- Coastal flooding including storm surge, tidal and nuisance flooding, and long-term inundation from sea level rise; and
- Dam failure.

Riverine (Inland) Flooding

Riverine flooding, or fluvial flooding, is when streams and rivers exceed the capacity of their natural or constructed channels to accommodate water flow and water overflows the banks, spilling out into adjacent low-lying, dry land. This occurs when the flow of a river exceeds the bank sides and causes damage or obstruction to a nearby floodplain. Riverine flooding can turn into a flash flood if the river is at or above its flood stage and if the soil is saturated (FEMA 2019).

Flash Flooding

A flash flood is a rapid inundation of low-lying areas caused by heavy rain associated with severe thunderstorms, tropical systems, or melting water from ice or snow. Flash flooding also occurs far away from water bodies when a large volume of water cannot be absorbed by the soil or storm water systems and travels overland unimpeded (NWS 2019).

Local (urban) drainage systems collect groundwater from heavy rainfall in developed areas. Water that does not evaporate or become absorbed by the ground is carried by conduits to waterways such as creeks, rivers, or the ocean. These systems have two purposes: 1) to control storm water runoff during periods of heavy rainfall; and 2) to minimize disruption of activity from more frequently occurring, less significant storms. Flooding occurs when runoff exceeds system capacity, or because systems are blocked from lack

of maintenance. Flooding which results from poorly designed or blocked drainage systems is categorized as urban/stormwater flooding (NOAA 2022).

Coastal Flooding

Coastal areas can experience various kinds of flooding including storm surge and sea level rise. The combination of these events can result in the total perceived coastal flooding event.

Storm Surge

Storm surge is the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. The surge is caused primarily by a storm's winds pushing water onshore. The amplitude of the storm surge at any given location depends on the orientation of the coastline with the storm track; the intensity, size, and speed of the storm; and the local bathymetry (NOAA n.d.).

Storm tide is the total observed seawater level during a storm, resulting from the combination of storm surge and the astronomical tide. Astronomical tides are caused by the gravitational pull of the sun and the moon and have their greatest effects on seawater level during new and full moons—when the sun, the moon, and the Earth are in alignment. As a result, the highest storm tides are often observed during storms that coincide with a new or full moon (NOAA n.d.).

Sea Level Rise

Relative or local sea level is affected by global sea level fluctuations, changes in land elevation, winds, and ocean circulation. It refers to the height of the water as measured along the coast relative to a specific point on land. Tide stations measure local sea level rise. Water measurements at the tide stations are referenced to stable vertical points on the land, and a known relationship is established. As the temperature of the Earth changes, so does sea level. Temperature and sea level are linked for two main reasons (USEPA 2025):

- Land ice melt: Changes in the volume of water and ice on land (namely glaciers and ice sheets) can increase or decrease the volume of water in the ocean.
- Thermal expansion: As water warms, it expands slightly—an effect that is cumulative over the entire depth of the oceans.

Rising sea level inundates low-lying wetlands and dry land, erodes shorelines, contributes to coastal flooding, and increases the flow of salt water into estuaries and nearby groundwater aquifers. Higher sea level also makes coastal infrastructure more vulnerable to damage from storms (USEPA 2025).

Sea level rise is contributing to the increase in nuisance flooding (also known as tidal flooding, high tide flooding, sunny-day flooding, or king tide flooding), a flood event influenced by minor impacts, such as high tide occurrences. Nuisance flooding occurs fairly frequently because it is caused by events that happen on a regular basis. Nuisance flooding causes public inconvenience by influencing frequent road closures, overwhelmed storm drains and deterioration of infrastructure. Recently, nuisance flooding has been increasing around the coastal United States due to sea level rise and land subsidence (NOAA 2025b).

Dam Failure

A dam is an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water (FEMA 2019). They are built for the purpose of power production, agriculture, water supply, recreation, and flood protection. Dam failure is any malfunction or abnormality outside of the design that adversely affects a dam's primary function of impounding water. Dams can fail for one or a combination of the following reasons (FEMA 2018):

- Overtopping caused by floods that exceed the capacity of the dam or levee (inadequate spillway capacity);
- Prolonged periods of rainfall and flooding;
- Deliberate acts of sabotage (terrorism);
- Structural failure of materials used in dam construction;
- Movement and/or failure of the foundation supporting the dam;
- Settlement and cracking of concrete or embankment dams;
- Piping and internal erosion of soil in embankment dams;
- Inadequate or negligent operation, maintenance and upkeep;
- Failure of upstream dams on the same waterway; or
- Earthquake (liquefaction / landslides).

Regulatory Oversight of Dams

Potential for catastrophic flooding caused by dam failures led to enactment of the National Dam Safety Act (Public Law 92-367), which for 30 years has protected Americans from dam failures. The National Dam Safety Program (NDSP) is a partnership among states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and purchases of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most dams in the United States (FEMA n.d.).

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers (USACE) is responsible for safety inspections of some federal and nonfederal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state's and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety (USACE 2021).

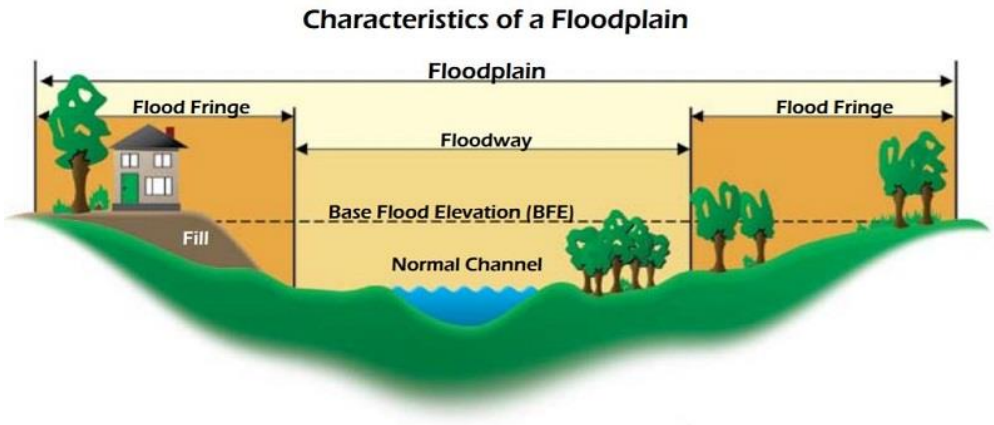
Floodplains

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. The floodplain describes the area inundated by the "100-year" flood, or a flood that has a 1-percent chance in any given year of being equaled or exceeded. A floodplain is designated when floodwater exceeds the capacity of the main channel, or

water escapes the channel through bank erosion. Figure 10-1 depicts the flood hazard area, the flood fringe, and the floodway areas of a floodplain.

In Essex County, floodplains line the rivers and streams of the County and the coastal areas. The boundaries of the floodplains are altered as a result of changes in land use, the amount of impervious surface, placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, and utilization of different hydrologic modeling techniques.

Figure 10-1. Characteristics of a Floodplain



Source: (FEMA 2009)

Flood hazard areas are identified as Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled to or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. A 100-year floodplain is not a flood that will occur once every 100 years; the designation indicates a flood that has a 1-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. Similarly, the moderate flood hazard area (500-year floodplain) will not occur every 500 years but is an event with a 0.2-percent chance of being equaled or exceeded each year). The 1-percent annual chance floodplain establishes the area that has flood insurance and floodplain management requirements. The following are additional definitions relating to flood maps (FEMA 2025):

- Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA).
- SFHA = the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.
- 1-percent annual chance flood = the base flood or 100-year flood.
- SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30.
- Zone B or Zone X (shaded) = Moderate flood hazard areas and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.

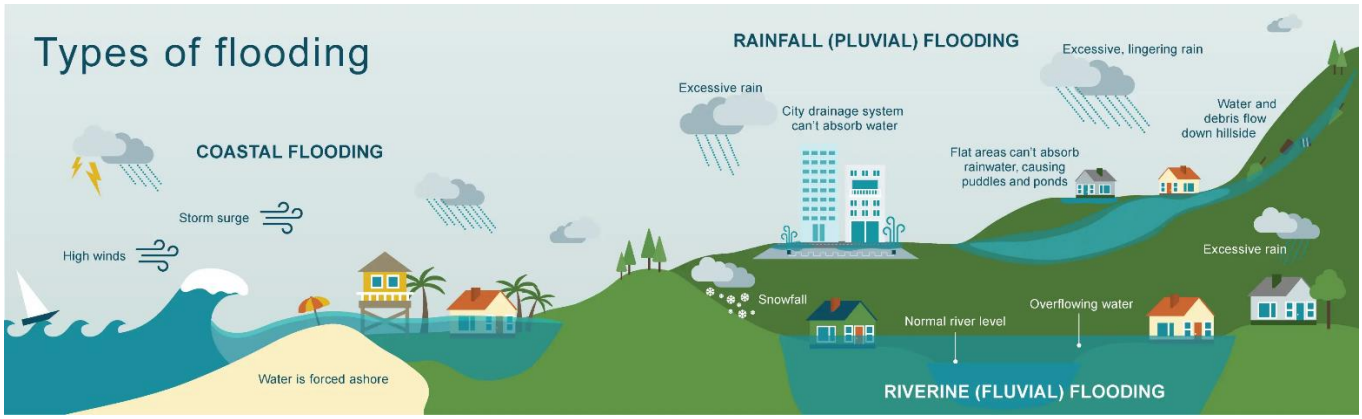
- Zone C or Zone X (unshaded) = Areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled.

Locations of flood zones in Essex County as depicted on the FEMA preliminary Digital Flood Insurance Rate Map (DFIRM) are illustrated in Figure 10 3. Refer to Volume II (Jurisdictional Annexes) for a map of each jurisdiction depicting the floodplains.

Cause of the Hazard

Flooding typically occurs when prolonged rain falls over several days, when intense rain falls over a short period of time, or when an ice or debris jam causes a river or stream to overflow onto the surrounding area. Flooding can also result from the failure of a water control structure, such as a levee or dam. The most common cause of flooding is water due to rain and/or snowmelt that accumulates faster than soils can absorb it or rivers can carry it away (NWS n.d.).

Figure 10-2. Causes of Flooding



Source: (USACE National Levee Database 2025)

Summary of Potential Impacts

Flooding in Essex County can have significant impacts on the people, structures, infrastructure, and natural environment. Roads, bridges, and buildings can be severely damaged or destroyed, making transportation difficult and disrupting daily life and emergency response efforts. Hydrostatic pressures and flowing floodwaters can easily cause structures to collapse or float away. This can lead to costly repairs and loss of property value, impacting homeowners and businesses. Floodwaters can contaminate drinking water and lead to the spread of contaminants and diseases. During severe flood events, residents may need to evacuate their homes, which can lead to displaced residents and the potential increased risk of drowning during evacuation efforts. Flooding can result in scouring and erosion of sediment in areas with flow or wave action.

Cascading Hazard Impacts

Flooding can result in utility failures, hazardous material releases, and the spread of disease. Disease outbreak is discussed in Section 6 (Disease Outbreak). Flooding and waves action from coastal storms

can result in 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 flooding, hurricanes, or flooding associated with surges spawned by tropical and extratropical systems and may be long-term or short-term in scale (FEMA 2020). While the majority of coastal shorelines in Essex County are hardened with bulkheads and breakwaters, unprotected natural shorelines can experience significant short term and long-term coastal erosion.

10.1.2 Location

Flooding potential is influenced by climatology, meteorology, and topography. Extensive development, such as that seen in Essex County, also can impact flooding potential as it leaves fewer natural surfaces available to absorb rainwater, forcing water directly into streams, rivers, and existing drainage systems swelling them more than when more natural surface buffered the runoff rate.

Flood Insurance Study (FIS)

According to the revised 2020 FEMA Flood Insurance Study, flooding in Essex County is caused by coastal flooding, riverine flooding, and heavy rainfall events. Riverine flooding takes place in low-lying areas adjacent to Essex County's rivers and brooks. The 2007 FEMA Flood Insurance Study identifies the following waterways as sources of riverine flooding: Passaic River and its tributaries, Second River and its tributaries, Third River, Peckman River, Nishuane Brooke, Pompton River, Toneys Brook, Canoe Brook, Slough Brook, Rahway River, East Branch Rahway River, West Branch Rahway River, Elizabeth River, Crooked Brook, Lightning Brook, Taylor Brook, Great Hills Brook, Wigwam Brook, Foulerton's Brook, North Branch Foulerton's Brook, Pine Brook, Green Brook, and Kane Brook (FEMA 2020).

Flood Protection Measures

There are several flood protection structures located in Essex County (FEMA 2020):

- Almost the entire length of Nishuane Brook in the City of East Orange was constructed to include concrete sidewalls and inverts. Culverts have also been installed at all the street crossings. These improvements, designed to contain the 2-percent-annual-chance flood, were not enough to prevent some local flooding during the August 1973 storm.
- The Township of Irvington has few flood protection measures implemented. Previous improvements include a flume constructed in 1933 along the Elizabeth River. The flume varies from 6 to 10 ft. deep with widths from 20 to 30 ft. A double culvert was built to accommodate the Garden State Parkway.
- Improvements by the Township of Livingston along Canoe Brook, including a new concrete lined channel to improve flow conditions and prevent bank erosion upstream of Cedar Street, were constructed in 1972. In the section between Serbrooke Parkway and East Mount Pleasant Avenue (State Route 10), a concrete lining was created to prevent erosion of the bank slopes, and concrete grade beams were placed across the bottom of the channel to reduce erosion of the streambed. Upstream of Slough Brook, along West Northfield Road, a channel was protected from erosion by lining the bank slopes with riprap.

- During the early 1930s, the Works Progress Administration constructed mortar rubble masonry walls along the East Branch of the Rahway River, from the Jefferson Avenue Bridge to a point approximately 750 ft. downstream from the Baker Street Bridge in the Township of Maplewood. The purpose of this work was to protect the banks of the river and to prevent erosion.
- The Memorial Park Retention Basin on the Second River in the Township of Montclair was modified around 1950 to provide storage for approximately 357,000 cubic ft. of floodwater.
- An overall Rahway River Flood Control Project was authorized by the Flood Control Act of October 27, 1965, in accordance with the recommendations of the Chief of Army Engineers in House Document No. 67, 89th Congress, First Session. A General Design Memorandum, detailing the work to be accomplished by the USACE, New York District, was completed in September 1969. This study includes the authorized flood control improvement along the East Branch Rahway River at the Village of South Orange. The flood area for which protection is being provided consists of approximately 70 acres on the left and right banks of the East Branch Rahway River. The improvement is designed to protect the area against an overflow of the East Branch Rahway River with a frequency of occurrence of once in 100 years. The improvement is essentially a channel enlargement project, which provides for clearing and excavation for a length of about 7,000 ft. Generally, the project consists of concrete walls, levees, a flume, drainage structures, replacement of four bridges, and miscellaneous changes to existing utilities. The upstream limit of the project is the upstream corporate limits of the Village of South Orange and the downstream limit is approximately 800 ft. upstream of the Erie-Lackawanna Railroad spur, about 1,400 ft. below Third Street. The area around the Village of South Orange water-pumping plant and the service building has been previously flooded and will still be susceptible to future flooding when the upstream channel is completed. Installing flashboards at the doors and windows has temporarily protected the pumping station, and valuable equipment within the service building has been raised above flood levels.

Floodplains

The Digital Flood Insurance Rate Map (DFIRM) data provided by FEMA for Essex County show the following flood hazard areas:

- 1-Percent Annual Chance Flood Hazard: Areas subject to inundation by the 1-percent-annual-chance flood event. This includes Zone AE and Zone VE. This is also referred to as the Special Flood Hazard Area (SFHA). Mandatory flood insurance requirements and floodplain management standards apply.
- 0.2-Percent Annual Chance Flood Hazard: Area of minimal flood hazard, usually depicted on FIRMs as the 500-year flood level or Shaded X Zone.

Locations of flood zones in Essex County as depicted on the FEMA 2020 effective DFIRM are illustrated in Figure 10-3. Figure 10-4 displays the areas of Essex County exposed to Category 1 through 4 storm surge events. Only three municipalities have exposure to storm surge in Essex County; the Township of Belleville, the City of Newark, and the Township of Nutley.

Figure 10-3The most extensive areas of the 1-percent annual chance floodplains extend along the Passaic River through much of the Passaic Meadows Complex in Fairfield, West Caldwell and Roseland. In southwestern Essex County, extensive 1/2- to 1-mile-wide floodplains exist in the vicinity of Slough and Canoe Brooks in Millburn Township and near Willow Brook in Livingston. In eastern Essex County, much of Lower Newark City is within the Floodplain of Newark Bay. Other larger floodplains are identified along the West Branch of the Rahway River, and along Second River, Wigwam Brook, and Third River in northeastern Essex County.

Figure 10-3. FEMA Flood Hazard Areas

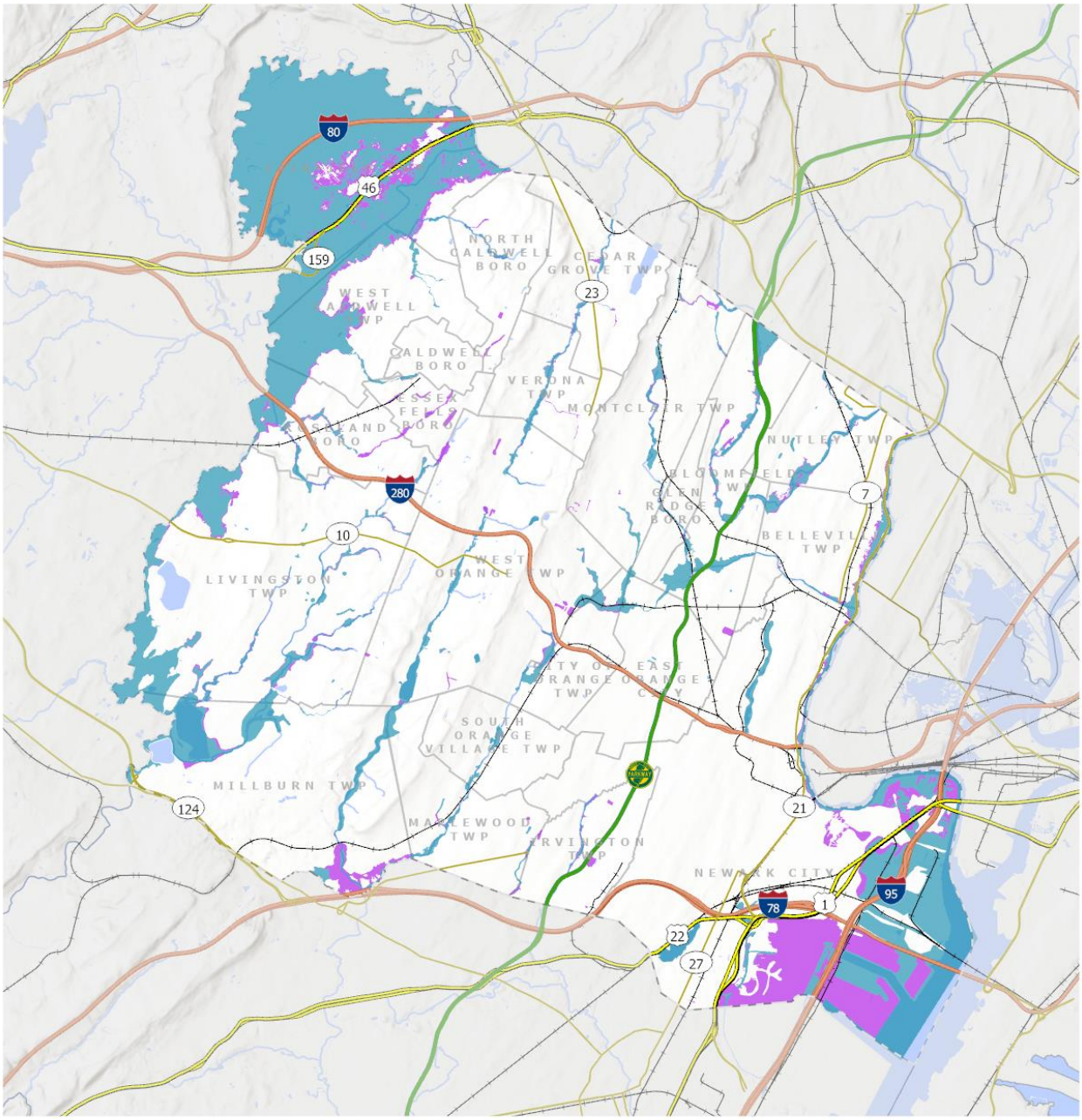
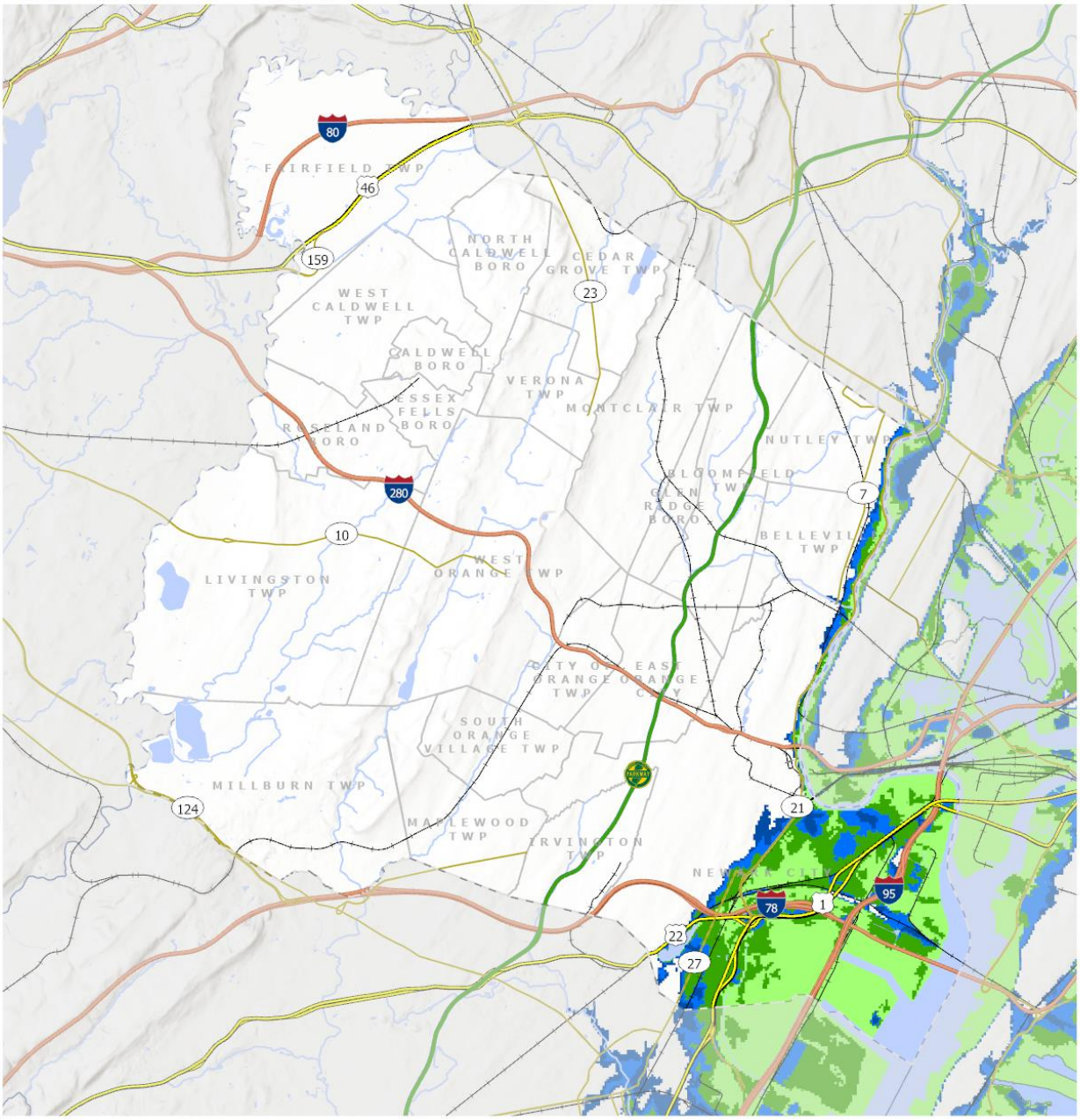


Figure 10-4. Storm Surge Areas



Sources: NJ Office of GIS, Rutgers University/NOAA

Base Map Credits: Esri, NASA, NGA, USGS

Figure 10-5 displays the areas of Essex County exposed to the NJDEP Inland Flood Rule. The Inland Flood Rule was adopted to ensure that new investments are well-suited to manage current flood risk and the anticipated future conditions over the lifetime of an asset (NJDEP 2023a). This map depicts the geographic extent of the future flood hazard by adding 3 ft of to the Base Flood. The Inland Flood Rule results in the expansion of the design floodplain in all of the municipalities in Essex County aside from the Borough of Caldwell.

Figure 10-6 displays the proposed NJ Tidal Climate Adjusted Flood Elevation (CAFE) Map of the Reform to Support Resilient Environments and Landscapes (REAL). REAL is part of the New Jersey Protecting Against Climate Threats (NJPACT) initiative. Through amendments to existing land resource protection rules, if adopted REAL will bolster resilience to the unavoidable impacts of climate change. The proposed rules address sea-level rise, coastal storm surge, flooding, and stormwater management concerns while improving water quality, protecting natural resources, and streamlining permitting processes that will expedite resilient investments in New Jersey's communities and economy. This map depicts the geographic extent of the future flood hazard by adding 5 ft of sea level rise to the Base Flood, which is consistent with sea-level rise projections for 2100 as recommended in the DEP's Sea-level Rise Guidance (NJDEP 2024a). The proposed Inundation Risk Zone (Tidal Climate Adjusted Flood Elevation Map) only impacts three municipalities in Essex County; the Township of Belleville, the City of Newark, and the Township of Nutley.

Figure 10-5. NJ Inland Flood Rule Design Flood Area

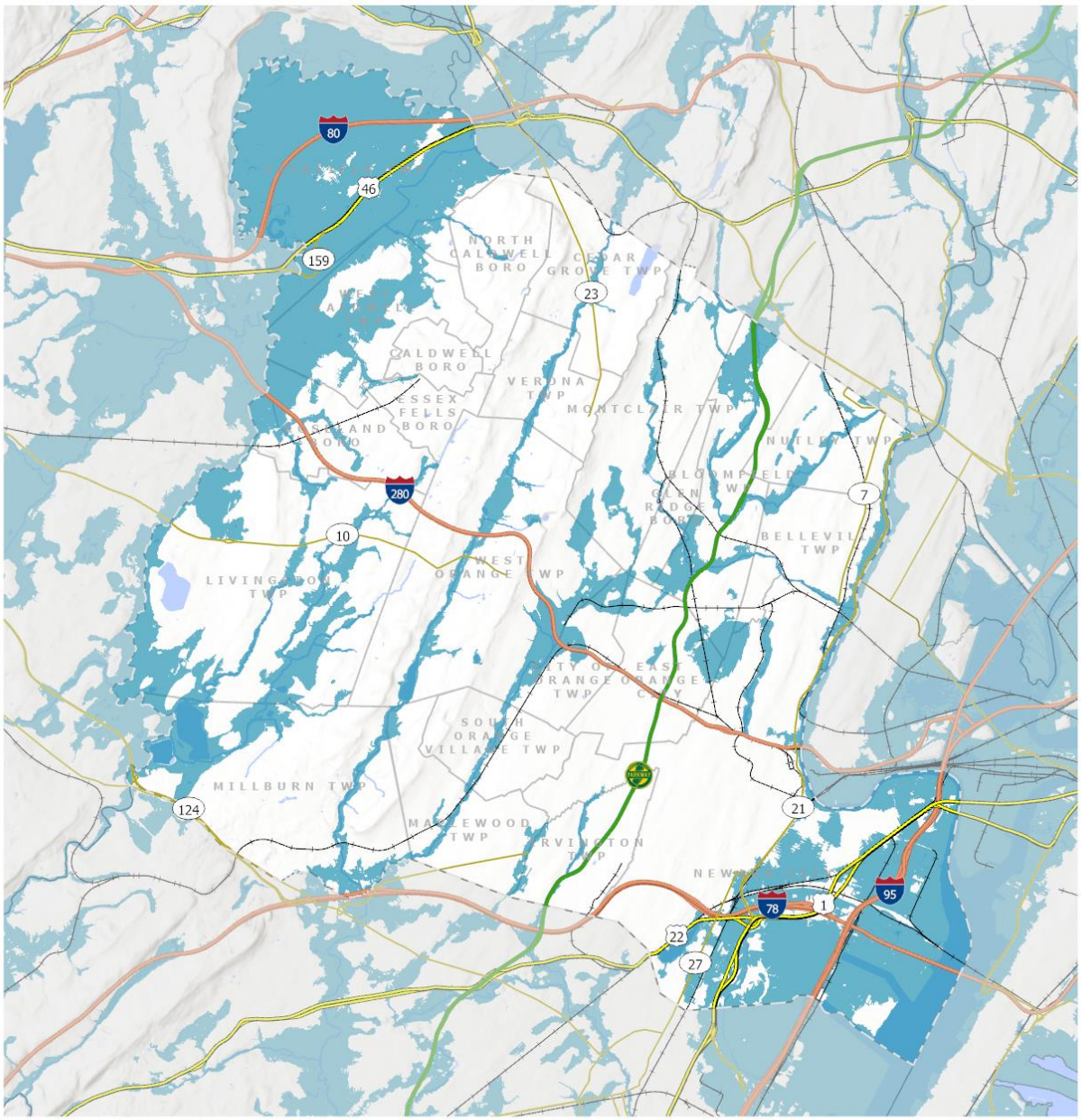
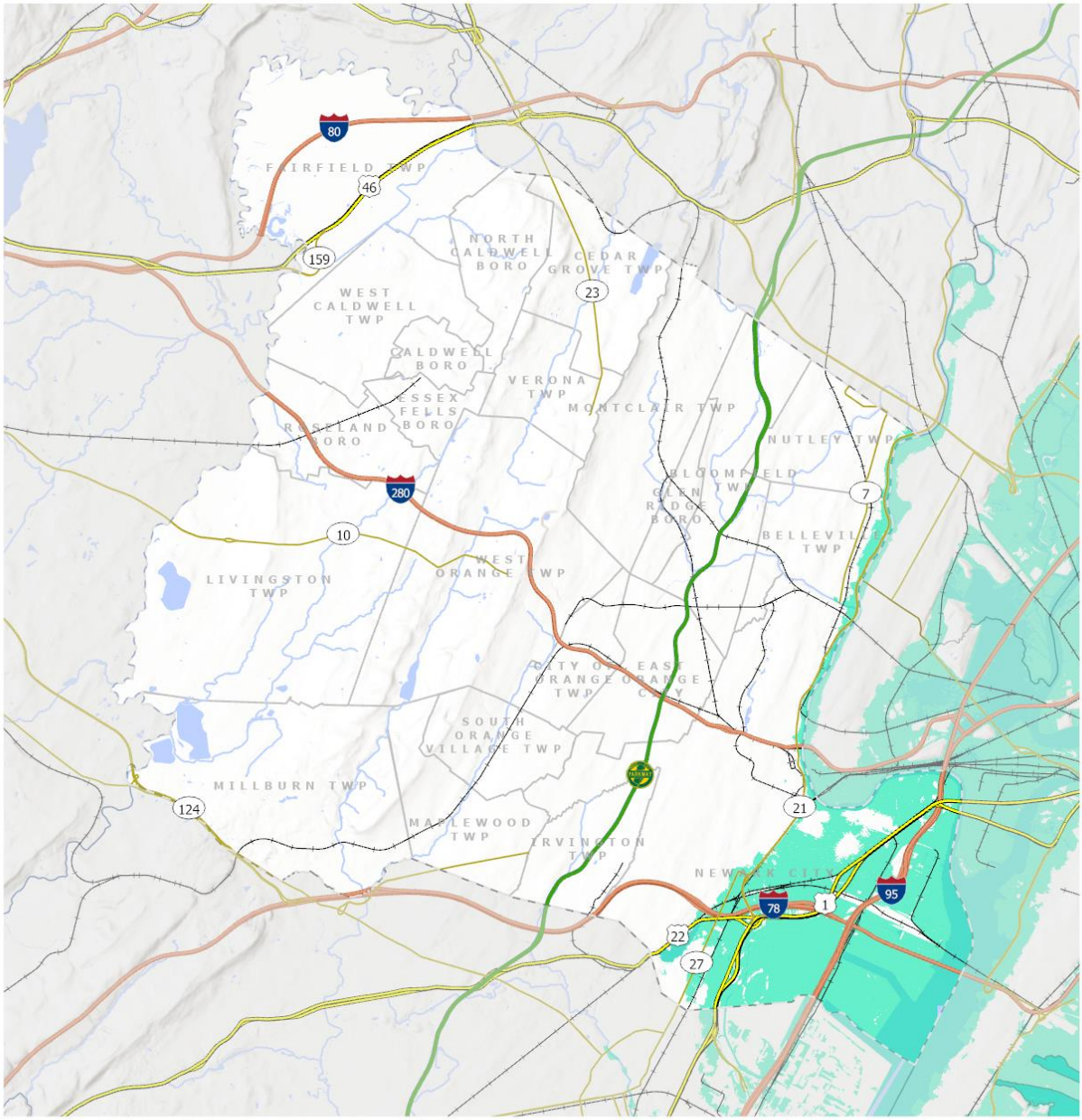


Figure 10-6. NJ Proposed Tidal Climate Adjusted Flood Elevation Map (CAFE)



10.1.3 Extent

The severity of a flood depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage this water. The size of rivers and streams in an area and infiltration rates are significant factors. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration rates decrease and any more water that accumulates must flow as runoff (Harris 2001).

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1-percent chance of being equaled or exceeded in any given year. The "annual flood" is the greatest flood event expected to occur in a typical year. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher recurrence interval to occur in a short time period. The same flood can have different recurrence intervals at different points on a river.

The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance, as well as the regulatory flood boundary by many agencies. Also referred to as the Special Flood Hazard Area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water-surface elevations describe the water elevation resulting from a given discharge level, which is one of the most important factors used in estimating flood damage. A structure located within a SFHA shown on an NFIP map has a 26-percent chance of suffering flood damage during the term of a 30-year mortgage.

The term "500-year flood" is the flood that has a 0.2-percent chance of being equaled or exceeded each year. The 500-year flood could occur more than once in a relatively short period of time. Statistically, the 0.2-percent (500-year) flood has a 6-percent chance of occurring during a 30-year period of time, the length of many mortgages. The 500-year floodplain is referred to as Zone X500 for insurance purposes on FIRMs. Base flood elevations or depths are not shown within this zone and insurance purchase is not required in this zone (FEMA 2022).

Coastal flooding can cause impacts such as frequent road closures, reduced stormwater drainage capacity, and deterioration of infrastructure not designed to withstand frequent inundation or exposure to salt water. Coastal flooding can also affect human health by increasing the risk that drinking water and wastewater infrastructure will fail, putting people at risk of being exposed to pathogens and harmful chemicals (US EPA 2025).

While most dams have storage volumes small enough that failures would have little or no consequences, dams with large storage amounts could cause significant flooding downstream.

Measuring Intensity

Riverine (Inland) Flooding

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

- Minor Flooding - minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding - some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations (NOAA 2021).

Currently, there is no measurement used to further define the frequency and severity of stormwater/urban flooding.

Coastal Flooding

Coastal flooding can be categorized by the warnings, watches, and advisories issued by the National Weather Service (NWS). A coastal flood watch is issued when moderate-major coastal flooding is possible. A coastal flood warning is issued when moderate-major coastal flooding is actively occurring or imminent. A coastal flood advisory is issued when a minor or nuisance coastal flood is occurring or imminent for the area. All coastal flooding warnings, watches, and advisories have the potential to cause serious risk to both life and property in the County's coastal areas (NWS n.d.).

Sea Level Rise

Sea level is measured by two main methods: tide gauges and satellite laser altimeters. Tide gauge stations from around the world have measured the daily high and low tides for over a century. Using data from these stations, scientists can calculate a global average of change. Since the early 1990s, sea level has been measured from space using laser altimeters. This method determines the height of the sea surface by measuring the return speed and intensity of a laser pulse directed at the ocean. The higher the sea level, the faster and stronger the return signal (NASA n.d.).

Dam Failure

The extent or magnitude of a dam failure event can be measured in terms of the classification of the dam. According to the NJDEP Dam Safety Program, there are three hazard classifications of dams. The classifications relate to the potential for property damage and/or loss of life in the event of a dam failure. Probable future development of the area downstream from the dam which might be affected by its failure is also considered in determining the hazard classification (NJOEM 2024).

- Class I - High-Hazard Potential: This classification includes those dams, the failure of which may cause the probable loss of life or extensive property damage.
- Class II - Significant-Hazard Potential: This classification includes those dams, the failure of which may cause significant damage to property and project operation, but loss of human life is not

envisioned. This classification applies to predominantly rural, agricultural areas, where dam failure may damage isolated homes, major highways or railroads or cause interruption of service of relatively important public utilities.

- Class III - Low-Hazard Potential: This classification includes those dams, the failure of which would cause loss of the dam itself but little or no additional damage to other property. This classification applies to rural or agricultural areas where failure may damage farm buildings other than residences, agricultural lands, or non-major roads.

According to the National Inventory of Dams, Essex County is home to 13 dams. 8 dams are high hazard dams and 5 are significant hazard dams (USACE 2025).

Warning Time

Most floods are preceded by a warning period that allows emergency managers to communicate the need to prepare for the event. A flood may last from minutes to days (O'Connor, Grant and Costa 2002). Warnings issued through official sources, such as the National Weather Service (NWS) and the Storm Prediction Center, provide the most reliable and timely preparedness information, but the exact flood location and depth depends on the amount, duration, and location of rainfall.

The NWS uses the following advisory, watch, and warnings when flooding conditions are anticipated (NWS 2025):

- Flood Advisory: Issued when flooding is forecast to occur, generally within the next 6 hours, but is not expected to substantially threaten life and property.
- Flash Flood Warning: Issued when flash flooding is imminent, generally within the next 6 hours. This is usually issued based on observed heavy rainfall (measured or radar estimated) for dangerous small stream or urban flooding, but may also be issued for significant dam or levee failures that have occurred or are imminent.
- Areal Flood Warning: Issued when widespread general flooding is forecast to occur throughout an identifiable geographic area.
- Flood Warning for River Forecast Point: Issued when a river gauge is forecast to exceed a predetermined flood stage.
- Storm Surge Warning: Issued when there is danger of life-threatening inundation (3 ft or greater at ground level) from rising water moving inland from the shoreline somewhere within the specified area, generally within 36 hours, in association with a tropical, subtropical, or post-tropical cyclone.
- Storm Surge Watch: Issued when there is potential of life-threatening inundation (3 ft or greater at ground level) from rising water moving inland from the shoreline somewhere within the specified area, generally within 48 hours, in association with a tropical, subtropical, or post-tropical cyclone.

There is often limited warning time for a dam failure event.

Worst Case Scenario

A worst-case scenario for flood would likely involve a strong, slow-moving hurricane that drops heavy rainfall and pushes storm surge into the eastern areas of the County combined with heavy predecessor

rainfall events that limit the availability of the natural systems to absorb rainfall. An event of this magnitude would result in widespread coastal and inland flooding.

10.1.4 Previous Occurrences

The following sections provide a review of previous flood occurrences in Essex County.

10.1.4.1 Declarations

Federal Declarations

Between 1954 and 2024, FEMA declared that Essex County experienced six flood-related disasters (DR) or emergencies (EM). Those events are listed in Table 10-1. Additional disasters declared for severe storms and severe winter weather are included in Sections 12 and 13.

Table 10-1. FEMA Flood Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
DR-245-NJ	June 18, 1968	June 18, 1968	New Jersey Heavy Rains, Flooding
DR-310-NJ	September 4, 1971	September 4, 1971	New Jersey Heavy Rains, Flooding
DR-402-NJ	August 7, 1973	August 7, 1973	New Jersey Severe Storms, Flooding
DR-477-NJ	July 23, 1975	July 23, 1975	New Jersey Heavy Rains, High Winds, Hail, Tornadoes
DR-701-NJ	March 28 - April 8, 1984	April 12, 1984	New Jersey Coastal Storms, Flooding
DR-973-NJ	December 10-17, 1992	December 18, 1992	New Jersey Coastal Storm, High Tides, Heavy Rain, Flooding

Source: (FEMA 2024)

USDA Declarations

Between 2020 and 2024, the USDA included Essex County was not included in any flood-related agricultural disaster declarations (USDA 2025a).

10.1.4.2 Summary of Significant Events

The inland flood of record likely is the Passaic Flood of 1903. Impacting the Passaic River Valley, a slow moving tropical storm dropped nearly a foot of rain in 24 hours leading to widespread flooding in the region. Superstorm Sandy is the coastal flood event of record for Essex County. A maximum and record storm surge of 14 feet was recoded at Sandy Hook.

10.1.4.3 Recent Events

For the 2025 HMP update, flood events that impacted Essex County between January 2020 and December 2024 are listed in Table 10-2. For events prior to January 2020, refer to the 2020 HMP.

Table 10-2. Recent Flood Hazard Events

Date (s) of Event	Declaration Number	County Included	Flood Type	Description
July 1, 2020	N/A	N/A	Flash Flood	Energy rotating around an upper-level low over the northeast resulted in the development of scattered showers and thunderstorms. With light steering flow, this resulted in slow moving convection and isolated flash flooding. In Newark, all lanes were closed in both directions on NJ21 (McCarter Highway) at Clay Street due to flooding.
July 10, 2020	N/A	N/A	Flash Flood	Tropical Storm Fay tracked northward along the New Jersey coast before passing west of New York City. Several rounds of heavy rain occurred over the New York City metro area as the storm approached. This rain developed in a tropical airmass, with precipitable water values over 2 inches, resulting in numerous reports of flash flooding. Rainfall totals ranged from 1-3 inches across northeast New Jersey, with the ASOS in Caldwell, NJ reporting 2.75 inches, Newark Airport reporting 2.68 inches, and Teterboro Airport reporting. 2.62 inches. NJ21 (McCarter Highway) was flooded at Clay Street near Mount Pleasant Avenue in Newark. The Newark Fire Department rescued 18 people from flood waters in Newark, including 8 people in the 300 block of Wilson Avenue, 2 people from a car at Miller Avenue and New Jersey Railroad Avenue, and 8 people from their cars at the intersection of Pulaski Street and Clifford Street. Harper Terrace in Verona was closed due to flooding.
July 2, 2021	N/A	N/A	Flash Flood	A slow moving storm resulted in flash flooding across portions of urban northeast New Jersey, including Essex County. Rainfall amounts ranged from around 1 to 1.5 inches, including 1.47 inches reported by the Newark Airport ASOS. All lanes were closed due to flooding on the US 1&9 truck route northbound at the New Jersey Turnpike in Newark.
July 17, 2021	N/A	N/A	Flash Flood	Showers and thunderstorms developed in the vicinity of a stalled frontal boundary. This resulted in widespread flash flooding across portions of urban northeast New Jersey during the mid to late afternoon hours. Rainfall totals include 2.28 inches recorded by the Newark Airport ASOS and 2.17 inches reported by a COOP observer in Harrison. This rain fell across an area with wet antecedent conditions as a result of several rounds of heavy rainfall during the previous week to week and a half. The entrance ramp to the southbound New Jersey Turnpike from the Hudson County Extension (I-78) in Newark was closed due to flooding. All lanes were closed due to flooding on the US Route 1&9 truck route northbound at the New Jersey Turnpike in Newark. A NJ Transit bus was stuck in flood waters under the overpass on Meeker Avenue between Elizabeth Avenue and Frelinghuysen Avenue in Newark. The 22 people on board the bus were rescued by firefighters on a boat after climbing through the hatch on the roof of the bus. All lanes on NJ 21 were closed due to flooding at Emmet Street in Newark. Multiple motorists

Date (s) of Event	Declaration Number	County Included	Flood Type	Description
				were stranded in significant flash flooding in the Ironbound section and South and East Wards of Newark. Public safety was responding to multiple calls to assist people trapped inside their vehicles. Significant flooding was reported in the Ironbound section of Newark, with water above car tires and waist deep in many spots near the intersection of Ferry Street and Wilson Avenue. Flooding was reported in Port Newark with all lanes closed on Corbin Street northbound at Tyler Street. Port Authority officers rescued multiple people trapped in vehicles due to flash flooding in Port Newark and near the Newark International Airport.
July 29, 2021	N/A	N/A	Flash Flood	Scattered showers and thunderstorms moved across northeast New Jersey, resulting in isolated reports of flash flooding. CoCoRaHS observations show a localized area of 1-3 inches of rain along the border of Passaic and Essex Counties. In Essex County, there was significant street flooding reported around Bloomfield Avenue and Passaic Avenue in West Caldwell with cars flooded and people stuck. There were also reports of flooded basements.
August 21-22, 2021	N/A	N/A	Flash Flood	Showers and thunderstorms streaming northward well ahead of approaching Hurricane Henri resulted in flash flooding across portions of northeast New Jersey. Rainfall totals from this predecessor rainfall event ranged from 1-4 inches. The Peckman River at Ozone Avenue in Verona quickly rose above minor flood stage (3.5 feet) at 12:35am EDT August 22, crested at a height of 3.78 feet at 12:40am EDT, and fell back below flood stage at 12:55am EDT. All lanes were closed due to flooding on the I-280 eastbound exit ramp to Northfield Avenue in Orange.
September 1, 2021	3573-EM-NJ & 4614-DR-NJ for Remnants of Hurricane Ida	Yes	Flash Flood	Extremely heavy rainfall associated with the remnants of Hurricane Ida overspread northeast New Jersey during the evening of September 1 and continued through the early morning hours of September 2. Rainfall totals ranged from 5-8+ inches across much of the region, with much of that rain falling in just a few hours. This resulted in widespread flash flooding leading to numerous road closures and water rescues in addition to extensive river flooding. A 66-year-old man and his 46-year-old daughter died as a result of flooding after going into the basement of their home on Lincoln Place in Irvington to secure it as the Elizabeth River began to overflow. A 55-year-old man was found dead on Ridgewood Road in the vicinity of Berkeley Road in Maplewood due to flooding. He is believed to have been swept away by flood waters while attempting to remove debris from drains in the area. A car carrying two Seton Hall University students was overcome by flood waters on Main Avenue near Benson Avenue in Passaic. The body of one of the students, a 21-year-old man,

Date (s) of Event	Declaration Number	County Included	Flood Type	Description
				was later found in Newark after being swept down the Passaic River. An unidentified person died by electrocution as a result of flooding in Essex County. People were trapped in their cars in flood waters on Mill Street near the Second River in Belleville. A water rescue took place for a vehicle trapped in flood waters on South Street in Newark. The occupant was rescued by a Fire Department rescue boat from the roof of the car. A water rescue took place at the intersection of White Oak Ridge Road and Mohawk Road in Millburn with a vehicle stranded in flood waters. Multiple rescues were needed across Livingston for occupied cars stranded in flood waters. Numerous water rescues took place in Livingston. Rescue boats were used to pull occupants to safety on Walnut Street, East Hobart Gap Road, and Old Short Hills Road. Basement and garage flooding were reported in Livingston. Bragaw Avenue in Irvington, NJ had all lanes closed due to flooding from heavy rain. Flash flooding took place on McClellan Street near Newark International Airport with traffic blocked. The Essex County Sheriff's Department closed Branch Brook Park in Newark due to flooding on September 1. The Peckman River at Ozone Avenue in Verona rose above its minor flood stage of 3.5 feet at 8:00pm EDT. It then continued to rise, surpassing moderate flood stage (4.0 feet) at 8:10pm EDT, then major flood stage (5.0 feet) at 8:25pm EDT before cresting at a height of 6.20 feet at 9:20pm EDT. The river then slowly fell over the next few hours, returning to its banks at 12:40am EDT on September 2nd. The Third River at Bloomfield rose above its minor flood stage of 6.0 feet at 8:10pm EDT. The river then continued to rise, surpassing moderate flood stage (8.0 feet) at 8:45pm EDT and major flood stage (9.0 feet) at 9:05pm EDT before cresting at a height of 10.14 feet at 11:30pm EDT. After cresting, the river quickly fell back below minor flood stage by 3:45am EDT September 2nd. The crest of 10.14 feet is the highest on record for this location, exceeding the previous record crest of 9.97 feet in September 1999 due to Hurricane Floyd.

Source: (FEMA 2024); (NOAA NCEI 2024)

10.1.5 Future Conditions

Future hazard conditions, including frequency and severity of future events, is discussed in the sections below.

10.1.5.1 Probability

Information from FEMA, the New Jersey State HMP, and the NOAA-NCEI storm events database was used to identify the number of flood events that occurred in Essex County between 1996 and 2024. Table 10-3 presents the probability of future events for flooding in Essex County.

Table 10-3. Probability of Future Occurrences of Flood Events

Hazard Type	Number of Occurrences Between 1996 and 2024	% Chance of Occurring in Any Given Year
Coastal Flood	2	6.7%
Flash Flood	67	100%
Flood	23	76.7%
Total	92	100%

Source: (FEMA 2024); (NOAA NCEI 2024)

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for flood in the County is considered 'frequent' (100% annual probability; a hazard event may occur multiple times per year.).

10.1.5.2 Climate Change

According to the 2020 New Jersey Scientific Report on Climate Change, New Jersey is warming faster than the rest of the Northeast region and the world. Historically unprecedented warming is projected for the 21st century with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050. Annual precipitation in New Jersey is expected to increase by 4 percent to 11 percent by 2050. The intensity and frequency of precipitation events is anticipated to increase due to climate change (NJDEP 2020).

As temperatures increase, Earth's atmosphere can hold more water vapor which leads to a greater potential for precipitation. Currently, New Jersey receives an average of 46 inches of precipitation each year. Since the end of the twentieth century, New Jersey has experienced slight increases in the amount of precipitation it receives each year, and over the last 10 years there has been a 7.9 percent increase. By 2050, annual precipitation in New Jersey could increase by 4 percent to 11 percent. By the end of this century, heavy precipitation events are projected to occur two to five times more often and with more intensity than in the last century. New Jersey will experience more intense rain events, less snow, and more rainfalls. These factors mean New Jersey is likely to experience an increase in the number of flood events (NJDEP 2020).

A warmer atmosphere means storms have the potential to be more intense and occur more often. In New Jersey, extreme storms typically include coastal nor'easters, snowstorms, spring and summer thunderstorms, tropical storms, and on rare occasions hurricanes. Most of these events occur in the warmer months between April and October, with nor'easters occurring between September and April. Over the last 50 years, in New Jersey, storms that resulted in extreme rain increased by 71 percent which is a faster rate than anywhere else in the United States (NJDEP 2020).

Sea level rise is likely to increase the frequency and severity of coastal flooding events and nuisance flooding events. Assessed over several decades, the national trend in high tide flooding frequency is accelerating and is more than twice as likely now as it was in 2000. The rapid growth is in response to relative sea level rise, which is occurring along most U.S. coastlines and around the globe. High tide flooding is now rising and/or accelerating at nearly all NOAA tide gauge locations (NOAA 2025b).

10.1.5.3 Potential Future Impacts

Climate change is likely to increase flood risk across Essex County. While the County is largely built out, redevelopment may increase the population and structural value exposed to flooding. Changes in building requirements, including higher elevation requirements, are likely to reduce flood risk to new and substantially improved structures in Essex County.

10.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

10.2.1 Summary of Vulnerability

Flood vulnerability in Essex County is focused within the floodplain. However, flooding does take place outside the floodplain during severe rainfall and storm surge events and in areas of urban flooding. Municipalities with the greatest amount of development within the floodplain are most vulnerable to flooding. Flood risk has also been analyzed for areas exposed to storm surge flooding (Category 1 through Category 4), and climate influenced expanded design floodplains enforced and proposed by the NJ DEP.

10.2.2 Impact on Life, Health, and Safety

The impact of flooding on life, health, and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time is provided to residents. Exposure represents the population living in or near floodplain areas that could be impacted should a flood event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by the effects of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event). The degree of that impact will vary and is not strictly measurable. The impacts from each flood hazard of concern are described below.

To estimate population exposure to the 1-percent- and 0.2-percent annual chance flood events, the DFIRM flood boundaries were used. Based on the spatial analysis, there are an estimated 15,089 residents living in the 1-percent annual chance floodplain, or 1.8-percent of the County's total population. There are an estimated 29,367 residents living in the 0.2-percent annual chance floodplain, or 3.4-percent of the County's total population. The Township of Fairfield has the greatest number of residents living in the 1-

percent annual chance flood event hazard area with approximately 4,221 residents and the City of Newark has the greatest number of residents living in the 0.2-percent annual chance flood event with approximately 6,475 residents. Table 10-4 summarizes the population exposed to the flood hazard by jurisdiction.

Table 10-4. Estimated Number of Persons in Essex County Living in the 1-Percent and 0.2-Percent Annual Chance Flood Event Hazard Areas

Jurisdiction	Total Population (2023 ACS)	1-Percent Annual Chance Flood Event (100-year, SFHA)		0.2-Percent Annual Chance Flood Event (500-year)	
		Population Exposed	Percent of Total	Population Exposed	Percent of Total
Belleville (T)	37,756	525	1.4%	1,245	3.3%
Bloomfield (T)	52,974	2,341	4.4%	2,920	5.5%
Caldwell (B)	8,898	0	0.0%	0	0.0%
Cedar Grove (T)	13,252	19	0.1%	115	0.9%
East Orange (C)	69,183	305	0.4%	305	0.4%
Essex Fells (B)	2,320	0	0.0%	71	3.1%
Fairfield (T)	7,712	4,221	54.7%	6,358	82.4%
Glen Ridge (B)	7,827	97	1.2%	101	1.3%
Irvington (T)	60,334	221	0.4%	1,215	2.0%
Livingston (T)	31,128	586	1.9%	713	2.3%
Maplewood (T)	25,406	245	1.0%	360	1.4%
Millburn (T)	21,793	27	0.1%	1,411	6.5%
Montclair (T)	39,873	1,387	3.5%	1,644	4.1%
Newark (C)	307,188	365	0.1%	6,475	2.1%
North Caldwell (B)	6,622	10	0.1%	40	0.6%
Nutley (T)	29,767	692	2.3%	871	2.9%
City of Orange (T)	33,973	2,724	8.0%	3,131	9.2%
Roseland (B)	6,211	115	1.9%	277	4.5%
South Orange (V)	18,299	0	0.0%	0	0.0%
Verona (T)	14,441	121	0.8%	189	1.3%
West Caldwell (T)	10,897	43	0.4%	257	2.4%
West Orange (T)	48,276	1,047	2.2%	1,669	3.5%
Essex County (Total)	**854,130**	**15,089**	**1.8%**	**29,367**	**3.4%**

Source: (U.S. Census 2023); (FEMA 2020)

Table 10-5 displays the estimated number of persons exposed to Category 1 through 4 storm surge events. Only three municipalities have exposure to storm surge in Essex County; the Township of Belleville, the City of Newark, and the Township of Nutley. The City of Newark has the greatest number of persons exposed, ranging from 8,721 in the Category 1 storm surge scenario to 70,235 in the Category 4 scenario.

Table 10-5. Estimated Number of Persons in Essex County Living in the Storm Surge Hazard Areas

Jurisdiction	Total Population (2023 ACS)	Category 1 Storm Surge Hazard Area		Category 2 Storm Surge Hazard Area		Category 3 Storm Surge Hazard Area		Category 4 Storm Surge Hazard Area	
		Population Exposed	Percent of Total	Population Exposed	Percent of Total	Population Exposed	Percent of Total	Population Exposed	Percent of Total
Belleville (T)	37,756	89	0.2%	1,216	3.2%	3,025	8.0%	3,385	9.0%
Newark (C)	307,188	8,721	2.8%	40,748	13.3%	61,769	20.1%	70,235	22.9%

Jurisdiction	Total Population (2023 ACS)	Category 1 Storm Surge Hazard Area		Category 2 Storm Surge Hazard Area		Category 3 Storm Surge Hazard Area		Category 4 Storm Surge Hazard Area	
		Population Exposed	Percent of Total	Population Exposed	Percent of Total	Population Exposed	Percent of Total	Population Exposed	Percent of Total
Nutley (T)	29,767	0	0.0%	53	0.2%	213	0.7%	492	1.7%
Essex County (Total)	**854,130**	**8,810**	**1.0%**	**42,018**	**4.9%**	**65,006**	**7.6%**	**74,112**	**8.7%**

Source: (U.S. Census 2023); (NOAA 2025a)

Table 10-6 displays the estimated number of persons exposed to the Inland Flood Rule (BFE +3 feet) and the proposed Inundation Risk Zone (BFE +5 feet). The Inland Flood Rule would impact the population in all of the municipalities in Essex County aside from the Borough of Caldwell. The Township of Fairfield has the greatest percentage of population exposed (84.5%). In total, 11.9% of the population in Essex County are exposed to the Inland Flood Rule in Essex County (101,473 persons).

The proposed Inundation Risk Zone only impacts three municipalities; the Township of Belleville, the City of Newark, and the Township of Nutley. The City of Newark has the greatest percentage of buildings exposed (12.9%). In total, 4.9% of the population in Essex County would be exposed to the proposed Inundation Risk Zone in Essex County (41,586).

Table 10-6. Estimated Number of Persons in Essex County Living in the Inland Flood Rule and Proposed Inundation Risk Zone Hazard Areas

Jurisdiction	Total Population (2023 ACS)	1-Percent Annual Chance Flood Event (100-year, SFHA)		Inland Flood Rule		Proposed Inundation Risk Zone	
		Population Exposed	Percent of Total	Population Exposed	Percent of Total	Population Exposed	Percent of Total
Belleville (T)	37,756	525	1.4%	2,751	7.3%	1,918	5.1%
Bloomfield (T)	52,974	2,341	4.4%	13,045	24.6%	0	0.0%
Caldwell (B)	8,898	0	0.0%	0	0.0%	0	0.0%
Cedar Grove (T)	13,252	19	0.1%	221	1.7%	0	0.0%
East Orange (C)	69,183	305	0.4%	5,707	8.2%	0	0.0%
Essex Fells (B)	2,320	0	0.0%	6	0.3%	0	0.0%
Fairfield (T)	7,712	4,221	54.7%	6,518	84.5%	0	0.0%
Glen Ridge (B)	7,827	97	1.2%	898	11.5%	0	0.0%
Irvington (T)	60,334	221	0.4%	2,576	4.3%	0	0.0%
Livingston (T)	31,128	586	1.9%	4,383	14.1%	0	0.0%
Maplewood (T)	25,406	245	1.0%	1,439	5.7%	0	0.0%
Millburn (T)	21,793	27	0.1%	2,040	9.4%	0	0.0%
Montclair (T)	39,873	1,387	3.5%	4,449	11.2%	0	0.0%
Newark (C)	307,188	365	0.1%	32,350	10.5%	39,575	12.9%
North Caldwell (B)	6,622	10	0.1%	23	0.3%	0	0.0%
Nutley (T)	29,767	692	2.3%	1,947	6.5%	93	0.3%
City of Orange (T)	33,973	2,724	8.0%	8,299	24.4%	0	0.0%
Roseland (B)	6,211	115	1.9%	519	8.4%	0	0.0%
South Orange (V)	18,299	0	0.0%	391	2.1%	0	0.0%
Verona (T)	14,441	121	0.8%	592	4.1%	0	0.0%
West Caldwell (T)	10,897	43	0.4%	1,695	15.6%	0	0.0%
West Orange (T)	48,276	1,047	2.2%	11,622	24.1%	0	0.0%
Essex County (Total)	**854,130**	**15,089**	**1.8%**	**101,473**	**11.9%**	**41,586**	**4.9%**

Source: (U.S. Census 2023); (Rutgers n.d.) (NJDEP n.d.) (FEMA 2020)

In addition, displaced populations were estimated for the 1-percent annual chance flood event. It is important to note that the impacts to the households in the FEMA flood hazard area are assessed using the riverine flood model in Hazus. Using 2023 American Community Survey data, Hazus estimates 4,679 people would be displaced by the 1-percent annual chance flood event with 467 that may seek short-term sheltering. These statistics, by jurisdiction, are presented in Table 10-7.

Table 10-7. Estimated Population Seeking Short-Term Shelter from the 1-percent Annual Chance Flood Event

Jurisdiction	Total Population (2023 ACS)	Displaced Population	Persons Requiring Short-Term Shelter
Belleville (T)	37,756	132	13
Bloomfield (T)	52,974	508	68
Caldwell (B)	8,898	0	0
Cedar Grove (T)	13,252	1	0
City of Orange (T)	33,973	991	178
East Orange (C)	69,183	39	12
Essex Fells (B)	2,320	0	0
Fairfield (T)	7,712	2,482	92
Glen Ridge (B)	7,827	12	0
Irvington (T)	60,334	25	15
Livingston (T)	31,128	29	5
Maplewood (T)	25,406	17	5
Millburn (T)	21,793	1	0
Montclair (T)	39,873	152	24
Newark (C)	307,188	25	6
North Caldwell (B)	6,622	1	0
Nutley (T)	29,767	130	16
Roseland (B)	6,211	3	1
South Orange (V)	18,299	0	0
Verona (T)	14,441	16	2
West Caldwell (T)	10,897	3	1
West Orange (T)	48,276	111	28
Essex County (Total)	854,130	4,679	467

Source: (FEMA 2025); (FEMA 2024a); (FEMA 2024b)

10.2.2.1 Socially Vulnerable Populations

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

Socially vulnerable populations are most susceptible to flood events based on several factors, including their physical and financial ability to react or respond during a flood. Vulnerable populations include homeless persons, elderly (over 65 years old), low income or linguistically isolated populations, people with life-threatening illnesses, and residents that may struggle to evacuate. The population over the age of 65 is also more vulnerable. They may require extra time to evacuate or need assistance to evacuate and are more likely to seek or need medical attention.

10.2.3 Impact on General Building Stock

After considering the population exposed and potentially vulnerable to the flood hazard, the built environment was evaluated. Exposure includes those buildings located in the flood hazard areas. Table 10-8 summarizes the number of structures located in the 1-percent and 0.2-percent annual chance flood events by jurisdiction. In summary, there are 4,640 buildings located in the 1-percent annual chance flood boundary. In addition, there are 8,119 buildings located in the 0.2-percent annual chance flood boundary.

Table 10-8. Estimated Number of Buildings in Essex County Located in the 1-Percent and 0.2-Percent Annual Chance Flood Event Hazard Areas

Jurisdiction	Total Number of Buildings	1-Percent Annual Chance Flood Event (100-year, SFHA)		0.2-Percent Annual Chance Flood Event (500-year)	
		Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total
Belleville (T)	7,910	123	1.6%	259	3.3%
Bloomfield (T)	11,720	494	4.2%	616	5.3%
Caldwell (B)	1,738	1	0.1%	1	0.1%
Cedar Grove (T)	3,944	9	0.2%	39	1.0%
East Orange (C)	7,908	48	0.6%	48	0.6%
Essex Fells (B)	766	0	0.0%	27	3.5%
Fairfield (T)	3,121	1,766	56.6%	2,578	82.6%
Glen Ridge (B)	2,256	31	1.4%	32	1.4%
Irvington (T)	7,934	39	0.5%	175	2.2%
Livingston (T)	9,795	204	2.1%	262	2.7%
Maplewood (T)	6,738	65	1.0%	95	1.4%
Millburn (T)	6,437	20	0.3%	457	7.1%
Montclair (T)	9,436	290	3.1%	363	3.8%
Newark (C)	43,085	598	1.4%	1,821	4.2%
North Caldwell (B)	2,095	6	0.3%	19	0.9%
Nutley (T)	7,945	230	2.9%	289	3.6%
City of Orange (T)	3,890	378	9.7%	427	11.0%
Roseland (B)	1,794	40	2.2%	87	4.8%
South Orange (V)	4,188	6	0.1%	6	0.1%
Verona (T)	4,113	33	0.8%	52	1.3%
West Caldwell (T)	3,730	46	1.2%	115	3.1%
West Orange (T)	11,845	213	1.8%	351	3.0%
Essex County (Total)	162,388	4,640	2.9%	8,119	5.0%

Source: (Essex County 2019); (FEMA 2020)

Table 10-9 displays the estimated number of buildings exposed to Category 1 through 4 storm surge events. Only three municipalities have exposure to storm surge in Essex County; the Township of Belleville, the City of Newark, and the Township of Nutley.

Table 10-9. Estimated Number of Building in Essex County Located in the Storm Surge Hazard Areas

Jurisdiction	Total Number of Buildings	Category 1 Storm Surge Hazard Area		Category 2 Storm Surge Hazard Area		Category 3 Storm Surge Hazard Area		Category 4 Storm Surge Hazard Area	
		Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total
Belleville (T)	7,910	25	0.3%	198	2.5%	469	5.9%	543	6.9%
Newark (C)	43,085	2,020	4.7%	6,433	14.9%	9,009	20.9%	9,872	22.9%
Nutley (T)	7,945	0	0.0%	9	0.1%	43	0.5%	85	1.1%
Essex County (Total)	162,388	2,045	1.3%	6,640	4.1%	9,521	5.9%	10,500	6.5%

Source: (Essex County 2019); (NOAA 2025a)

Table 10-10 displays the estimated number of buildings exposed to the Inland Flood Rule (BFE +3 feet) and the proposed Inundation Risk Zone (BFE +5 feet). The Inland Flood Rule would impact all of the municipalities in Essex County. The Township of Fairfield has the greatest percentage of buildings exposed (86.1% of buildings). In total, 13.7% of buildings in Essex County are exposed to the Inland Flood Rule in Essex County.

The proposed Inundation Risk Zone only impacts three municipalities; the Township of Belleville, the City of Newark, and the Township of Nutley. The City of Newark has the greatest percentage of buildings exposed (14.7% of buildings). In total, 4.1% of buildings in Essex County would be exposed to the proposed Inundation Risk Zone in Essex County.

Table 10-10. Estimated Number of Buildings in Essex County Located in the Inland Flood Rule and Proposed Inundation Risk Zone Hazard Areas

Jurisdiction	Total Number of Buildings	1-Percent Annual Chance Flood Event (100-year, SFHA)		Inland Flood Rule		Inundation Risk Zone	
		Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total
Belleville (T)	7,910	123	1.6%	546	6.9%	294	3.7%
Bloomfield (T)	11,720	494	4.2%	2,885	24.6%	0	0.0%
Caldwell (B)	1,738	1	0.1%	1	0.1%	0	0.0%
Cedar Grove (T)	3,944	9	0.2%	77	2.0%	0	0.0%
East Orange (C)	7,908	48	0.6%	1,000	12.6%	0	0.0%
Essex Fells (B)	766	0	0.0%	2	0.3%	0	0.0%
Fairfield (T)	3,121	1,766	56.6%	2,686	86.1%	0	0.0%
Glen Ridge (B)	2,256	31	1.4%	258	11.4%	0	0.0%
Irvington (T)	7,934	39	0.5%	386	4.9%	0	0.0%
Livingston (T)	9,795	204	2.1%	1,449	14.8%	0	0.0%
Maplewood (T)	6,738	65	1.0%	359	5.3%	0	0.0%
Millburn (T)	6,437	20	0.3%	662	10.3%	0	0.0%
Montclair (T)	9,436	290	3.1%	1,034	11.0%	0	0.0%
Newark (C)	43,085	598	1.4%	5,736	13.3%	6,333	14.7%
North Caldwell (B)	2,095	6	0.3%	13	0.6%	0	0.0%
Nutley (T)	7,945	230	2.9%	624	7.9%	18	0.2%
City of Orange (T)	3,890	378	9.7%	968	24.9%	0	0.0%
Roseland (B)	1,794	40	2.2%	157	8.8%	0	0.0%

Jurisdiction	Total Number of Buildings	1-Percent Annual Chance Flood Event (100-year, SFHA)		Inland Flood Rule		Inundation Risk Zone	
		Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total	Buildings Exposed	Percent of Total
South Orange (V)	4,188	6	0.1%	101	2.4%	0	0.0%
Verona (T)	4,113	33	0.8%	163	4.0%	0	0.0%
West Caldwell (T)	3,730	46	1.2%	609	16.3%	0	0.0%
West Orange (T)	11,845	213	1.8%	2,530	21.4%	0	0.0%
Essex County (Total)	162,388	4,640	2.9%	22,246	13.7%	6,645	4.1%

Source: (Essex County 2019); (FEMA 2020); (Rutgers n.d.) (NJDEP n.d.)

10.2.4 Impact on Community Lifelines

Community lifelines are at high risk to flooding events. Flooding often can result in impassable roadways, reducing or eliminating access to critical services. Flooding can result in utility failure and the contamination of drinking water.

Table 10-11. Lifelines Most Likely Impacted by Flood

Lifeline Categories	Notable Impacts
Safety and Security	Community safety may be threatened due to potential direct harm from flooding and compounding effects on administration of services. Transportation infrastructure issues may directly impact the abilities of law enforcement, emergency medical services, fire service, search and rescue, and other government services to respond to a flooding hazard.
Food, Hydration, Shelter	Flooding can cause damage to structures which provide shelter, and the food that people store in those structures. Thus, the food supply chain may be disrupted due to impacts on agricultural production and transportation infrastructure.
Health and Medical	Medical facilities can be impacted due to damage to structures from flooding, while patient movement and medical supply chains can be impacted by effects on transportation infrastructure.
Energy	Components of electric power generation, transmission and distribution systems are at risk for damage by floods, potentially resulting in service failure. Flooding can also adversely impact oil and gas production and electricity generation impacting energy supply.
Communications	Flooding can damage telecommunications equipment. Communications can also be impacted by power outages caused by flooding. This can impact response coordination across all emergency service disciplines.
Transportation	Flooding can strain the Transportation lifeline in both the short- and long-term through transportation delays and infrastructure damage. When flooding occurs on roadways, it can make transportation dangerous or even impossible. Damage to the Transportation lifeline has cascading effects among other lifelines which depend on movement of people or goods.
Hazardous Materials	The Hazardous Materials lifeline can be disrupted by flooding in several ways. Floodwaters may directly impact facilities that store or handle hazardous materials, while flooded infrastructure can hinder their safe transport. Additionally, contaminated sites may be disturbed, causing hazardous materials to spread through the floodwaters, increasing the risk of exposure and environmental damage.
Water Systems	Flooding can threaten the Water System lifeline in multiple ways. It can damage drinking water wells, leading to contamination of aquifers and water supplies.

Lifeline Categories	Notable Impacts
	Additionally, sewage systems especially combined sewer systems may be overwhelmed, causing backups in sewer pipes or direct overflow of untreated sewage into water sources, increasing public health risks.

Source: (NJOEM 2024)

Table 10-12 and Table 10-13 summarize the number of community lifelines exposed to the 1-percent and 0.2-percent flood inundation areas by jurisdiction. In total, 69 critical facilities are exposed to the 1-percent annual chance flood event and 101 facilities are exposed to the 0.2-percent annual chance flood event. The Township of Fairfield and the City of Newark have the greatest number of facilities exposed in each flood scenario.

Table 10-12. Critical Facility Exposure to the 1-Percent Annual Chance Flood Event

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Water Systems	Other	Total
Belleville (T)	0	1	1	0	0	0	0	0	0	2
Bloomfield (T)	0	0	0	0	0	3	0	0	1	4
Caldwell (B)	0	0	0	0	0	0	0	0	0	0
Cedar Grove (T)	0	0	0	0	0	0	0	0	0	0
East Orange (C)	0	0	0	0	0	0	0	0	0	0
Essex Fells (B)	0	0	0	0	0	0	0	0	0	0
Fairfield (T)	0	3	0	0	1	6	1	4	0	15
Glen Ridge (B)	0	0	0	0	0	0	0	0	0	0
Irvington (T)	0	0	0	0	0	0	0	0	0	0
Livingston (T)	0	0	0	0	1	0	0	0	0	1
Maplewood (T)	0	0	0	0	0	0	0	0	0	0
Millburn (T)	0	0	1	0	0	0	0	5	0	6
Montclair (T)	0	0	0	1	2	0	0	1	0	4
Newark (C)	0	3	1	2	0	1	7	2	0	16
North Caldwell (B)	0	0	0	0	0	0	0	0	0	0
Nutley (T)	0	0	0	0	0	2	0	0	0	2
City of Orange (T)	0	2	0	0	0	4	1	1	0	8
Roseland (B)	0	0	0	0	0	1	0	2	0	3
South Orange (V)	0	0	0	0	0	1	0	0	0	1
Verona (T)	0	0	0	0	0	2	0	0	0	2
West Caldwell (T)	0	0	0	0	0	0	0	0	0	0
West Orange (T)	0	0	0	0	0	3	0	2	0	5
Essex County (Total)	**0**	**9**	**3**	**3**	**4**	**23**	**9**	**17**	**1**	**69**

Source: *(FEMA 2020); (Essex County 2019)*

Table 10-13. Critical Facility Exposure to the 0.2-Percent Annual Chance Flood Event

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Water Systems	Other	Total
Belleville (T)	0	1	1	0	0	1	0	0	0	3
Bloomfield (T)	0	0	0	0	0	3	0	0	1	4
Caldwell (B)	0	0	0	0	0	0	0	0	0	0
Cedar Grove (T)	0	0	0	0	0	0	0	0	0	0
East Orange (C)	0	0	0	0	0	0	0	0	0	0
Essex Fells (B)	0	0	0	0	0	0	0	2	0	2
Fairfield (T)	0	6	1	0	1	12	1	4	0	25
Glen Ridge (B)	0	0	0	0	0	0	0	0	0	0
Irvington (T)	0	1	0	0	0	0	0	0	0	1
Livingston (T)	0	0	0	0	1	0	0	1	0	2
Maplewood (T)	0	1	0	0	0	0	0	0	0	1
Millburn (T)	0	0	1	0	0	1	0	6	0	8
Montclair (T)	0	0	0	1	2	0	0	2	0	5
Newark (C)	0	7	1	3	0	3	8	2	0	24
North Caldwell (B)	0	0	0	0	0	0	0	1	0	1
Nutley (T)	0	0	0	0	0	3	0	0	0	3
City of Orange (T)	0	2	0	0	0	4	1	1	0	8
Roseland (B)	0	0	0	0	0	1	0	2	0	3
South Orange (V)	0	0	0	0	0	1	0	0	0	1
Verona (T)	0	0	0	0	0	2	0	0	0	2
West Caldwell (T)	0	0	0	0	0	0	0	1	0	1
West Orange (T)	0	0	0	0	0	3	0	4	0	7
Essex County (Total)	**0**	**18**	**4**	**4**	**4**	**34**	**10**	**26**	**1**	**101**

Source: (FEMA 2020); (Essex County 2019)

Table 10-14 summarizes the number of community lifelines exposed to the Category 1-4 storm surge areas by jurisdiction. Only the Township of Belleville, the City of Newark, and the Township of Nutley have critical facilities exposed to the storm surge hazard areas with the City of Newark with the greatest number of facilities exposed.

Table 10-14. Critical Facility Exposure to Storm Surge Areas

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Water Systems	Other	Total
Category 1 Storm Surge Area										
Belleville (T)	0	1	1	0	0	0	0	0	0	2
Newark (C)	0	7	1	2	0	3	8	2	0	23
Nutley (T)	0	0	0	0	0	0	0	0	0	0
Essex County (Total)	0	8	2	2	0	3	8	2	0	25
Category 2 Storm Surge Area										
Belleville (T)	0	1	1	0	0	2	0	0	0	4
Newark (C)	0	7	3	3	1	15	12	2	0	43
Nutley (T)	0	0	0	0	0	0	0	0	0	0
Essex County (Total)	0	8	4	3	1	17	12	2	0	47
Category 3 Storm Surge Area										
Belleville (T)	0	1	1	0	0	3	0	0	0	5
Newark (C)	0	8	3	3	2	24	14	2	0	56
Nutley (T)	0	0	1	0	0	1	0	0	0	2
Essex County (Total)	0	9	5	3	2	28	14	2	0	63
Category 4 Storm Surge Area										
Belleville (T)	0	2	1	0	0	3	0	0	0	6
Newark (C)	0	9	4	3	2	33	14	2	0	67
Nutley (T)	0	0	1	0	0	1	0	0	0	2
Essex County (Total)	0	11	6	3	2	37	14	2	0	75

Source: (NOAA 2025a); (Essex County 2019)

Note: No critical facility exposure to storm surge for the municipalities that are not listed.

10.2.5 Impact on the Economy

Table 10-15 displays the estimated exposure to the 1-percent annual chance flood event (also known as the 100-year event). 6.9% of the total replacement cost value (structure and contents) in Essex County is exposed to the 100-year event. However, using Hazus, expected damages from this event are roughly 0.8% of the total replacement cost value in the County.

Table 10-15. Estimated Exposure and Total Value of Damages from the 1-Percent Annual Chance Flood Events in Essex County

Jurisdiction	Total Replacement Cost Value	1-Percent Annual Chance Flood Event			
		Total Replacement Cost Value Exposed	Percent of Total Replacement Cost Value Exposed	Total Replacement Cost Value Damaged	Percent of Total Replacement Cost Value Damaged
Belleville (T)	$5,440,939,832	$313,921,025	5.8%	$27,765,315	0.5%
Bloomfield (T)	$7,149,452,578	$393,843,481	5.5%	$85,747,183	1.2%

Jurisdiction	Total Replacement Cost Value	1-Percent Annual Chance Flood Event			
		Total Replacement Cost Value Exposed	Percent of Total Replacement Cost Value Exposed	Total Replacement Cost Value Damaged	Percent of Total Replacement Cost Value Damaged
Caldwell (B)	$1,437,101,129	$547,866	0.0%	$0	0.0%
Cedar Grove (T)	$3,664,877,018	$6,604,434	0.2%	$556,994	0.0%
East Orange (C)	$7,298,495,889	$81,573,699	1.1%	$13,771,479	0.2%
Essex Fells (B)	$624,599,485	$0	0.0%	$0	0.0%
Fairfield (T)	$7,708,467,384	$4,821,567,684	62.5%	$711,801,771	9.2%
Glen Ridge (B)	$1,311,356,144	$13,394,259	1.0%	$2,652,988	0.2%
Irvington (T)	$6,543,152,214	$40,102,433	0.6%	$4,119,442	0.1%
Livingston (T)	$9,227,217,608	$235,372,942	2.6%	$16,561,523	0.2%
Maplewood (T)	$4,279,929,361	$35,458,941	0.8%	$8,077,823	0.2%
Millburn (T)	$6,236,661,855	$22,566,650	0.4%	$1,488,841	0.0%
Montclair (T)	$7,012,741,670	$171,938,010	2.5%	$12,724,081	0.2%
Newark (C)	$50,617,106,841	$3,195,772,432	6.3%	$221,375,375	0.4%
North Caldwell (B)	$2,103,919,331	$9,256,970	0.4%	$1,135,653	0.1%
Nutley (T)	$4,550,682,627	$174,232,196	3.8%	$20,666,357	0.5%
City of Orange (T)	$4,186,194,813	$412,481,177	9.9%	$37,115,934	0.9%
Roseland (B)	$2,338,671,996	$38,384,657	1.6%	$1,317,806	0.1%
South Orange (V)	$3,553,949,814	$11,385,517	0.3%	$1,929,987	0.1%
Verona (T)	$2,639,752,949	$20,473,544	0.8%	$2,999,757	0.1%
West Caldwell (T)	$4,439,689,868	$235,558,763	5.3%	$18,501,118	0.4%
West Orange (T)	$9,974,739,027	$288,089,615	2.9%	$24,953,652	0.3%
Essex County (Total)	$152,339,699,431	$10,522,526,296	6.9%	$1,215,263,080	0.8%

Source: (FEMA 2020); (Essex County 2019)

Table 10-16 displays the total replacement cost value exposed to the Inland Flood Rule (BFE +3 feet) and the proposed Inundation Risk Zone (BFE +5 feet). The Inland Flood Rule would impact all of the municipalities in Essex County. The Township of Fairfield has the greatest percentage of total replacement cost value exposure (90.9% total building value exposed). In total, $35 billion total building value is exposed to the Inland Flood Rule in Essex County. The proposed Inundation Risk Zone only impacts three municipalities; the Township of Belleville, the City of Newark, and the Township of Nutley. The City of Newark has the greatest percentage of total replacement cost value exposure (17.7% total replacement cost value exposed). In total, $18.1 billion total replacement cost value is exposed to the proposed Inundation Risk Zone in Essex County.

Table 10-16. Estimated Total Building Value Located in the Inland Flood Rule and Proposed Inundation Risk Zone Hazard Areas

Jurisdiction	Total Replacement Cost Value	1-Percent Annual Chance Flood Event (100-year, SFHA)		Inland Flood Rule		Proposed Inundation Risk Zone	
		Total Replacement Cost Value Exposed	Percent of Total Replacement Cost Value Exposed	Total Replacement Cost Value Exposed	Percent of Total Replacement Cost Value Exposed	Total Replacement Cost Value Exposed	Percent of Total Replacement Cost Value Exposed
Belleville (T)	$5,440,939,832	$313,921,025	5.8%	$670,148,112	12.3%	$511,423,198	9.4%
Bloomfield (T)	$7,149,452,578	$393,843,481	5.5%	$2,037,451,068	28.5%	$0	0.0%
Caldwell (B)	$1,437,101,129	$547,866	0.0%	$547,866	0.0%	$0	0.0%
Cedar Grove (T)	$3,664,877,018	$6,604,434	0.2%	$72,284,943	2.0%	$0	0.0%
East Orange (C)	$7,298,495,889	$81,573,699	1.1%	$677,816,310	9.3%	$0	0.0%
Essex Fells (B)	$624,599,485	$0	0.0%	$1,249,091	0.2%	$0	0.0%
Fairfield (T)	$7,708,467,384	$4,821,567,684	62.5%	$7,004,820,017	90.9%	$0	0.0%
Glen Ridge (B)	$1,311,356,144	$13,394,259	1.0%	$108,300,189	8.3%	$0	0.0%
Irvington (T)	$6,543,152,214	$40,102,433	0.6%	$263,079,413	4.0%	$0	0.0%
Livingston (T)	$9,227,217,608	$235,372,942	2.6%	$1,440,301,685	15.6%	$0	0.0%
Maplewood (T)	$4,279,929,361	$35,458,941	0.8%	$419,219,429	9.8%	$0	0.0%
Millburn (T)	$6,236,661,855	$22,566,650	0.4%	$807,736,758	13.0%	$0	0.0%
Montclair (T)	$7,012,741,670	$171,938,010	2.5%	$836,042,198	11.9%	$0	0.0%
Newark (C)	$50,617,106,841	$3,195,772,432	6.3%	$15,017,085,939	29.7%	$17,666,887,098	34.9%
North Caldwell (B)	$2,103,919,331	$9,256,970	0.4%	$30,919,575	1.5%	$0	0.0%
Nutley (T)	$4,550,682,627	$174,232,196	3.8%	$437,310,295	9.6%	$21,204,268	0.5%
City of Orange (T)	$4,186,194,813	$412,481,177	9.9%	$1,295,046,266	30.9%	$0	0.0%
Roseland (B)	$2,338,671,996	$38,384,657	1.6%	$150,354,296	6.4%	$0	0.0%
South Orange (V)	$3,553,949,814	$11,385,517	0.3%	$75,868,497	2.1%	$0	0.0%
Verona (T)	$2,639,752,949	$20,473,544	0.8%	$94,783,736	3.6%	$0	0.0%
West Caldwell (T)	$4,439,689,868	$235,558,763	5.3%	$1,424,812,688	32.1%	$0	0.0%
West Orange (T)	$9,974,739,027	$288,089,615	2.9%	$2,087,607,839	20.9%	$0	0.0%
Essex County (Total)	$152,339,699,431	$10,522,526,296	6.9%	$34,952,786,209	22.9%	$18,199,514,564	11.9%

Source: (U.S. Census 2023); (Essex County 2019); (FEMA 2020); (Rutgers n.d.); (NJDEP n.d.)

Table 10-17 provides the total replacement cost value exposed to the Category 1 through 4 storm surge events. Only three municipalities are exposed to storm surge; the Township of Belleville, the City of Newark, and the Township of Nutley. Exposure of total replacement cost value in the County ranges from 4.9% exposure ($7.4 billion) from the Category 1 storm surge event to 14.2% exposure ($23.4 billion) from the Category 4 storm surge event. The City of Newark has the greatest exposure, ranging from 14.6% exposure of total replacement cost value ($7.4 billion) from the Category 1 storm surge event to 44.2% exposure ($22.3 billion) from the Category 4 storm surge event.

Table 10-17. Estimated Building Value Exposed to Category 1-4 Storm Surge Events

Jurisdiction	Total Replacement Cost Value	Total Replacement Cost Value Exposed	Percent Exposed
Category 1 Storm Surge Area			
Belleville (T)	$5,440,939,832	$43,099,991	0.8%
Newark (C)	$50,617,106,841	$7,394,707,263	14.6%
Nutley (T)	$4,550,682,627	$0	0.0%
Essex County (Total)	152,339,699,431	$7,437,807,254	4.9%
Category 2 Storm Surge Area			
Belleville (T)	$5,440,939,832	$436,284,503	8.0%
Newark (C)	$50,617,106,841	$17,971,125,294	35.5%
Nutley (T)	$4,550,682,627	$9,966,734	0.2%
Essex County (Total)	152,339,699,431	$18,417,376,532	12.1%
Category 3 Storm Surge Area			
Belleville (T)	$5,440,939,832	$731,974,159	13.5%
Newark (C)	$50,617,106,841	$20,729,239,208	41.0%
Nutley (T)	$4,550,682,627	$98,444,002	2.2%
Essex County (Total)	152,339,699,431	$21,559,657,368	14.2%
Category 4 Storm Surge Area			
Belleville (T)	$5,440,939,832	$916,843,606	16.9%
Newark (C)	$50,617,106,841	$22,380,328,295	44.2%
Nutley (T)	$4,550,682,627	$141,873,629	3.1%
Essex County (Total)	152,339,699,431	$23,439,045,531	15.4%

Source: (Essex County 2019); (NOAA 2025a)

10.2.5.1 National Flood Insurance Program

All municipalities in Essex County participate in the National Flood Insurance Program (NFIP). Participating in the NFIP is voluntary and to join, a community must complete an application; adopt a resolution of intent to participate and cooperate with FEMA; and adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria, and the ordinance must also adopt any FIRM or FHBM for the community. By participating, communities agree to adopt and implement local floodplain management regulations that protect lives and reduce risk from future flooding. In return, the federal government makes flood insurance available to property owners throughout the community (FEMA 2020) (FEMA 2022).

There are roughly 4,280 NFIP policies in Essex County. The majority of NFIP policies are found in the Township of Fairfield (1,045). However, other structures may have flood insurance through private insurers.

The County has 580 repetitive loss properties and 146 severe repetitive loss properties. Occupancy class of these properties was not available for this HMP update. The majority of these properties are located in the Township of Fairfield (274 repetitive loss properties and 105 severe repetitive loss properties). According to FEMA, a repetitive loss (RL) property is a NFIP-insured structure that has had at least two paid flood losses of more than $1,000 in any 10-year period since 1978. A severe repetitive loss (SRL) property is a NFIP-insured structure that has had four or more separate claim payments made under a standard flood insurance policy, with the amount of each claim exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or at least two separate claims payments made under a standard flood insurance policy with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss (FEMA 2022).

Table 10-18 summarizes the NFIP community statistics for Essex County.

Table 10-18. National Flood Insurance Program Statistics

Jurisdiction	Total Policies	Total Premiums	Total Insurance in Force	Total Claims	Total Payment	Repetitive Loss Properties	Severe Repetitive Loss Properties
Belleville (T)	379	$310,916	$74,721,000	247	$10,947,550	40	7
Bloomfield (T)	410	$743,046	$110,323,000	640	$10,339,917	33	4
Caldwell (B)	5	$16,734	$1,924,000	12	$429,004	0	0
Cedar Grove (T)	38	$62,210	$12,274,000	33	$1,088,017	6	0
East Orange (C)	87	$105,979	$24,167,000	85	$984,001	4	0
Essex Fells (B)	9	$8,606	$2,726,000	14	$175,322	1	0
Fairfield (T)	1,045	$1,412,900	$348,231,000	2,127	$70,863,699	274	105
Glen Ridge (B)	42	$42,004	$12,524,000	33	$201,549	2	0
Irvington (T)	50	$69,214	$14,096,000	153	$1,781,649	17	1
Livingston (T)	198	$249,647	$73,820,000	288	$2,720,274	14	2
Maplewood (T)	150	$153,650	$42,784,000	141	$1,977,009	13	1
Millburn (T)	239	$363,233	$70,473,000	416	$13,680,992	39	3
Montclair (T)	480	$333,866	$144,225,000	300	$3,094,342	29	3
Newark (C)	225	$637,861	$104,124,000	338	$25,408,294	26	7
North Caldwell (B)	31	$19,387	$9,827,000	32	$347,600	5	0
Nutley (T)	230	$413,798	$49,077,000	338	$6,890,896	26	8
Roseland (B)	28	$34,806	$8,601,000	29	$317,578	3	0
City of Orange (T)	238	$350,883	$60,367,000	227	$2,151,211	16	2
South Orange (V)	54	$52,862	$16,768,000	63	$633,899	5	0
Verona (T)	72	$117,118	$19,070,000	93	$932,173	9	1
West Caldwell (T)	85	$110,754	$31,778,000	54	$2,804,637	5	2
West Orange (T)	185	$241,319	$54,275,000	268	$2,190,597	13	0
Essex County (Total)	**4,280**	**$5,850,793**	**$1,286,175,000**	**5,931**	**$159,960,219**	**580**	**146**

Source: (FEMA 2025); (FEMA 2024a); (FEMA 2024b)

Notes: Total policies and total insurance in force data current as of 11/30/2024.
Total claims, total payment, and total premium data current as of 12/2/2024.
Repetitive Loss and Severe Repetitive Loss data current as of 1/9/2025.

10.2.6 Impact on Historic and Cultural Resources

Historic structures were not constructed to the modern building code and are less likely to be able to withstand the forces of flooding events. This may result in structures being pushed off their foundations, collapses, and other structural failures. Historic structures in the floodplain are also very unlikely to be built to the modern design elevation, making them more likely to be damaged by flooding events.

10.2.7 Impact on Ecosystems and Natural Resources

The environmental impacts of a flood can include significant water quality and debris-disposal issues. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and waterways. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals can get added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties. In addition, severe erosion is likely; such erosion can negatively impact local ecosystems.

10.2.8 Change in Vulnerability Since the Previous HMP

Available Risk Map products were used for the flood risk assessment in the 2020 HMP (dated 2017). During the previous plan the FEMA floodplains were also being remapped. The effective FEMA floodplain dated April 2020 with latest LOMAR effective September 2020 was used for this plan update. There have been changes in the floodplain throughout the county, with the largest change being seen in the City of Newark with a decreased 1% annual chance floodplain. The depth grid used in Hazus is the same data as the State of NJ HMP flood risk assessment which aligns with the 2020 FEMA effective maps.

The vulnerability of Essex County to flooding continues to grow as climate change increases the likelihood of heavy rainfall events and the sea level rises. However, continued mitigation efforts aim to combat this flood risk. The establishment of the Inland Flood Rule and the proposed REAL Rule also will result in new construction being built to account for the changing flood risks in Essex County.

10.3 Mitigation Opportunities

A range of potential opportunities for mitigating the flood hazard have been identified and considered by plan participants:

- Manipulate the hazard:
    - Clear stormwater drains and culverts
    - Providing retention and detention areas
    - Structural flood control: levees, dams, channelization, revetments.
    - Construct regional stormwater control facilities
    - Separate CSOs
    - Permeable pavement

- Reduce exposure and vulnerability to the hazard:
  - Locate or re-locate personal residences, businesses, and critical facilities outside of hazard area
  - Relocate critical infrastructure, such as power lines, underground
  - Institute low impact development techniques on property
  - Retrofit existing structures and utilities above Base Flood Elevation (BFE)and Design Flood Elevation (DFE)
  - Floodproof existing structures and when new critical infrastructure must be located in floodplains (wet- or dry floodproofing)
  - Store hazardous materials above BFE or outside of flood prone areas
  - Build redundancy for critical functions/ retrofit critical buildings
  - Harden structures and infrastructure (wet and dry-floodproofing)
  - Acquire or relocate identified repetitive loss properties
  - Adopt land development criteria such as PUD's, density transfers, clustering
  - Pass an ordinance to incorporate additional zoning classifications into flood zones within each municipality
  - Increase floodplain standards within municipality
  - Provide redundancy for critical functions and infrastructure
  - Adopt appropriate regulatory standards such as cumulative substantial improvement/damage, freeboard, lower substantial damage threshold, compensatory storage
  - Enhance stormwater management regulations
  - Add a Flood and/or a Utility Master Plan element to master planning
  - Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on down-stream communities.
  - Participate in the Community Rating System (CRS)
  - Implement as-built regulatory requirements
  - Implement site review ordinances/requirements
  - Incorporate retrofitting/replacement of critical facilities and infrastructure in Capital Improvement Plans (CIPs)
  - Purchase flood insurance
  - Support sustainable and resilient land use and community development
  - Recognize sea level rise and erosion areas as a hazard overlay for planning
  - Limit new development and critical infrastructure inside the sea level rise area
  - Develop design standards for development inside sea level rise hazard area
  - Incentivize improved flood risk management
- Build local capacity to respond to or prepare for the hazard:
  - Develop household mitigation plan, such as retrofit savings, communication capability with outside, 72-hr. self-sufficiency during and after an event
  - Buy flood insurance; encourage property owners to purchase flood insurance
  - Improve awareness of hazard and insurance options

- Increase capability by having cash reserves for reconstruction
- Develop and adopt a Continuity of Operations Plan (COOP)
- Solicit 'cost-sharing" through partnerships with private sector stakeholders on projects with multiple benefits.
- Dam owner/operators should continue to be aware of and understand dam inspection and reporting requirements.
- Ensure that all dam EAP's are kept in compliance with State regulations
- Produce better hazard maps, and improve access to flood hazard mapping
- Capture/survey "high-water" marks during flood events
- Provide technical information and guidance on appropriate mitigation options available to businesses and homeowners
- Enact tools to help manage development in hazard areas (stronger controls, tax incentives, information)
- Establish an additional layer of zoning within flood hazard areas
- Improve compliance with and enforcement of the NFIP Develop mitigation partnerships with regional stakeholders
- Join Community Rating System (CRS) program, or improve level of participation in CRS
- Develop and implement a public information strategy for flood hazard awareness, flood insurance (NFIP) and mitigation
- Maintain existing data as well as gather new data needed to define risks and vulnerability.
- Create a building and elevation inventory of structures in the floodplain
- Identify flood prone areas that may be in need of new flood studies
- Establish a program to identify and educate owners of flood-prone properties of potential mitigation options (e.g. elevations, relocations)
- Charge a hazard mitigation fee on all new permits to create a hazard mitigation funding source for initiatives or grant cost share requirements.
- Integrate floodplain management policies into other planning mechanisms within the planning area.
- Establish a stormwater utility fee based on amount of impermeable surfaces that contribute to stormwater flooding
- Establish a Stormwater Utility to deal with urban drainage/flooding issues
- Establish incentives to promote flood hazard mitigation of private property (e.g. permit fee waivers)
- Adopt ordinances/standards for cumulative damages and/or improvements
- Upgrade NFIP Floodplain ordinance, as well as other ordinances to current or above current standards
- Develop and adopt a COOP
- Join NWS "StormReady" Program
- Participate in county and regional training programs
- Provide additional training/certification to NFIP floodplain administrators and code officials

- Implement annual training to account for high turnover of municipal officials
- Maintain and enhance flood forecasting ability, including the establishment and maintenance of critical stream gages
- Promote awareness and participation in alert systems Support and participate in regional flood management efforts, such as the Flood Mitigation Task Force or similar efforts
- Support and implement hazard disclosure for the sale/re-sale of property in identified risk zones
- Provide continued and enhanced training for emergency responders
- Establish a revolving "bank" or budget line item to fund grant application support
- Continue to review updated Flood Insurance Rate Maps to ensure accuracy as well as maintaining lines of communication with homeowners to make them aware of potential changes related to their property status
- Provide trainings for FPA's on the NFIP/Floodplain Best Practices and also pursue CFM accreditation for municipal FPA's
- Build and maintain relationships to develop regional watershed/floodplain mitigation solutions
- Pursue grant funding opportunities to fund repairs of catchments and infrastructure on a proactive basis
- Explore grant funding opportunities related to climate change to fund mitigation projects
- Develop a Watershed Improvement Plan

- Nature-based opportunities:
  - Promote open space uses in identified high hazard areas via techniques such as: PUD's, easements, setbacks, greenways, sensitive area tracks
  - Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff
  - Establish stream maintenance programs with stakeholders
  - Promote the use of vegetation/plants as green erosion control measures to reduce localized flooding
  - Build rain gardens
  - Develop guidance and checklist for developers to assist with integration and incorporation of green and sustainable approaches
  - Restore and reconnect floodplains that have been degraded by development and structural flood control
  - Preserve floodplain storage capacity by limiting or prohibiting the use of fill in floodplain
  - Lead and develop a county-wide stream clearing strategy including the development of thresholds for response/action.

11 GEOLOGICAL HAZARDS

11.1 HAZARD PROFILE

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

11.1.1 Description of the Hazard

Defining the Hazard

Landslides

According to the United States Geological Survey (USGS), the term landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity. In New Jersey, there are four main types of landslides: slumps, debris flows, rockfalls, and rockslides (NJOEM 2024):

- Slumps are coherent masses that move downslope by rotational slip-on surfaces that underlie and penetrate the landslide deposit.
- A debris flow, also known as a mudslide, is a form of rapid mass movement in which loose soil, rock, organic matter, air, and water mobilize as slurry that flows downslope. Debris flows are often caused by intense surface water from heavy precipitation or rapid snow melt. This precipitation loosens surface matter, thus triggering the slide.
- Rockfalls are common on roadway cuts and steep cliffs. These landslides are abrupt movements of geological material such as rocks and boulders. Rockfalls happen when these materials become detached.
- Rockslides are the movement of newly detached segments of bedrock sliding on bedrock, joint, or fault surfaces.

Sinkholes/Subsidence

Subsidence is when the ground sinks due to movement underground. In New Jersey, this often happens as a sinkhole. A sinkhole is a depression in the ground that has no natural external surface drainage. Basically, this means that when it rains, all of the water stays inside the sinkhole and typically drains into the subsurface. There are three types of sinkholes: geologic, solid waste, and excavation (NJOEM 2024):

- Geologic sinkholes are most common in what geologists call, "karst terrain." These are regions where the types of rock below the land surface can naturally be dissolved by groundwater circulating through them. Soluble rocks include salt beds and domes, gypsum, limestone, and other carbonate rock.
- Solid waste sinkholes form when material, such as wood, is buried and then decays, leaving a subsurface void.

- Excavation sinkholes occur when fill material that was placed during an excavation erodes away or compacts. These types of sinkholes may form after a water or sewer pipe breaks, or when underground tanks (septic and/or oil) collapse.

Cause of the Hazard

Landslides

Almost every landslide has multiple causes. Slope movement occurs when forces acting down-slope (mainly due to gravity) exceed the strength of the earth materials that compose the slope. Causes include factors that increase the effects of downslope forces and factors that contribute to low or reduced strength. Landslides can be initiated in slopes already on the verge of movement by rainfall, snowmelt, changes in water level, stream erosion, changes in ground water, earthquakes, volcanic activity, disturbance by human activities, or any combination of these factors. Earthquake shaking and other factors can also induce landslides underwater. These landslides are called submarine landslides (NJOEM 2024).

Subsidence/Sinkhole

Subsidence and sinkholes are most often caused by the removal of water, oil, natural gas, or mineral resources out of the ground by pumping, fracking, or mining activities (State of New Jersey Office of Emergency Management 2024). 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 a property (NJOEM 2024).

Summary of Potential Impacts

Geological hazards in Essex County can damage homes, destroy critical infrastructure, block or damage roads, and disrupt utilities and communication lines (U.S. Geological Survey 2024). Landslides in particular can also lead to rockfall and mudslides (NJOEM 2024).

Cascading Hazard Impacts

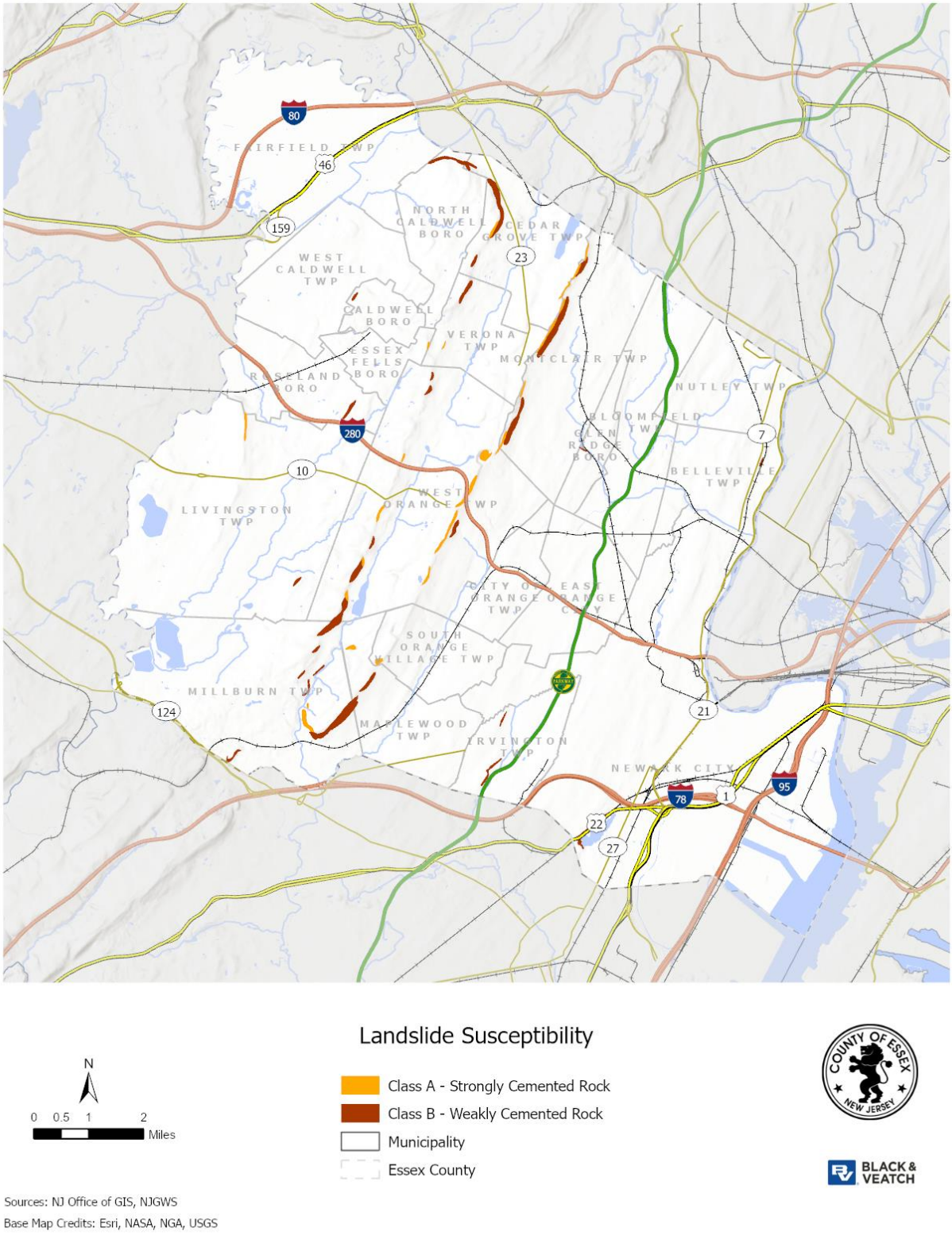
Landslides and sinkholes can result in utility failures and hazardous material releases. Landslides along streambanks can result in blocked streams that cause flooding. For more information on flooding, refer to Section 10 (Flood).

11.1.2 Location

Landslide

Areas susceptible in Essex County include those with steep slopes. This includes steep streambanks areas of the Watchung Mountains that run from southwest to northeast through the center of Essex County.

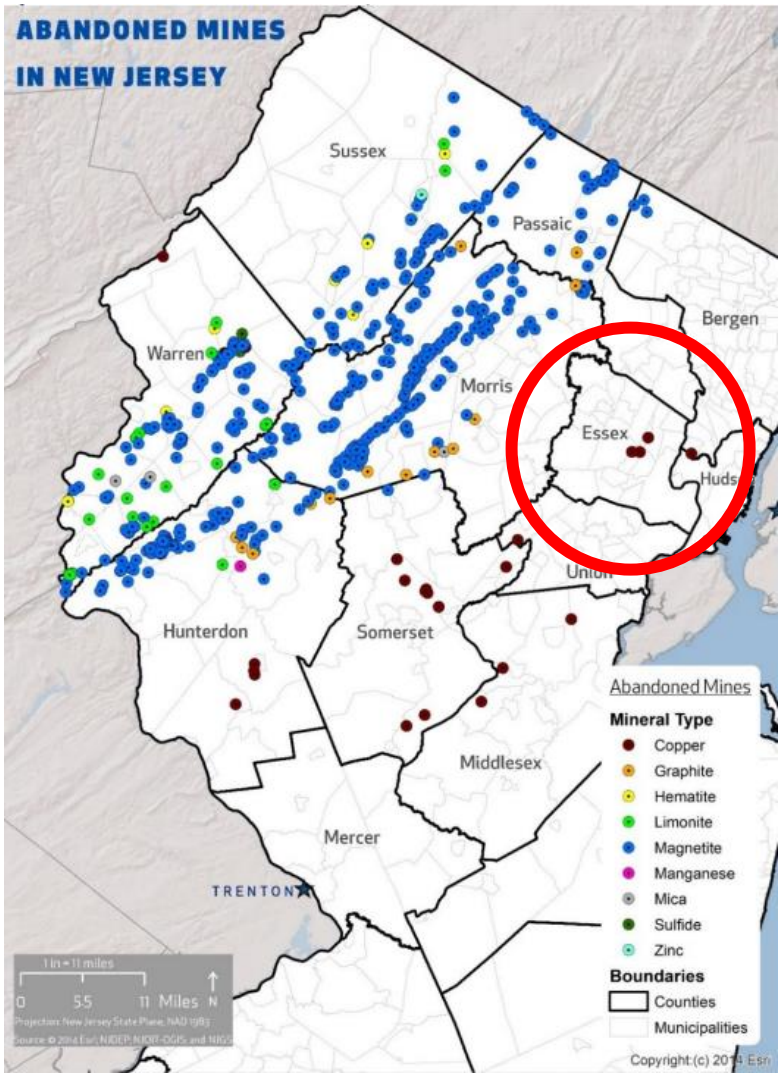
Figure 11-1. Landslide Susceptibility in Essex County



Subsidence/Sinkhole

Naturally occurring sinkholes occur within bands of carbonate bedrock. However, Essex County is not identified as being underlain by this bedrock type. Essex County's susceptibility to subsidence is due in part to the presence of abandoned mines. Essex County is home to three abandoned copper mines. Although the mines have closed, continued development in the Essex County could prove problematic because of the extensive mining there which has caused widespread subsidence. One problem is that the mapped locations of some of the abandoned mines may not be accurate. Another issue is that many of the surface openings were improperly filled in, and roads and structures have been built adjacent to or on top of these former mine sites. The figure below shows the locations of all known abandoned mines in New Jersey, with Essex County circled in red (NJOEM 2024).

Figure 11-2. Abandoned Mines in New Jersey



Source(s): (NJOEM 2024)

11.1.3 Extent

Measuring Intensity

Landslide

To determine the extent of a landslide hazard, the affected areas need to be identified and the probability of the landslide occurring needs to be assessed. Natural variables that contribute to the overall extent of potential landslide activity in any particular area include soil properties, topographic position and slope, and historical incidence. Predicting a landslide is difficult, even under ideal conditions and with reliable information. As a result, the Geological Survey of Alabama indicates that the landslide hazard is often represented by landslide incidence and/or susceptibility, as defined below (NJOEM 2024):

- Landslide incidence is the number of landslides that have occurred in a given geographic area. High incidence means greater than 15% of a given area has been involved in landslide; medium incidence means that 1.5 to 15% of an area has been involved; and low incidence means that less than 1.5% of an area has been involved.
- Landslide susceptibility is defined as the probable degree of response of geologic formations to natural or artificial cutting, to loading of slopes, or to unusually high precipitation. It can be assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced numerous landslides in the past. Landslide susceptibility depends on slope angle and the geologic material underlying the slope. Landslide susceptibility only identifies areas potentially affected and does not imply a time frame when a landslide might occur. High, medium, and low susceptibility are delimited by the same percentages used for classifying the incidence of landslide.

Subsidence/Sinkhole

Subsidence and sinkholes can occur due to either natural processes (karst sinkholes in areas underlain by soluble bedrock) or because of human activities. Similar to landslides, the affected areas need to be identified and the probability of the sinkhole occurring within some time period needs to be assessed (NJOEM 2024).

Warning Time

Geologic hazards such as landslides and sinkholes may be triggered by both natural and human-caused changes in the environment. They generally occur with little to no warning time, but warning signs for both activities do exist. These include (NJOEM 2024):

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavement, or sidewalk
- Soil moving away from foundations
- Ancillary structures, such as decks and patios, tilting and moving relative to the main house
- Tilting or cracking of concrete floors and foundations

- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls, or fences
- Offset fence lines
- Sunken or down-dropped road beds
- Rapid increase in creek water levels, possibly accompanied by increased turbidity
- Sudden increase in creek water levels while rain is still falling or just recently ended
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together

Worst Case Scenario

The worst-case scenario for geological hazards would consist of a major landslide in a highly populated area. A worst-case scenario would be subsidence causing a sinkhole that affects critical facilities or a major transportation route.

11.1.4 Previous Occurrences

The following sections provide a review of previous geological hazard occurrences in Essex County.

11.1.4.1 Declarations

Federal Declarations

Between 1954 and 2024, Essex County has not experienced a FEMA disaster (DR) or emergency management (EM) declaration specifically for geologic hazards. However, the remnants of Hurricane Ida in 2021 triggered landslide events in Essex County (FEMA 2024) (NJOEM 2024).

USDA Declarations

Between 2020 and 2024, the USDA included Essex County was not included in any geological hazard-related agricultural disaster declarations (USDA 2025a).

11.1.4.2 Summary of Significant Events

According to the State Hazard Mitigation Plan, Essex County has experienced less than 10 recorded landslide events, categorized as rockfalls, debris flows, and one slump. None of these events have resulted in injury or death (NJOEM 2024).

11.1.4.3 Recent Events

For the 2025 HMP update, geological hazard events that impacted Essex County between January 2020 and December 2024 are listed in Table 11-1. For events prior to January 2020, refer to the 2020 HMP.

Table 11-1. Recent Geological Hazard Events

Date (s) of Event	Declaration Number	County Included	Description
September 1, 20221	4614-DR-NJ, 3573-EM-NJ	Yes	A rockslide caused by heavy rain from Hurricane Ida impacted an apartment complex in West Orange. 45 families were forced to evacuate. The structure was later demolished.

Source: (NOAA NCEI 2024); (FEMA 2024); (NJOEM 2024)

11.1.5 Future Conditions

11.1.5.1 Probability

Geological hazards are likely to occur in Essex County in the future, though at a low frequency. Given changes in precipitation, and changes in development, it is possible that the potential for the magnitude/extent of the risk and frequency may also change. However, the location of susceptibility for landslide and subsidence events is expected to remain relatively static as the driving factors for the potential location of occurrence is underlying bedrock and soil formation (NJOEM 2024).

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for a geological hazard event in the County is considered 'rare' (between 1 and 10% annual probability of a hazard event occurring.).

11.1.5.2 Climate Change

According to the 2020 New Jersey Scientific Report on Climate Change, New Jersey is warming faster than the rest of the Northeast region and the world. Historically unprecedented warming is projected for the 21st century with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050. Annual precipitation in New Jersey is expected to increase by 4 percent to 11 percent by 2050. The intensity and frequency of precipitation events is anticipated to increase due to climate change (ONJSC Rutgers University n.d.).

Intense rainfall can saturate and destabilize soil creating landslide conditions. Additionally, warming temperatures and changing precipitation patterns could increase the occurrence and duration of droughts, which could increase the probability of wildfire, reducing the vegetation that helps to support steep slopes (NJOEM 2024).

The projected increase in precipitation levels in the state will coincide with an increased potential risk in subsidence and sinkholes in vulnerable areas. Subsidence and sinkholes can also be caused through groundwater depletion. Extended drought periods can result in high levels of groundwater withdrawal for personal and agricultural uses. As precipitation patterns change due to climate change, periods of intense drought are expected to increase. This can create favorable conditions for sinkholes to form (NJOEM 2024).

11.1.5.3 Potential Future Impacts

Increasing frequency and severity of heavy rainfall events may result in an increased frequency of landslide events. An increase in development beneath or on steep slope areas may also result in increased risk from landslide. As many sinkholes in Essex County are influenced by development (water main breaks, etc.), continued development and aging infrastructure may result in an increased occurrence of sinkholes.

11.2 VULNERABILITY ASSESSMENT

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

11.2.1 Summary of Vulnerability

To evaluate the geological hazard in Essex County, the New Jersey Geological & Water Survey (NJGWS) landslide susceptibility data was used to perform a quantitative assessment for the landslide hazard. A qualitative assessment was completed for the sinkhole hazard. Refer to Section 5 (Risk Assessment Methodology and Tools) for additional details on the methodology used to assess geological hazard risk.

11.2.2 Impact on Life, Health, and Safety

Generally, a landslide or subsidence/sinkhole event would be an isolated incidence and impact the populations within the immediate area of the incident. Specifically, the population located downslope of the landslide hazard areas are particularly vulnerable to this hazard. In addition to causing damages to residential buildings and displacing residents, landslides and subsidence events can block off or damage major roadways and inhibit travel for emergency responders or populations trying to evacuate the area (Essex County n.d.).

Table 11-2 summarizes the population living within the landslide hazard areas and have an increased risk in susceptibility to landslides. Class A areas are strongly cemented rock at different slope angles and Class B areas are weakly cemented rock and soil at different slope angles. Both classes are considered susceptible to landslides.

Table 11-2. Estimated Population Living in the Landslide Hazard Areas

Jurisdiction	Total Population (2023 ACS)	Class A		Class B	
		Population Exposed	% Exposed	Population Exposed	% Exposed
Belleville (T)	37,756	0	0.0%	8	0.0%
Bloomfield (T)	52,974	0	0.0%	0	0.0%
Caldwell (B)	8,898	0	0.0%	42	0.5%
Cedar Grove (T)	13,252	29	0.2%	102	0.8%
East Orange (C)	69,183	0	0.0%	0	0.0%

Jurisdiction	Total Population (2023 ACS)	Class A		Class B	
		Population Exposed	% Exposed	Population Exposed	% Exposed
Essex Fells (B)	2,320	10	0.4%	0	0.0%
Fairfield (T)	7,712	0	0.0%	0	0.0%
Glen Ridge (B)	7,827	0	0.0%	4	0.0%
Irvington (T)	60,334	0	0.0%	921	1.5%
Livingston (T)	31,128	12	0.0%	30	0.1%
Maplewood (T)	25,406	0	0.0%	110	0.4%
Millburn (T)	21,793	0	0.0%	313	1.4%
Montclair (T)	39,873	38	0.1%	541	1.4%
Newark (C)	307,188	0	0.0%	0	0.0%
North Caldwell (B)	6,622	0	0.0%	40	0.6%
Nutley (T)	29,767	0	0.0%	93	0.3%
City of Orange (T)	33,973	0	0.0%	0	0.0%
Roseland (B)	6,211	0	0.0%	16	0.3%
South Orange (V)	18,299	20	0.1%	0	0.0%
Verona (T)	14,441	8	0.1%	0	0.0%
West Caldwell (T)	10,897	0	0.0%	0	0.0%
West Orange (T)	48,276	258	0.5%	196	0.4%
Essex County (Total)	**854,130**	**375**	**0.04%**	**2,415**	**0.3%**

Source: (NJGWS 2023)

11.2.2.1 Socially Vulnerable Populations

There is limited research indicating a relationship between socially vulnerable populations and unique/increased risk from geological hazards in Essex County. However, it is important to note that the cost for mitigating geological hazards will fall to the individual property owner on the site where the event occurs. Therefore, individual homeowners without significant disposable income may face hardship from the financial burden of mitigating the potential of and/or recovering from a geological hazard event (NJOEM 2024). In Essex County, approximately 33% of people over the age of 65 live within Class A landslide areas and 22.5% live within Class B landslide areas. Approximately 13.2% of the population are identified as low income and living in Class A landslide areas. Approximately 15.5% of the population are identified as low income and living in Class B landslide areas.

11.2.3 Impact on General Building Stock

In general, the built environment located in the high landslide susceptibility area and the population, structures and infrastructure located downslope are vulnerable to this hazard. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary losses to businesses and residents (Essex County n.d.)

Table 11-2 summarizes the number of buildings located within the landslide hazard areas and have an increased risk in susceptibility to landslides. In summary, there are 95 buildings located in Class A and 516 buildings located in Class B.

Table 11-3. Estimated Building Stock Located in the Landslide Hazard Areas

Jurisdiction	Total Number of Buildings	Class A		Class B	
		Buildings Exposed	% Exposed	Buildings Exposed	% Exposed
Belleville (T)	7,910	0	0.0%	1	0.0%
Bloomfield (T)	11,720	0	0.0%	0	0.0%
Caldwell (B)	1,738	0	0.0%	8	0.5%
Cedar Grove (T)	3,944	8	0.2%	35	0.9%
City of Orange (T)	3,890	0	0.0%	0	0.0%
East Orange (C)	7,908	0	0.0%	0	0.0%
Essex Fells (B)	766	3	0.4%	0	0.0%
Fairfield (T)	3,121	0	0.0%	0	0.0%
Glen Ridge (B)	2,256	0	0.0%	1	0.0%
Irvington (T)	7,934	0	0.0%	121	1.5%
Livingston (T)	9,795	4	0.0%	9	0.1%
Maplewood (T)	6,738	0	0.0%	32	0.5%
Millburn (T)	6,437	0	0.0%	91	1.4%
Montclair (T)	9,436	12	0.1%	140	1.5%
Newark (C)	43,085	0	0.0%	0	0.0%
North Caldwell (B)	2,095	0	0.0%	18	0.9%
Nutley (T)	7,945	0	0.0%	14	0.2%
Roseland (B)	1,794	0	0.0%	4	0.2%
South Orange (V)	4,188	7	0.2%	0	0.0%
Verona (T)	4,113	1	0.0%	0	0.0%
West Caldwell (T)	3,730	0	0.0%	0	0.0%
West Orange (T)	11,845	60	0.5%	42	0.4%
Essex County (Total)	**162,388**	**95**	**0.1%**	**516**	**0.3%**

Source: (NJGWS 2023)

11.2.4 Impact on Community Lifelines

Community lifelines are important for ensuring the day-to-day functioning of a society. These facilities include utilities, hospitals, and schools, among others similar in nature. They are also important in emergency response; thus, it is vital that in the event of a disaster they continue to operate (NJOEM 2024).

Bridges are a critical node in our transportation infrastructure. Landslides along streambanks have the potential to cause damage to bridges, possibly even resulting in collapse (NJOEM 2024). Landslides and sinkholes can result in utility failures and hazardous material releases.

Table 11-4 summarizes the number of community lifelines located within the landslide hazard areas. Of the 1,118 lifelines, only two are located in Class B hazard areas.

Table 11-4. Community Lifelines Located in Landslide Hazard Areas

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines Located in Class A Landslide Hazard Area	Number of Lifelines Located in Class B Landslide Hazard Area
Communications	24	0	1
Energy	78	0	0

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines Located in Class A Landslide Hazard Area	Number of Lifelines Located in Class B Landslide Hazard Area
Food, Hydration, Shelter	80	0	0
Hazardous Material	13	0	0
Health and Medical	130	0	0
Safety and Security	620	0	0
Transportation	58	0	0
Water Systems	105	0	1
Other	10	0	0
Essex County (Total)	1,118	0	2

Source: (NJGWS 2023)

Table 11-5 provides the number of community lifelines exposed to the landslide hazard areas by jurisdiction. The Township of Montclair is the only community with lifelines in Class B.

Table 11-5. Community Lifelines Located in Landslide Hazard Areas by Jurisdiction

Jurisdiction	Total Community Lifelines	Class A		Class B	
		Number of Community Lifelines	% of Total Lifelines	Number of Community Lifelines	% of Total Lifelines
Belleville (T)	47	0	0%	0	0%
Bloomfield (T)	47	0	0%	0	0%
Caldwell (B)	21	0	0%	0	0%
Cedar Grove (T)	21	0	0%	0	0%
City of Orange (T)	54	0	0%	0	0%
East Orange (C)	58	0	0%	0	0%
Essex Fells (B)	23	0	0%	0	0%
Fairfield (T)	29	0	0%	0	0%
Glen Ridge (B)	25	0	0%	0	0%
Irvington (T)	58	0	0%	0	0%
Livingston (T)	40	0	0%	0	0%
Maplewood (T)	31	0	0%	0	0%
Millburn (T)	48	0	0%	0	0%
Montclair (T)	83	0	0%	2	2.4%
Newark (C)	293	0	0%	0	0%
North Caldwell (B)	17	0	0%	0	0%
Nutley (T)	39	0	0%	0	0%
Roseland (B)	18	0	0%	0	0%
South Orange (V)	30	0	0%	0	0%
Verona (T)	34	0	0%	0	0%
West Caldwell (T)	30	0	0%	0	0%
West Orange (T)	72	0	0%	0	0%
Essex County (Total)	1,118	0	0%	2	2.4%

Source: (NJGWS 2023)

While there are only two lifelines exposed to the landslide hazard area, community lifelines throughout the County can experience the direct and indirect impacts of landslides and sinkholes. The following table

provides a general overview of impacts of community lifelines most likely to be impacted by landslides and sinkholes.

Table 11-6. Geological Hazard Impacts on Community Lifelines

Community Lifeline	Potential Impacts
Safety and Security	Community safety may be threatened due to potential direct harm from geological hazards and compounding effects on the administration of services. Transportation infrastructure issues may directly impact the abilities of law enforcement, fire service, search and rescue, and other government services to respond to a flooding hazard.
Food, Hydration, Shelter	Food, Water, and Shelter lifelines may be impacted by geological hazards. Landslides may damage water lines. Water supplies may be threatened by saltwater intrusion affecting access to water for human consumption and agricultural uses potentially leading to consequences in the food supply chain. Radon exposure can impact shelter lifelines.
Health and Medical	Medical facilities can be impacted due to damage to structures from geological hazards such as landslides, while patient movement and medical supply chains can be impacted by effects on transportation infrastructure. Radon exposure can impact any structure including a medical facility.
Energy	Geological hazards can damage power lines and fuel supplies, as well as disrupt underground utilities, including gas and water lines.
Communications	Geological hazards can disrupt communication infrastructure, affecting phone, cellular, and internet services, as well as interfering with emergency services communication systems.
Transportation	Geological hazards can impact Transportation lifelines when events such as landslides, sinkholes, or land subsidence occur near roadways or other transportation infrastructure. These disruptions may result in cascading effects on other critical lifelines.
Hazardous Materials	At fixed sites, geological hazards can cause the release of chemicals stored at facilities, while underground pipelines and storage tanks may be compromised, leading to potential environmental contamination
Water Systems	Geological hazards pose a threat to the Water System lifeline. Landslides can damage water lines, while sinkholes may lead to groundwater contamination, compromising water quality.

Source: (NJOEM 2024)

11.2.5 Impact on the Economy

Geologic hazards can impose direct and indirect impacts on society. Direct costs include the actual damage sustained by buildings, property, and infrastructure. Indirect costs, such as clean-up costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity are difficult to measure. Additionally, ground failure threatens transportation corridors, fuel and energy conduits, and communication lines (USGS 2005). Estimated potential damages to general building stock can be quantified as discussed above. For the purposes of this analysis, general building stock damages are discussed further.

Most of the areas that are potentially at risk to the landslide hazard are located along the ridges of the Watchung Mountains in areas that have steep slopes. Many of these areas remain undeveloped. Interstate 280 runs through the center of the County from the northwest corner of the County to the southeastern

corner of the County and traverses both the western and eastern ridges of this mountain range. There is risk to potential landslides along this road in these areas; however, engineering standards would have likely mitigated landslide potential.

A landslide or sinkhole/subsidence event will alter the landscape. In addition to changes in topography, vegetation and wildlife habitats may be damaged or destroyed, and soil and sediment runoff will accumulate downslope potentially blocking waterways and roadways and impacting quality of streams and other water bodies. Additional environmental impacts include loss of forest productivity. There are 612 buildings located on steep slopes and account for $404 million, or less than 1-percent of the County's total building replacement cost. These losses would impact Essex County's tax base and the local economy.

I-280 and US-22 are major roadways that are used every day by commuters and provide access to major urban areas within and outside the County. I-280 runs west to east across the County and through some of the most densely populated areas in eastern Essex County and provides access to major areas of both Morris and Hudson Counties. US-22 provides access to populations from Union County and other western New Jersey communities to the US-1&9 corridor in the City of Newark. Both of these roads traverse the landslide susceptible areas, and a landslide impacting these roadways would cause cascading impacts to populations throughout the region (Essex County n.d.).

Table 11-7 provides the estimated building values (contents and structure) exposed to the landslide hazard areas in Essex County. Overall, the County has $100 million exposed to Class A and $365 million exposed to Class B.

Table 11-7. Estimated Losses of Buildings Located in the Landslide Hazard Areas

Jurisdiction	Total Building Value (structure and contents	Class A		Class B	
		Building Value Exposed	% Exposed	Building Value Exposed	% Exposed
Belleville (T)	$5,440,939,832	$0	0.0%	$425,351	0.0%
Bloomfield (T)	$7,149,452,578	$0	0.0%	$0	0.0%
Caldwell (B)	$1,437,101,129	$0	0.0%	$5,850,167	0.4%
Cedar Grove (T)	$3,664,877,018	$11,667,448	0.3%	$36,722,525	1.0%
East Orange (C)	$7,298,495,889	$0	0.0%	$0	0.0%
Essex Fells (B)	$624,599,485	$2,056,120	0.3%	$0	0.0%
Fairfield (T)	$7,708,467,384	$0	0.0%	$0	0.0%
Glen Ridge (B)	$1,311,356,144	$0	0.0%	$704,498	0.1%
Irvington (T)	$6,543,152,214	$0	0.0%	$48,126,105	0.7%
Livingston (T)	$9,227,217,608	$2,735,922	0.0%	$8,436,437	0.1%
Maplewood (T)	$4,279,929,361	$0	0.0%	$20,531,752	0.5%
Millburn (T)	$6,236,661,855	$0	0.0%	$65,185,483	1.0%
Montclair (T)	$7,012,741,670	$12,005,802	0.2%	$107,549,150	1.5%
Newark (C)	$50,617,106,841	$0	0.0%	$0	0.0%
North Caldwell (B)	$2,103,919,331	$0	0.0%	$27,139,472	1.3%
Nutley (T)	$4,550,682,627	$0	0.0%	$6,365,171	0.1%
City of Orange (T)	$4,186,194,813	$0	0.0%	$0	0.0%
Roseland (B)	$2,338,671,996	$0	0.0%	$2,538,045	0.1%

Jurisdiction	Total Building Value (structure and contents	Class A		Class B	
		Building Value Exposed	% Exposed	Building Value Exposed	% Exposed
South Orange (V)	$3,553,949,814	$19,498,342	0.5%	$0	0.0%
Verona (T)	$2,639,752,949	$591,718	0.0%	$0	0.0%
West Caldwell (T)	$4,439,689,868	$0	0.0%	$0	0.0%
West Orange (T)	$9,974,739,027	$58,267,654	0.6%	$35,843,223	0.4%
Essex County (Total)	**$152,339,699,431**	**$106,823,006**	**0.1%**	**$365,417,380**	**0.2%**

Source: (NJGWS 2023)

11.2.6 Impact on Historic and Cultural Resources

Older buildings and structures are more susceptible to foundational damage, making historic and cultural resources especially vulnerable to geologic hazards. Historic buildings and museums may be the most at risk.

11.2.7 Impact on Ecosystems and Natural Resources

Water Resources

Sinkhole formation near coastal areas may result in saltwater intrusion of freshwater aquifers where groundwater withdrawals are causing a decline in water levels. Sinkholes may also result in radon exposure to groundwater in areas with karst terrain. Landslides can result in degradation of surface water quality by increasing turbidity or the release of contaminants. Both sinkholes and landslides can also cause the loss of surface water resources (NJOEM 2024).

Freshwater and Coastal Wetlands

Freshwater and coastal wetlands located near dunes can be filled in by slumps covering vegetation resulting in full or partial loss of wetland functions. Sinkholes can also consume wetland vegetation resulting in significant damage to these resources (NJOEM 2024).

Forests and Vegetated Lands

Forests and vegetated lands including agricultural lands located near slopes can experience rapid loss from landslides by vegetation being completely covered or trees knocked down. Sinkholes can consume trees and vegetation also resulting in significant damage to these resources (NJOEM 2024).

11.2.8 Change in Vulnerability Since the Previous HMP

Overall, Essex County remains vulnerable to geological hazard events.

11.3 Mitigation Opportunities

A range of potential opportunities for mitigating geological hazards have been identified and considered by plan participants:

- Manipulate the hazard:

- None

- Reduce exposure and vulnerability to the hazard:
  - Consider hazard areas in land-use planning, zoning and development siting
  - Acquire structures in highest hazard areas (demolish and convert to restricted open space)
  - Relocation of structures in high risk locations for landslide or subsidence
  - Open space preservation
  - Consider hazard areas in land-use planning and development siting
  - Stabilize vulnerable slopes near structures and infrastructure
  - Work with stakeholders to develop appropriate risk reduction strategies
- Build local capacity to respond to or prepare for the hazard:
  - Increase understanding of hazard areas (e.g. Landslide Susceptibility Maps) - geotechnical surveys, LIDAR and mapping
  - Work with stakeholders such as USGS, NJDEP to develop appropriate risk reduction strategies
  - Support and implement hazard disclosure for the sale/re- sale of property in identified risk zones
  - Develop county-level programs to document slide events (landslide inventory), and maintain its currency
- Nature-based opportunities:
  - Replace or restore native vegetation known to stabilize steep slope areas
  - Hybrid solutions refer to conventional engineering solutions that are combined with nature-based solutions using appropriate vegetation

12 Severe Weather

12.1 Hazard Profile

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

The following section provides the hazard profile (description of hazard, location, extent, previous occurrences, and future occurrences) and vulnerability assessment for the severe weather hazard in Essex County. For the 2025 HMP, severe weather includes thunderstorms and lightning, hail, wind, tornadoes, and tropical storms and hurricanes. Storm surge associated with tropical storms and hurricanes is discussed in Section 10 (Flood).

12.1.1 Description of the Hazard

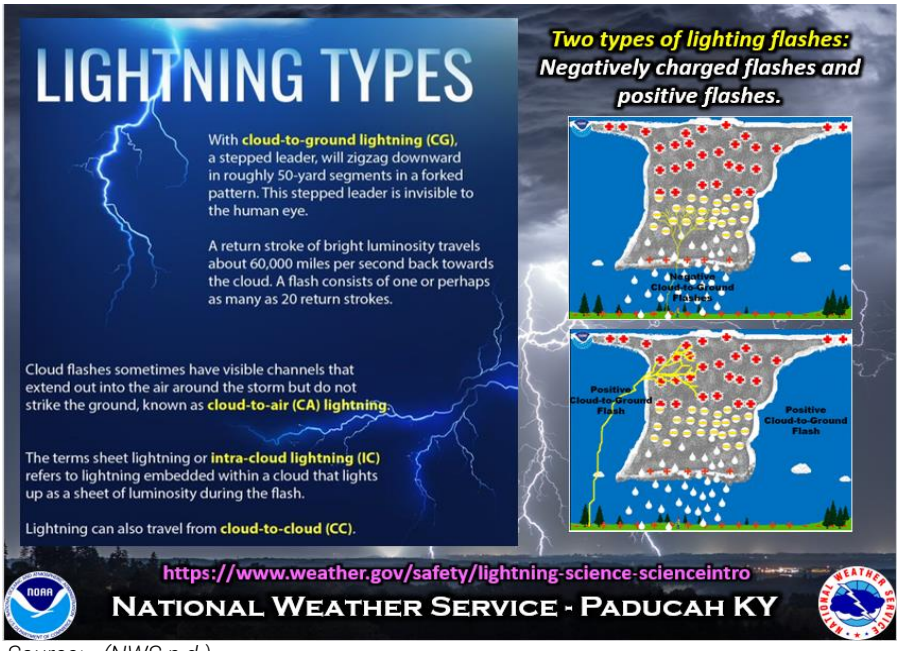
Defining the Hazard

Thunderstorms and Lightning

A thunderstorm is a local storm characterized by lightning and thunder, originating from a cumulonimbus cloud. NWS classifies a thunderstorm as severe if it generates damaging wind gusts of 58 mph or higher, hail one inch (quarter size) in diameter or larger, or tornadoes. On average, thunderstorms are 15 miles in diameter and last about 30 minutes. During the warm season, they are responsible for most of the rainfall (NJOEM 2024).

Lighting is a bright flash of electrical energy produced by a thunderstorm and occurs anywhere there is a thunderstorm. The resulting clap of thunder is the result of a shock wave created by the rapid heating and cooling of the air in the lightning channel. Lightning ranks as one of the top weather killers in the United States, killing approximately 20 people and injuring hundreds each year (NOAA n.d.). Figure 12-1 describes the types of lightning that occur.

Figure 12-1. Types of Lightning



Source: (NWS n.d.)

Hail

Hail is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. It can grow to very large sizes through the collection of water that freezes onto the hailstone's surface. They can have a variety of shapes, from lumps and bumps to small spikes. Hail can damage aircraft, homes, and cars, and can be deadly to livestock and people (NSSL 2025).

Wind

High winds are often associated by other severe weather events such as thunderstorms, tornadoes, hurricanes, and tropical storms (NWS 2012). The following are descriptions of types of damaging winds (NOAA n.d.):

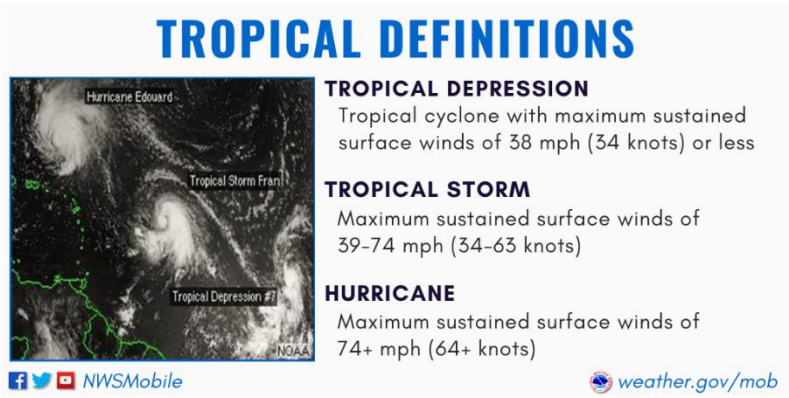
- Straight-line Wind is a term used to define thunderstorm wind which is not linked with rotation and is mainly used to differentiate from tornadic winds;
- Downdraft is a small scale column of air that sinks towards the ground;
- Macroburst is an outward burst of strong winds that are more than 2.5 miles in diameter and occurs when a strong downdraft reaches the surface;
- Microburst is a small, concentrated downburst which produces an outward burst of relatively strong winds near the surface;
- Downburst is a general term to describe macro and microbursts and is a general term for all localized strong wind events caused by a strong downdraft within a thunderstorm;
- Gust Front is the leading edge of rain-cooled air which clashes with a warm thunderstorm inflow; and
- Derecho is a widespread, long-lived windstorm associated with rapidly moving precipitation or thunderstorms. If wind damage swatch is more than 240 miles and includes gusts of wind that reach 58 mph or greater, then the event can be classified as a derecho.

Tornadoes

Tornadoes are violent storms and can cause fatalities and devastate neighborhoods in seconds. A tornado appears as a rotating, funnel-shaped column of air that extends from a thunderstorm to the ground with whirling winds that can reach over 200 mph. Damage paths can be greater than one mile in width and 50 miles in length. Tornadoes typically develop from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. Tornadoes move at speeds which appear stationary to speeds of 60 mph and can generate internal winds exceeding 300 mph (NJOEM 2024).

Tropical Storms and Hurricanes

Figure 12-2. Tropical Cyclone Definitions



Source: (National Weather Service (NWS) 2025b)

Tropical storms and hurricanes are low-pressure systems that can result in damaging winds, precipitation, flooding, tornadoes, and lightning strikes and the potential to cause devastating damages. Tropical storms and hurricanes are considered tropical cyclones (refer to Figure 12-2 for the definitions of each). They originate over warmer waters and thrive on warmer air temperatures (NJOEM 2024).

Tropical storms and tropical depressions are generally less dangerous than hurricanes due to their slower wind speeds but they can be deadly. The winds of tropical depressions/storms are usually not the greatest threat; rather, the rains, flooding, and severe weather such as thunderstorms associated with them are what customarily cause more significant problems (NJOEM 2024).

A hurricane is a tropical storm that attains hurricane status when its wind speed reaches 74 or more miles an hour. Storms of this intensity develop a central eye that is an area of relative calm and the lowest atmospheric pressure. Surrounding the eye is a circulating eye wall and the strongest thunderstorms and winds (NJOEM 2024).

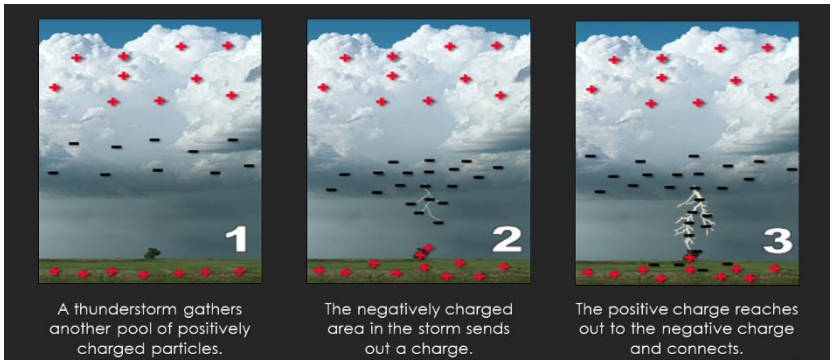
Cause of the Hazard

Thunderstorms and Lightning

A thunderstorm forms when moisture, rapidly rising warm air, and a lifting force such as a warm or cold front, sea breeze, or mountain come together. They can become dangerous, producing tornadoes, hail, strong winds, flash flooding, and lightning (NJOEM 2024).

Lightning occurs during thunderstorms when there are strong updrafts of warm air and downdrafts of cold air within a cumulonimbus cloud. These movements cause ice particles and water droplets to collide, creating static electricity. Over time, this static electricity builds up, with the top of the cloud becoming positively charged and the bottom becoming negatively charged (NOAA n.d.).

Figure 12-3. How Lightning Develops



Source: (NWS 2025c)

When the difference in charge between the cloud and the ground (or between different parts of the cloud) becomes too great, the electricity is released in the form of a lightning bolt. This sudden discharge of electricity heats the air around it to extremely high temperatures, causing the air to expand rapidly and create the sound we know as thunder (NOAA n.d.). Figure 12-3 provides an illustration of how lightning develops.

Hail

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32°F or colder. As the frozen droplet begins to fall, it might thaw as it moves into warmer air toward the bottom of the thunderstorm, or the droplet might be picked up again by another updraft and carried back into the cold air to re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. The frozen droplet, with many layers of ice, falls to the ground as hail (NSSL 2025); (NJOEM 2024).

Wind

Wind begins with differences in air pressures. It is rough horizontal movement of air caused by uneven heating of the earth's surface. Wind occurs at all scales, from local breezes lasting a few minutes to global winds resulting from solar heating of the earth (NWS 2012).

Tornadoes

A tornado forms from a large thunderstorm. Inside thunderclouds, warm, humid air rises, while cool air falls–along with rain or hail. These conditions can cause spinning air currents inside the cloud. Although the spinning currents start out horizontal, they can turn vertical and drop down from the cloud–becoming a tornado (NOAA SciJinks 2025a).

Hurricanes and Tropical Storms

Tropical cyclones (hurricanes and tropical storms) form near the equator over warm ocean waters. They need warm water (at least 80°F) for at least the top 165 feet below the surface. The second thing tropical cyclones need is wind. For hurricanes that form in the Atlantic Ocean, the wind blowing westward across the Atlantic from Africa provides the necessary ingredient. As the wind passes over the ocean's surface, water evaporates (turns into water vapor) and rises. As it rises, the water vapor cools, and condenses back into large water droplets, forming large cumulonimbus clouds. Meteorologists have divided the development of a tropical cyclone into four stages: Tropical disturbance, tropical depression, tropical storm, and full-fledged tropical cyclone (NOAA 2025b).

Storm Surge

Storm surge is produced by water being pushed by the force and pressure toward the shore by the force of winds from a tropical cyclone. Storm surge is affected by the storm's intensity, forward speed, size, angle of the approach to the cost, pressures, and the shape of the coastline. The impact on surge of the

low pressure associated with intense storms is minimal in comparison to the water being forced toward the shore by the wind (NOAA 2025).

Summary of Potential Impacts

Thunderstorms and Lightning

Thunderstorms and lightning can have significant impacts on Essex County and its jurisdictions, especially during the warmer months. Strong winds and hail can damage homes, businesses, roads, and infrastructure. Lightning strikes can lead to fires and electrical damage. All of which can down trees and power lines which leads to widespread power outages. Heavy rainfall from thunderstorms often to lead to flooding, especially stormwater flooding throughout the County. All of these impacts can disrupt services like transportation, communication, and emergency response (NJOEM n.d.).

Hail

Similar to thunderstorms and lightning, hail can cause significant damage to Essex County. Hail can lead to property damage, damaging roofs, windows, and cars. Because hail often accompanies strong winds and lighting, it can lead to downed power lines and trees, resulting in widespread power outages. Larger hailstones can injure people and animals who are outside during hail events (NJOEM 2024); (NOAA n.d.).

Wind

Wind events are often associated with thunderstorms and can have impacts throughout Essex County. The most common types of impacts include downed trees and power lines, damage to buildings and infrastructure, and transportation disruptions. This can lead to widespread power outages, repair costs, closed roadways that lead to delays, and injuries to those outside during wind events (NJOEM 2024); (NOAA National Severe Storms Laboratory n.d.).

Tornadoes

Tornadoes in Essex County are rare; however, they can still have significant impacts. The State of New Jersey averages about two tornadoes per year, most of which are weak and short-lived. Even the weaker tornadoes can cause property damage, uproot trees, disrupt power lines. The most common impacts from tornadoes include (Rutgers University 2024):

- Property damage to homes, businesses, and infrastructure. This can also lead to disruption of services like transportation, communication, and emergency services.
- Power outages as a result of strong winds knocking down power lines that lead to widespread power outages.
- Injuries, and very rarely fatalities, from flying debris and structural damages/collapses.

Hurricanes and Tropical Storms

Hurricanes and tropical storms have the potential for significant damage. Impacts include wind damage, inland flooding from heavy rains, coastal flooding, storm surge flooding, and tornadoes. This can result in

widespread power outages, economic losses, injuries, fatalities, structural damage, and disruption in transportation services.

Cascading Hazard Impacts

Severe weather hazards (thunderstorms, lightning, hail, wind, tornadoes, and hurricanes/tropical storms) can also cause other hazards. Heavy rain and hurricanes/tropical storms can lead to flooding throughout Essex County, especially in areas susceptible to stormwater and inland flooding. Refer to Section 10 (Flood) for details on flooding in the County. Lightning strikes have the ability to cause brush fires that could lead to larger wildfires (see Section Error! Reference source not found. [Error! Reference source not found.] for specific details and impacts). Strong winds associated with severe weather can result downed trees and power lines, causing power failure.

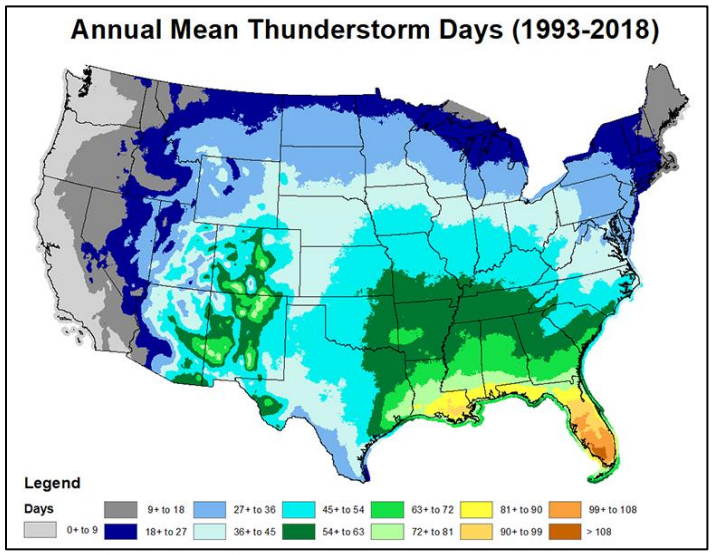
12.1.2 Location

Severe weather can occur anywhere in Essex County; however, the time of year they occur can vary. Thunderstorms, lightning, tornadoes, and hail typical occur in the warmer months, usually between June and August. But they can occur anytime throughout the year. Wind can occur anytime of the year and often accompany thunderstorms, tornadoes, hurricanes/tropical storms, and winter storms (refer to Section Error! Reference source not found. [Error! Reference source not found.] for details). Hurricane season is from June 1st through November 30th, with August and September being the peak months for hurricanes in New Jersey (NJOEM 2024).

Thunderstorms and Lightning

Thunderstorms tend to take place during the spring and summer months, and during the warmest times of the day, which tend to be late afternoon and early evening (NOAA n.d.). The interior and northern regions of New Jersey, which includes Essex County, have about twice as many thunderstorms than coastal areas in the State (NJOEM 2024). Figure 12-4 shows the average number of thunderstorm days throughout the United States, which shows New Jersey as experiencing between 27 and 36 thunderstorm days each year.

Figure 12-4. Annual Mean Thunderstorm Days (1993-2018) in the United States

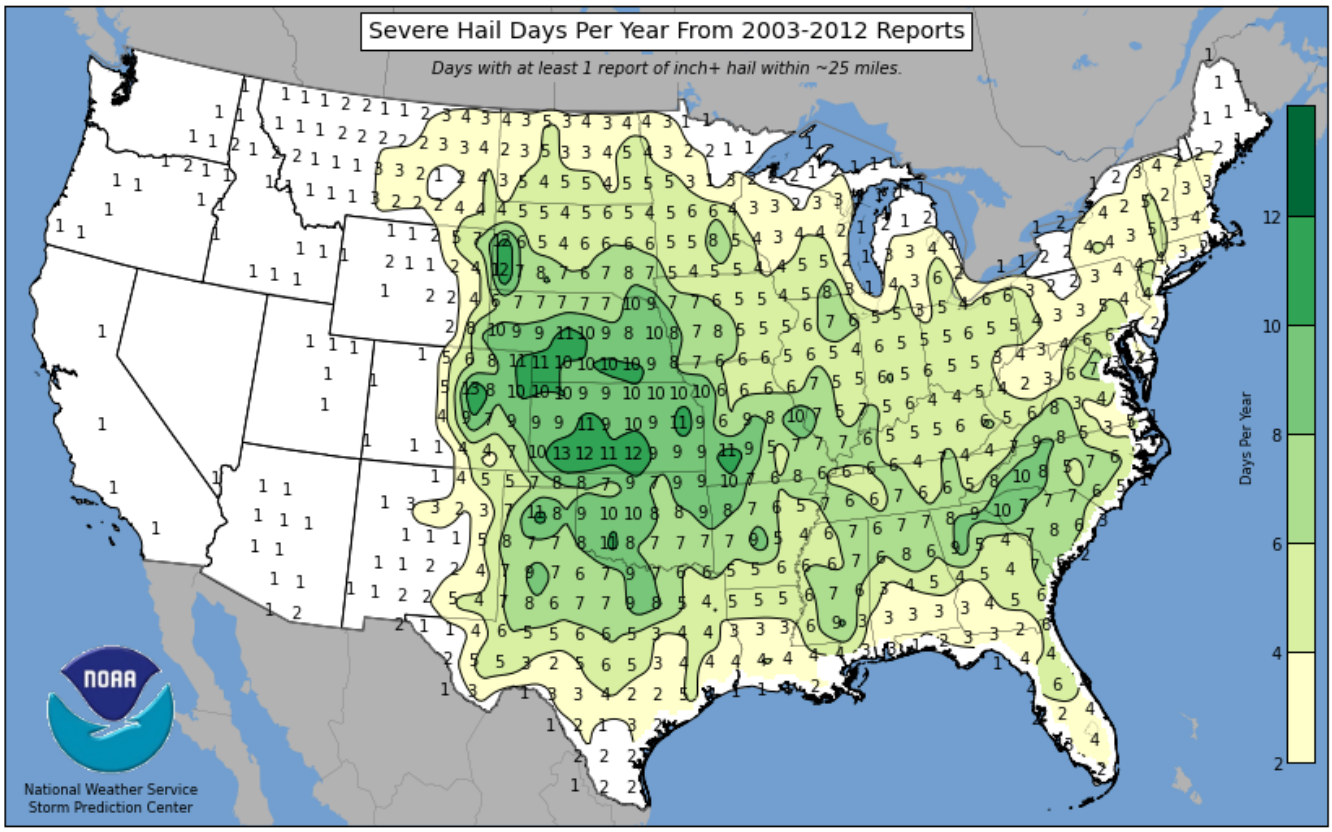


Source: (NOAA 2023a)

Hail

Hailstorms can form anywhere; however, they are more likely to fall in areas that have the most thunderstorms (NOAA n.d.). Figure 12-5 illustrates the number of severe hail reports (>1 inch in diameter). The figure shows that Essex County experienced between two and four days per year where hail of greater than one inch in diameter was reported.

Figure 12-5. Severe Hail Days Per Year (2003-2012)

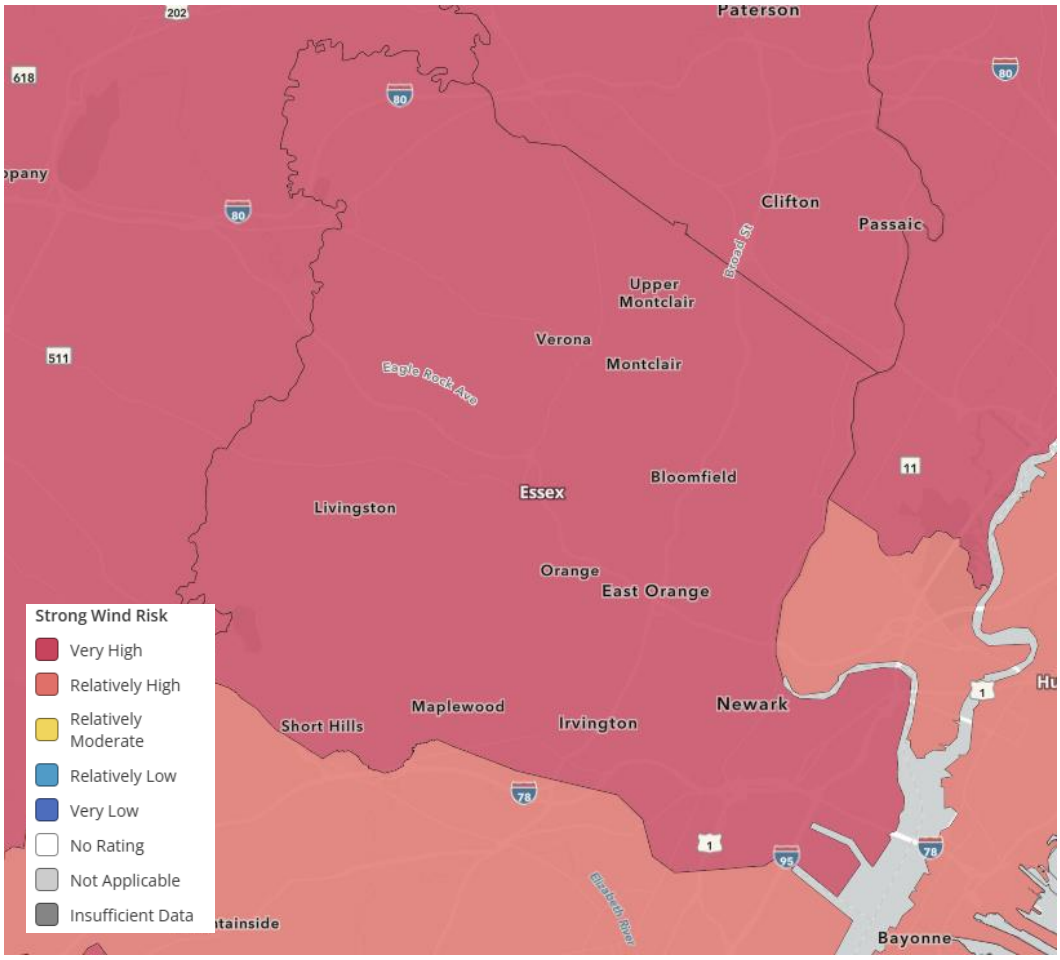


Source: (NOAA Storm Prediction Center 2025)

Wind

Since most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas of the world is at risk for experiencing this hazard (NOAA National Severe Storms Laboratory n.d.). In addition, high wind events may occur without a thunderstorm, tornado, or hurricane present and can be just as dangerous and destructive as those hazards. Figure 12-6 displays the strong wind risk index for Essex County from FEMA's National Risk Index. According to the figure, Essex County has a very high risk for strong winds (greater than 58 mph).

Figure 12-6. National Risk Index, Strong Wind Risk Index Score

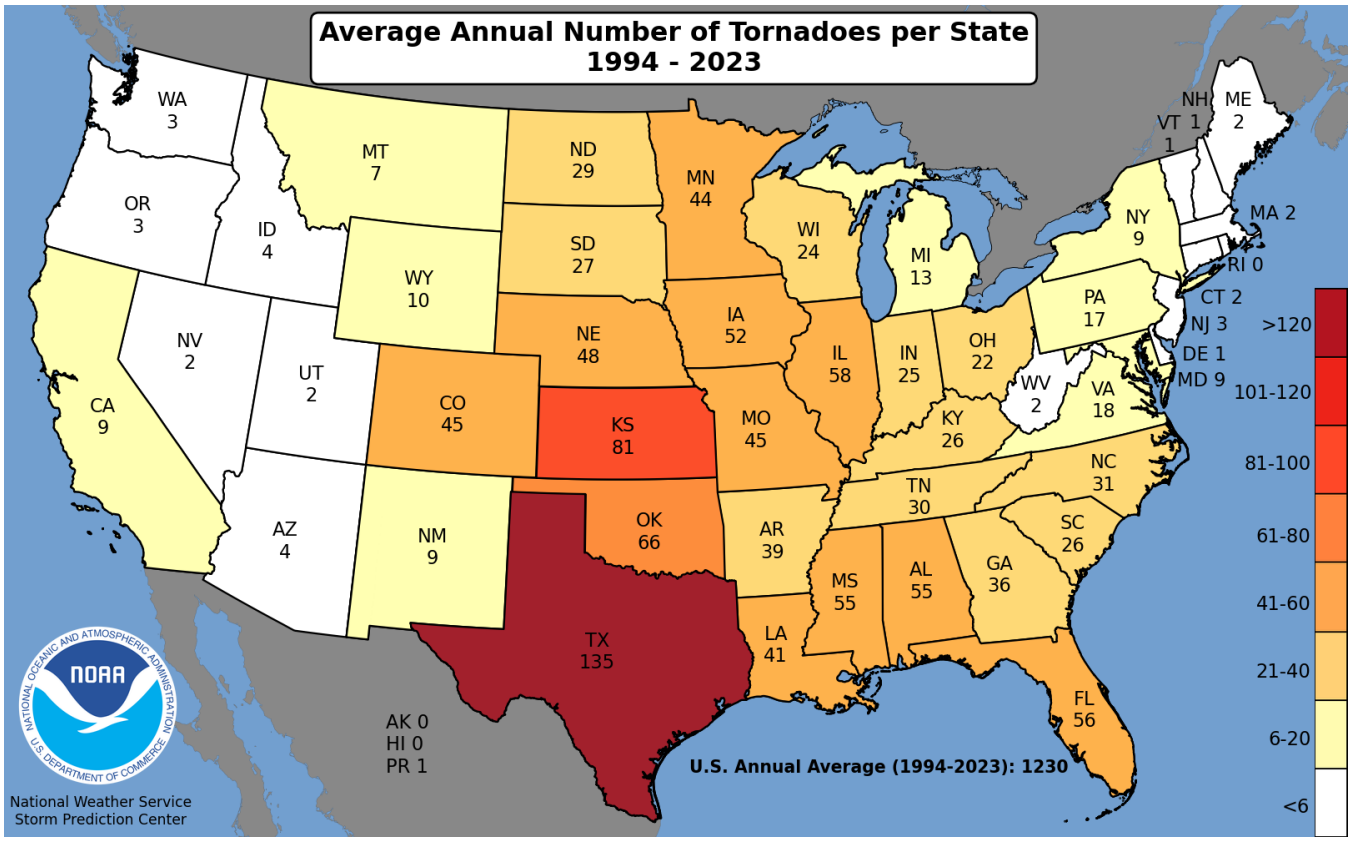


Source: (FEMA 2024)

Tornadoes

The peak of the tornado season is between April and June, with the highest concentration of tornadoes in the central United States. The potential for a tornado strike is about equal across New Jersey, except in the northern areas which typically has a steeper terrain and less likely to experience tornadoes. Figure 12-7 shows the average annual number of tornadoes between 1994 and 2023, showing three for New Jersey.

Figure 12-7. Annual Average Number of Tornadoes in the United States (1994-2023)



Source: (NOAA Storm Prediction Center 2025)

Hurricanes and Tropical Storms

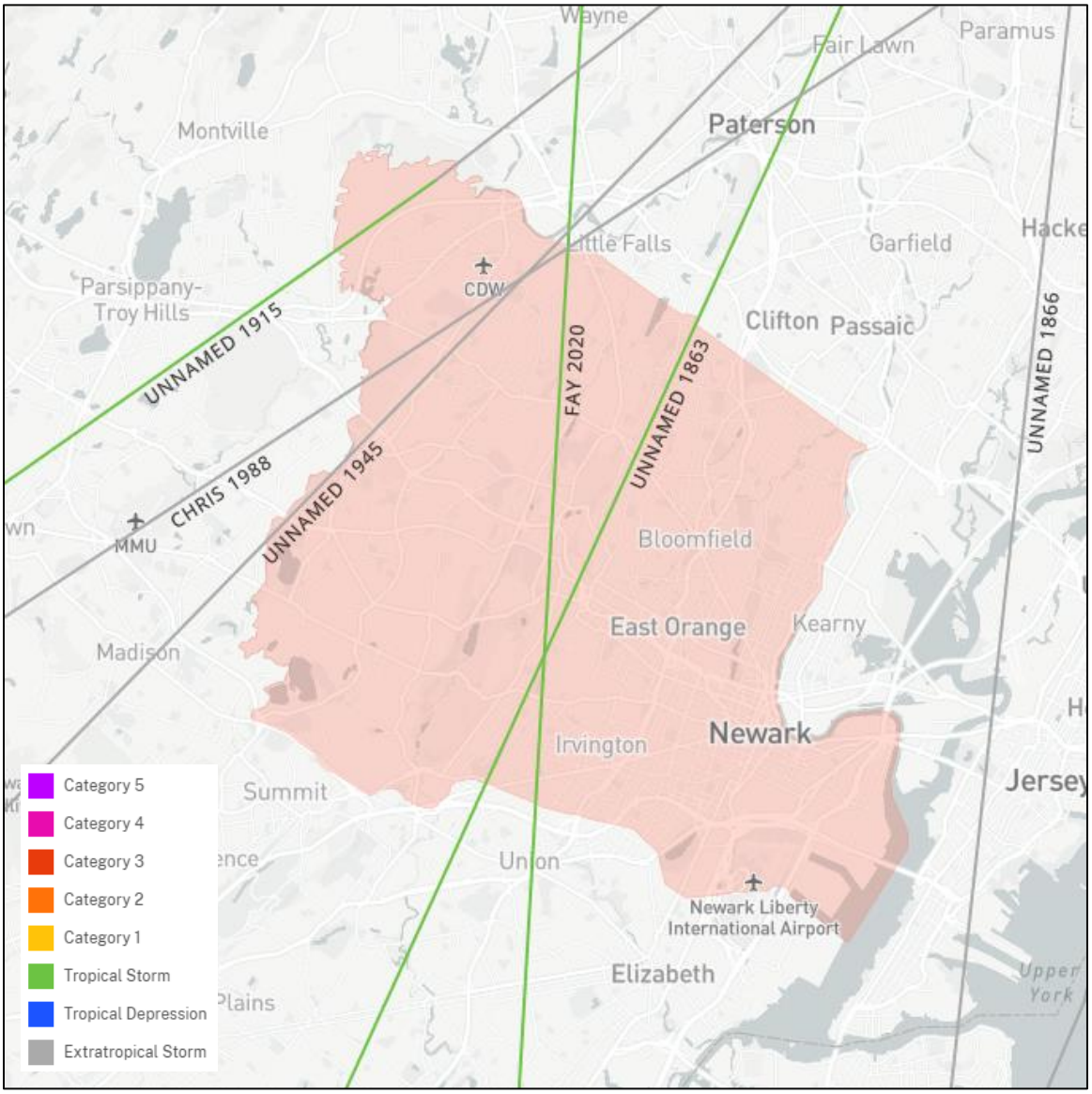
Hurricanes are most likely to form during hurricane season, which is from June to November each year. Each hurricane's path is predicted on a case-by-case basis which allows scientists to be able to consider information from the specific storm as well as what is known about the conditions of the atmosphere and the ocean (University Corporation for Atmospheric Research 2022).

Because of its northern location on the Atlantic coastline, direct hits by storms of hurricane strength have a relatively low probability in New Jersey compared to the Southern coastal and Gulf States. They tend to either travel up the coastline or over land through the United States. As stated above, wind effects tend to be concentrated in coastal areas of New Jersey (NJOEM 2024).

Because of its location, all of Essex County is susceptible to the direct and indirect impacts of tropical storms and hurricanes. While the strongest winds are traditionally found at the center of circulation, significant impacts including wind and heavy rainfall can stretch far beyond the core of the storm. Since 1842, 47 tropical cyclone paths occurred within 50 nautical miles of Essex County, with five having direct paths through the County. Since the date of the last HMP (2020), five tropical cyclones had paths within 50 nautical miles of the County, with one (Tropical Storm Fay in 2020) having a direct path across the

County (NOAA 2025). Figure 12-8 shows the tropical cyclone tracks within 50 nautical miles of Essex County.

Figure 12-8. Tropical Cyclone Tracks Across Essex County (1842-2023)



Source: (NOAA 2025)

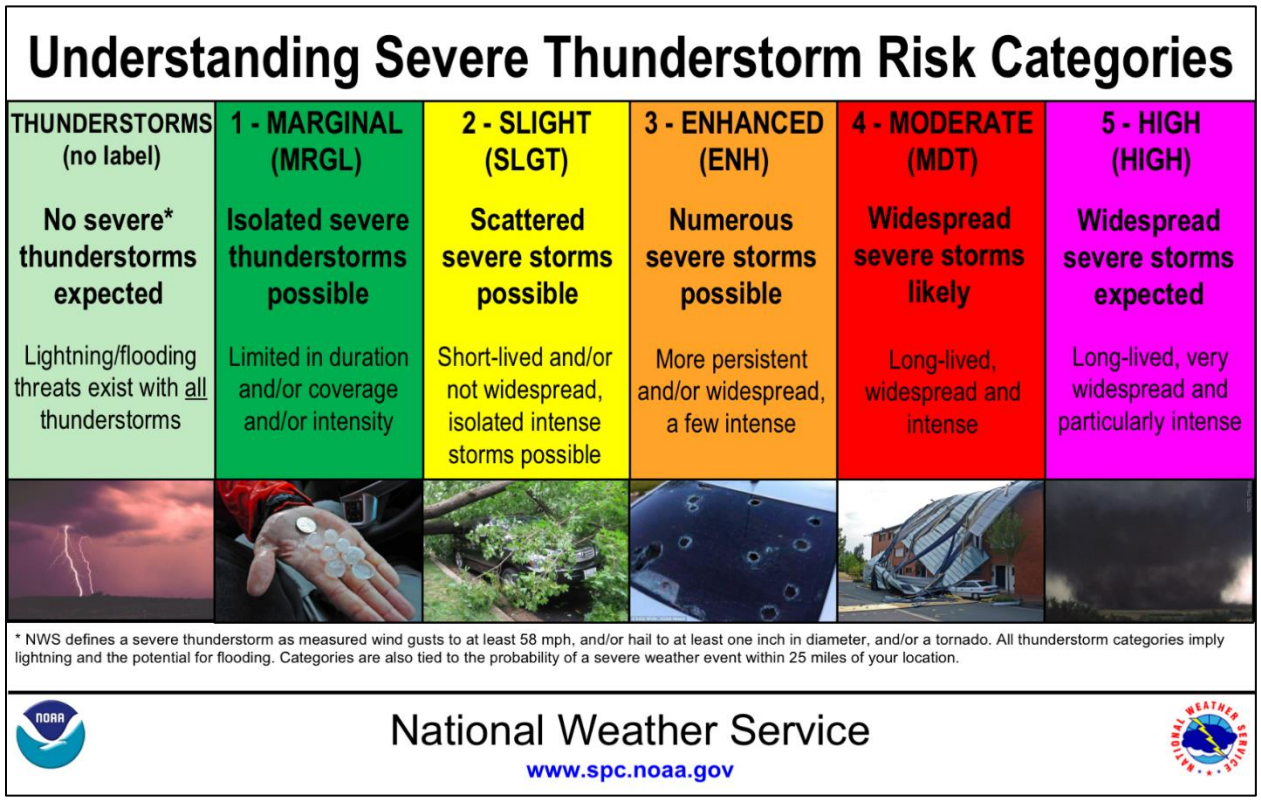
12.1.3 Extent

Measuring Intensity

Thunderstorms

The NWS has five risk categories for severe weather: marginal, slight, enhanced, moderate, and high. The probabilistic forecast directly expresses the best estimate of a severe weather event occurring within 25 miles of a point (NWS 2022). Figure 12-9 details the NWS severe thunderstorm risk categories.

Figure 12-9. Severe Thunderstorm Risk Categories



Source: (NOAA Storm Prediction Center 2025)

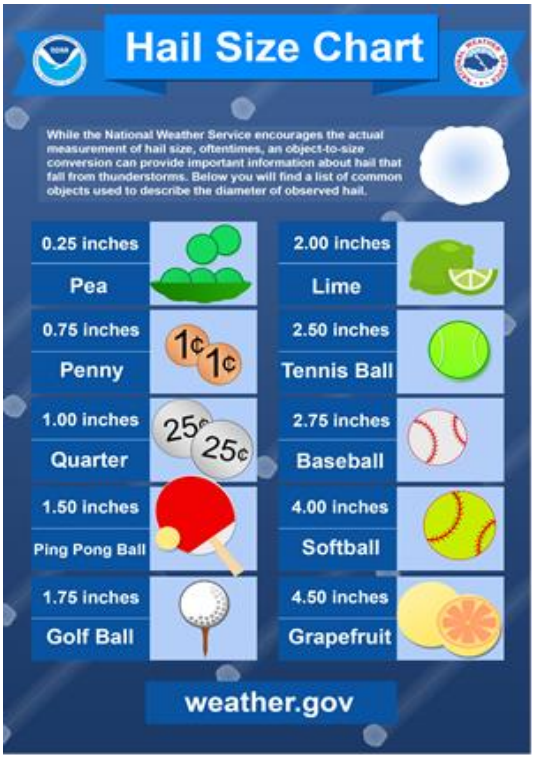
Lightning

Currently, cloud-to-ground (CG) and intra-cloud (IC) lightning flashes are detected and mapped in real-time by two different networks in the United States: the National Lightning Detection Network (NLDN) and the Earth Networks Total Lightning Network. These systems work by detecting radio waves (sferics) emitted by fast electric currents (strokes) in lightning channels. A "stroke" can be a fast current within the cloud, or a "return stroke" in a channel to ground (NOAA n.d.).

Hail

The severity of hail is measured by duration, hail size, and geographic extent. Hail can exhibit a variety of sizes, though only the very largest hail stones pose serious risk to people, if exposed. It is often estimated by comparing it to a known object (Figure 12-10). Most hailstorms are made up of a mix of different sizes, and only the very largest hail stones pose serious risk to people caught in the open (NSSL 2021).

Figure 12-10. Hail Size Chart



Source: (NSSL 2025)

Wind

High winds can occur during a severe thunderstorm, with a strong weather system, or can flow down a mountain. When winds are sustained at 40-50 mph, isolated wind damage is possible. Widespread significant wind damage can occur with higher wind speeds (NWS n.d.).

Table 12-1. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very Wind	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light or light and variable wind	0-5

Source: (NJOEM 2024)

Tornadoes

The Enhanced Fujita (EF) Scale was developed in 2008 to address limitations with the previously used Fujita (F) Scale. It is used to assign tornadoes a 'rating' based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators (DI) and Degree of Damage (DOD), which help better estimate the range of wind speeds produced by the tornado. From that, a rating is assigned, similar to that of the F-Scale, with six categories from EF0 to EF5, representing increasing degrees of damage. This new scale considers how most structures are designed (NJOEM 2024).

Damage from tornadoes can vary from minor damage that breaks tree limbs to massive damage demolishing homes in its path. The type of damage depends on the intensity, size, and duration of the tornado. The magnitude or severity of a tornado is categorized using the Enhanced Fujita Tornado Intensity Scale (EF Scale). This is the scale now used exclusively for determining tornado ratings by comparing wind speed and actual damage. Figure 12-11 illustrates the relationship between EF ratings, wind speed, and expected tornado damage. Essex County has experienced tornadoes ranging from EF0 to EF1.

Figure 12-11. Explanation of EF-Scale Ratings

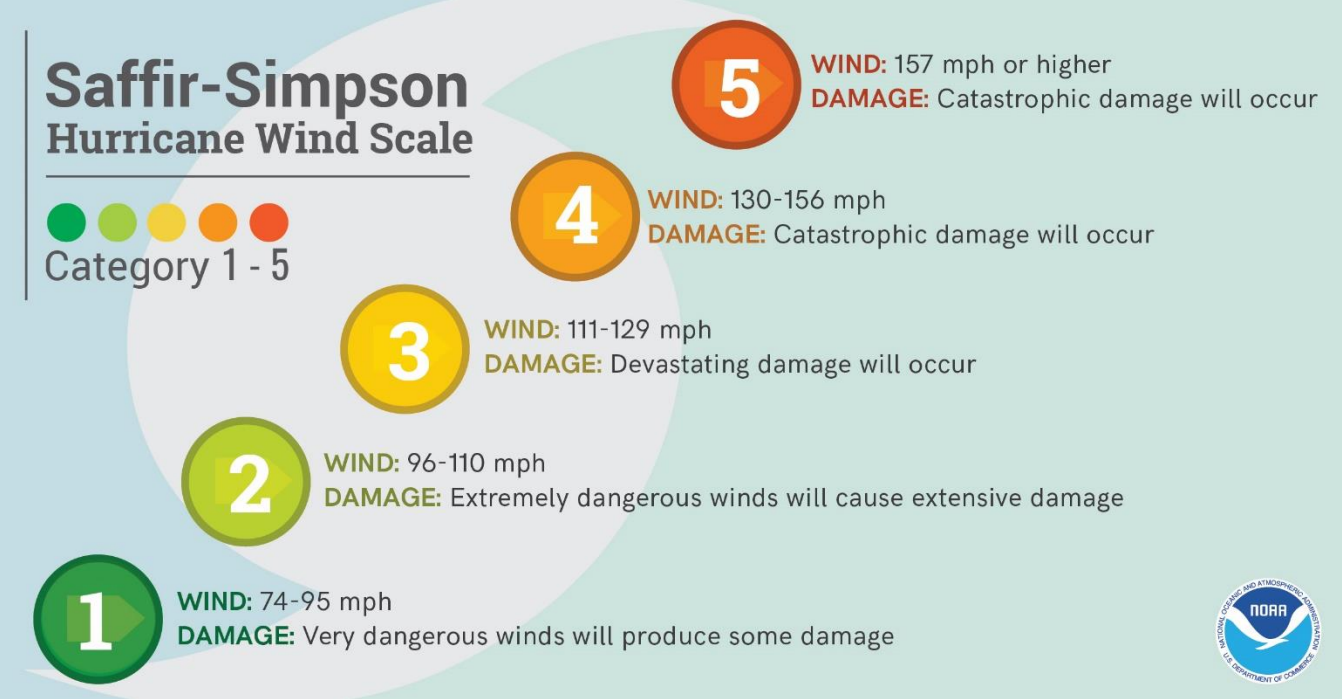
EF Rating	Wind Speeds	Expected Damage	
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.	
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.	
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.	
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.	
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.	
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.	

Source: (NWS 2025b)

Hurricanes and Tropical Storms

Tropical systems are traditionally classified by sustained wind speed. A tropical depression is a weak system with maximum sustained winds of 38 mph or less, while a tropical storm has winds between 39-73 mph, and a hurricane has winds reaching 74 mph or higher. Hurricanes are classified according to the Saffir-Simpson Hurricane Wind Scale from a Category 1 to Category 5 by sustained wind speed. Figure 12-12 shows the categories of the scale and the type of damage associated with each category.

Figure 12-12. Saffir-Simpson Hurricane Wind Scale



Source: (NOAA 2025b)

Warning Time

Thunderstorms, Lightning, and Hail

Severe thunderstorm statements, watches, and warnings are issued by the local NWS office and the Storm Prediction Center (SPC). The NWS and SPC will update the watches and warnings and notify the public when they are no longer in effect. NWS issues statements, watches, and warnings for thunderstorms (NWS 2025):

- Special Weather Statement: Issued for strong thunderstorms that are below severe levels, but still may have some adverse impacts. Usually issued for the threat of wind gusts of 40-58 mph or small hail less than 1 inch in diameter.
- Severe Thunderstorm Watches: Issued by the Storm Prediction Center when conditions are favorable for the development of severe thunderstorms over a larger-scale region for a duration of at least 3 hours. Tornadoes are not expected in such situations, but isolated tornado development can also occur.
- Severe Thunderstorm Warning: Issued when there is evidence based on radar or a reliable spotter report that a thunderstorm is producing, or forecast to produce, wind gusts of 58 mph or greater, structural wind damage, and/or hail 1 inch in diameter or greater.

Wind

The NWS issues advisories and warnings for winds that are typically site-specific. The NWS issues high wind advisories, watches, and warnings when wind speeds can pose a hazard or are life threatening. The criterion for each of these varies from state to state. According to the NWS (2025), wind warnings and advisories for New Jersey are as follows (NWS 2025):

- Wind Advisory: Issued when sustained winds of 30 to 39 mph are forecast for 1 hour or longer, or wind gusts of 46-57 mph for any duration.
- High Wind Warning: Issued when sustained winds of 40 mph or greater are forecast for 1 hour or longer, or wind gusts of 58 mph or greater for any duration.
- Extreme Wind Warning: Issued when surface winds of 100 knots (115 MPH) or greater associated with non-convective winds, a derecho (NOT associated with a tornado), or sustained hurricane winds (eyewall of a category 3) are expected to occur within one hour.

Tornadoes

The NWS issues tornado watches and warnings. They are issued when conditions are favorable for the development of tornadoes in and close to the watch area. According to the NWS, the following tornado watches and warnings are issued in New Jersey (NWS 2025):

- Tornado Warning: Issued when there is evidence based on radar or a reliable spotter report that a tornado is imminent or occurring.
- Tornado Watch: Issued by the Storm Prediction Center when conditions are favorable for the development of severe thunderstorms and multiple tornadoes over a larger-scale region for a duration of at least 3 hours.

Hurricanes and Tropical Storms

The NWS issues hurricane and tropical storm watches and warnings. These watches and warnings are issued or will remain in effect after a tropical cyclone becomes post-tropical, when such a storm poses a significant threat to life and property. The NWS allows the National Hurricane Center (NHC) to issue advisories during the post-tropical stage (NHC NOAA 2010). According to the NWS, the following watches and warnings are issued in New Jersey for tropical cyclones (NWS 2025):

- Tropical Storm Watch: Issued by the National Hurricane Center when sustained winds between 39 and 73 mph are possible within the specified coastal area within 48 hours.
- Tropical Storm Warning: Issued by the National Hurricane Center when sustained winds between 39 and 73 mph are forecast within the specified coastal area within 36 hours.
- Hurricane Watch: Issued by the National Hurricane Center when sustained winds of 74 mph or higher are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.
- Hurricane Warning: Issued by the National Hurricane Center when sustained winds of 74 mph or higher are forecast within the specified area. Because hurricane preparedness activities become

difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

Worst Case Scenario

Thunderstorms and Lightning

A worst-case scenario would involve straight-line winds of over 50 mph, heavy rains, and a lightning strike at multiple community lifelines (police or fire station, hospital, and potable water pump stations) during a thunderstorm. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. Prolonged rain could produce flooding, inundating roadways and damaging structures. Overall, the County would experience power outages, closed roadways, emergency rescues, debris cleanup, and impacts to drinking water.

Hail

A hail event with golf ball-sized hail (1.75-inch diameter) would be the worst-case scenario for Essex County. This size of hail can cause significant damage to buildings and vehicles, injuring people and animals who are outside, widespread power outages, and economic losses as a result of property and infrastructure damages.

Tornadoes

An EF-3 tornado would be the reasonable worst-case scenario for Essex County. Although an EF-3 has not occurred in Essex County, there have been EF-3 tornadoes elsewhere in the State of New Jersey. The County could expect wind speeds between 136 and 165 mph that would cause severe damage. There would be significant damage to buildings, with poorly constructed homes completely lost in addition to widespread damage to tress and vegetation.

Wind, Hurricanes, and Tropical Storms

A direct hit from a major hurricane (Category 3 hurricane or higher) would be the worst-case scenario. A storm of this magnitude could cause severe damage to buildings in the County. Near-total power loss would be expected with outages that could last from several days to weeks. Flooding associated with combined heavy rainfall and storm surge would be catastrophic. For more information on flood risk from hurricanes, refer to Section 10 (Flood).

12.1.4 Previous Occurrences

The following sections provide a review of previous severe weather occurrences in Essex County.

12.1.4.1 Declarations

Federal Declarations

Between 1954 and 2024, FEMA declared that Essex County experienced 19 severe weather-related disasters (DR) or emergencies (EM). Those events are listed in Table 12-2. Additional disasters declared for flood and severe winter weather are included in Sections 10 (Flood) and 13 (Severe Winter Weather).

Table 12-2. FEMA Severe Weather Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
DR-245-NJ	June 18, 1968	June 18, 1968	New Jersey Heavy Rains, Flooding
DR-310-NJ	September 4, 1971	September 4, 1971	New Jersey Heavy Rains, Flooding
DR-402-NJ	August 7, 1973	August 7, 1973	New Jersey Severe Storms, Flooding
DR-477-NJ	July 23, 1975	July 23, 1975	New Jersey Heavy Rains, High Winds, Hail, Tornadoes
DR-701-NJ	March 28 - April 8, 1984	April 12, 1984	New Jersey Coastal Storms, Flooding
DR-973-NJ	December 10-17, 1992	December 18, 1992	New Jersey Coastal Storm, High Tides, Heavy Rain, Flooding
DR-1295-NJ	September 16-18, 1999	September 18, 1999	Hurricane Floyd
DR-1588-NJ	April 1-3, 2005	April 19, 2005	Severe Storms and Flooding
DR-1694-NJ	April 14-20, 2007	April 26, 2007	Severe Storms and Inland And Coastal Flooding
DR-1897-NJ	March 12 – April 15, 2010	April 2, 2010	Severe Storms and Flooding
DR-4021-NJ EM-3332-NJ	August 27 – September 5, 2011 August 26, September 5, 2011	August 31, 2011 August 27, 2011	Hurricane Irene
DR-4048-NJ	October 29-30, 2011	November 30, 2011	Severe Storm
DR-4086-NJ EM-3354-NJ	October 26 – November 8, 2012	October 30, 2012 October 28, 2012	Hurricane Sandy
DR-4574-NJ	August 4, 2020	December 11, 2020	Tropical Storm Isaias
DR-4614-NJ EM-3573-NJ	September 1-3, 2021	September 5, 2021 September 2, 2021	Remnants of Hurricane Ida

Source: (FEMA 2024)

USDA Declarations

Between 2020 and 2024, the USDA included Essex County was included in one severe weather-related agricultural disaster declarations (USDA 2025a), listed in the table below.

Table 12-3. USDA Severe Weather Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
S4892	August 3-4, 2020	December 18, 2020	High winds and heavy rain from Hurricane Isaias

Source: (U.S. Department of Agriculture 2024)

12.1.4.2 Summary of Significant Events

The most notable severe weather event to affect Essex County and its municipalities in the past five years was the remnants of Hurricane Ida in September 2021. The substantial rainfall resulted in severe flooding, impacting homes, businesses, and infrastructure throughout the County, with municipalities such as the Township of Millburn, City of Newark, Township of Bloomfield, Village of South Orange, and Township of Nutley experiencing particularly extensive damage. Numerous water rescues were conducted, and flash flooding unfortunately led to multiple fatalities within the County. The flooding and resulting infrastructure damage were considerable, affecting residential properties, businesses, and public facilities countywide.

12.1.4.3 Recent Events

For the 2025 HMP update, severe weather events that impacted Essex County between January 2020 and December 2024 are listed in Table 12-4. For events prior to January 2020, refer to the 2020 HMP.

Table 12-4. Recent Severe Weather Hazard Events

Date (s) of Event	Declaration Number	County Included	Event Type	Description
August 4, 2020	DR-4574-NJ	Yes	Tropical Storm Isaias	In Essex County, Tropical Storm Isaias brought strong winds with sustained wind speeds of up to 52 mph. These winds resulted downed trees and limbs, downed power lines, damages to homes and cars, power outages, and disruption to public transportation. This event also brought heavy rain, with totals between one and two inches.
July 29, 2021	N/A	N/A	Tornado (EF0)	Severe thunderstorms moved across northeastern New Jersey. An EF0 tornado formed in Essex County. It touched down inside the Montclair Golf Club and traveled northeast. This resulted in downed trees, power outages, and a home that was knocked from its foundation. In total, the County had approximately $330,000 in property damage from this event.
September 1-3, 2021	DR-4614-NJ EM-3573-NJ	Yes	Remnants of Hurricane Ida	Extremely heavy rainfall associated with the remnants of Hurricane Ida overspread northeast New Jersey during the evening of September 1 and continued through the early morning hours of September 2. Rainfall totals ranged from 5-8+ inches across much of the region, with much of that rain falling in just a few hours. This resulted in widespread flash flooding leading to numerous road closures and water rescues in addition to extensive river flooding. A 66-year-old man and his 46-year-old daughter died as a result of flooding after going into the basement of their home on Lincoln Place in Irvington to secure it as the Elizabeth River began to overflow. A 55-year-old man was found dead on Ridgewood Road in the vicinity of Berkeley Road in Maplewood due to

Date (s) of Event	Declaration Number	County Included	Event Type	Description
				flooding. He is believed to have been swept away by flood waters while attempting to remove debris from drains in the area. A car carrying two Seton Hall University students was overcome by flood waters on Main Avenue near Benson Avenue in Passaic. The body of one of the students, a 21-year-old man, was later found in Newark after being swept down the Passaic River. An unidentified person died by electrocution as a result of flooding in Essex County. People were trapped in their cars in flood waters on Mill Street near the Second River in Belleville. A water rescue took place for a vehicle trapped in flood waters on South Street in Newark. The occupant was rescued by a Fire Department rescue boat from the roof of the car. A water rescue took place at the intersection of White Oak Ridge Road and Mohawk Road in Millburn with a vehicle stranded in flood waters. Multiple rescues were needed across Livingston for occupied cars stranded in flood waters. Numerous water rescues took place in Livingston. Rescue boats were used to pull occupants to safety on Walnut Street, East Hobart Gap Road, and Old Short Hills Road. Basement and garage flooding were reported in Livingston. Bragaw Avenue in Irvington, NJ had all lanes closed due to flooding from heavy rain. Flash flooding took place on McClellan Street near Newark International Airport with traffic blocked. The Essex County Sheriff's Department closed Branch Brook Park in Newark due to flooding on September 1.
July 21, 2022	N/A	N/A	Thunderstorms	Strong thunderstorms hit Essex County, causing downed trees and damage in Nutley Township (East Passaic Avenue and Watchung Avenue). The County had an estimated $16,000 in property damage.
September 8, 2023	N/A	N/A	Thunderstorms	Thunderstorms impacted Essex County, with some severe and producing strong winds and large hail. In the City of Newark, large tree limbs fell on a car. In Livingston Township, large trees fell onto roadways. Overall, the County had approximately $10,000 in property damage.
June 26, 2024	N/A	N/A	Thunderstorms	Showers and thunderstorms fell over Essex County, with some severe at times. In East Orange, a tree fell onto a person who died from the injuries.

Source: (FEMA 2024); (NOAA NCEI 2024)

12.1.5 Future Conditions

Future hazard conditions, including frequency and severity of future events, is discussed in the sections below.

12.1.5.1 Probability

Information from FEMA, the New Jersey State HMP, and the NOAA-NCEI storm events database was used to identify the number of severe weather events that occurred in Essex County between 1996 and 2024. Table 10-3 presents the probability of future events for severe weather in Essex County.

Table 12-5. Probability of Future Occurrences of Severe Weather Events

Hazard Type	Number of Occurrences Between 1996 and 2024	% Chance of Occurring in Any Given Year
Thunderstorms	155	100%
Lightning	22	32%
Hail	33	48%
Wind	32	47%
Tornadoes	3	4%
Tropical Storms	3	4%
Hurricane	0	0%
Total	248	100%

Source: (FEMA 2024); (NOAA NCEI 2024); (NJOEM 2024)

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for severe weather in the County is considered 'frequent' (100% annual probability; a hazard event may occur multiple times per year.).

12.1.5.2 Climate Change

According to the 2020 New Jersey Scientific Report on Climate Change, New Jersey is warming faster than the rest of the Northeast region and the world. Historically unprecedented warming is projected for the 21st century with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050. Annual precipitation in New Jersey is expected to increase by 4 percent to 11 percent by 2050. The intensity and frequency of precipitation events is anticipated to increase due to climate change (NJDEP 2020).

As temperatures increase, Earth's atmosphere can hold more water vapor which leads to a greater potential for precipitation. Currently, New Jersey receives an average of 46 inches of precipitation each year. Since the end of the twentieth century, New Jersey has experienced slight increases in the amount of precipitation it receives each year, and over the last 10 years there has been a 7.9 percent increase. By 2050, annual precipitation in New Jersey could increase by 4 percent to 11 percent. By the end of this century, heavy precipitation events are projected to occur two to five times more often and with more intensity than in the last century. New Jersey will experience more intense rain events, less snow, and more rainfalls. These factors mean New Jersey is likely to experience an increase in the number of flood events (NJDEP 2020).

A warmer atmosphere means storms have the potential to be more intense and occur more often. In New Jersey, severe weather typically occurs in the warmer months between April and October, but a warming climate may result in these events becoming more common in traditionally cooler months. Over the last

50 years, in New Jersey, storms that resulted in extreme rain increased by 71 percent which is a faster rate than anywhere else in the United States (NJDEP 2020).

12.1.5.3 Potential Future Impacts

Climate change is likely to increase severe weather risk across Essex County. An increase in storms will produce more wind events and can increase the risk of tornado activity. It will also bring more severe rain events that will lead to more flooding and flood damage. With an increased likelihood of severe weather events occurring, all Essex County's assets will experience additional risk for losses due to these events. As all of Essex County is exposed to severe weather, anticipated increases in population and development will increase the overall exposure to severe weather in Essex County.

12.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

12.2.1 Summary of Vulnerability

All of Essex County is considered vulnerable to severe weather. To assess Essex County's risk to the severe weather hazard, a Hazus probabilistic analysis was performed to analyze estimated anticipated future wind hazard losses in the County for the 100-year and 500-year MRP events. For all other severe weather hazards, a qualitative assessment was conducted to analyze the severe weather hazard for Essex County.

12.2.2 Impact on Life, Health, and Safety

The entire population of Essex County is exposed and vulnerable to the severe weather hazard. Lightning can have serious impacts on life, health, and safety of all residents in Essex County. Lightning strikes can cause severe injuries or even fatalities. Strikes can disrupt communication infrastructure and can cause fires in homes, buildings, and wooded areas. All of which can have impacts on those that live and work in Essex County (NJOEM 2024).

Large hail can cause serious injuries to people caught outside during a storm. Hail can damage roofs, windows, cars, and other structures, leading to costly repairs and safety concerns. Wind-driven hail can tear up siding on houses, break windows and blow into houses, break side windows on cars, and cause severe injury and/or death to people and animals (NSSL 2021).

The impact of a high wind event, tornado, hurricane, or tropical storm on life, health, and safety depends on several factors, including the severity of the event and whether or not adequate warning time was provided to residents. Residents may be displaced or require temporary to long-term sheltering as a result of a hurricane or tropical storm. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life (NJOEM 2024).

Residents may be displaced or require temporary to long-term sheltering. Hazus estimates there will be two displaced households and two people requiring short-term sheltering for a 100-year MRP wind event (peak winds gusts ranging from 76 to 80 mph) and 1,045 displaced households and 938 people requiring short-term sheltering for a 500-year MRP wind event (peak wind gusts ranging from 95 to 101 mph) (refer to Table 12-6).

Table 12-6. Estimated Displaced Households and Persons Seeking Shelter for the 100-year and 500-year MRP Wind Events in Essex County

Jurisdiction	100-Year MRP Hurricane		500-Year MRP Hurricane	
	Displaced Households	Persons Seeking Short-Term Sheltering	Displaced Households	Persons Seeking Short-Term Sheltering
Belleville (T)	0	0	45	49
Bloomfield (T)	0	0	62	50
Caldwell (B)	0	0	7	3
Cedar Grove (T)	0	0	8	5
East Orange (C)	0	0	102	76
Essex Fells (B)	0	0	1	1
Fairfield (T)	0	0	4	2
Glen Ridge (B)	0	0	8	6
Irvington (T)	1	1	96	71
Livingston (T)	0	0	21	10
Maplewood (T)	0	0	31	22
Millburn (T)	0	0	21	11
Montclair (T)	0	0	36	22
Newark (C)	1	1	415	478
North Caldwell (B)	0	0	5	2
Nutley (T)	0	0	37	24
City of Orange (T)	0	0	48	40
Roseland (B)	0	0	5	2
South Orange (V)	0	0	20	16
Verona (T)	0	0	15	8
West Caldwell (T)	0	0	8	4
West Orange (T)	0	0	50	36
Essex County (Total)	**2**	**2**	**1,045**	**938**

Source: (Hazus v6.1 2023)

12.2.2.1 Socially Vulnerable Populations

Socially vulnerable populations are most susceptible due to their physical and financial ability to react and respond during extreme severe weather events. This population includes the elderly, young, and individuals with disabilities or access or functional needs who may be unable to evacuate in the event of an emergency. The elderly are considered most vulnerable because they require extra time or outside assistance during evacuations and are more likely to seek or need medical

The vulnerable population also includes those who would not have adequate warning from an emergency warning system (e.g., television or radio); this would include residents and visitors. The population adversely affected by severe summer weathers may also include those beyond the disaster area that rely on affected roads for transportation.

attention that might not be readily available due to isolation during a storm event. Section 3 (County Profile) provides statistics of these populations.

Economically disadvantaged people are at high risk for severe weather events because of the potential inability to afford up-to-code homes and buildings that are deemed safe from storms passing through. They also may pose health issues, such as exposure to mold and other health issues that water seepage may cause. Repairs following severe weather events may be outside of financial means. These populations may also lack access to vehicles for any necessary evacuations.

12.2.3 Impact on General Building Stock

All buildings in Essex County are exposed and vulnerable to the severe weather hazard. However, damage to buildings is dependent upon several factors, including wind speed, storm duration, and path of the storm track. Depending on the size of the hail and severity of the storm, the County could see damage from hail impacting structures. Lightning can spark wildfires or building fires, especially if structures are not protected by surge protectors on critical electronic, lighting, or information technology systems. While damage to the building stock is possible because of lightning and hail, they are difficult to estimate and would not have as wide of an impact as a high wind or tornado event.

Building construction also plays a major role in the extent of damage resulting from a severe weather event. Due to differences in construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. Wood and masonry buildings, in general, regardless of their occupancy class, tend to experience more damage than concrete or steel buildings. Furthermore, high-rise buildings are also very vulnerable structures as wind speed traditionally increases with height above ground level.

Building damage as a result of 100-year and 500-year MRP hurricanes was estimated using Hazus. Table 12-7 summarizes estimated total building and content losses caused by the 100-year and 500-year MRP events. Hazus estimates that there will be $229,986,663 in damage to structures caused by the 100-year MRP event (0.2% of the total damage) and $1,309,278,700 in damage to structures caused by the 500-year MRP event (0.9% of the total damage).

Table 12-7. Estimated Building Losses for the 100-year and 500-year MRP Wind Events in Essex County

Jurisdiction	Total Building Value (structure and contents)	100-Year MRP Hurricane		500-Year MRP Hurricane	
		Structure and Contents	% Total Value Damaged	Structure and Contents	% Total Value Damaged
Belleville (T)	$5,440,939,832	$9,055,949	0.2%	$49,747,108	0.9%
Bloomfield (T)	$7,149,452,578	$11,750,694	0.2%	$66,980,635	0.9%
Caldwell (B)	$1,437,101,129	$1,480,813	0.1%	$10,035,848	0.7%
Cedar Grove (T)	$3,664,877,018	$3,853,426	0.1%	$24,484,594	0.7%
East Orange (C)	$7,298,495,889	$12,011,267	0.2%	$70,630,320	1.0%
Essex Fells (B)	$624,599,485	$2,156,903	0.3%	$8,185,777	1.3%
Fairfield (T)	$7,708,467,384	$3,390,264	0.0%	$29,058,621	0.4%
Glen Ridge (B)	$1,311,356,144	$2,416,390	0.2%	$12,889,585	1.0%
Irvington (T)	$6,543,152,214	$12,281,871	0.2%	$69,065,369	1.1%

Jurisdiction	Total Building Value (structure and contents)	100-Year MRP Hurricane		500-Year MRP Hurricane	
		Structure and Contents	% Total Value Damaged	Structure and Contents	% Total Value Damaged
Livingston (T)	$9,227,217,608	$12,505,843	0.1%	$77,399,714	0.8%
Maplewood (T)	$4,279,929,361	$9,122,921	0.2%	$53,501,159	1.3%
Millburn (T)	$6,236,661,855	$15,749,005	0.3%	$72,860,106	1.2%
Montclair (T)	$7,012,741,670	$11,014,428	0.2%	$58,755,968	0.8%
Newark (C)	$50,617,106,841	$71,861,460	0.1%	$412,286,566	0.8%
North Caldwell (B)	$2,103,919,331	$2,477,272	0.1%	$15,724,924	0.7%
Nutley (T)	$4,550,682,627	$9,556,233	0.2%	$47,315,351	1.0%
City of Orange (T)	$4,186,194,813	$5,745,516	0.1%	$35,318,770	0.8%
Roseland (B)	$2,338,671,996	$2,061,077	0.1%	$13,446,144	0.6%
South Orange (V)	$3,553,949,814	$9,040,998	0.3%	$44,062,983	1.2%
Verona (T)	$2,639,752,949	$3,691,591	0.1%	$22,785,204	0.9%
West Caldwell (T)	$4,439,689,868	$3,439,623	0.1%	$24,607,993	0.6%
West Orange (T)	$9,974,739,027	$15,323,122	0.2%	$90,135,961	0.9%
Essex County (Total)	**$152,339,699,431**	**$229,986,663**	**0.2%**	**$1,309,278,700**	**0.9%**

Source: (Hazus v6.1 2023)

12.2.4 Impact on Community Lifelines

All community lifelines in Essex County are exposed and vulnerable to the severe weather hazard. Impacts are similar to that of general building stock; however, community lifelines are essential for ensuring day-to-day functioning of Essex County. These lifelines include utilities, hospitals, schools, county and local offices, and others. Refer to Section 3 (County Profile) for a complete inventory of community lifeline sin the County. Table 12-8 summarizes potential impacts the severe weather hazard can have on community lifelines in Essex County.

Table 12-8. Severe Weather Impacts on Community Lifelines

Community Lifeline	Potential Impacts
Safety and Security	Community safety may be at risk due to the potential for direct harm from severe weather impacts. Disruptions to emergency services and public safety infrastructure can further compromise the ability to effectively respond to emergencies.
Food, Hydration, Shelter	Damage to grocery stores and food distribution networks can lead to food shortages, while buildings designated as shelters may be damaged or destroyed, leaving individuals without a place to stay.
Health and Medical	Medical facilities may be impacted by power disruptions or structural damage from severe weather, while patient transport and medical supply chains can be hindered by dangerous conditions on roadways.
Energy	Power outages caused by downed power lines and damaged infrastructure can lead to disruption in service to homes, businesses, and community lifelines.
Communications	Many types of communications equipment are impacted by power failures or destruction of communication networks; leading to disruption in service which are crucial for emergency response and day-to-day operations.
Transportation	Flooding, debris, and damaged roads can hinder transportation and cause disruption to public transportation.

Community Lifeline	Potential Impacts
Hazardous Materials	Severe weather can cause leaks or spills at facilities, posing environmental and health risks.
Water Systems	Severe weather can cause damage to structures and water utility infrastructure, leading to water shortages, flood, and water contamination.

Source: (NJOEM 2024)

12.2.5 Impact on the Economy

All of Essex County is exposed and vulnerable to the severe weather hazard. Severe weather events can have short- and long-lasting impacts on the County's economy. Property damage can be extensive to homes, businesses, and infrastructure which can be costly to repair or replace. These events can also disrupt local businesses due to power outages and infrastructure damage, leading to lost revenue. Overall, economic impacts include the loss of business function (e.g., tourism, recreation), damage to inventory, relocation costs, wage loss, and rental loss due to the repair/replacement of buildings (NOAA n.d.).

According to FEMA's National Risk Index, Essex County's expected annual losses from the following severe summer weather events include:

- Hail - $38,170
- Hurricane - $19.8 million
- Lightning – $350,350
- Strong Wind - $5.5 million
- Tornado - $7.1 million

Impacts to transportation lifelines affect both short-term (e.g., evacuation activities) and long-term (e.g., day-to-day commuting and goods transport) transportation needs. Utility infrastructure (power lines, gas lines, electrical systems) could suffer damage and impacts can result in the loss of power, which can impact business operations and can impact heating or cooling provision to the population. Direct building losses are the estimated costs to repair or replace the damage caused to the building. This is reported in the "Impact on General Building Stock" section discussed earlier. Business interruption losses are the losses associated with the inability to operate a business because of the wind damage sustained during the storm or the temporary living expenses for those displaced from their home because of the event.

Hazus estimates building and tree debris as a result of 100-year and 500-year MRP wind events. For building debris, Hazus estimates are divided into two categories: (1) reinforced concrete and steel that require special equipment to break it up before it can be transported, and (2) brick, wood, and other debris that can be loaded directly onto trucks with bulldozers. For tree debris, Hazus provides estimates the weight and volume of downed trees that would likely be collected and disposed of by the County (FEMA 2024). Table 12-9 summarizes the overall estimated debris generated as a result of these events for Essex County.

Table 12-9. Estimated Debris Generated by the 100-year and 500-year MRP Wind Events

Mean Return Period	Brick/Wood (tons)	Concrete/Steel (tons)	Tree (tons)	Eligible Tree Volume (cubic yards)
100-year	16,848	0	19,249	156,069
500-year	97,983	321	68,428	542,953

Source: (Hazus v6.1 2023)

12.2.6 Impact on Historic and Cultural Resources

Historic and cultural buildings in Essex County are vulnerable to structural damage from severe weather events. This damage can affect buildings, monuments, and other structures, with older buildings that do not meet modern building codes being particularly at risk. Artifacts, artwork, and historical documents housed within these buildings are also susceptible to damage or destruction. The costs of repair and restoration can be substantial, leading to significant economic impacts on the County.

12.2.7 Impact on Ecosystems and Natural Resources

The impact of severe weather events on the environment varies, but researchers are finding that the long-term impacts of more severe weather can be destructive to the natural and local environment. National organizations such as USGS and NOAA have been studying and monitoring the impacts of extreme weather phenomena as it impacts long-term climate change, streamflow, river levels, reservoir elevations, rainfall, floods, landslides, erosion, etc. (USGS 2020). For example, severe weather that creates longer periods of rainfall can erode natural banks along waterways and degrade soil stability for terrestrial species. Severe wind events can tear apart habitats, causing fragmentation across ecosystems. Researchers also believe that a greater number of diseases will spread across ecosystems because of impacts that severe weather and climate change will have on water supplies (NOAA 2019). Overall, as the physical environment becomes more altered, species will begin to contract or migrate in response, which may cause additional stressors to the entire ecosystem within Essex County.

12.2.8 Change in Vulnerability Since the Previous HMP

Essex County's vulnerability to severe weather events has increased since the 2020 HMP due to an increase in overall population, new development, and climate change projections.

12.3 Mitigation Opportunities

A range of potential opportunities for mitigating the severe weather hazard have been identified and considered by plan participants:

- Manipulate the hazard:
  - None
- Reduce exposure and vulnerability to the hazard:
  - Retrofit structures (improved roofing, glazing, insulation, etc.)
  - Provide for redundant heat and power
  - Contact municipality or utilities to trim or remove trees that could affect power lines; trimming trees back from power lines
  - Relocate critical infrastructure, such as power lines, underground
  - Reinforce or relocate critical infrastructure such as powerlines so that it meets performance expectations
  - Harden infrastructure such as locating utilities underground
  - Adopt ordinances that regulate the type and quantity of trees planted near utility lines

- Build local capacity to respond to or prepare for the hazard:
    - Improve awareness of impending severe weather (e.g. obtain a NOAA weather radio)
    - Promote 72-hour self-sufficiency Provide for redundant heat and power
    - Participate in NOOA's SKYWARN training to increase knowledge and awareness of hazard
    - Create redundancy (e.g. backup generators)
    - Develop a Continuity of Operations Plan (COOP)
    - Monitor impending storm events so that you can release employees in such a manner as to not negatively impact emergency response personnel/services
    - Support programs that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc.
    - Increase communication alternatives
    - Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines
    - Promote awareness and participation in alert systems
    - Provide NOAA weather radios to the public
    - Create/Enhance "mutual aid" agreements for response to all emergencies
    - Create/identify evacuation routes to be utilized during severe storm events.
    - Develop debris management plans
    - Join NWS "StormReady" program
    - Provide early warning of impending severe storm events to identified critical or essential facilities
    - Promote emergency power supplies to private property
    - Improve, expand or harden communications facilities and services
    - Recruit additional emergency personnel or use mutual aid agreements
    - Increase sheltering capabilities
    - Increase capability to respond to power outages and downed power lines
    - Establish partnerships with utility providers through pro-active planning
- Nature-based opportunities:
- Plant appropriate trees near homes and power lines ("Right tree, right place" National Arbor Day Foundation Program)
    - Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors

13 Severe Winter Weather

13.1 Hazard Profile

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

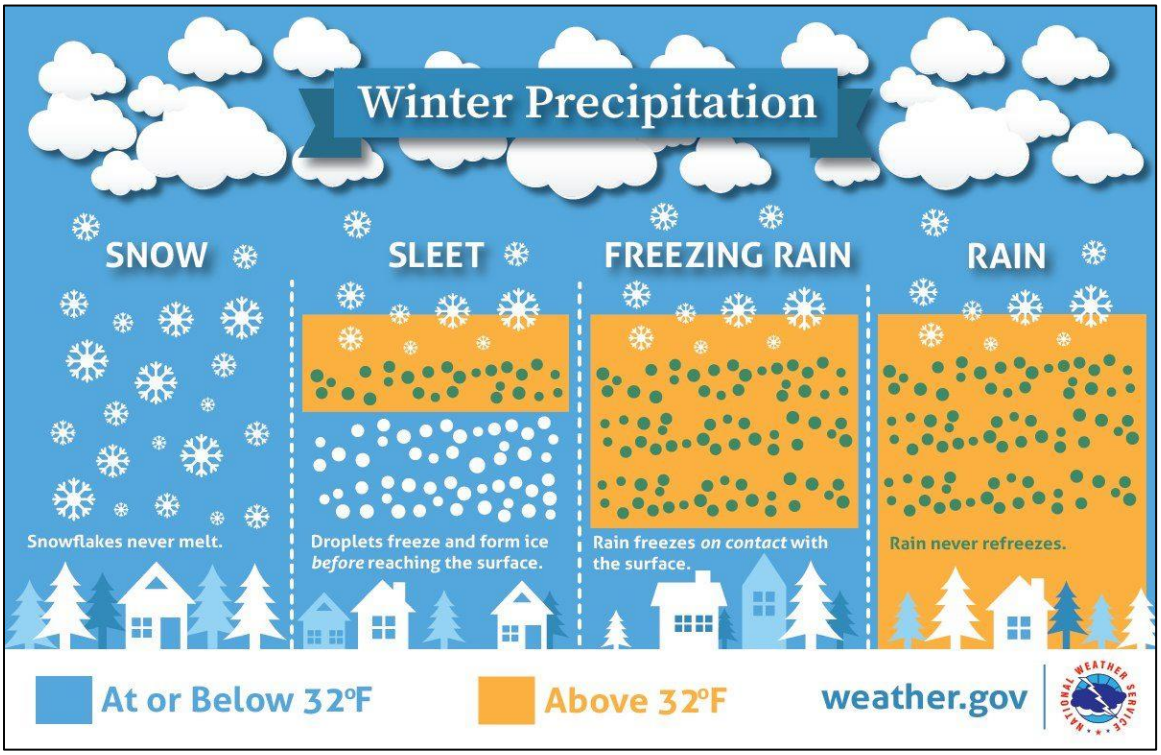
Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

13.1.1 Description of the Hazard

Defining the Hazard

Severe winter weather events include precipitation like snow, sleet, or freezing rain (see Figure 13-1). They can also include high winds leading to dangerous wind chills and blowing snow. The following are common severe winter weather events that occur in Essex County.

Figure 13-1. Winter Precipitation



Source: (NWS Sioux Falls South Dakota 2024)

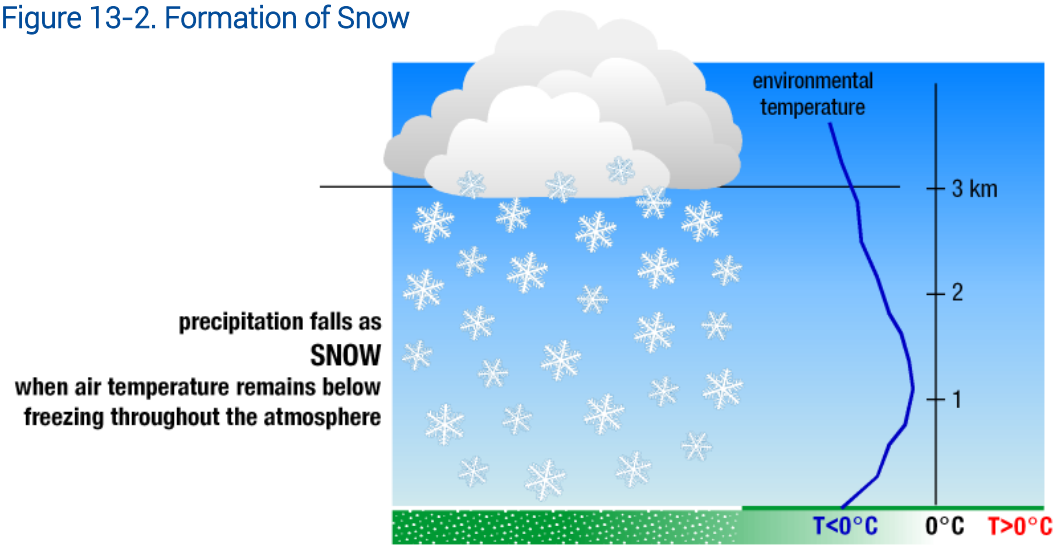
Snow

According to the National Snow and Ice Data Center (NSIDC), snow is precipitation in the form of ice crystals. It originates in clouds when temperatures are below the freezing point (32°F) and water vapor in the atmosphere condenses directly into ice without going through the liquid stage. Once an ice crystal has

formed, it absorbs and freezes additional water vapor from the surrounding air, growing into snow crystals or a snow pellet, which then falls to the earth through air that is below freezing all the way to the ground (NSIDC 2025). Figure 13-2 illustrates how snow forms. The following describes the different categories of snow.

- Snow Flurries. Light snow falling for short durations. No accumulation or light dusting is all that is expected.
- Snow Showers. Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- Blowing Snow. Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.
- Blizzards. Winds over 35mph with snow and blowing snow, reducing visibility to 1/4 mile or less for at least 3 hours (NWS n.d.).

Figure 13-2. Formation of Snow



Source: (NOAA NSSL n.d.)

Blizzards

A blizzard is a winter snowstorm with sustained or frequent wind gusts of 35 mph or more, accompanied by falling or blowing snow reducing visibility to or below 0.25 mile. These conditions must be predominant over a 3-hour period. Cold temperatures are often associated with blizzard conditions but are not a formal part of the definition. The hazard, created by the combination of snow, wind, and low visibility, significantly increases when temperatures are below 20°F. A severe blizzard is categorized as having temperatures

Figure 13-3. What's a Blizzard



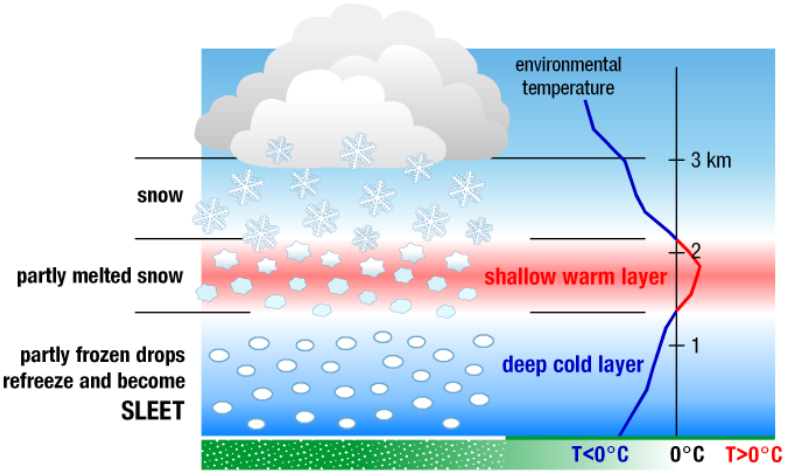
Source: (National Weather Service n.d.)

near or below 10°F, winds exceeding 45 mph, and visibility reduced by snow to near zero (NJOEM 2024). Blizzard conditions often develop on the northwest side of an intense storm system. The difference between pressure systems causes very strong winds which then pick up available snow from the ground, or blow any snow which is falling, creating very low visibilities and the potential for significant drifting of snow (National Weather Service n.d.).

Sleet and Freezing Rain

Sleet occurs when snowflakes only partially melt when they fall through a shallow layer of warm air. These slushy drops refreeze as they next fall through a deep layer of freezing air above the surface, and eventually reach the ground as frozen rain drops that bounce on impact. Depending on the intensity and duration, sleet can accumulate on the ground much like snow (NWS 2013). Figure 13-4 provides an illustration on the formation of sleet.

Figure 13-4. Formation of Sleet



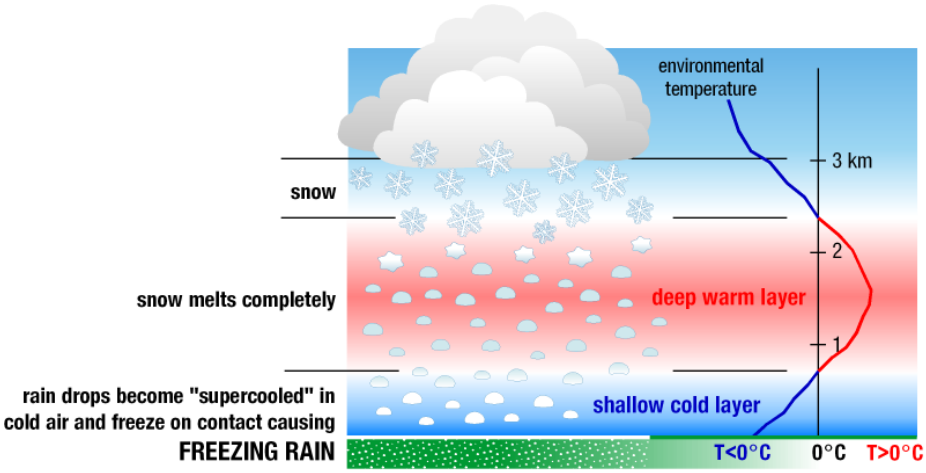
Source: (NOAA NSSL n.d.)

Ice Storms

Freezing rain occurs when snowflakes descend into a warmer layer of air and melt completely (refer to Figure 13-5). When these liquid water drops fall through another thin layer of freezing air just above the surface, they don't have enough time to refreeze before reaching the ground. Because they are "supercooled," they instantly refreeze upon contact with anything that that is at or below 32°F, creating a glaze of ice on the ground, trees, power lines, or other objects (NOAA NSSL n.d.).

An ice storm describes those events when damaging accumulations of ice are expected during freezing rain situations. Significant ice accumulations are typically accumulations of ¼-inch or greater. Heavy accumulations of ice can bring down trees, power lines and utility poles, and communication towers. Ice can disrupt communications and power for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians (NJOEM 2024).

Figure 13-5. Formation of Freezing Rain

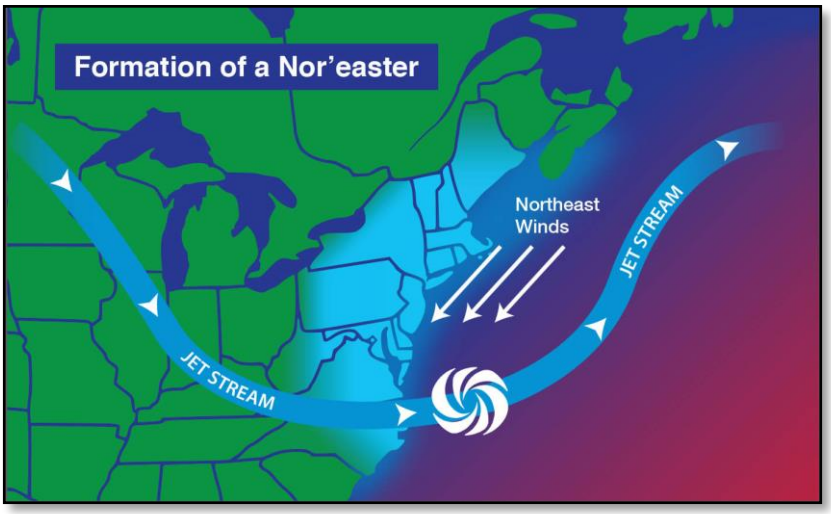


Source: (NOAA NSSL n.d.)

Nor'easters

A nor'easter is an extratropical cyclone storm that typically brings wind, snow, rain, and flooding to the region. It forms along the east coast of North America and is named after the direction of the strongest winds, which generally blow over the northeast region (refer to Figure 13-6). Nor'easters form within 100 miles of the coast between New Jersey and Georgia. The polar jet stream blow eastward towards the warm Atlantic Ocean while northeast winds blow cold air southward along the coast from Canada. When the cold air meets with the warm water, a low-pressure system forms. This low-pressure system results in the formation of clouds in which a nor'easter storm starts to develop (NWS n.d.).

Figure 13-6. Nor'easter Formation



Source: (NOAA n.d.)

Nor'easters are typically more severe during the winter months. They can produce extremely heavy snow and blizzards, in addition to rain and flooding. These hazards cause coastal erosion and severe damages to structures. Wind gusts are also common during a nor'easter and

sometimes can rival that of a tropical cyclone (NWS n.d.). Nor'easters can stall off the mid-Atlantic coast resulting in prolonged episodes of precipitation, coastal flooding, and high winds.

Nor'easters and tropical cyclones can be mistaken as the same type of storm. They are similar in that they are both types of cyclone storm events with spiraling winds around a central pressure zone. However, while tropical cyclones gain their strength from warm, moist air from tropical waters, nor'easters are cold-core systems that do not rely on warm sea surface temperatures (NWS n.d.). Nor'easters can occur any time of the year but are generally common between September and April.

Cause of the Hazard

Severe winter weather in Essex County includes snow, blizzards, sleet and freezing rain, ice storms, and nor'easters. This hazard is the combined result of temperatures near or below freezing and storm systems.

Summary of Potential Impacts

Winter storms can immobilize an entire region. Winter weather affects travel by making road conditions hazardous with snow, ice, or impaired visibility. Winds, heavy snow, and ice can also disrupt the power grid and communications lines or cause damage to people and property. During a storm, schools, businesses, and local governments may be shut down until the storm passes, roads are cleared, and power is restored. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months as damage is repaired (NJOEM n.d.).

Cascading Hazard Impacts

In addition to the damage and disruption that may occur from snow and ice, severe winter weather events bring threats of extreme cold temperatures, flooding, and wind damage. For more on extreme temperatures, refer to Section Error! Reference source not found.. For more i nformation on flooding, refer to Section Error! Reference source not found.. For more information on the impacts of strong wind, refer to Section Error! Reference source n ot found.. Power outages/failure is a secondary hazard of significant concern as can lead to significant consequences, including service disruption, disruption to infrastructure operations, and loss of heat or cooling that can cause further disturbance or injury. Carbon monoxide poisoning is also known to increase during winter months as home heating systems run for extended periods of time. Winter storms and freezing conditions that move gatherings indoors can also exacerbate the spread of COVID-19 and other airborne diseases. For more on disease outbreak, refer to Section Error! Reference source not found. (Disease Outbreak).

> Severe winter weather can cause additional dangers such as extreme cold, which can lead to frostbite and hypothermia, as well as flooding and damage from wind and ice. Ice and wind can knock down trees and power lines, disrupting electricity and communication, which makes the cold even more dangerous. Even a small amount of snow or ice can create problems for drivers and pedestrians.

13.1.2 Location

All of Essex County is exposed and vulnerable to severe winter weather and its impacts. The County is located in the State's Central Climate Zone. The northern part of this zone is often the boundary between

freezing and non-freezing precipitation during winter. Snow can fall between October and April (New Jersey State Climatologist n.d.). According to the ONJSC, Essex County's normal seasonal snowfall is approximately 25-28 inches (ONJSC n.d.). Areas in Essex County with higher elevations may experience ice and snow while other areas of lower elevation experience rain (NJOEM 2024).

13.1.3 Extent

Measuring Intensity

The magnitude or severity of a severe winter storm depends on several factors, including snowfall rates, regional climatological susceptibility to snowstorms, snowfall amounts, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day and week (e.g., weekday versus weekend), and time of season (NJOEM 2024).

NOAA's National Centers for Environmental Information (NCEI) created a Regional Snowfall Index (RSI) to categorize significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes (National Centers for Environmental Information n.d.). The RSI is based on the spatial extent of the storm, the amount of snowfall, and the impacts on population and property (NJOEM 2024).Figure 13-7 presents the five RSI ranking categories.

Figure 13-7. RSI Ranking Categories

CATEGORY	RSI VALUE	DESCRIPTION
1	1-3	NOTABLE
2	3-6	SIGNIFICANT
3	6-10	MAJOR
4	10-18	CRIPPLING
5	18+	EXTREME

Source: (National Centers for Environmental Information n.d.)

Nor'easters are also classified into five major categories. Category A and B were developed by researcher J. E. Miller in 1946. The most common is the Miller Type A nor'easter. These classic nor'easters form in the Gulf of Mexico and develop into full-fledged storms that moves along the East Coast. Miller Type B nor'easters originate as low-pressure systems in the United States' Midwest. These less-common systems diminish after crossing the Appalachian Mountains and reform into nor'easters on the East Coast (National Geographic 2025). A study written by Albright and Cobb (2004) added classification types C through E (Glen Allen Weather n.d.).

Warning Time

The NWS operates a widespread network of observing systems, such as geostationary satellites, Doppler radars, and automated surface observing systems that feed into the current state-of-the-art numerical computer models to provide a look into what will happen next, ranging from hours to days. The models are then analyzed by NWS meteorologists who then write and disseminate forecasts (NOAA NSSL n.d.).

The NWS uses winter weather watches, warnings, and advisories to ensure that people know what to expect in the coming hours and days. Figure 13-8 illustrates the NWS winter weather warnings and advisories.

Figure 13-8. NWS Winter Weather Notifications



Source: (National Weather Service n.d.)

Worst Case Scenario

A worst-case scenario for winter weather in Essex County would involve a storm similar to the record-breaking Blizzard of '96 in January 1996. During this storm, over 25 inches of snow fell within 24 hours that led to widespread business and school closures, airport shutdowns, power outages, and poor road conditions. A storm of this magnitude, followed by warming temperatures, could lead to significant impacts across Essex County. Warmer temperatures could lead to rapid snowmelt, resulting in severe flooding. The combination of heavy snowfall, strong winds, and subsequent flooding could be detrimental to Essex County and its residents.

13.1.4 Previous Occurrences

The following sections provide a review of previous severe winter weather occurrences in Essex County.

13.1.4.1 Declarations

Federal Declarations

Between May 1954 and November 2024, FEMA included the State of New Jersey in six winter storm-related major disaster (DR) or emergency (EM) declarations. FEMA included Essex County in six winter storm-related DR or EM declarations classified as one or a combination of the following disaster types: severe winter storm, snowstorm, snow, ice storm, winter storm, and blizzard.

Table 13-1. FEMA Severe Winter Weather Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
EM-3106	March 13 – March 17 1993	March 17, 1993	Snow: Severe Blizzard

Disaster Number	Incident Period	Declaration Date	Description
DR-1088	January 7 – 12, 1996	January 13, 1996	Snow: Blizzard of 96 (Severe Snowstorm)
EM-3181	February 16 – Feb 17, 2003	March 20, 2003	Snow
EM-1954	December 26 – 27, 2010	February 4, 2011	Snow: Severe Winter Storm and Snowstorm
DR-4264	January 22 – 25, 2016	March 15, 2016	Severe Storm: Severe Winter Storm and Snowstorm
DR-4368	March 6 – 7, 2018	June 8, 2018	Severe Storm: Severe Winter Storm and Snowstorm

Source: (FEMA 2024)

USDA Declarations

Between 2020 and 2024, the USDA included Essex County in one winter weather-related agricultural disaster declaration (Table 13-2).

Table 13-2. USDA Severe Winter Weather Disaster Declarations

Disaster Number	Incident Period	Declaration Date	Description
S4748	April 6 -May 15, 2020	August 28, 2020	Freeze and Frost

Source: (USDA 2025a)

13.1.4.2 Summary of Significant Events

Essex County has experienced several significant winter weather events over the years. This includes the January 1996 blizzard that brought over 25 inches of snow within 24 hours, leading to closures, power outages, and snowmelt flooding, and resulted in a FEMA major disaster declaration. On March 7, 2018, nearly two feet of snow fell in some parts of Essex County, resulting in downed trees and power outages (NOAA NCEI 2024).

13.1.4.3 Recent Events

For the 2025 HMP update, severe winter weather events that impacted Essex County between January 2020 and December 2024 are listed in Table 13-3. For events prior to January 2020, refer to the 2020 HMP.

Table 13-3. Recent Severe Winter Weather Hazard Events

Date(s) of Event	Declaration Number	County Included	Description
December 16-17, 2020	N/A	Countywide	Heavy snow and strong winds impacted Essex County from December 16th to December 17th. Snow amounts ranged from six to eight inches and wind gusts of 47 mph were measured at Newark Airport.
February 1-3, 2021	N/A	Countywide	A major winter storm impacted northeast New Jersey, bringing over 20 inches of snow and wind gusts of over 50 mph. This led to power outages, closed roads, cancelled flights, and suspended trains. In Essex County, snow amounts totaled up to 21 inches. Wind gusts measured 41 mph at Newark Airport.

Date(s) of Event	Declaration Number	County Included	Description
February 7-8, 2021	N/A	Countywide	Heavy snow developed across northeast New Jersey, bringing between six and eight inches of snow to Essex County.
January 5-7, 2022	N/A	Countywide	A wintery mix brought snow and ice to Essex County. Approximately 0.01 inches of ice accretion took place in the western part of the County. Snowfall totals ranged from five to six inches.
January 28-30, 2022	N/A	Countywide	A Nor'easter brought heavy snow and strong winds to northeast New Jersey. In Essex County, snowfall totals ranged from five inches to seven inches.
February 13-14, 2024	N/A	Countywide	Heavy, wet snow fell across northeast New Jersey, with totals ranging from seven to nine inches in Essex County.

Source: (NJOEM 2024); (NOAA NCEI 2024); (FEMA 2024)

13.1.5 Future Conditions

Severe winter weather is a common occurrence in Essex County and it is likely that the County and its municipalities will continue to experience the impacts of winter weather in the future.

13.1.5.1 Probability

Information from FEMA, the New Jersey State HMP, and the NOAA-NCEI storm events database was used to identify the number of winter weather events that occurred in Essex County between 1993 and 2024. Table 13-4 presents the probability of future events for severe winter weather in Essex County.

Table 13-4. Probability of Future Occurrences of Severe Winter Weather Events

Hazard Type	Number of Occurrences Between 1993 and 2024	% Chance of Occurring in Any Given Year
Blizzard	4	12%
Heavy Snow	18	56%
Ice Storm	1	3%
Sleet	0	0%
Winter Storm	15	46%
Winter Weather	24	75%
Total	62	100%

Source: (NJOEM 2024); (NOAA NCEI 2024); (FEMA 2024)

Note: Disaster occurrences include federally declared disasters since the 1950 Federal Disaster Relief Act, and selected events since 1968. Due to limitations in data, not all severe winter weather events occurring between 1954 and 1996 are accounted for in the tally of occurrences. Asa result, the number of hazard occurrences is underestimated.

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for severe winter weather in the County is considered 'frequent' (100% annual probability; a hazard event may occur multiple times per year.).

13.1.5.2 Climate Change

The frequency, intensity, geographic distribution, and timing of extreme weather events are changing. For some areas, that means an increased risk for winter weather events. The frequency of extreme snowstorms in the eastern two-thirds of the contiguous United States has increased over the past century. Approximately twice as many extreme United States snowstorms occurred in the latter half of the 20th century than the first (National Centers for Environmental Information 2016).

Climate change includes major changes in temperature, precipitation, or wind patterns, which occur over several decades or longer. Since 1895, New Jersey's annual temperature has increased by 3.5° F, a trend projected to continue with average annual temperatures in New Jersey expected to increase by 4.1° F to 5.7° F by 2050 (NJDEP 2020). The general warming trend in the state is expected to be felt more during the winter months, and result in fewer sub-freezing days, and less snow accumulation ((NJDEP 2020). However, climate change research also indicates global patterns of increasing surface temperatures, reductions in Arctic Sea ice, and a greater prevalence of high-pressure blocking patterns over the North Atlantic create conditions that are conducive to the formation of slow-moving winter storm development. However, warming of the lower atmosphere could potentially lead to more ice storms by allowing snow to more frequently melt as it falls and then refreeze near or at surface (NYPCC 2009). This suggests that while snowfall may decrease in the upcoming decades, along with a decline in the number of snowstorms, snow will still remain a part of the weather scene in New Jersey for years to come.

13.1.5.3 Potential Future Impacts

Understanding future changes that impact vulnerability in the County can assist in planning for future development and ensure that appropriate mitigation, planning, and preparedness measures are in place.

Areas targeted for future growth and development have been identified across Essex County (refer to Sections 3 and 9). Any areas of growth could be potentially impacted by the severe winter weather hazard because the entire planning area is exposed and vulnerable. However, due to increased standards and codes, new development may be less vulnerable to the severe winter weather hazard compared with the aging building stock in the County.

According to population projections from the State of New Jersey Department of Labor and Workforce Development, Essex County will experience an increase in population through 2040 (approximately 20,000 people between 2023 and 2040) (NYMTC 2020). Each year a non-profit organization in New Jersey, Monarch Housing Associates, conducts a point-in-time count of homeless populations across the State. In 2024, 2,451 unhoused persons were counted in Essex County (Monarch Housing Associates 2024). This accounted for 19% of the State's total count. The homeless population decreased since 2020 to a low of 1,595 in 2023, but has increased in 2024. If the increase in homeless population trend continues, the County's vulnerability to severe winter weather will continue to increase as well. New Jersey has a Code Blue program that activates a network of organizations, led by County Offices of Emergency Management to provide temporary shelter to unsheltered populations experiencing homelessness during severe winter weather events.

Based on a warming climate, the frequency of severe winter weather events is likely to decrease. It remains to be seen if changes in steering patterns will result in more severe winter weather events when they do occur.

13.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

13.2.1 Summary of Vulnerability

All of Essex County is exposed to the severe winter weather hazard; therefore, all assets in the County (population, structures, critical facilities, and lifelines) are potentially vulnerable to a severe winter weather event. The following discusses Essex County's vulnerability, in a qualitative nature, to the severe winter weather hazard.

A specific area that is vulnerable to the severe winter weather hazard is the floodplain. Severe winter weather can cause flooding through blockage of streams or through snow melt. At-risk residential infrastructures are presented in Section 10 (Flood). Generally, losses resulting from flooding associated with severe winter weather should be less than that associated with a 1-percent annual chance flood event. In addition, coastal areas are at high risk during winter weather events that involve storm surge and coastal flooding.

13.2.2 Impact on Life, Health, and Safety

The entire population of Essex County is exposed to severe winter weather events (population of 854,130, according to the 2023 US Census ACS). The homeless and elderly are considered most susceptible to this hazard; the homeless due to their lack of shelter and the elderly due to their increased risk of injuries and death from falls and overexertion or hypothermia from attempts to clear snow and ice.

According to NSSL, every year winter weather indirectly and deceptively kills hundreds of people in the U.S., primarily from automobile accidents, overexertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow and extreme cold temperatures and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold (NOAA NSSL n.d.).

Heavy accumulations of ice can bring down trees and power lines, disabling electric power and communications for days or weeks. Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services. Storms near the coast can cause coastal flooding and beach erosion as well as sink ships at sea. The economic impact of winter weather each year is huge, with costs for snow removal, damage, and loss of business in the millions (NOAA NSSL n.d.).

13.2.2.1 Socially Vulnerable Populations

According to the 2023 ACS, 14.0 percent of the population in Essex County is over 65 years in age (U.S. Census 2023). Severe winter weather events can reduce the ability of these populations to access emergency services. In Essex County, each municipality has areas of high concentration of elderly population (over 100 persons per square mile) with higher concentrations located in the more urban, densely populated areas of the County. Refer to Figure 3-10 in Section 3 (County Profile) that displays the densities of populations over 65 in Essex County.

The homeless and residents below the poverty level or with low incoming might not have access to housing or their housing could be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). In Essex County, 22.1% of households are below the poverty line 2023 ACS (U.S. Census 2023). Areas with the highest concentration of population below the poverty level are located in and near the Cities of East Orange and Newark and Townships of Irvington and Orange. Refer to Figure 3-12 in Section 3 (County Profile) that displays the densities of low-income populations in Essex County.

The CDC 2016 Social Vulnerability Index (SVI) ranks U.S. Census tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. Census tracts throughout the Cities of East Orange and Newark and the Townships of Irvington and Orange have been ranked in the highest vulnerability category with values between 0.75 and 1.0; Census tracts in the City of Newark have the highest social vulnerability with a ranking of between 0.9 - 1. These Census tracts may be more susceptible to impacts from severe winter weather. Table X-1 below displays the CDC 2022 SVI.

13.2.3 Impact on General Building Stock

All buildings in Essex County are exposed to the severe winter storm hazard; however, properties in poor condition or not built to modern building code may be more vulnerable to impacts. Older buildings may be more vulnerable to heavy snow that may result in roof collapse due to the weight of the snow. Building structure type, age, and load distribution may vary and influence structural vulnerability (NJOEM 2024).

In addition to building damage, heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians (NJOEM 2024).

13.2.4 Impact on Community Lifelines

All community lifelines in Essex County are exposed and vulnerable to the severe winter weather hazard. Impacts are similar to that of general building stock; however, community lifelines are essential for ensuring day-to-day functioning of Essex County. These lifelines include utilities, hospitals, schools, county and local offices, and others. Refer to Section 3 (County Profile) for a complete inventory of community lifeline sin the County. Table 13-5 summarizes potential impacts the severe winter weather hazard can have on community lifelines in Essex County.

Table 13-5. Community Lifeline Impacts by Severe Winter Weather

Community Lifeline	Potential Impacts
Safety and Security	Community safety may be threatened due to potential direct harm from severe weather impacts; disruptions to emergency services and public safety infrastructure can compromise the ability to respond to emergencies.
Food, Hydration, Shelter	Damage to grocery stores and food distribution networks that can lead to food shortages; buildings used for shelters may be damaged or destroyed leaving people without shelter
Health and Medical	Medical facilities can be impacted due to power disruptions. Patient movement and medical supply chains can be impacted by damage to transportation infrastructure and dangerous conditions on roadways.
Energy	Power outages caused by downed power lines and damaged infrastructure can lead to disruption in service to homes, businesses, and lifelines
Communications	Accumulation of ice has the potential of causing collapse of trees, utility poles, and communication towers. Ice can disrupt communications and power for days.
Transportation	Dangerous road conditions due to ice and snow; bridges and overpasses tend to freeze before other surfaces; this all can lead to delays or inaccessibility to the roads
Hazardous Materials	Hazardous Materials facilities may be affected by power disruptions resulting from damage to energy infrastructure. The transport of hazardous materials can be disrupted by transportation infrastructure issues and hazardous road conditions, increasing the risk of spills or releases.
Water Systems	Severe winter weather poses a significant threat to the Water Systems lifeline. Cold temperatures from winter and ice storms can cause water infrastructure, such as pipes, to burst. As water freezes, it expands, leading to damage in pipes that aren't properly insulated. When temperatures rise, these broken pipes begin to leak, affecting water pressure and disrupting the delivery of water to homes, businesses, and other critical community services.

Source: (NJOEM 2024)

13.2.5 Impact on the Economy

While widespread damages to structures is not likely to occur as the result of severe winter weather events, extensive damage to utilities and slow down or shut down of highway, rail, and air travel is common. Shutdown of businesses due to power outages and unsafe travel conditions can have a significant impact

on the local economy. The cost of snow and ice removal and repair of roads from the freeze/thaw process can also drain local financial resources.

13.2.6 Impact on Historic and Cultural Resources

Historic structures, like older building stock, are at risk for damage from heavy snowfall events that can cause roof collapse. Outdoor events are likely to be postponed or cancelled as the result of severe winter weather.

13.2.7 Impact on Ecosystems and Natural Resources

Severe winter weather can have a major impact on the environment. Heavy snowfall or ice events can be damaging to vegetation and lead to downed branches and trees. Aquifers, streams, rivers, and lakes depend on winter precipitation to replenish volumes and ensure water quality. However, large amounts of snowfall and rapid melt can cause significant runoff and flow rates, resulting in erosion and eroded streambanks which may disrupt terrestrial plants and animals.

Not only does winter weather create changes in natural processes, the residual impacts of a community's methods to maintain its infrastructure through winter weather maintenance may also have an impact on the environment. Road-salt runoff can cause groundwater salinization, modify the soil structure, and result in loss or reduction in lake turnover. Additionally, road salt can cause changes in the composition of aquatic invertebrate assemblages and pose threats to birds, roadside vegetation, and mammals (Rachlin 2018).

13.2.8 Change in Vulnerability Since the Previous HMP

Overall, the County's exposure and vulnerability have not changed, and the entire County will continue to be exposed and vulnerable to severe winter weather events.

13.3 Mitigation Opportunities

A range of potential opportunities for mitigating the severe winter weather hazard have been identified and considered by plan participants:

- Manipulate the hazard:
  - None
- Reduce exposure and vulnerability to the hazard:
  - Insulate homes to provide greater thermal efficiency and reduce heat loss
  - Provide redundant heat and power
  - Ensure natural gas input/release valves do not get covered in snow
  - Relocate critical infrastructure, such as power lines, underground
  - Reinforce or relocate critical infrastructure such as powerlines so that it meets performance expectations
  - Install tree wire
  - Harden infrastructure such as locating utilities underground where appropriate.
  - Trimming trees back from power lines

- Designate snow routes and strengthen critical road sections and bridges
- Adopt codes and regulations that address the issues of parking of vehicles along roadways during severe weather events
- Develop or enhance the capacity/capability of stormwater conveyance systems
- Provide backup power sources at vital critical facilities

- Build local capacity to respond to or prepare for the hazard:
  - Trim or remove trees that could affect power lines
  - Enforce building codes to withstand wind speeds
  - Prepare emergency food and supplies to be self-sufficient for at least 72 hours in the event of a severe winter storm
  - Be aware of inclement weather conditions and move your vehicles off of the street as severe weather systems approach
  - Retrofit structures
  - Create redundancy in utilities and communications
  - Develop a Continuity of Operations Plan (COOP) to address operations before, during and after coastal storm events
  - Utilize weather radios at the workplace to keep your employees aware of severe weather conditions
  - Support programs such as "Tree Watch" that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc.
  - Establish and enforce building codes that require all roofs to withstand snow loads—Develop/Improve/Enforce building Codes in Hazard Areas
  - Increase communication alternatives
  - Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines
  - Provide weather radios to vulnerable populations
  - Enhance public awareness campaigns to address those issues of alert and warning and actions to take during severe weather events.
  - Utilize the best available technology to enhance the warning systems for all severe weather events
  - Coordinate severe weather warning capabilities and the dissemination of warning amongst those agencies within the planning are with the highest degree of capability.
  - Increase tree management programs
  - Join NWS "StormReady"
  - Retrofit critical structures and promote hazard resistant construction
  - Keep open communications and education of hazards for mobile home communities
  - Retrofit above-ground utilities to underground facilities if appropriate
  - Create a salt reserve or research alternates to stretch salt reserve
  - Ensure accessibility to hospitals and other critical facilities
  - Provide better debris logistics and removal
  - Provide better communication systems and back-up communication systems to inform public of hazards and to communicate during the hazard event

- Nature-based opportunities:
  - Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation)
  - Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors
  - Encourage local ordinances for planting tree near lines and join Tree City USA

14 WILDFIRE

14.1 HAZARD PROFILE

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(i)

Include a description of the type, location, and extent for the identified hazards of concern and include information on previous occurrences of hazard events and the probability of future hazard events.

14.1.1 Description of the Hazard

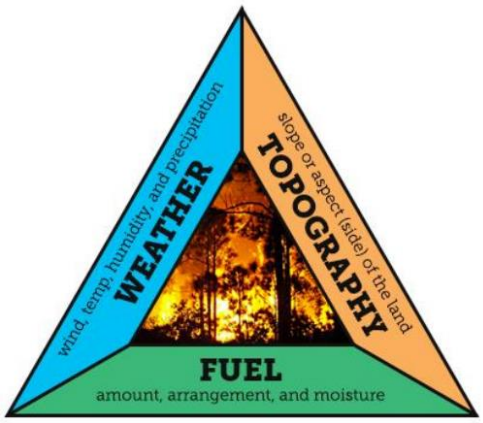
Defining the Hazard

A wildfire is an unplanned, unwanted fire burning in a natural area, such as a forest, grassland, or prairie. Wildfires can damage natural resources, destroy homes, and threaten human lives and safety. A potentially explosive combination is created when hazardous wildland fuels interface home development, and an increased risk of human-caused ignition come together under extreme fire weather conditions (NJOEM 2024).

The height of wildland fire season in New Jersey is typically considered the spring (March through May) and typically culminates in early May, corresponding with the driest live fuel moisture periods of the year. Although the spring months are the most severe, the summer and fall months may also experience extensive fires in the State. Drought, snowpack, and local weather conditions can influence the length of the fire season (NJOEM 2024).

The "wildfire behavior triangle" (Figure 14-1) illustrates how three primary factors influence wildfire behavior: fuel, topography, and weather. For example, drier and warmer weather combined with dense fuel loads and steeper slopes will cause more hazardous fires than light fuels on flat ground. A fire needs all the following three elements in the right combination to start and grow: a heat source, fuel, and oxygen. The growth of the fire primarily depends on the characteristics of available fuel, weather conditions, and terrain (NJOEM 2024).

Figure 14-1. Wildfire Behavior Triangle



Source: (NJDEP 2020)

Cause of the Hazard

Although, wildfires can start from lightning or other natural causes, most are ignited by human activity, either accidentally or intentionally. The early and late shoulders of the fire season usually are associated with human-caused fires while lightning-related fires are more common in the peak season of June through August (NJOEM 2024).

Summary of Potential Impacts

Wildfires not only damage woodlands but could threaten homeowners who live within or adjacent to forest environments. In addition to damage and loss of structures from burning, wildfire smoke and ash can present significant health risks.

Cascading Hazard Impacts

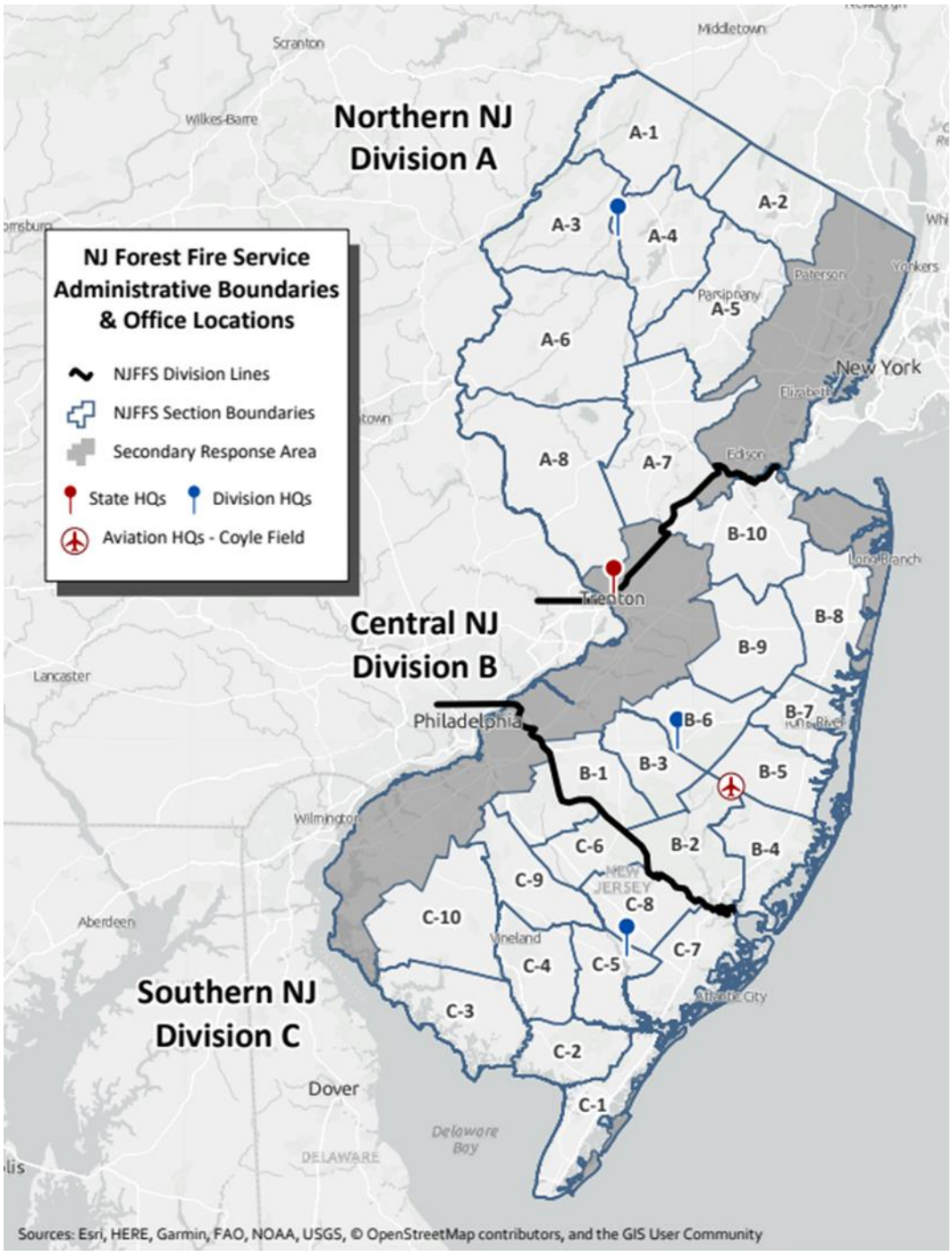
Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires can cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding. They can strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause slope failures. Major landslides can occur several years after a wildfire. Wildfires that burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding (NJOEM 2024). Intense wildfire events that destroy existing ecosystems can result in an increase in invasive species that may be able to move into an area with a lack of natural competitors (U.S. Department of Interior 2012).

14.1.2 Location

In Essex County, northern hardwood, white pine, eastern hemlock, mixed oak, and a variety of other species are part of the forest composition. Northern New Jersey fires spread rapidly in dry leaf litter and downed, gypsy moth-killed hardwoods. Slope becomes a significant factor in both the spread and the difficulty in suppressing these fires (NJOEM 2024).

The New Jersey Forest Fire Service (NJFFS,) a division of the New Jersey Department of Environmental Protection (NJDEP), is responsible for protecting the 3.15 million acres of wildland in the State. NJFFS is under the direction of the State fire warden and is headquartered in Trenton. NJFFS divides the State into three regions (Northern, Central, Southern). Each division is administered by a division forest fire warden and the land is partitioned into sections of approximately 100,000 acres. A full-time forest fire warden is assigned to each section. There are twenty-nine sections statewide. A section forest fire warden is responsible for all phases of fire prevention, pre-suppression and fire suppression within their assigned area (NJDEP 2020). Figure 14-2 illustrates the NJFFS region divisions within the State. Essex County is located in Division A (Northern NJ).

Figure 14-2. NJ Forest Fire Service Administrative Boundaries and Office Locations

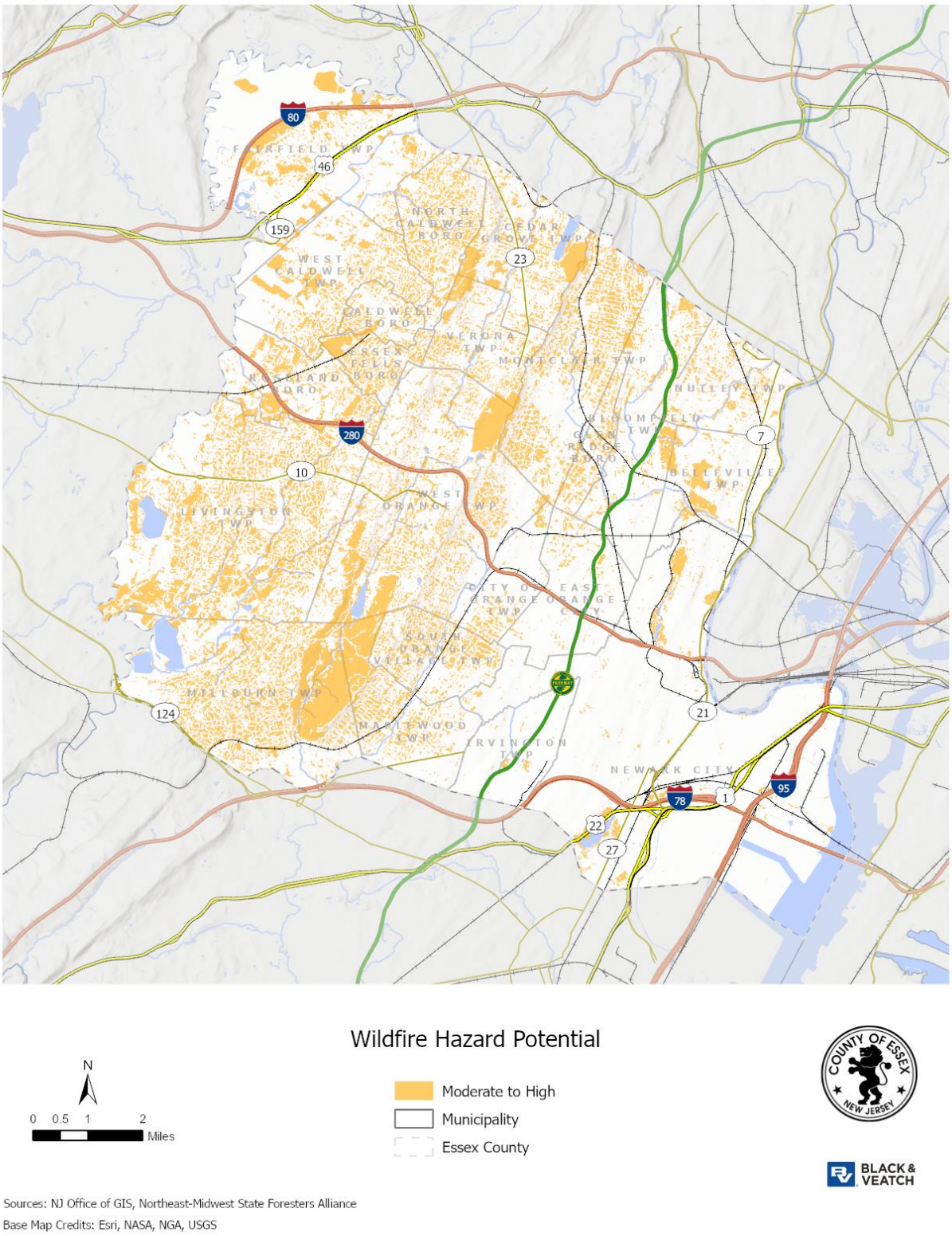


Source: (NJDEP 2020)

Figure 14-3 displays the locations of moderate to high wildfire potential in Essex County. Urbanized municipalities that are largely built out have less exposure than those with wooded areas. For this reason, the City of Newark, the Township of Irvington, and the City of East Orange have the least exposure to

wildfire. Municipalities with larger natural areas, including preserved areas like South Mountain Reservation, have the higher wildfire risk in the County.

Figure 14-3. Wildfire Hazard Potential in Essex County



14.1.3 Extent

The magnitude or severity of wildfires depends on weather, climate conditions, and human activity (NJOEM 2024). While more moderate wildfires are good for forest health, intense wildfires can severely damage the forest ecosystem and spread to neighborhoods and businesses.

Measuring Intensity

The NJ Forest Fire Services uses two indices to measure and monitor dryness of forest fuels and the possibility of fire ignitions becoming wildfires. These indices include the National Fire Danger Rating System's Buildup Index, and the Keetch-Byram Drought Index. Both are used for fire preparedness planning, which includes the following: campfire and burning restrictions, fire patrol assignments, staffing of fire lookout towers, and readiness status for both observation and firefighting aircraft (NJOEM 2024).

The Buildup Index (BUI) is a number that reflects the combined cumulative effects of daily drying and precipitation in fuels with a 10-day time lag constant. The BUI can represent three to four inches of compacted litter or can represent up to six inches or more of loose litter (North Carolina Forest Service, 2009).

The Keetch-Byram Drought Index (KBDI) is a drought index designed for fire potential assessment as defined by the United States Department of Agriculture Forest Service. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. The index increases each day without rain and decreases when it rains. The scale ranges from zero (no moisture deficit) to 800 (maximum drought possible). The Florida Forest Service states that the range of the index is determined by assuming that 8 inches of moisture in a saturated soil is readily available to the vegetation. For different soil types, the depth of soil required to hold eight inches of moisture varies. A prolonged drought influences fire intensity, largely because more fuel is available for combustion. The drying of organic material in the soil can lead to increased difficulty in fire suppression (WFAS 2025).

As per the NWS, each day during the fire season, national maps of selected fire weather and fire danger components of the National Fire Danger Rating System (NFDRS) are produced by the WFAS. The USFS indicates that the Fire Danger Rating level considers current and antecedent weather, fuel types, and both live and dead fuel moisture. This information is provided by local station managers. Table 14-1 describes the fire danger ratings and color codes.

Table 14-1. National Fire Danger Rating System

Fire Danger Rating and Color Code	Description
Low (L) (Dark Green)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting
Moderate (M) (Light Green or Blue)	Fires can start from most accidental causes, and except for lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately

Fire Danger Rating and Color Code	Description
	fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H) (Yellow)	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High (VH) (Orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E) (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash (trunks, branches, and treetops) or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes, or the fuel supply lessens.

Source: (U.S. Forest Services n.d.)

Warning Time

The occurrence of lightning and conditions that support the spread of wildfire (windy and dry conditions) are able to be forecasts days in advance by the National Weather Service.

The NJFFS is the agency responsible for protecting life and property, as well as the state's natural resources from wildfire. When a wildfire occurs, the first step in the process is a timely and accurate reporting of the fire's location. To accomplish this, the NJFFS maintains a system of 21 look out towers at strategic locations throughout the state. At least one tower in each division is operated whenever the woods are dry enough to burn and all towers are staffed during the months of March, April, May, October and November. The northwestern corner of the County is located in Division A5. The nearest lookout tower is Greystone near Parsippany in Morris County. Look out towers continue to be effective and observers detect one half of all wildfires reported. The other half are called in by the general public, aircraft pilots and forest fire patrols (NJDEP 2020).

Worst Case Scenario

A worst case scenario for wildfire would involve exceptional drought in the spring or fall, a severe windstorm, and multiple ignition sites around the County. This could lead to rapid spread of wildfires and potential jumping of wildfires over potential barriers such as non-vegetated areas and waterways.

14.1.4 Previous Occurrences

The following sections provide a review of previous wildfire occurrences in Essex County.

14.1.4.1 Declarations

Federal Declarations

Between 1954 and 2024, Essex County has not been included in any wildfire-related FEMA declared disasters (DR) or emergencies (EM) (FEMA 2024).

USDA Declarations

Between 2020 and 2024, the USDA included Essex County was not included in any wildfire-related agricultural disaster declarations (USDA 2025a).

14.1.4.2 Summary of Significant Events

The largest wildfire in recent memory in Essex County occurred in October 2024. The Industrial Wildfire burned 192 acres. No structures were lost.

14.1.4.3 Recent Events

For the 2025 HMP update, severe winter weather events that impacted Essex County between January 2020 and December 2024 are listed in Table 14-2. For events prior to January 2020, refer to the 2020 HMP.

Table 14-2. Recent Wildfire Hazard Events

Date (s) of Event	Declaration Number	County Included	Description
Early June 2023	N/A	N/A	Heavy smoke from wildfires in Canada permeated into the region, leading to poor visibility and hazardous air quality conditions. Outdoor events and some schools were canceled.
October 26, 2024	N/A	N/A	Following incredibly dry conditions across the region, a wildfire, referred to as the Industrial Wildfire, burned 192 acres near Route 10 and Eisenhower Parkway in Livingston. Although multiple structures, including the water treatment plant, were threatened, no structural losses were reported. Response included a 72-hour operational time, response from multiple jurisdictions including local fire and EMS, the Essex County Sheriff's Office, and the State Forest Fire Service. 7 air drops were used to help control the blaze. Lingering smoke remained in the area for weeks.

Source: (NOAA NCEI 2024) (FEMA 2024)

14.1.5 Future Conditions

While wildfire is not a common occurrence in Essex County it is likely that the County and its municipalities will continue to experience the impacts of wildfire events in the future,

14.1.5.1 Probability

Estimating the approximate number of urban fires and wildfires to occur in Essex County is difficult to predict in a probabilistic manner. This is because a number of variable factors impact the potential for a fire to occur and because some conditions (for example, ongoing land use development patterns, location,

fuel sources, and construction sites) exert increasing pressure on the wildland urban interface zone. Based on available data, urban fires and wildfires will continue to present a risk to Essex County. Given the numerous factors that can impact urban fire and wildfire potential, the likelihood of a fire event starting and sustaining itself should be gauged by professional fire managers on a daily basis.

In Section 15, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for wildfire in the County is considered 'occasional' (between 10 and 100% annual probability of a hazard event occurring).

14.1.5.2 Climate Change

According to the 2020 New Jersey Scientific Report on Climate Change, New Jersey is warming faster than the rest of the Northeast region and the world. Historically unprecedented warming is projected for the 21st century with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050. Annual precipitation in New Jersey is expected to increase by 4 percent to 11 percent by 2050. The intensity and frequency of precipitation events is anticipated to increase due to climate change (ONJSC Rutgers University n.d.).

Multiple studies have found that climate change has already led to an increase in wildfire season length, wildfire frequency, and burned area. The wildfire season has lengthened in many areas due to factors including warmer springs, longer summer dry seasons, and drier soils and vegetation. Similarly, climate change threatens to increase the frequency, extent, and severity of fires through increased temperatures and drought. Earlier spring melting and reduced snowpack result in decreased water availability during hot summer conditions, which in turn contributes to an increased wildfire risk, allowing fires to start more easily and burn hotter. These trends of longer wildfire seasons and larger wildfire size are predicted to continue as more frequent and longer droughts occur (US EPA 2025).

Climate change may also increase the frequency of lightning strikes. A warmer atmosphere holds more moisture which is one of the key items for triggering a lightning strike. The number of lightning strikes across the continental United States is likely to increase by about 12% for every degree of rise in global temperature. Lightning strikes cause approximately half the wildfires in the United States (Romps, Seeley, Vollaro, and Molinari 2014). If the frequency of lightning strikes increases, the potential for wildfires from these strikes also increases.

14.1.5.3 Potential Future Impacts

As climate change increases wildfire risks, continued development trends in Essex County are likely to reduce risk. While preserved open spaces will remain vulnerable to wildfire, trends for continued infill of development in Essex County is likely to reduce areas where wildfires can form and spread.

14.2 Vulnerability Assessment

Local Plan Requirement B1 – 44 CFR Part 201.6(c)(2)(ii)

The plan must include a description of the jurisdiction's vulnerability to the hazards of concern and include an overall summary of the hazard's impact on the community. The impacts need to include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard areas, and estimate of potential dollar losses to vulnerable structures, and a description of land uses and development trends.

14.2.1 Summary of Vulnerability

A spatial analysis was conducted using the Wildfire Hazard Potential dataset from the Northeast-Midwest State Foresters Alliance. For the purposes of the assessment, an asset (population, structures, critical facilities, and lifelines) is considered exposed and potentially vulnerable to the wildfire hazard if it is located in the moderate to high wildfire hazard potential areas. In general, wildfire risk is highest where wooded areas abut development. Refer to Section 5 for additional details on the methodology used to assess wildfire risk.

14.2.2 Impact on Life, Health, and Safety

As demonstrated by historic wildfire events in New Jersey and other parts of the country, potential losses include impacts to human health and life of residents and responders, structures, infrastructure and natural resources. In addition, wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed business and decrease in tourism. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

Larger and more intense wildfires are creating the potential for greater smoke production and chronic exposures in the U.S. Wildfire smoke contains particulate matter, carbon monoxide, nitrogen oxides, and various volatile organic compounds and can significantly reduce air quality, both locally and in areas downwind of fires (CDC 2024a). The effects from wildfires can range from eye and respiratory tract irritation to more serious disorders, including reduced lung function, bronchitis, exacerbation of asthma and heart failure, and premature death. Children, pregnant people, and the elderly are especially vulnerable to smoke exposure (USEPA 2025).

Based on the spatial analysis, an estimated 79,174 people, or 9.3% of the County's population, are located in the moderate to high wildfire hazard potential areas. Overall, the Township of Maplewood has the greatest number of populations hazard areas (11,564 people), while the Townships of Nutley and Maplewood have the greatest percentage of their population exposed (roughly 37% of the municipal populations).

Table 14-3. Estimated Number of Persons in Essex County Living in the Moderate to High Wildfire Hazard Potential Areas

Jurisdiction	Total Population (2023 ACS)	Moderate to High Wildfire Hazard Potential Area	
		Population Exposed	Percent of Total
Belleville (T)	37,756	1,169	3.1%
Bloomfield (T)	52,974	2,768	5.2%
Caldwell (B)	8,898	2,688	30.2%
Cedar Grove (T)	13,252	2,850	21.5%
East Orange (C)	69,183	2,883	4.2%
Essex Fells (B)	2,320	1,144	49.3%
Fairfield (T)	7,712	1,437	18.6%
Glen Ridge (B)	7,827	2,317	29.6%
Irvington (T)	60,334	267	0.4%
Livingston (T)	31,128	11,564	37.2%
Maplewood (T)	25,406	3,664	14.4%
Millburn (T)	21,793	7,181	33.0%
Montclair (T)	39,873	10,011	25.1%
Newark (C)	307,188	1,212	0.4%
North Caldwell (B)	6,622	2,470	37.3%
Nutley (T)	29,767	3,115	10.5%
City of Orange (T)	33,973	1,968	5.8%
Roseland (B)	6,211	1,792	28.8%
South Orange Village (T)	18,299	4,413	24.1%
Verona (T)	14,441	3,277	22.7%
West Caldwell (T)	10,897	3,339	30.6%
West Orange (T)	48,276	7,646	15.8%
Essex County (Total)	**854,130**	**79,174**	**9.3%**

Source: (U.S. Census 2023); (Northeast-Midwest State Foresters Alliance 2024a)

14.2.2.1 Socially Vulnerable Populations

Economically disadvantaged populations are more vulnerable to wildfire because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a wildfire event, and they may have more difficulty evacuating. Children, pregnant people, and the elderly are especially vulnerable to smoke exposure (USEPA 2025). 6% of the County population is under the age of 5 and 13.8% are over the age of 65.

As noted above, wildfire smoke exposure is associated with a host health impacts. Public health recommendations to reduce exposure to wildfire smoke include staying indoors in places with adequate air filtration, reducing activity during smoke events, reducing other sources of indoor air pollution, using air filters, and, for those who cannot stay indoors (e.g., agricultural and outdoor workers), wear suitable respiratory protection when outdoors (Jason Vargo 2023). Making these kinds of changes can be difficult for people with limited resources. For example, people with poor indoor air filtration at home, those without access to clean air spaces, and people experiencing homelessness may be especially challenged to reduce

their personal exposure to wildfire smoke. Many of the self-protective actions are costly, and therefore unlikely to benefit some populations (Jason Vargo 2023).

14.2.3 Impact on General Building Stock

Buildings located within the moderate to high wildfire hazard potential areas are exposed and considered vulnerable to the wildfire hazard. Buildings constructed of wood or vinyl siding are generally more likely to be impacted by the fire hazard than buildings constructed of brick or concrete. Of the structures exposed, the majority (411) are government owned, followed by residential structures (192), and religious facilities (94). Overall, 13.1% of structures in Essex County are located in the moderate to high wildfire hazard potential areas. The Borough of North Caldwell (36.8%), Livingston (35.7%), and Millburn (32.8%) have the highest percentage of buildings exposed.

Table 14-4. Estimated Number of Buildings and Replacement Cost Value in Essex County Located in the Moderate to High Wildfire Hazard Potential Areas

Jurisdiction	Total Number of Buildings	Total Replacement Cost Value	Moderate to High Wildfire Hazard Potential Area			
			Buildings Exposed	Percent of Total	Total Replacement Cost Value	Percent of Total
Belleville (T)	7,910	$5,440,939,832	260	3.3%	$155,534,031	2.9%
Bloomfield (T)	11,720	$7,149,452,578	707	6.0%	$331,702,512	4.6%
Caldwell (B)	1,738	$1,437,101,129	474	27.3%	$255,956,935	17.8%
Cedar Grove (T)	3,944	$3,664,877,018	818	20.7%	$515,832,838	14.1%
East Orange (C)	7,908	$7,298,495,889	355	48.7%	$221,489,304	3.0%
Essex Fells (B)	766	$624,599,485	373	15.5%	$289,468,947	46.3%
Fairfield (T)	3,121	$7,708,467,384	483	29.1%	$363,897,244	4.7%
Glen Ridge (B)	2,256	$1,311,356,144	657	0.4%	$339,041,537	25.9%
Irvington (T)	7,934	$6,543,152,214	33	35.7%	$14,510,774	0.2%
Livingston (T)	9,795	$9,227,217,608	3,498	15.8%	$2,130,023,617	23.1%
Maplewood (T)	6,738	$4,279,929,361	1,067	32.8%	$551,190,571	12.9%
Millburn (T)	6,437	$6,236,661,855	2,109	28.3%	$1,636,026,240	26.2%
Montclair (T)	9,436	$7,012,741,670	2,667	0.5%	$1,493,198,703	21.3%
Newark (C)	43,085	$50,617,106,841	207	36.8%	$148,025,878	0.3%
North Caldwell (B)	2,095	$2,103,919,331	771	11.2%	$625,296,330	29.7%
Nutley (T)	7,945	$4,550,682,627	886	7.2%	$395,220,433	8.7%
City of Orange (T)	3,890	$4,186,194,813	279	4.5%	$167,855,959	4.0%
Roseland (B)	1,794	$2,338,671,996	489	27.3%	$375,506,520	16.1%
South Orange Village (T)	4,188	$3,553,949,814	1,114	26.6%	$681,349,435	19.2%
Verona (T)	4,113	$2,639,752,949	894	21.7%	$438,387,034	16.6%
West Caldwell (T)	3,730	$4,439,689,868	1,094	29.3%	$641,061,200	14.4%
West Orange (T)	11,845	$9,974,739,027	2,095	17.7%	$1,377,416,455	13.8%
Essex County (Total)	**162,388**	**152,339,699,431**	**21,330**	**13.1%**	**$13,147,992,495**	**8.6%**

Source: (Essex County 2019); (Northeast-Midwest State Foresters Alliance 2024a)

14.2.4 Impact on Community Lifelines

Wildfires can have an impact on the water supplies throughout the County because of residual pollutants like char or debris landing in water resources which can clog wastewater pipes, culverts, etc. Wildfires may also impact transportation routes, blocking residents and commuters from getting in and out of the County during a wildfire event because of heavy smoke making it difficult to drive, or where the flames have close proximity to the roadways, making the route an unsafe passageway.

Table 14-5. Lifelines Most Likely Impacted by Wildfire

Lifeline Categories	Notable Impacts
Safety and Security	Community safety may be threatened due to potential direct harm from wildfire impacts and compounding effects on administration of services. Transportation infrastructure issues may directly impact the abilities of law enforcement, fire service, search and rescue, and other government services.
Food, Hydration, Shelter	Wildfire can cause damage to structures which provide shelter, while the food supply chain may be disrupted due to impacts on agriculture transportation infrastructure. Due to the high temperatures associated with wildfire, hydration can be difficult to maintain especially for firefighters engaged in suppression activities.
Health and Medical	Potential impacts to the Health and Medical lifeline due to wildfire can include physical damage to medical facilities. Facilities can be impacted due to power disruptions or damage patient movement and medical supply chains can be impacted by dangerous conditions on roadways in areas where wildfires are burning.
Energy	Wildfire has the potential to cause direct damage to energy infrastructure and its ability to provide power to the grid, disrupting service. Power lines made of wood area especially susceptible. Additionally, pipelines that provide a source of fuel could be ignited, leading to a catastrophic explosion.
Communications	Wildfires can disrupt various types of communication equipment, either through power failures or damage to communication lines. This can cripple Wi-Fi and cellular data infrastructure, leaving many individuals and first responders without access to essential communication lifelines.
Transportation	Anticipated impacts create a causal relationship for the Transportation lifeline during response and recovery, due to direct damage to infrastructure and hazardous road conditions caused by wildfires. Severe wildfires have the potential to significantly impact major roadways. Damage to the Transportation lifeline can have cascading effects on other lifelines that rely on the movement of people and goods.
Hazardous Materials	Hazardous Materials facilities could be impacted directly by wildfire or indirectly by power disruptions due to effects to energy infrastructure. Transport of hazardous materials can be impacted by hazardous roadway conditions due to wildfire. Wildfire can burn through hazardous material releasing it into the air.
Water Systems	Wildfire may cause direct damage to the Water System lifeline, physically damaging infrastructure components such as distribution pipes and pumps. Additionally, wildfire can lead to contamination of drinking water supplies with known pollutants and other potentially harmful compounds.

Source: (NJOEM 2024)

In Essex County, there are 54 critical facilities located in the moderate to high wildfire potential area. The majority of the critical facilities exposed are water system lifelines (31), followed by safety and security lifelines (12). Refer to Table 14-6 which summarizes the number of critical lifelines in the wildlife fuel hazard area.

Table 14-6. Critical Facility Exposure to the Moderate to High Wildfire Potential Area

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Water Systems	Other	Total
Belleville (T)	0	0	0	0	0	1	0	0	0	1
Bloomfield (T)	0	0	0	0	0	0	0	0	0	0
Caldwell (B)	0	0	0	0	0	0	0	0	0	0
Cedar Grove (T)	0	0	0	0	1	2	0	0	0	3
East Orange (C)	0	0	0	0	0	0	0	0	0	0
Essex Fells (B)	0	0	0	0	0	0	0	8	0	8
Fairfield (T)	0	0	0	0	0	0	0	0	0	0
Glen Ridge (B)	0	0	0	0	0	0	0	0	1	1
Irvington (T)	0	0	0	0	0	0	0	0	0	0
Livingston (T)	0	0	0	0	0	0	0	1	0	1
Maplewood (T)	0	0	0	0	0	0	0	0	0	0
Millburn (T)	0	0	0	0	0	1	0	4	0	5
Montclair (T)	0	0	0	1	0	2	0	3	0	6
Newark (C)	0	0	0	0	0	0	1	0	0	1
North Caldwell (B)	0	0	0	0	0	0	0	3	0	3
Nutley (T)	0	0	1	0	0	1	0	0	0	2
City of Orange (T)	0	0	0	0	0	0	0	0	0	0
Roseland (B)	0	0	1	0	0	1	0	4	0	6
South Orange Village (T)	0	0	0	0	1	2	0	0	0	3
Verona (T)	0	0	0	0	1	0	0	2	0	3
West Caldwell (T)	0	0	0	0	0	1	0	1	0	2
West Orange (T)	1	0	0	0	2	1	0	5	0	9
Essex County (Total)	**1**	**0**	**2**	**1**	**5**	**12**	**1**	**31**	**1**	**54**

Source: (Northeast-Midwest State Foresters Alliance 2024a); (Essex County 2019)

14.2.5 Impact on the Economy

The economic cost of wildfires can be exorbitant. Wildfires impact human health, degrade ecosystems, interrupt economic activity, and yield considerable fiscal costs for prevention and recovery (Levitz 2023). Wildfires elsewhere in the U.S. have been multibillion-dollar disasters. While New Jersey has not experienced wildfires of that magnitude, given predictions about how climate change will impact New Jersey temperatures, precipitation, and storms, and that fire is determined by these variations in climate, it is projected that wildfires in the state will become more larger and more frequent.

The total economic impacts of wildfire go beyond the cost of damages, as they include health costs and indirect losses due to power shut-offs, business closures, travel cancellations, supply chain disruptions, among other costs. In vulnerable areas, declining tourism following a wildfire could lead to employment losses in a spike in unemployment claims. Wildfires could lead to an uptick in hospital admissions and

related health costs. Wildfires could also cause shifts in the housing market. As fires destroy homes and displace residents, cities may struggle to bounce back causing a stagnant or declining population in counties with large wildfire events (Bay Area Council Economic Institute 2021).

Wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed business. These events may cost thousands of taxpayer dollars to suppress and control and may involve hundreds of operating hours on fire apparatus and thousands of volunteer man hours from the volunteer firefighters. There are also many direct and indirect costs to local businesses that excuse volunteers from working to fight these fires.

Of the County's $152.3 billion in Total Replacement Cost Value, $13.1 billion (8.6%) are located in the moderate to high wildfire potential area (See Table 14-4). Closure of major roadways and cancellation of outdoor events due to nearby fire and smoke can also result in economic impacts.

14.2.6 Impact on Historic and Cultural Resources

Historic buildings constructed of wood are generally more likely to be impacted by the fire hazard than other building types and are less likely to have fire suppression systems in place. Outdoor cultural events may be negatively impacted by smoke from wildfires.

14.2.7 Impact on Ecosystems and Natural Resources

While wildfire can be a necessary part of ecosystem health, intense wildfire that burns too hot can result in severe damage to the environment, including burning and killing of plant and animal life. Intense fire can also heat narrow and shallow waterways, resulting in damage to aquatic systems.

Studies show that urban fires in particular are more harmful to the environment compared to forest fires (Scientific American 2025). The age and density of infrastructure within Essex County can exacerbate consequences of fires on the environment because of the increased amount of chemicals and contaminates that would be released from burning infrastructure. These chemicals, such as iron lead, and zinc, may leach into the stormwater, contaminate nearby streams, and impair aquatic life.

14.2.8 Change in Vulnerability Since the Previous HMP

Overall, Essex County has not had a change in vulnerability to wildfire since the 2020 HMP. However, the technique used for the vulnerability assessment was changed from using the NJFFS Wildfire Fuel Hazard spatial layer to the Wildfire Hazard Potential dataset from the Northeast-Midwest State Foresters Alliance, resulting in changes to the results of the analysis.

14.3 Mitigation Opportunities

A range of potential opportunities for mitigating the wildfire hazard have been identified and considered by plan participants:

- Manipulate the hazard:
  - None

- Reduce exposure and vulnerability to the hazard:
  - Create, clean and maintain defensible space around structures and infrastructure
  - Provide water onsite
  - Locate outside hazard area
  - Use fire-retardant building materials
  - Higher regulatory standards
  - Establish water main supply and hydrants in areas without hydrants
  - Decrease hydrant spacing
- Build local capacity to respond to or prepare for the hazard:
  - Employ Firewise techniques to safeguard your home
  - Identify alternative water supply points proximate to your home such as swimming pools, lakes, streams
  - Support local fire department
  - Be aware of weather conditions that support/enhance the probability of wildfires
  - Support Firewise community initiatives
  - More public outreach and education efforts including an active "Firewise" program
  - Identify fire response and alternative evacuation routes Seek alternative water supplies in urban wildland interface areas
  - Become a "Firewise" community
  - Increase capability to fight wildfires utilizing equipment that can support wildfire fighting such as: tankers, engines with "pump-and-run" capabilities, dump tanks for tanker shuttle operations
  - Develop/implement wildfire management plans
  - Establish Mutual Aid Agreements with the Tender Task Force
  - Attend the Tender Apparatus Response Plan (TARP) training conducted by Kean University
  - Develop a Water Supply Plan
- Nature-based opportunities:
  - Manage invasive species that are susceptible to increased wildfire risk
  - Incorporate nature-based wildfire risk reduction buffers into existing ecosystem-friendly land uses (e.g., green space, trails, or community parklands)
  - Implement and fund ecological thinning and prescribed fire and cultural fire and, where appropriate, manage wildfire for resource benefit

15 HAZARD RANKING

The methodology used to rank the hazards of concern for Essex County is described below. Estimates of risk for the County were developed using methodologies promoted by FEMA's hazard mitigation planning guidance, generated by FEMA's HAZUS-MH risk assessment tool, and input from Essex County and participating jurisdictions.

As described in Section 5 (Risk Methodology and Tools), three different levels of analysis were used to estimate potential impacts: 1) historic loss/qualitative analysis; 2) exposure analysis; and 3) loss estimation. All three levels of analysis are suitable for planning purposes; however, with any risk analysis, there is underlying uncertainty resulting from assumptions used to describe and assess vulnerability and the methodologies available to model impacts. Impacts from any hazard event within the County will vary from the analysis presented here based on the factors described for each hazard of concern; namely location, extent, warning time, and mitigation measures in place at the time of an event.

The hazard ranking methodology for some hazards of concern is based on a scenario event, while others are based on the potential vulnerability to the County as a whole. In order to account for these differences, the quantitative hazard ranking methodology was adjusted using professional judgement and subject-matter input; assumptions are included, as appropriate, in the following subsections. The limitations of this analysis are recognized given that all scenarios do not have the same likelihood of occurrence; nonetheless, there is value in summarizing and comparing the hazards using a standardized approach to evaluate relative risk. The following categories were considered when evaluating the relative risk of the hazards of concern.

- Probability of Occurrence—The probability of occurrence of the scenario evaluated was estimated by examining the historic record and/or calculating the likelihood of annual occurrence. When no scenario was assessed, an examination of the historic record and judgement was used to estimate the probability of occurrence of an event that will impact the County and each municipality.
- Impact—The following three hazard impact subcategories were considered: impact to people; impact to buildings; and impact to the economy. The results of the updated risk assessment and/or professional judgement were used to assign the numeric values for these three impact subcategories. A factor was applied to each subcategory, giving impact on population the greatest weight.
    - Population—Numeric value x 3
    - Buildings—Numeric value x 2
    - Economy—Numeric value x 1
- Capability Effectiveness—Capability effectiveness describes a jurisdiction's current ability to protect from or withstand a hazard event. This includes capabilities and capacity in the following areas: administrative, technical, planning/regulatory and financial. Mitigation measures already in place increases a jurisdiction's capacity to withstand and rebound from events (e.g. codes/ordinances with higher standards to withstand hazards due to design or location; deployable resources; or plans and procedures in place to respond to an event). In other words, assigning 'low'

for adaptive capacity means the jurisdiction does not have the capability to effectively respond, which increases vulnerability; whereas 'high' adaptive capacity means the jurisdiction does have the capability to effectively respond, which decreases vulnerability. These ratings were assigned using the results of the core capability assessment with subject-matter input from each jurisdiction.

Climate Change (Changing Future Conditions) - Current climate change projections were considered as part of the hazard ranking to ensure the potential for an increase in severity/frequency of the hazard was included. This was important to Essex County to include because the hazard ranking helps guide and prioritize the mitigation strategy development, which should have a long-term future vision to mitigate the hazards of concern. The potential impacts climate change may have on each hazard of concern is discussed in Sections 7 through 14.

The relative hazard risk score was calculated for each hazard using the following formula. Table 15-1 summarizes the categories, benchmark values, and weights used to calculate the risk factor for each hazard.

HAZARD RANKING = [PROBABILITY OF OCCURRENCE X .30] + [(IMPACT ON POPULATION X 3) + (IMPACT ON PROPERTY X 2) + (IMPACT ON ECONOMY X 1) X .30] + [CAPABILITY EFFECTIVENESS X .30] + [CLIMATE CHANGE X .10]

Using the weighting applied, the highest possible risk factor value is 6.75. The higher the number, the greater the relative risk. Based on the total for each hazard, a priority ranking is assigned to each hazard of concern (high, medium, or low). The rankings were categorized as follows: Low = Values less than or equal to 3.8; Medium = Values between 3.9 and 4.9; High = Values greater than or equal to 5.0.

Table 15-1. Summary of Hazard Ranking Approach

Category		Degree of Risk			Assigned Weighting Factor
		Level	Criteria	Index Value	
Probability		Unlikely	A hazard event is not likely to occur or is unlikely to occur with less than a 1% annual chance probability.	0	30%
		Rare	Between 1 and 10% annual probability of a hazard event occurring.	2	
		Occasional	Between 10 and 100% annual probability of a hazard event occurring.	3	
		Frequent	100% annual probability; a hazard event may occur multiple times per year.	4	
Impact (Sum of all 3)	Population (Numeric Value x 3)	Low	14% or less of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location.	1	30%
		Medium	15% to 29% of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location.	2	

Category		Degree of Risk			Assigned Weighting Factor
		Level	Criteria	Index Value	
		High	30% or more of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location.	3	
	Property (Numeric Value x 3)	Low	Property exposure is 14% or less of the total number of structures for your community.	1	
		Medium	Property exposure is 15% to 29% of the total number of structures for your community.	2	
		High	Property exposure is 30% or more of the total number of structures for your community	3	
	Economy (Numeric Value x 3)	Low	Loss estimate is 9% or less of the total replacement cost for your community.	1	
		Medium	Loss estimate is 10% to 19% of the total replacement cost for your community.	2	
		High	Loss estimate is 20% or more of the total replacement cost for your community.	3	
Capability Effectiveness		Weak	Weak/outdated/inconsistent plans, policies, codes/ordinances in place; no redundancies; limited to no deployable resources; limited capabilities to respond; long recovery.	1	30%
		Moderate	Plans, policies, codes/ordinances in place and meet minimum requirements; mitigation strategies identified but not implemented on a widespread scale; county/jurisdiction can recover but needs outside resources; moderate county/Jurisdiction capabilities.	0	
		Strong	Plans, policies, codes/ordinances in place and exceed minimum requirements; mitigation/protective measures in place; county/jurisdiction has ability to recover quickly because resources are readily available, and capabilities are high.	-1	
Climate Change		Low	No local data is available; modeling projections are uncertain on whether there is increased future risk; confidence level is low (inconclusive evidence).	1	10%
		Medium	Studies and modeling projections indicate a potential for exacerbated conditions due to climate change; confidence level is medium to high (suggestive to moderate evidence).	2	
		High	Studies and modeling projections indicate exacerbated conditions/increased future risk due to climate change; very high confidence level (strong evidence, well documented and acceptable methods).	3	

**For the purposes of this exercise, "impacted" means exposed for population and property and estimated loss for economy.*

Using the process described above, the hazard ranking was determined for each hazard of concern. The hazard ranking is detailed in the subsequent tables that present the step-wise process for the ranking. The countywide risk ranking includes the entire planning area and may not reflect the highest risk indicated for any of the participating jurisdictions. Each jurisdiction had the option to amend these values if desired if additional factors should be considered for their individual hazard rankings. The final rankings for each jurisdiction are included in the jurisdictional annexes in Volume II. By determining a value for each hazard that can be compared to other hazards threatening the planning area, hazards can be ranked with greater ease.

Table 15-2. Hazard Ranking Scoring for Essex County

Hazard	Probability	Impact on Population	Impact on Property	Impact on Economy	Capability Effectiveness	Climate Change	Risk Ranking
Disease Outbreak	Occasional	Medium	Medium	Low	Moderate	Medium	Medium
Drought	Occasional	Medium	Low	Low	Moderate	High	Medium
Earthquake	Rare	Medium	Medium	Medium	Moderate	Low	Medium
Extreme Temperature	Frequent	Medium	Low	Low	Moderate	High	Medium
Flood	Frequent	Medium	Low	Low	Moderate	High	Medium
Geological Hazards	Rare	Low	Low	Low	Moderate	Medium	Low
Severe Weather	Frequent	Medium	High	High	Moderate	High	High
Severe Winter Weather	Frequent	Medium	Medium	Low	Strong	Medium	Medium
Wildfire	Occasional	Medium	Medium	Low	Moderate	High	Medium

16 CAPABILITY ASSESSMENT

Local Plan Requirement C1—44 CFR Part 201.6(c)(3)

The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.

The purpose of the capability assessment is to understand the planning, regulatory, administrative, technical, and financial capabilities present in Essex County. This assessment helps the County and other participating jurisdictions identify strengths and opportunities that can be used to reduce losses from hazard events and reduce risks throughout Essex County in an effort to create more resilient communities.

16.1 OVERVIEW

Existing laws, ordinances, plans and programs at the federal, state, and local level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Federal and state programs identified through this review are those that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan.

During the 2025 plan update process, all participating jurisdictions were tasked with developing or updating their capability assessment, paying particular attention to evaluating the effectiveness of these capabilities in supporting hazard mitigation, and identifying opportunities to enhance local capabilities to integrate hazard mitigation into their plans, programs, and day-to-day operations.

The capability assessment section of each jurisdictional annex in Volume II describes the planning, regulatory, administrative, technical, and fiscal capabilities of each participating jurisdiction.

16.2 PLANNING AND REGULATORY CAPABILITY

Planning and regulatory capabilities are based on the implementation of ordinances, policies, local laws, state statutes, plans, and programs that relate to guiding and management growth and development. Planning and regulatory capabilities refer not only to current plans and regulations, but also to the jurisdiction's ability to change and improve those plans and regulations as needed.

16.2.1 Federal Planning and Regulatory Capabilities

Table 16-1 summarizes the planning and regulatory capabilities available to Essex County at the federal level.

Table 16-1. Summary of Federal Planning and Regulatory Capabilities

Capability	Details	
Disaster Mitigation Act of 2000 (DMA 2000) P.L. 106-390	Responsible Agency:	FEMA
	Hazard(s):	All Natural Hazards
	The DMA is the current federal legislation addressing hazard mitigation planning. DMA 2000 provides an opportunity for states, tribes, and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). This new section emphasizes the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. HMPs designed to meet the requirements of DMA will remain eligible for future FEMA Hazard Mitigation Assistance funds. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds. The NJOEM Mitigation Unit is the lead agency within New Jersey to promote mitigation planning. The law sets forth a more granular review of mitigation planning. Once approved, the applicant is eligible to apply for federal funds for mitigation of hazards. The rules provide detailed guidance on what applicants should include in a plan	
Code of Federal Regulations, Standard State Mitigation Plans (44 CFR PART 201.4)	Responsible Agency:	FEMA
	Hazard(s):	All Natural Hazards
	FEMA has prepared policies and procedures for FEMA's review and approval of state and local emergency all-hazard mitigation plans. The State Hazards Mitigation Plan provides actions based on risk assessments and capabilities of the State to achieve and fund mitigation activities based on those actions. Both the law and regulations have encouraged the counties to prepare plans.	
Robert T. Stafford Disaster Relief and Emergency Assistance Act	Responsible Agency:	FEMA
	Hazard(s):	All Natural Hazards
	The Act provides an orderly and continuing means of assistance by the federal government to state and local governments in carrying out their responsibilities to alleviate the suffering and damage that results from disasters. The provisions of the Act include (1) revising and broadening the scope of existing disaster relief programs; (2) encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by state and local governments; (3) achieving greater coordination and responsiveness of disaster preparedness and relief programs; (4) encouraging individuals, and state and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance; (5) encouraging hazard mitigation measures to reduce losses from disasters, including development of land-use and construction regulations; and (6) providing federal assistance programs for both public and private losses sustained in disasters. From a mitigation perspective of the Act, the NJOEM Mitigation Unit is the lead agency that reviews, submits, and administers federal funding to programs that mitigate hazards. These programs help find projects that are cost beneficial to help reduce damages from hazards.	

Capability	Details	
Disaster Recovery Reform Act	Responsible Agency:	FEMA
	Hazard(s):	All Natural Hazards
	This bill amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) to modify the Pre-disaster Hazard Mitigation Grant Program to permit the use of technical and financial assistance to establish and carry out enforcement activities to implement codes, specifications, and standards that incorporate the latest hazard-resistant designs; direct the President to establish a National Public Infrastructure Pre-disaster Mitigation Fund; authorize the President's contribution to the cost of hazard mitigation measures to be used to increase resilience in any area affected by a major disaster; and direct the FEMA to issue a final rulemaking that defines the terms "resilient" and "resiliency. From a mitigation perspective of the Act, the NJOEM Mitigation Unit is the lead agency that reviews, submits, and administers federal funding to programs that mitigate hazards. These programs help find projects that are cost beneficial to help reduce damages from hazards.	
Presidential Policy Directive 8 (PPD-8)	Responsible Agency:	Department of Homeland Security and NJ Office of Homeland Security and Preparedness
	Hazard(s):	All Hazards
	PPD-8 requires that a Threat Hazard Identification and Risk Assessment (THIRA) be developed for a state to remain eligible for Homeland Security Grant Program (HSGP) and Emergency Management Program Grant (EMPG) funding. The New Jersey Office of Homeland Security and Preparedness is the lead agency in preparing the State's THIRA. The fiscal year 2013 NJ State THIRA and Strategic Planning Report was submitted to FEMA Region II in December 2013.	
National Flood Insurance Program (NFIP)	Responsible Agency:	FEMA
	Hazard(s):	Flood
	The NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. The Flood Hazard Profile in Section 4.-7 (Flood) provides information on recent legislation related to reforms to the NFIP. Full compliance and good standing under the NFIP are application prerequisites for all FEMA grant programs for which participating jurisdictions are eligible under this plan.	
Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004	Responsible Agency:	FEMA. NJDEP and NJOEM at state level.
	Hazard(s):	Flood
	The Flood Insurance Reform Act of 2004 amended the 1994 National Flood Insurance Reform Act of 1968 to reduce losses to properties for which repetitive flood insurance claim payments have been made. This Act established a program for mitigation of severe repetitive loss properties and gave FEMA the authority to fund mitigation activities for individual repetitive loss claims properties. The Act provides additional coverage for compliance with land-use and control measures. The NJDEP Flood Control Division is the lead coordinator of New Jersey's NFIP efforts. NJOEM Mitigation Unit is the agency working with New Jersey communities with severe repetitive loss properties. This Statute helps New Jersey residents with affordable flood insurance and gives additional tools to the states and communities to mitigate severe repetitive loss properties.	
	Responsible Agency:	FEMA
	Hazard(s):	Flood

Capability	Details	
Biggert Waters National Flood Insurance Reform Act of 2012	Under the Biggert-Waters National Flood Insurance Reform Act of 2012, long-term changes to the National Flood Insurance Program have been adopted that have increased rates overall to reflect the flood risk more accurately to buildings in flood hazard areas. This has significantly influenced construction and reconstruction within flood hazard areas. Property owners are encouraged to consider long-term insurance costs when undertaking reconstruction or elevation of damaged buildings. An investment to reconstruct the lowest floor of a building an additional foot or two higher today may translate into significant future flood insurance savings.	
Homeowner's Flood Insurance Affordability Act	Responsible Agency:	FEMA
	Hazard(s):	Flood
	This 2014 law repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act, which was enacted in 2012, and makes additional program changes to other aspects of the program not covered by that Act. The new law lowers the recent rate increases on some policies, prevents some future rate increases, and implements a surcharge on all policyholders. The Act also repeals certain rate increases that have already gone into effect and provides for refunds to those policyholders. The Act also authorizes additional resources for the National Academy of Sciences (NAS) to complete the affordability study. FEMA, Congress, the private Write Your Own insurance companies, and other stakeholders work together to implement these Congressionally mandated reforms and to work toward shared goals of helping families maintain affordable flood insurance, ensuring the financial stability of the NFIP, and reducing the risks and consequences of flooding nationwide	
NFIP Community Rating System (CRS)	Responsible Agency:	FEMA
	Hazard(s):	Flood
	As an additional component of the NFIP, CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses, (2) facilitate accurate insurance rating, and (3) promote the awareness of flood insurance. Municipalities could expect significant cost savings on premiums if enrolled in the CRS program. CRS premium discounts on flood insurance range from 5 percent for Class 9 communities up to 45 percent for Class 1 communities.	
U.S. Army Corps of Engineers (USACE) – Dam Safety Program	Responsible Agency:	USACE
	Hazard(s):	Dam & Levee Failure
	The USACE is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety (USACE 2024).	
Emergency Support Function (ESF) #14, Long-Term Recovery Planning	Responsible Agency:	FEMA
	Hazard(s):	All Hazards
	Long-Term Community Recovery provides a mechanism for coordinating Federal support to State, tribal, regional, and local governments, nongovernmental organizations (NGOs), and the private sector to enable community recovery from the long-term consequences of extraordinary disasters. ESF #14 accomplishes this by identifying and facilitating availability and use of sources of recovery funding and	

Capability	Details	
	providing technical assistance (such as impact analyses) for community recovery and recovery planning support (FEMA 2011). ESF #14 may be activated for incidents that require a coordinated Federal response to address significant long-term impacts (e.g., impacts on housing, government operations, agriculture, businesses, employment, community infrastructure, the environment, human health, and social services) to foster sustainable recovery (FEMA 2011). Actions coordinated under ESF #14 include pre-incident planning and coordination, immediately prior to the incident, post-event planning, and operations (FEMA 2011). Through ESF 14, Long-Term Recovery Planning, NJOEM works with the Office of Homeland Security and Preparedness to have a plan for long-term planning and recovery prior to a disaster or emergency. One of the areas of planning includes mitigation. This coordination allows for another Statewide plan to incorporate mitigation principles and planning.	
Post-Hurricane Sandy Transportation Resilience Study of New York, New Jersey, and Connecticut	Responsible Agency:	Federal Highway Administration
	Hazard(s):	All Hazards
	This Post-Sandy Study was part of a series of research projects funded by FHWA with a goal of mainstreaming the consideration of climate vulnerability and risk in transportation decision making. The Post-Sandy Study was intended to inform the collective understanding on how to integrate climate resilience at multiple levels: in planning, during the project development process, and as part of operations and maintenance strategies, including asset management and emergency management.	

National Flood Insurance Program

Local Plan Requirement C2—44 CFR Part 201.6(c)(3)(ii)

The plan shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements.

All municipalities in Essex County participate in the National Flood Insurance Program (NFIP). NFIP administration is the responsibility of the municipalities and discussed in Section 16.5.6.

16.2.2 State Planning and Regulatory Capabilities

Table 16-2 summarizes the planning and regulatory capabilities available to Essex County at the state level.

Table 16-2. Summary of State Planning and Regulatory Capabilities

Capability	Details	
Municipal Land Use Law (MLUL)	Responsible Agency:	State of New Jersey
	Hazard(s):	All Hazards
	The State of New Jersey Municipal Land Use Law, MLUL (L.1975, c. 291, s. 1, effective August 1, 1976) is the legislative foundation for the land use process in the State of New Jersey, including decisions by Planning Boards and Zoning Boards of Adjustment. It defines the powers and responsibilities of boards and is essential to their functions and decisions. It also provides the required components of a municipal master plan.	

Capability	Details	
	Every municipal agency must adopt and can amend reasonable rules and regulations consistent with this act or with any applicable ordinance for the administration of its functions, powers, and duties. These plans help jurisdictions review their land use plans and policies with public participation. In 2017 the MLUL was amended to add a new subparagraph (f) to N.J.S.A. 40-55D-28.b.(2), which requires that any land use plan element adopted after the amendment include a statement of strategy concerning smart growth, storm resiliency, and environmental sustainability. This section of the MLUL was further amended on February 4, 2021, to require that any land use plan element of the master plan adopted or amended after that date must include a climate change-related hazard vulnerability assessment, which shall include an analysis of current and future threats to and vulnerabilities of the municipality associated with climate change-related hazards, including many of those identified in this Hazard Mitigation Plan update. The Municipal Land Use Law requires that each municipality prepare a comprehensive plan and update that plan every 10 years.	
New Jersey Soil Erosion and Sediment Control Act (N.J.S.A. 4:24)	Responsible Agency:	Soil Conservation Districts
	Hazard(s):	Geological Hazards, Flood
	New Jersey has 15 soil conservation districts, following county boundaries that implement the New Jersey Soil Erosion and Sediment Control Act (N.J.S.A. 4:24), which governs certain aspects of new development.	
Uniform Construction Code (UCC)	Responsible Agency:	NJ DCA
	Hazard(s):	All Hazards
	Building codes mandate best practices and technology, much of which is designed to reduce or prevent damage from occurring when structures are under stress. The UCC adopts up-to-date building codes as its Building Subcode and One- and Two-Family Subcode. These Subcodes contain requirements that address construction in both A and V flood zones. Also, all new construction is required to comply with the UCC for flood zone construction. New Jersey has enacted legislation directing the Department of Community Affairs (NJ DCA) to adopt a radon hazard code or revise the State building code to establish "adequate and appropriate standards to ensure that schools and residential buildings within tier one areas [as defined by the State] ... are constructed in a manner that minimizes radon gas and radon progeny entry and facilitates any subsequent remediation that might prove necessary." See N.J. Stat. Ann. 52:27D-123a. The Department then adopted a radon hazard sub-code which does not reference existing model standards or guidance but which sets forth the basic requirements for a passive sub-slab or sub-membrane depressurization system. See N.J. Admin. Code 5:23-10.4. The radon control standards and procedures apply to new residential construction (and school construction) in "tier one" areas, as defined by the State, and Appendix 10-A of the sub-code lists the specific municipalities that are designated as tier one areas. All of incorporated NJ has adopted standardized building codes (IBC 2021 NJ edition (as of 2022)).	
Growth Management Policy	Responsible Agency:	State Planning Commission
	Hazard(s):	All Hazards
	Land preservation and recreation comprise one of the cornerstones of New Jersey's smart growth policy. The New Jersey Statewide Comprehensive Outdoor	

Capability	Details	
	Recreation Plan provides Statewide policy direction to the State, local governments, and conservation organizations in the preservation of open space and the provision of public recreation opportunities. The State Plan was prepared and adopted by the State Planning Commission according to the requirements of the State Planning Act of 1985 as amended (NJSA 52:18A-196 et seq.) to serve as an instrument of State policy to guide State agencies and local government in the exercise of governmental powers regarding planning, infrastructure investment and other public actions and initiatives that affect and support economic growth and development in the State. The State Planning Act has enhanced the traditionally limited role of county land-use planning and control. The Act also provides tools for municipalities when preparing their master land use plans and better opportunity for a comprehensive approach to planning so not to harm or be in conflict with neighboring Municipalities' plans New Jersey's smart growth is growth that serves the environment, the economy, and the community equally. It attempts to concentrate development into already-existing communities when possible, and it addresses the inherent interconnections between environmental protection, social equity, public health, and economic sustainability.	
Flood Hazard Area Control Act (N.J.S.A. 58:16A-52) Flood Hazard Area Control Regulation (N.J.A.C. 7:13)	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Flood
	New Jersey enacted this law to delineate and mark flood hazard areas; authorize NJDEP to adopt land-use regulations for the flood hazard area; control stream encroachments; coordinate effectively the development, dissemination, and use of information on floods and flood damages that may be available; authorize the delegation of certain administrative and enforcement functions to county governing bodies; and integrate the flood control activities of the municipal, county, State, and federal governments. The intent of the regulations is to minimize potential on- and off-site damage to public or private property caused by development that, at times of flood, subject structures to flooding and increase flood heights and/or velocities both upstream and downstream. These rules are also intended to safeguard the public from the dangers and damages caused by materials being swept onto nearby or downstream lands, to protect and enhance the public's health and welfare by minimizing the degradation of water quality from point and non-point pollution sources, and to protect wildlife and fisheries by preserving and enhancing water quality and the environment associated with the floodplain and the watercourses that create them.	
Wetlands Act of 1970 (N.J.S.A. 13:9A – 1 to 10) Coastal Zone Management Rules Program (N.J.A.C.7:7E) Coastal Zone Management Adopted Amendment (N.J.A.C. 7:7-16.9)	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm
	In 1970, the New Jersey Legislature declared that one of the most vital and productive areas of our natural world is the area between the sea and the land known as the "estuarine zone." This area protects the land from the force of the sea, moderates the weather, provides a home for waterfowl and for fish and shellfish, and assists in absorbing sewage discharge by the rivers of the land. It is necessary to preserve the ecological balance of this area and prevent its further deterioration and destruction by regulating the dredging, filling, removing, or otherwise altering or polluting.	
Coastal Zone Management Rules Program (N.J.A.C.7:7E)	Responsible Agency:	NOAA, NJDEP
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm

Capability	Details	
Coastal Zone Management Adopted Amendment (N.J.A.C. 7:7-16.9)	Coastal Zone Management (CZM) rules mandate the use and development of coastal resources, to be used primarily by the Land Use Regulation Program in the Department in reviewing permit applications under the Coastal Area Facility Review Act (CAFRA), N.J.S.A. 13:19-1 et seq. (as amended to July 19, 1993); Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq.; Waterfront Development Law, N.J.S.A. 12:5-3; Water Quality Certification (401 of the Federal Clean Water Act); and Federal Consistency Determinations (307 of the Federal Coastal Zone Management Act). The rules also provide a basis for recommendations by the Program to the Tidelands Resource Council on applications for riparian grants, leases, and licenses. The most recent amendment, effective as of September 18, 2017, creates rules that update several provisions in the Department's requirements to provide public access to tidal waterways and their shores.	
Freshwater Wetland Protection Act (N.J.S.A. 13: B:1) Freshwater Wetland Protection Rules (N.J.A.C. 7:7A)	Responsible Agency:	NJDEP
	Hazard(s):	Flood, Harmful Algal Bloom
	New Jersey enacted this law to support development and enhancement of State and local wetland protection programs. Projects must clearly demonstrate a direct link to increasing the State's ability to protect wetland resources. Grants are federally funded and administered by the NJDEP. The associated implementing regulations support the New Jersey freshwater wetlands program. The Freshwater Wetlands Protection Act was last amended in 2016 and the Freshwater Wetland Protection Rules were last amended April 16, 2018.	
Waterfront Development Statute (N.J.S.A. 12:5-1) Coastal Permit Program (N.J.A.C. 7:7)	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm
	This Law sets forth the requirements of filling or dredging of, or placement or construction of structures, pilings, or other obstructions in any tidal waterway or in certain upland areas adjacent to tidal waterways outside the area regulated under Coastal Area Facility Review Act. These requirements are fully explained in N.J.A.C.7:7-2.3. These implementing rules establish the procedures by which the NJDEP will review permit applications and appeals from permit decisions the Waterfront Development Law.	
Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19)	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm
	CAFRA applies to projects near coastal waters in the southern part of the State. The law divides the CAFRA area into sections or zones and regulates different types of development in each zone. Generally, the closer it is to the water, the more likely a development will be regulated. The CAFRA law regulates almost all activities involved in residential, commercial, or industrial development, including construction, relocation, and enlargement of buildings or structures and all related work, such as excavation, grading, shore protection structures, and site preparation. This law is implemented through New Jersey's CZM Rules N.J.A.C. 7:7E-1.1 et seq. Permits issued require construction in accordance with the NFIP requirements in A and V zones. Effective July 1994, the CAFRA jurisdiction was expanded to include every single-family residential development within 150 feet of the mean high-water line, beach, or dune. The threshold for regulation over commercial development was lowered to capture smaller commercial developments, and NJDEP gained authority over any disturbance to a beach or dune area or the placement of a structure in these areas. Effective November 5, 2007, the CZM rules incorporate the new and more stringent Flood Hazard Area Control Act standards, including protection of	

Capability	Details	
	riparian buffers along tidal water courses that can be 50, 150, and 300 feet along environmentally sensitive (Category-1) waterways.	
Safe Dam Act of 1981 N.J.A.C.7:24A	Responsible Agency:	NJDEP
	Hazard(s):	Flood, Dam Failure
	No municipality, corporation, or person shall (without the consent of the Commissioner of Environmental Protection) build any reservoir or construct any dam; or repair, alter, or improve existing dams on any river or stream in this State or between this State and any other state that will raise the waters of the river or stream more than five feet above its usual mean low water height.	
Pinelands Protection Act (N.J.S.A. 13: 18A-30 to 49)	Responsible Agency:	Pinelands Commission
	Hazard(s):	Flood, Wildfire
	In 1979 the New Jersey Legislature declared the protection of the New Jersey Pinelands and established a regional planning and management commission empowered to prepare and oversee the implementation of a comprehensive management plan for the pinelands area. Management programs and minimum standards have been established under the Pinelands Comprehensive Management Plan that are intended to provide protection of wetlands, vegetation, fish and wildlife, water quality management, and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.	
Pinelands Comprehensive Management Plan (N.J.A.C.7:50)	Responsible Agency:	Pinelands Commission
	Hazard(s):	Flood, Wildfire
	The Comprehensive Management Plan implements the regulations and standards designed to promote orderly development of the Pinelands to preserve and protect the significant and unique natural, ecological, agricultural, archaeological, historical, scenic, cultural, and recreational resources of the Pinelands. The Pinelands Commission bears the ultimate responsibility for implementing and enforcing the provisions of the Pinelands Protection Act and this Plan. Under the Pinelands Comprehensive Management Plan management programs and minimum standards have been established that are intended to provide for the protection of wetlands, vegetation, fish and wildlife, water quality management, and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.	
Highlands Water Protection and Planning Act (N.J.S.A. 13:20-1)	Responsible Agency:	NJDEP
	Hazard(s):	Drought, Geological Hazards
	The Highlands Water Protection and Planning Act is a law signed in August 2004 that preserves open space and protects the State's greatest diversity of natural resources, including the precious water resources that supply drinking water to more than half of New Jersey's families. The Highlands Act documents the geographical boundary of the Highlands Region and establishes the Highlands Preservation Area and the Highlands Planning Area. It required the Department to establish regulations(pdf) in the Highlands Preservation Area and that the Highlands Water Protection and Planning Council develop a regional master plan for the entire Highlands Region. The Highlands Act calls for a prohibition on development on steep slopes defined in the Act.	
Tidelands Act (N.J.S.A 12:3)	Responsible Agency:	Tidelands Resource Council
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm

Capability	Details	
	Tidelands, also known as "riparian lands," are lands now or formerly flowed by the tide of a natural waterway. This includes lands that were previously flowed by the tide but have been filled and are no longer flowed by the tide. These lands are owned by the people of the State of New Jersey. Individuals must first get permission from the State to use these lands, in the form of a tidelands license, lease, or grant, and must pay for this use. The management of tidelands in New Jersey is overseen by the Tidelands Resource Council, a board of 12 Governor-appointed volunteers, along with DEP staff at the Bureau of Tidelands Management. Grants, licenses, and leases are issued by the Tidelands Resource Council, which makes all ultimate decisions with regard to tidelands.	
State Planning Act (N.J.S.A. § 52:18A-196 et seq)	Responsible Agency:	New Jersey State Planning Commission (SPC)
	Hazard(s):	All Hazards
	The State Planning Act (1985) created the New Jersey State Planning Commission (SPC) and the Office of State Planning (OSP) as staff to the SPC. New Jersey Department of State, Office for Planning Advocacy Duties of the SPC are to prepare and adopt a State Plan to provide a coordinated, integrated, and comprehensive plan for the growth, development, renewal, and conservation of the State and its regions; to prepare a long-term Infrastructure Needs Assessment, which shall provide information on present and prospective conditions, needs and costs with regard to State, county and municipal capital facilities, including water, sewerage, transportation, solid waste, drainage, flood protection, shore protection, and related capital facilities; to develop and promote procedures to facilitate cooperation and coordination among State agencies and local governments; to provide technical assistance to local governments; to periodically review State and local government planning procedures and relationships; and to review any bill introduced in either house of the Legislature which appropriates funds for a capital project.	
Stormwater Management Rules (N.J.A.C.7:8)	Responsible Agency:	NJDEP
	Hazard(s):	Flood
	These rules set forth the required components of regional and municipal stormwater management plans and establish the stormwater management design and performance standards for new (proposed) development. The design and performance standards for new development include groundwater recharge, runoff quantity controls, runoff quality controls, and buffers around Category 1 waters. New Jersey's Stormwater Management rules are implemented by the New Jersey Department of Environmental Protection through the review of permits issued by the Division of Land Use Regulation (Flood Hazard, Freshwater Wetlands, CAFRA, Waterfront Development, and Coastal Wetlands). The Stormwater Management rules (Stormwater rules or rules) are also implemented by local authorities through the Municipal Land Use Law (MLUL) and the Residential Site Improvement Standards (RSIS). Per the New Jersey Department of Community Affairs, the RSIS are applicable to any residential application that goes before a local board. Through the RSIS, the Stormwater rules are activated whenever a municipality requires the control of runoff from a site that is the subject of a site or subdivision application.	
New Jersey Pollutant Discharge Elimination System (NJPDES) Stormwater Regulation	Responsible Agency:	NJDEP
	Hazard(s):	Flood, Harmful Algal Blooms, Hazardous Substances
	The NJPDES Stormwater Rules are intended to address and reduce pollutants associated with existing stormwater runoff. The NJPDES Rules govern the issuance of permits to entities that own or operate small, separate municipal storm sewer	

Capability	Details	
Program (NJPDES) Rules (N.J.A.C.7:14A).	systems. The permit program establishes the Statewide Basic Requirements that must be implemented to reduce nonpoint source pollutant loads from these sources. The Statewide Basic Requirements include measures such as the adoption of ordinances (litter control, pet waste, wildlife feeding, proper waste disposal, etc.); the development of a municipal stormwater management plan and implementing ordinance(s); requiring certain maintenance activities (such as street sweeping and catch basin cleaning); implementing solids and floatables control; locating discharge points and stenciling catch basins; and a public education component. Guidance for the development of Municipal Mitigation Plans was developed and made available in February 2004. This has been effective in guiding the community for stormwater runoff. The program was developed in response to the EPA Phase II rules published in December 1999. The department issued final stormwater rules on February 2, 2004, and four NJPDES general permits authorizing stormwater discharges from Tier A and Tier B municipalities as well as public complexes and highway agencies that discharge stormwater from municipal separate storm sewers. There are 462 Tier A municipalities and 100 Tier B municipalities. The general permits address stormwater quality issues related to new development, redevelopment, and existing development by requiring municipalities to implement several Statewide Basic Requirements. All municipalities have a local stormwater coordinator, and the department has case managers assigned to each municipality for compliance assistance (see N.J.A.C. 7:22 below). Long-term water quality trends in rivers and streams indicate dramatic improvement over the past 30 years, likely the result of elimination or minimization of point sources, upgrades of wastewater treatment plants and natural attenuation of pollutants. Municipal stormwater management renewal permits have changed for Tier A and Tier B municipalities, effective as of January 1, 2018. The Tier A and Tier B Municipal Stormwater General Permits authorize the discharge of stormwater from small municipal separate storm sewers. The Tier A permit addresses stormwater quality issues related to both new and existing development. The Tier B permit focuses on new development and redevelopment projects and public education.	
Construction Permits (N.J.S.A. 13: 1D-29 to 34)	Responsible Agency:	NJDEP
	Hazard(s):	Flood
	The Law mandates that NJDEP make timely decisions on construction permit applications to ensure adequate public notice of procedures and to continue effective administration of the substantive provisions of other laws. This Law ensures NJDEP issues permits in a timely manner so as not to delay necessary construction projects. Historical records indicate NJDEP's conformance with this law. This does not apply to freshwater wetland rules, only coastal and flood hazard regulations. As part of the effort to recover from the impacts of Superstorm Sandy, this law was amended March 25, 2013, in conjunction with the amendment of R.2013d to the Flood Hazard Area Control Act.	
New Jersey Green Acres Land Acquisition Act of 1961	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm, Severe Weather
	The Legislature enacted the New Jersey Acres Land Acquisition Acts to achieve, in partnership with others, a system of interconnected open spaces, whose protection will preserve and enhance New Jersey's natural environment and its historic, scenic,	

Capability	Details	
	and recreational resources for public use and enjoyment. On November 3, 1998, New Jersey voters approved a referendum that created a stable source of funding for open space, farmland, and historic preservation and recreation development, and on June 30, 1999, the Garden State Preservation Trust Act was signed into law. The law establishes, for the first time in history, a stable source of funding for preservation efforts. These rules implement the Green Acres laws, governing the award of loans or matching grants, or both, to local government units for the acquisition or development of land, and 50% matching grants to nonprofits for the acquisition or development of land, for outdoor recreation and conservation purposes. These rules establish project eligibility requirements, application requirements, funding award categories and criteria, matching grant and loan terms, and program administrative requirements. The rules also contain procedures for the disposal, or diversion to a use other than recreation and conservation, of those lands acquired or developed with Green Acres funding or otherwise encumbered with Green Acres restrictions.	
Emergency Building Inspection Act (N.J.S.A. 52:27D-126.3)	Responsible Agency:	Department of Community Affairs
	Hazard(s):	All Hazards
	Enacted on January 17, 2007, this Act addresses how building code officials would be compensated if called to support damage assessment outside of their jurisdiction. The Commissioner of the Department of Community Affairs established a program to deploy State and local construction code officials to assist local construction code officials and inspectors. This program has provided flexibility and redundancy to the State and local governing bodies in the deployment of essential personnel to evaluate buildings and other structures affected by a natural or man-made disaster or emergency.	
New Jersey Civilian Defense and Disaster Control Act	Responsible Agency:	New Jersey Office of Emergency Management
	Hazard(s):	All Hazards
	The purpose of this act is to provide for the health, safety, and welfare of the people of the State of New Jersey and to aid in the prevention of damage to and the destruction of property during any emergency as herein defined by prescribing a course of conduct for the civilian population of this State during such emergency and by centralizing control of all civilian activities having to do with such emergency under the Governor and for that purpose to give to the Governor control over such resources of the State Government and of each and every political subdivision thereof as may be necessary to cope with any condition that shall arise out of such emergency and to invest the Governor with all other power convenient or necessary to effectuate such purpose. Implementation is overseen by the State Department of Defense, Office of Civilian defense director. The director is appointed by the Governor. The Act is implemented through coordination and established lines of communication through the State Office of Emergency Management and county emergency management coordinators.	
N.J.S.A. 38A:17-1	Responsible Agency:	New Jersey Office of Emergency Management
	Hazard(s):	All Hazards
	The Governor is authorized to enter into agreements with the governors of any of the states bordering on New Jersey for the protection in the event of emergency of any or all interstate bridges, tunnels, ferries, and other communications facilities	

Capability	Details	
	The State Office of Emergency Management (OEM) is responsible for the implementation of the Governor's directive to assist emergency response counterparts in bordering states. OEM manages inter-state assistance through delineated lines of communication and standard operating procedures.	
Forest Fire Prevention and Control Act (N.J.S.A. 13:9-44 to 44.10)	Responsible Agency:	New Jersey Forest Fire Service
	Hazard(s):	Wildfire
	The Forest Fire Service is responsible for determining wildfire hazards; removing or overseeing removal of brush, undergrowth, or other material that contributes to wildfire hazards; maintaining or overseeing maintenance of firebreaks; setting backfires; plowing lands; closing roads; and making regulations for burning brush. The Forest Fire Service has the authority to summon any male person between the ages of 18 and 50, who may be within the jurisdiction of the State, to assist in extinguishing fires. The Fire Service can require the use of property needed for extinguishing fires, issue permits, collect extinguishment costs and fines for violations, and direct all persons and apparatus engaged in extinguishing wildfires. The Service has the right of entry to inspect and ascertain compliance and extinguish wildfires, investigate fires to determine cause, close the woods to all unauthorized persons in an emergency, and arrest (without an official warrant) anyone violating the Forest Fire Laws. The laws that apply are 13:9-2, 9-23, and 9-24. Also, Forest Fire mitigation efforts are not exempted in other environmental regulations. Certain mitigation efforts sometimes occur where there is threatened and endangered habitat, even when that habitat was caused by past prescribed burning operations.	
N.J.S.A. 52:14E-11 (3-10-2003)The Fire Service Resource Emergency Deployment Act	Responsible Agency:	New Jersey Community Affairs, Fire Service Division
	Hazard(s):	All Hazards
	This Act allows for the Fire Division within the Department of Community Affairs to deploy fire assets to a pre-designated location in advance of a disaster or emergency as well as move assets to a pre-designated location to avoid assets being damaged. This has been used successfully in every disaster since the Act was passed.	
Best Management Practices for Creating and Maintaining Wildfire Fuelbreaks in New Jersey's Wildland Urban Interface, 2011	Responsible Agency:	NJ Forest Fire Service
	Hazard(s):	Wildfire
	In New Jersey, residential communities and development continue to spread into new, previously undisturbed natural areas which create a "Wildland Urban Interface" (WUI) - here rural land and developed areas meet. This fragmented rural landscape has greater ignition sources and more frequent fires, which makes it difficult for the Forest Fire Service to manage land for wildfire protection and preparedness. This problem can be seen throughout the country and in New Jersey, especially with the State having such a rapidly growing population. In a study done by the American Planning Association, 46 percent of homes in New Jersey are located in the Wildland Urban Interface, which stresses the importance of the problem in New Jersey.	
NJ Statewide Water Supply Plan	Responsible Agency:	NJDEP
	Hazard(s):	Drought, Harmful Algal Bloom
	The Water Supply Management Act of 1981 requires that the NJ Department of Environmental Protection (NJDEP) develop and periodically update the NJ Statewide Water Supply Plan to guide future water supply management. The NJ Statewide Water Supply Plan addresses the following issues: • Identify surface and ground water sources, and current demands on those resources	

Capability	Details	

	• Make demand projections for duration of the plan
	• Identify intended uses of land purchased for water supply facilities but not yet used
	• Recommend:
	  ○ Improvements, new construction, and interconnections
	  ○ Diversions for aquaculture
	  ○ Legislative and administrative actions to protect watershed areas
	  ○ Identification and purchase of land for water supply facilities
	  ○ Administrative actions to protect surface and ground water supplies
	
	The 2023-2028 plan, addresses the following issues:
	• Climate change implications for water availability and water supply demands,
	• Extend the planning period from 2040 to 2050,
	• Environmental justice and equity issues related to water supply management,
	• Potential water supply implications of source water contamination, especially regarding emerging contaminants of concern; and
	• More specific water management recommendations for stressed water resources (NJDEP 2024).	

Water Infrastructure Investment Plan (WIIP)	Responsible Agency:	NJDEP
	Hazard(s):	Drought, Harmful Algal Bloom
	The WIIP is New Jersey's program to optimize the use of limited federal and state resources to address high priority water infrastructure needs throughout the State. The WIIP is dedicated to protecting and enhancing New Jersey's water quality and water infrastructure which is vital to the State's health and economy. The WIIP is currently implemented through the administration of the Water Bank program through the Division of Water Quality and Division of Water Supply and Geoscience. Projects that have a significant resilience component are also awarded priority points towards their ranking score or end it at points.	
New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel (STAP)	Responsible Agency:	Rutgers University, NJDEP
	Hazard(s):	Coastal Erosion, Flood, Hurricane/Nor'easter/Tropical Storm, Severe Weather, Severe Winter Weather
	A 2016 New Jersey STAP was convened by Rutgers University, culminating in a report that identified planning options for practitioners to enhance the resilience of New Jersey's people, places, and assets to sea-level rise, coastal storms, and the resulting flood risk. The same team at Rutgers University was engaged by the NJDEP to update the 2016 report based on the most current scientific information. Similar to the inaugural work, the 2019 STAP was charged with identifying and evaluating the most current science on sea-level rise projections and changing coastal storms, considering the implications for the practices and policies of local and regional stakeholders, and providing practical options for stakeholders to incorporate science into risk-based decision processes (Kopp 2019). The 2019 STAP is used by multiple State agencies including NJDEP and NJOEM for sea level rise and coastal flooding planning and project design purposes.	
2020 New Jersey Scientific Report on Climate Change	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Drought, Extreme Temperature, Flood, Hurricane/Nor'easter/Tropical Storm, Severe Weather, Severe Winter Weather, Wildfire

Capability	Details	
	NJDEP's first scientific report on climate change summarizes the effects of climate change on New Jersey's environment to inform State and local decision-makers as they seek to understand and respond to the impacts of climate change. This report identifies and presents the best available science and existing data regarding the current and anticipated environmental effects of climate change globally, nationally, and regionally (NJDEP 2020).	
2021 New Jersey Climate Change Resilience Strategy	Responsible Agency:	NJDEP
	Hazard(s):	Coastal Erosion, Drought, Extreme Temperature, Flood, Hurricane/Nor'easter/Tropical Storm, Severe Weather, Severe Winter Weather, Wildfire
	New Jersey's first Statewide Climate Change Resilience Strategy provides a suite of forward-looking policy options to promote the long-term resilience of New Jersey to climate change. As a framework for policy, regulatory, and operational changes, the Resilience Strategy presents actions that New Jersey's Executive Branch can take to support the resilience of the state's communities, economy, and infrastructure. The Resilience Strategy includes 125 recommended actions across six priority areas: • Build resilient and healthy communities, • Strengthen the resilience of New Jersey's ecosystems, • Promote coordinated governance, • Invest in information and increase public understanding, • Promote climate informed investments and innovative financing; and • Coastal resilience plan ((NJDEP 2020)	

16.2.3 County and Regional Planning and Regulatory Capabilities

Table 16-3 summarizes the planning and regulatory capabilities available to Essex County at the county and regional levels.

Table 16-3. Summary of County and Regional Planning and Regulatory Capabilities

Capability	Details	
Essex 2045, Essex County Transportation Plan (2023)	Responsible Agency:	North Jersey Transportation Planning Authority
	Hazard(s):	Flood, Severe Weather, Severe Winter Weather, Extreme Temperature
	Essex 2045 proposes 43 candidate intersection and corridor projects, and a wide variety of policies, strategies, and studies, such as updating Complete Streets policies and plans; conducting corridor studies and traffic and roadway safety studies; and implementing Roadway Safety Audit and School Travel Plan improvements. The plan refers to the 2020 Essex County Hazard Mitigation Plan and discusses past hazard events (NJTPA 2023).	
Plan 2050: NJTPA Long-Range Transportation Plan (2021)	Responsible Agency:	North Jersey Transportation Planning Authority
	Hazard(s):	Flood, Severe Weather, Severe Winter Weather, Extreme Temperature
	The NJTPA's 2050 Long Range Transportation Plan focuses on the three themes of transportation, people, and opportunity. This plan laid out an implementation and investment plan for North Jersey (NJTPA 2021).	
NJTPA Resilience Improvement Plan (2024)	Responsible Agency:	North Jersey Transportation Planning Authority
	Hazard(s):	Flood, Severe Weather, Severe Winter Weather, Extreme Temperature

Capability	Details	
	The North Jersey Transportation Planning Authority (NJTPA) has developed this Resilience Improvement Plan (RIP), in collaboration with the Port Authority of New York and New Jersey (PANYNJ), to meet the objectives of the Federal Highway Administration's (FHWA) Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program. The Plan displays consistency with state and local hazard mitigation plans and includes a risk-based assessment of vulnerabilities to current and future weather events and natural disasters (NJTPA 2024).	
Resilient NJ Northeastern New Jersey Action Plan: A Roadmap to Resilience / Essex and Hudson Counties	Responsible Agency:	New Jersey Department of Environmental Protection
	Hazard(s):	Flood, Severe Weather, Severe Winter Weather
	This plan highlights projects including the installation of flood barriers, the raising of existing infrastructure, and the restoration of ecological resources to support the protection of infrastructure such as the New Jersey Turnpike, rail lines, and public roads near coastlines and shorelines. These projects are supported by a risk-based Flood Impact Assessment and Climate Hazards Assessment.	
Essex County Wastewater Management Plan (2014)	Responsible Agency:	Essex County Department of Public Works
	Hazard(s):	Flood
	The purpose of this document is to provide a comprehensive Wastewater Management Plan (WMP) for Essex County. The WMP is generally intended to project future development and the associated wastewater management and water supply requirements associated with that development. The WMP planning process was designed to protect environmentally sensitive areas and to reduce pollutant loads to the groundwater (Essex County 2014).	
New York City – Newark – Jersey City Metropolitan Statistical Area (NY-NJ MSA) Priority Climate Action Plan, March 2024	Responsible Agency:	North Jersey Transportation Planning Authority, New York Metropolitan Transportation Council
	Hazard(s):	Climate change related hazards
	The NY-NJ MSA is focused on three key objectives while developing the PCAP.16: 1. Enabling regional collaboration to create comprehensive pathways for reducing pollution and maximizing benefits to communities in the region, especially in low-income and disadvantaged communities; 2. Positioning the region to apply for and receive funding that supports innovative programs and policies that can be scaled up across jurisdictions; 3. Identifying optimized measures to achieve significant emissions reductions by 2030.	
Capital Improvement Plan:	Responsible Agency:	Essex County
	Hazard(s):	All Hazards
	The County Capital Improvement Plan is updated annually by the Engineering Division of the Department of Public Works. The Plan includes mitigation related projects such as County-roadway improvements, drainage improvements on County roads, and various studies for County-owned structures and facilities. The County also includes resiliency actions.	
Passaic River Climate Resilience Planning Study	Responsible Agency:	North Jersey Transportation Planning Authority
	Hazard(s):	All Natural Hazards Effected by Climate Change
	The North Jersey Transportation Planning Authority conducted a climate resilience planning effort for transportation in the New Jersey portion of the Passaic River Basin, including parts of Bergen, Essex, Hudson, Morris, Passaic, Somerset, Sussex, and Union counties. The purpose of the planning study was to identify adaptation strategies to protect transportation corridors and assets from extreme weather events, including excessive flooding, heat waves and sea level rise. The study consisted of the following activities: conduct a vulnerability assessment of	

Capability	Details	
	the area's transportation system; project future climate risks for the Passaic River Basin; develop adaptation strategies for critical transportation corridors and assets; develop recommended actions and strategies to protect the transportation system from damage and disruption (NJTPA 2019)	
Comprehensive Emergency Management Plan	Responsible Agency:	Office of Emergency Management
	Hazard(s):	All Hazards
	The Plan guides emergency response to disaster events. The Plan is updated every 2 years. Essex County continues to develop, enhance, and implement existing emergency response plans to utilize new and developing technology and information as it becomes available.	
Essex County Community Health Needs Assessment, 2022	Responsible Agency:	Essex County Office of Public Health Management
	Hazard(s):	Disease Outbreak
	The purpose of the Community Health Needs Assessment it to identify and prioritize the needs of the Essex County (NJ) community at large through strategic health planning. The report provides comprehensive information about the health status of the county population and what health issues need to be addressed. The specific objectives of the community health needs assessment are provided below. • Understand key health issues that impact the community; • Measure the health status and behaviors of Essex County residents; • Produce evidence for evaluating public health policies, strategies, and programs; and • Create data driven initiatives to advance health focused on the needs of Essex County residents. This project began during the summer of 2021 through a public-academic partnership developed between the Essex County Office of Public Health Management and the School of Public Affairs and Administration (SPAA) at Rutgers University-Newark. The two organizations worked together in the development and planning of a public health needs assessment in Essex County, New Jersey. The public health survey was conducted to understand key health issues impacting the health of community members in Essex County during the COVID-19 pandemic and included all 22 municipalities in the County (Essex County Office of Health Management 2022).	

Detailed information regarding capabilities at the local jurisdiction level can be found in each jurisdictional annex found in Volume II (Jurisdictional Annexes).

16.3 Administrative and Technical Capabilities

Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers and scientists, as well as personnel with capabilities that may be found in multiple departments, such as grant writers.

16.3.1 Federal Technical Capabilities Programs and Resources

Numerous federal agencies have specific capabilities that can support hazard mitigation in Essex County.

Federal Emergency Management Agency

FEMA is responsible for providing assistance before, during, and after disasters. FEMA is the federal reviewer of hazard mitigation plans, sets federal standards for local and state hazard mitigation plans, and funds hazard mitigation plans.

National Dam Safety Program (NDSP): The NDSP is a partnership of state and federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety to protect people from dam failures. It is administered through the Department of Homeland Security and FEMA. The program improves safety and security around dams by providing assistance grants to state dam safety agencies to assist them in improving their regulatory programs; producing educational materials for dam owners; funding research to enhance technical expertise as dams are built and rehabilitated; establishing training programs for dam safety inspectors; and creating a National Inventory of Dams (NID) (FEMA 2024).

HURREVAC

HURREVAC is the decision support tool of the National Hurricane Program, administered by FEMA, the United States Army Corps of Engineers (USACE), and the National Atmospheric and Oceanic Administration (NOAA) National Hurricane Center (HURREVAC n.d.). The NJOEM has established a strong working group with all 21 county Offices of Emergency Management (OEMs) to use HURREVAC software for tracking hurricanes. HURREVAC allows NJOEM and counties to work as a unified team, coordinating notification, communication, activations, public warning, and evacuation and sheltering efforts. By operating together, the State and the counties serve the public better by providing the same advisories and actions.

National Weather Service (NWS)

The NWS monitors weather and delivers weather forecasting for New Jersey. Most of the State is serviced by the Mount Holly weather forecast office (WFO). Passaic, Bergen, Essex, Hudson, and Union County are covered by the New York WFO. NJOEM uses conference calling with the NWS and county OEMs to share specific information and needs when severe weather is forecast. When an approaching storm warrants monitoring, NJOEM sends out e-mails with State Emergency Operations Center (SEOC) status information and advice embedded in jpeg files to keep all emergency managers statewide up to date with NJOEM's direction. Resources are deployed as early as possible to prepare for storm impacts. The NWS also offers various education and training programs on weather-related hazards (NWS n.d.)

StormReady Program: The NWS operates the StormReady program, which encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations. To be recognized by the program, a community must establish a 24-hour warning point and emergency operations center; have more than one way to receive severe weather warnings and forecasts and to alert the public; create a system that monitors weather conditions locally; promote the importance of public readiness through community seminars; and develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises (NWS n.d.).

United States Army Corps of Engineers (USACE)

The USACE works to strengthen the nation's security by building and maintaining America's infrastructure and providing military facilities where servicemembers train, work, and live. Projects include dredging, storm damage reduction, and ecosystem restoration in and near waterways (USACE n.d.). Essex County is serviced by the New York district. USACE has numerous initiatives to support hazard mitigation measures, which are described below.

Silver Jackets: Silver Jackets, developed by USACE, is the State-level implementation program for the National Flood Risk Management Program. The program's goals are to leverage information and resources from federal, state, and local agencies to improve flood risk management; improve public risk communication through a united effort; and create a mechanism to collaboratively solve issues and implement initiatives beneficial to local communities. The USACE Philadelphia District organizes this program in New Jersey.

Climate Preparedness and Resilience Community of Practice: The Practice develops and implements practical, nationally consistent, and cost-effective approaches and policies to reduce potential vulnerabilities to the nation's water infrastructure resulting from climate change and variability (USACE n.d.).

Planning Assistance to States (PAS) Program: Section 22 of the 1974 Water Resources Development Act provides authority for the USACE to assist states, local governments, Native American Tribes, and other non-federal entities in the preparation of comprehensive plans for the development and conservation of water and related land resources. Types of work that can be done include: Water Quality Studies, Wetland Evaluation Studies, Flood Plain Management Studies, Coastal Zone Management/Protection Studies, Harbor/Port Studies, or other water resource planning investigations. The individual nonfederal sponsors determine the needed planning assistance (USACE n.d.).

Flood Plain Management Services Program (FPMS): Section 206 of the 1960 Flood Control Act (PL 86-645), as amended, provides the authority for the USACE to provide assistance and guidance on all aspects of floodplain management planning. The program develops or interprets site-specific data on obstructions to flood flows, flood formation, and timing and the extent, duration, and frequency of flooding. Upon request, program services are provided to the State, regional, and local governments, Native American Tribes, and other non-federal public agencies without charge (USACE n.d.).

Inspection of Completed Works (ICW) Program: Civil works structures whose failure or partial failure could jeopardize the operational integrity of the project, endanger the lives and safety of the public, or cause substantial property damage, are periodically inspected and evaluated to ensure their structural stability, safety, and operational adequacy. For those structures constructed by the USACE and turned over to others for operation and maintenance, the operating entity is responsible for periodic inspection and evaluation. The USACE may conduct the inspection on behalf of the project sponsor provided appropriate reimbursement to the USACE is made. However, the USACE may participate in the inspection with the operating entity at the government's expense (USACE n.d.).

Rehabilitation and Inspection Program (RIP): RIP is a USACE program that provides for inspection of flood control projects, the rehabilitation of damaged flood control projects, and the rehabilitation of federally authorized and constructed hurricane or shore protection projects (USACE n.d.).

Dam Safety Program: The USACE is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety (USACE 2020).

U.S. Geological Survey (USGS)

USGS maintains a network of gauges across New Jersey that continuously measure lake, reservoir table, stream, and tidal levels. These data sets are transmitted to the USGS and made available over the Internet. As project needs and funding levels change, gauges may be added or deactivated, and deactivated gauges may be reactivated (USGS n.d.). USGS provides data to the Department of Environmental Protection for drought determinations. USGS also recovers high water marks post-coastal flooding (USGS 2018).

16.3.2 State Technical Capabilities Programs and Resources

Numerous state agencies have specific capabilities that can support hazard mitigation in Essex County.

Flood Early Warning System

The Flood Hazard Area Control Act (N.J.S.A. 58:16A-66 et seq.) granted the Commissioner of the Department of Environmental Protection authority to develop a flood early warning system in consultation with the USACE and in coordination with NJOEM in the Division of State Police. NJDEP/NJOEM have led the efforts for the development of the flood early warning system. NJOEM and several of the counties in the central and northern tier of the State above the coastal plain have live rain, stream, and flood gauges. In the back bays and along tidal waters in 14 coastal counties, the U.S. Geological Survey (USGS) manages the New Jersey Tide Telemetry System. All systems transmit telemetry continuously to the NWS, USGS, State Climatologist, NJDEP, NJOEM, and all affected counties and many municipalities. These systems were created and installed with federal assistance through NOAA and USACE.

Monmouth University's Urban Coast Institute (UCI)

The UCI maintains a principal focus on the interactions between humans and the coastal and ocean environment and sustainable coastal development along New Jersey's coasts and watersheds. The UCI seeks to foster collaboration among citizens, watershed and community organizations, governmental agencies, business, the scientific community, and other parties interested in coastal and watershed management, conservation, and restoration. UCI offers trainings and seminars related to coastal issues and floodplain management (Manmouth University 2023).

New Jersey Association of Floodplain Managers (NJAFM)

NJAFM is a statewide organization of over 500 members and is a chapter of the National Association of State Floodplain Managers (ASFPM). NJAFM offers an annual conference, training, seminars, and

certification in floodplain management, the National Flood Insurance Program, the Certified Floodplain Manager (CFM) Program for local officials, and NFIP's CRS (NJAFM n.d.).

New Jersey Board of Public Utilities (BPU)

BPU works with private utility companies to provide analysis of natural hazard information affecting the provision of electric power, telecommunications, public water, sewage collection and treatment, and other regulated public utilities. The data is used during response and recovery efforts in the event of emergency or disaster and is also used to analyze impact of mitigation plans and projects. BPU also provides technical assistance for the Energy Resiliency Program.

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New Jersey Cultural Alliance for Response (NJCAR)

NJCAR is a network of organizations, associations, agencies, and persons dedicated to safeguarding the cultural heritage of New Jersey. Through communication and training, the Alliance empowers New Jersey's cultural community to preserve assets and sustain operations before, during, and after disasters (NJCAR n.d.).

New Jersey Department of Agriculture (NJDA)

NJDA promotes, protects, and serves the State's diverse agriculture and agribusiness industries. NJDA manages programs that conserve soil and water resources and protects farmland from development (NJDA 2016). NJDA coordinates with the U.S. Department of Agriculture (USDA), the National Association of State Departments of Agriculture, the Northeastern Association of State Departments of Agriculture, and the Communications Officers of State Department of Agriculture to participate in national and regional planning and crisis communications initiatives regarding agriculture and agricultural livestock. NJDA coordinates with both governmental agencies and industry groups and maintains emergency response procedures for agricultural emergencies, including serving as central communications point for those agencies and groups. Agricultural groups such as the New Jersey Agricultural Society and New Jersey Farm Bureau, as well as individual agricultural commodity groups, participate in routine communications with NJDA on severe weather warnings, potential agricultural diseases, and manmade agricultural emergencies. NJDA's County Animal Response Teams (CART) ensure potential disaster evacuees are aware not to leave pets behind but instead to seek out animal-friendly shelters and/or other temporary housing.

New Jersey Department of Banking and Insurance (DOBI)

DOBI regulates the banking, insurance, and real estate industries.

DOBI mandates (through A07-126) companies authorized to sell homeowner insurance to have a prepared Business Continuation Plan to ensure all insurance entities prepare and maintain a disaster response preparation measure playbook. Any updates to plans are due June 30 of each year.

Through Bulletin No. 19-09, DOBI mandates companies authorized to sell insurance to submit primary and secondary person information for those individuals designated to be contacted in the event of a disaster or catastrophic event. Bulletin No. 19-11mandates that all state financial institutions (i.e., State Chartered Banks, Savings Banks, Savings and Loan Associations, Credit Unions, Check Cashers, and Money Transmitters) submit primary and secondary person information for those individuals designated to be contacted in the event of a disaster or catastrophic event. Any changes to contact information must be submitted to the Department within 30 days of the change.

Following catastrophic disasters and major property and casualty insurance losses, DOBI mandates companies who write business in the state of New Jersey to submit claim information on a continuous basis until 95-percent of their total claims (residential and commercial) have been closed, either with or without payment transfers.

New Jersey Department of Community Affairs (DCA)

DCA provides administrative guidance, financial support, and technical assistance to local governments, community development organizations, businesses, and individuals to improve the quality of life. DCA administers the U.S. Department of Housing and Urban Development (HUD) CDBG-DR funding (through Reconstruction, Rehabilitation, Elevation and Mitigation Program (RREM) and other State programs). DCA offers a wide range of programs and services that respond to issues of public concern, including fire and building safety, housing production, community planning and development, and local government management and finance. DCA's programs and services are provided through, among others, the following Divisions: Division of Codes and Standards, Division of Community Resources, Division of Fire Safety, and the Division of Local Government Services.

Division of Disaster Recovery and Mitigation (DRM): In the housing elevation programs, both those funded by CDBG-DR funds and those funded by FEMA, DRM is now requiring the structure to be raised at least three feet above base flood elevation, or more if required by the local standard. DRM is focusing CDBG-DR funds to require elevation for substantially damaged properties. DRM will require all new construction and substantial rehabilitation to meet the ICC-700 design standard, which incorporates resiliency as well as energy efficiency and includes building techniques like impact-resistant doors, attachment of shingles, and flash and seal roof penetrations. This allows DRM to focus on resource efficiency, indoor environmental quality, and homeowner operation and maintenance. DRM has also designed housing recovery programs to allow for mitigation activities to make homes more resilient to future storm events. These activities include structural and utility retrofits, grading and slope stabilization, and other drainage practices. DRM is also financing infrastructure projects that will help impacted communities become more resilient to current and future natural hazards. The scoring is aligned with FEMA's Building Resilient Infrastructure and Communities (BRIC) program and takes into account climate change, risk reduction/resilience effectiveness, and risk to critical infrastructures. DRM is incorporating climate resilience into the policies

of all the CDBG-DR programs. This ensures that disaster response funding is not wasted on homes and infrastructure that will not be able to withstand the next natural weather event.

New Jersey Economic Development Authority (NJEDA)

NJEDA works in partnership with a diverse range of stakeholders to implement programs and initiatives that improve quality of life, enhance economic vitality, and strengthen New Jersey's long-term economic competitiveness. The NJEDA provides small and medium-sized businesses and non-profits with low-interest financing grant funding for short-term operating costs following disaster events.

New Jersey Department of Environmental Protection (NJDEP)

NJDEP is responsible for protecting environmental quality and public health. Priorities include to reduce and respond to climate change; protect New Jersey's water; revitalize communities and protecting public health; and manage and promote thriving natural and historic resources (NJDEP 2024). NJDEP participates, as a member, in the Regional Catastrophic Planning Team. NJDEP coordinates with FEMA, USEPA, NJOEM, NJDSS, the New Jersey Department of Military and Veterans Affairs, and the NJSP to participate in State, county, and local planning initiatives. NJDEP has a wide array of bureaus, divisions, and offices that contribute to the State's pre- and post-disaster capabilities.

Fish and Wildlife

Fish and Wildlife's mission is to protect and manage the State's wildlife resources to maximize their long-term biological, recreational, and economic values for all New Jerseyans. Nine bureaus and two offices collectively oversee and execute all of Fish and Wildlife's activities and programs throughout the State of New Jersey. NJDEP coordinates with the U.S. Department of Commerce, NOAA/National Marine Fisheries Service (NMFS) and the U.S. Department of the Interior, Fish and Wildlife Service in fishery mitigation programs. The Governor may apply to the NMFS for financial assistance to address fishery failures. The Fish and Wildlife Councils and Committees of the State of New Jersey have a unique role in managing our fish and wildlife resources. The Governor appoints members of the Councils as unpaid volunteers who act in the best interest of the State's fish and wildlife resources on behalf of the public. The Councils help create and finalize each year's hunting and fishing regulations and enable our resources' professional and scientific management (NJDEP 2024).

Parks, Forests, and Historic Sites

Parks, Forests, and Historic Sites oversees and administers many of the preserved natural and historical resources for the State of New Jersey.

New Jersey Forest Fire Service: The New Jersey Forest Fire Service is the agency responsible for protecting life and property as well as the State's natural resources from wildfire. The Fire Service Section provides a full-time and a part-time staff of wildland firefighters. Staff provide continuing mechanical thinning and prescribed fire used to reduce hazardous wildland fuel accumulations statewide, particularly in high-risk areas. The Forest Fire Service encourages community acceptance and inclusion of FireWise concepts in municipal and regional planning; develops and implements effective silviculture strategies that improve the health of forests and reduce the number of fuels available for wildland fires from dead and dying trees.

New Jersey Forest Service: Through sustainable science-based management and conservation practices, the New Jersey Forest Service promotes the resilience of New Jersey's forests and their interdependent natural systems in the face of societal needs and a climate crisis that demands urgent and decisive action. The Service's 2020 NJ State Forest Action Plan (NJ SFAP) reassesses the State's forest resources and provides forest owners, land managers, and other natural resource professionals with the ability to make informed decisions about forest resources across the State (NJDEP 2021).

New Jersey Urban & Community Forestry Program (NJUCF): NJUCF works to encourage, promote, and support the local stewardship and effective management of trees and forest ecosystems in New Jersey's communities through technical assistance and financial assistance.

New Jersey State Park Service: The New Jersey State Park Service administers over 452,000 acres of land comprising parks, forests, historic sites, and other recreation areas actively working to manage and promote thriving natural and historic resources (NJDEP 2024).

Air, Energy, and Materials Sustainability

The mission of Air, Energy, and Materials Sustainability is to protect human health and the environment from all air contaminants, including those that cause climate change, and to protect the public from unnecessary radiation exposure (NJDEP 2023).

Bureau of Environmental Radiation: The Bureau of Environmental Radiation addresses the protection of the public from excessive exposure to radiation, exclusive of x - ray and nuclear powerplant sources. This includes the State's program to reduce radon gas exposure in homes and other buildings; licensing the use of certain radioactive materials in medicine, industry, and research; supporting the clean - up of the State's radioactively contaminated sites; and the control of nonionizing radiation from industrial microwave and radiofrequency sources of such radiation.

Division of Air Quality: The Division manages air quality with ambient air monitoring, inventories of sources, emission reduction plans, rules, permits, and air quality modeling and risk assessment (NJ State Library n.d.).

Division of Sustainable Waste Management: This division administers contracts for post-disaster debris management for land and water and oversees permitting for pre-approved areas for temporary debris management following disaster events.

- *Bureau of Solid Waste Permitting:* The Bureau of Solid Waste Permitting is responsible for the management of permit applications for solid waste landfills, resource recovery facilities (incinerators), and transfer stations/materials recovery facilities.
- *Bureau of Solid Waste Planning and Licensing:* The Bureau of Solid Waste Planning and Licensing oversees county solid waste planning and licensing of companies commercially engaged in the solid waste industry and administers county recycling and clean communities grants.

Office of Climate Resilience

The Office of Climate Resilience at NJDEP, led by the Chief Resilience Officer, provides technical support to New Jersey communities to help them make informed decisions in planning for climate change. The Office of Climate Resilience oversees the Blue Acres program, the Bureau of Climate Resilience Planning, and the State's Coastal Management Program.

Bureau of Climate Resilience Planning (BCRP): BCRP provides planning and technical support to New Jersey's communities to help them make informed decisions about climate resilience. BCRP is responsible for coordinating NJDEP policies, programs, and activities to plan for the impacts and the associated hazards of climate change and promote public awareness of climate change science. The State's Chief Climate Resilience Officer leads the Bureau (NJDEP 2024).

- *Blue Acres Program*: Blue Acres helps New Jersey residents whose homes have been damaged in flooding events. Blue Acres contributes to New Jersey's Climate Change Resilience Strategy through a proactive approach to guide State acquisition of lands that increases host community resilience through the strategic acquisition of lands that have been damaged or may be prone to future damage, due to sea-level rise, storms, or storm-related flooding, or that may buffer or protect other lands from such damage (NJDEP 2024). The recent re-alignment of the Blue Acres Program into the Office of Climate Resilience has allowed for the integration of greater climate and vulnerability-focused buyout planning and messaging. Under the current iteration of the program, Blue Acres will advance proactive, preparedness-focused buyout planning that has a climate resilience and social equity emphasis and which embraces community planning principles. At the same time, Blue Acres will also be poised to pivot and respond to buyouts needed as a result of a storm or flood event. This philosophical change was driven by the growing threat of flooding that comes with increasing precipitation and the more intense storms that are regularly impacting many NJ communities. Blue Acres has broadened its communication, outreach efforts, and transparency through both passive and active means.
- *Resilient NJ Program:* Resilient NJ is an assistance program to support local and regional climate resilience planning using the best available science on precipitation, temperature, and sea-level rise (NJDEP 2024).
- *Living Shoreline Program:* Staff from the Living Shoreline Program coordinate the efforts to promote and develop living shorelines in New Jersey. Working with an internal Living Shorelines Workgroup and external partners, staff will assist in project development, design, permitting, and monitoring (NJDEP 2024).
- *2020 New Jersey Scientific Report on Climate Change:* NJDEP's first scientific report on climate change summarizes the current state of knowledge regarding the effects of climate change on New Jersey's environment to inform State and local decision-makers as they seek to understand and respond to the impacts of climate change. This report identifies and presents the best available science and existing data regarding the current and anticipated environmental effects of climate change globally, nationally, and regionally. The report will be updated every two years (NJDEP 2024).

- *2022 Climate Change Impacts on Human Health and Communities: Addendum to the Scientific Report on Climate Change*: The Addendum includes impact of climate change on human health and communities to the report. Understanding how these new environmental challenges will directly and indirectly affect New Jersey residents is essential to establishing strategies that can effectively and equitably protect and improve health outcomes throughout the State (NJDEP 2024).
- *New Jersey Coastal Zone Management Program (NJCMP):* The NJCMP is composed of a network of offices within the NDEP that serve distinct functions yet share responsibilities that influence the State's coastal areas. These offices include the BCRP, the Office of Policy Implementation, the Division of Land Use Regulation, and the Office of Dredging and Sediment Technology. NJCMP is part of the National Coastal Zone Management Program that addresses coastal issues, including sustainable and resilient coastal community planning, climate change, ocean planning, and planning for energy facilities and development. It is a voluntary partnership between the federal government and U.S. coastal and Great Lakes states and territories authorized by the Coastal Zone Management Act (CZMA) of 1972 and administered by the NOAA. Under the CZMA Act, the federal government provides financial assistance to States that develop and maintain approved coastal zone management programs. CZM grants are received annually from the NOAA, Office of Ocean and Coastal Resource Management (OCRM). This funding is used for administration of the NJCMP and also provides funding for municipal grants (NJDEP 2024).

Interagency Council on Climate Resilience: Through Executive Order No. 89, the Interagency Council on Climate Resilience (Interagency Council) was established in 2019 to develop short- and long-term action plans that will promote the long-term mitigation, adaptation, and resilience of New Jersey's economy, communities, infrastructure, and natural resources. In addition to these coordinated efforts, the Interagency Council will support the development and implementation of the Climate Change Resilience Strategy that will guide and inform State actions to address the impacts of climate change. The inaugural Climate Change Resilience Strategy was released in 2021 (NJDEP 2024).

Contaminated Site Remediation and Redevelopment Program

When a hazard event is forecast, staff will communicate with site managers to discuss the need to strengthen remediation systems to withstand the event and are prepared to respond if there are any unintended discharges as a result of the event.

Site Remediation and Waste Management Program (SRWMP): SRWMP is responsible for site remediation, ranging from local homeowners to large corporate sites. SRWMP can fund remediation work if no responsible party is identified or capable of remediation. SRWMP can also fund treatment of wells.

Office of the Commissioner

The Office of the Commissioner is responsible for the administration of the NJDEP. In addition, the Office of the Commissioner houses several divisions and offices.

Division of Green Acres: The Green Acres Program was created to meet New Jersey's growing recreation and conservation needs. Together with public and private partners, Green Acres has protected well over

1.5 million acres of open space around the State (NJDEP 2025). Local/nonprofit funding for land acquisition and park development prioritizes ranking and provides higher grant percentages and total awards to projects in Adversely Stressed Overburdened Communities and Urban Aid municipalities. Over the last 60 years, the Green Acres Program has placed an emphasis on preserving and supporting the preservation of open space throughout the State. As a result of the State's environmental justice and climate change priorities, NJDEP is encouraging local governments and eligible non-profit organizations interested in acquiring open space, creating or rehabilitating parks, completing stewardship projects, and creating inclusive playgrounds to apply for Green Acres funding. Green Acres will prioritize projects that contribute to resilience or mitigate climate change impacts, such as by preserving forested and flood-prone areas, enhancing chronically inundated wetlands, revegetating riparian areas, connecting wildlife corridors, expanding upstream flood attenuation potential, promoting wildlife and including green infrastructure into park designs. Overall, this will allow equitable and meaningful public access and maximize social, environmental and health benefits to the public, particularly in underserved communities in New Jersey (NJDEP 2025).

Division of Science and Research (DSR): The role of this division is to provide the department with, and access to, expertise and information that supports its technical and policy needs. In addition, the division performs research to meet the information and problem-solving needs, identifies and understands emerging issues that require the department's attention, and advocates/integrates the multi-disciplinary perspective into the department's identification, analysis, and resolution of environmental issues (NJDEP 2025).

The division tracks temperature and precipitation patterns and provides guidance on future projections for rainfall and coastal flooding due to climate change into design criteria and evaluation criteria of NJDEP projects. The division supports multiple programs in the development of drinking water, ground water, soil, surface water, and air standards. Additionally, the Office of Quality Assurance (OQA) ensures laboratory certification is granted in accordance with the state Environmental Laboratory Certification Program and/or the National Environmental Laboratory Accreditation Program. To this effort OQA reviews certification applications, audits and approves laboratory's quality system and technical methodologies, reviews data, and provides annual recertifications. OQA also administers the Department's Quality Assurance Program with the responsibility to ensure that environmental data is generated, compiled, and reviewed using specific quality assurance/quality control (QA/QC) procedures.

Office of Emergency Management: The role of the Emergency Management Program is to effectively plan, prepare, respond, recover, and mitigate all hazards that affect the public health of NJ Citizens and the Environment through the implementation of NJDEP's responsibilities outlined in the Emergency Operations Plan of the State of New Jersey and the continued performance of ongoing duties of the Program. The Emergency Management Program operates 24 hours a day, 7 days a week supporting the network of NJDEP responders and coordinating with federal, state, county, and local stakeholders (NJDEP 2025).

- *Bureau of Emergency Response (BER):* BER supports two field offices strategically located for rapid response on a 24-hour, 7 days a week basis. BER is responsible for responding to emergencies

involving a wide variety of hazards that threaten the public, environment, and infrastructure of the State, including natural disasters, pathogenic outbreaks, terrorism, and hazardous materials (NJDEP 2025).

- *Bureau of Communications and Response Services:* The NJDEP Communication Center serves the entire NJDEP as a vital link with the community through the Environmental Action Hotline: (877) WARN DEP. Operators at the Communication Center receive incident notifications and generate reports related to chemical releases, environmental emergencies, forest fires, industrial accidents, and terrorist threats. The Communication Center also maintains and uses a state-of-the-art radio system that allows prompt, reliable, interoperable, and secure communication with all first responders throughout New Jersey. The radio system and the computer-aided dispatch are used to coordinate NJDEP's statewide law enforcement officers, which are dispatched to all manner of emergencies (NJDEP 2025).

Office of Environmental and Public Health Analysis (EPHA): The Office of Environmental Public Health and Analysis (EPHA) supports the administration of environmental and public health programs and initiatives consistent with the NJDEP's authorities and legislative mandates. EPHA leverages various data sets to develop tools and resources that highlight the public health impacts from environmental degradation. These tools look at environmental public health from various perspectives (e.g., local government, environmental justice) and scales (e.g., parcel, block group, municipality) to inform meaningful solutions (NJDEP 2023). EPHA is working to identify urban heat islands in the State, with a focus on areas that impact overburdened populations.

- *Environmental Justice Mapping, Assessment, and Protection (EJMAP) Tool:* Designed to support the NJDEP's efforts to implement the EJ Law through its regulatory and permitting processes, EJMAP visualizes the information that determines what areas are subject to the law's protections and whether those areas are already adversely stressed. The tool has a companion Technical Guidance document that outlines the data sources and methodologies used in the tools and provides rationale for the stressors within the tool (NJDEP 2024). EJMAP shows overburdened communities, flooding, and lack of tree canopy. The tool can be used to review permits and impacts of projects. EJMAP is intended to provide the public with a visual representation of:
    - The location of overburdened communities (OBC) throughout the State
    - The presence of environmental and public health stressors in each OBC
    - How the stressors in each OBC compare on a State and county basis, both individually and cumulatively

Healthy Community Planning NJ (HCP-NJ): A State web resource designed to assist local community planning activities. The site provides individual, municipal-level snapshots of a community's health and environmental data to help facilitate active local public health planning and action. HCP-NJ was developed by the New Jersey Department of Health (NJDOH) and NJDEP, working in partnership as part of the New Jersey Environmental Public Health Tracking (EPHT) program with funding from the federal Centers for Disease Control and Prevention (CDC) (NJDEP 2023).

Office of Environmental Justice (OEJ): OEJ aims to improve the quality of life in New Jersey's most vulnerable communities by educating and empowering communities who are often outside of government decision-making processes and guiding NJDEP's programs and other State departments and agencies in implementing environmental justice (NJDEP 2023).

- *Environmental Justice Law (EJ Law):* The EJ Law, adopted in April 2023, implements first in the nation rules for reducing pollution in historically overburdened communities and communities of color that have been subjected to a disproportionately high number of environmental and public health stressors. The rules require enhanced upfront community engagement before such facilities are proposed in the State's overburdened communities. Using community-level environmental and public health data available through DEP's EJMAP tool, the EJ Law directs permit applicants to avoid and minimize environmental and public health stressors and enable the NJDEP to establish permit conditions that better protect vulnerable communities (NJDEP 2024).
- *Trees for Schools:* This Sustainable Jersey (SJ) program aims to use tree plantings to filter pollutants from air and water, reduce stormwater runoff, and lower carbon emissions (Sustainable Jersey 2025). Through Regional Greenhouse Gas Initiative (REGGI) funding, OEJ asked SJ to plant trees at school properties, with funding specifically set aside for schools in overburdened communities.

Historic Preservation Office (HPO): The HPO works to assist the residents of New Jersey in identifying, preserving, protecting, and sustaining historic and archaeological resources through the implementation of the State's historic preservation program.

- *Flood Mitigation Guide and the Elevation Design Guidelines for Historic Properties:* The HPO released the Flood Mitigation Guide and the Elevation Design Guidelines for Historic Properties in 2019 to provide guidance to local governments and property owners to protect their properties from hazards while maintaining historic preservation efforts (NJDEP NJHPO 2019).
- *Historic Structure Reports and Preservation Plans:* Disaster planning is now incorporated as a funding category in historic structure reporting and preservation planning guidance.
- *NJ Comprehensive Statewide Historic Preservation Plan:* The plan was updated and adopted in 2023. One of the goals of this updated plan is to increase the integration of historic preservation into disaster planning and resilience.

Office of Natural Resource Restoration (ONRR): ONRR responds to substantial spills, assesses natural resource injury, and assists in providing information on how to prioritize protection of critical habitats. ONRR prepares for spill response with internal and external spill drill exercises (NJDEP 2024).

Water Resources Management (WRM)

The WRM Program establishes water quality and drinking water standards, monitors the waters of the State to ensure surface and groundwater standards are met, helps ensure delivery of water that meets drinking water standards, regulates discharges of wastewater and stormwater to surface and ground water, regulates and manages the diversion of water from surface and groundwaters to ensure protection

of the resource, and provides low cost financial assistance for finance capital improvements to water infrastructure (NJDEP 2023).

WRM has a variety of capabilities including:

Division of Water Monitoring, Standards and Pesticide Control (DWMSPC): The DWMSPC regulates pesticides and assesses New Jersey's waters in order to protect and manage public drinking water supplies, recreational uses, shellfish harvesting, and the health of aquatic organisms, in accordance with State and Federal regulations (NJDEP 2023).

- *Bureau of Freshwater and Biological Monitoring:* The Bureau of Freshwater and Biological Monitoring is responsible for numerous multi-year monitoring programs mandated by the Clean Water Act, some of which have served as prototypes for the nation. Water quality monitoring projects emphasize watershed monitoring and frequently combine biological and chemical/physical monitoring to assess the success of state and federal clean water programs. The sampling stations include surface water as well as groundwater monitoring. Chemical and physical monitoring includes the Rivers and Stream Chemical/Physical Monitoring Program, NJDEP Lake Monitoring Network, and Groundwater Quality Monitoring. A wide range of parameters are collected, including chemical/physical (nutrients, metals, discharge, etc.), biological, and microbiological. The bureau is also responsible for harmful algal bloom (HAB) monitoring, including sampling and laboratory analysis for cyanobacterial HABs in lakes, rivers, and streams (NJDEP 2023).
    - *2021 Cyanobacterial HAB Freshwater Recreational Response Strategy:* The Strategy provides a unified statewide approach to responding to HABs in recreational waters and sources of drinking water and to protect the public from risk associated with these toxins (NJDEP 2023).

Division of Water Quality (DWQ): DWQ has primary responsibility for protecting New Jersey's surface and ground waters from pollution caused by improperly treated wastewater and its residuals. To protect the State's waters, the DWQ implements the New Jersey Pollutant Discharge Elimination System (NJPDES Program), administers financial assistance programs for wastewater treatment facilities, and administers the Treatment Works Approval, Capacity Assurance, and Sewer Ban Programs (NJDEP 2024).

DWQ also administers the Water Bank program and has updated resilience guidance to ensure that new or significantly improved water infrastructure is built with the future in mind. DWQ is also responsible for administration of a number of state and federally funded programs for the planning, design, and/or construction of wastewater, drinking water, and stormwater/nonpoint source management programs. DWQ assists communities to construct and fund sustainable infrastructure that protects water quality and public health.

Division of Water Supply and Geoscience (DW&GS): DW&GS works to ensure that adequate, reliable, and safe water supply is available for the future. This goal is accomplished through the regulation of ground and surface water diversions, permitting of wells, permitting of drinking water infrastructure, monitoring of drinking water quality, and technical support for water systems to achieve compliance with all federal and

state standards. DW&GS staff act in a support role during an emergency to provide technical assistance, as needed to re-establish safe and adequate public water supplies. DW&GS provides operator licensing and training support as well as financial assistance through the DW State Revolving Fund program. DW&GS is responsible for issuing drought watches, drought warnings, or a water emergency.

- *New Jersey Geological and Water Survey (NJGWS):* NJGWS evaluates geologic, hydrogeological, and water quality data to manage and protect water resources, identify natural hazards and contaminants, and provide mineral resources, including offshore sands for beach nourishment. The mission of the Survey has recently been expanded to include water resource planning and regulatory functions (NJDEP 2024). Information provided by the survey includes Geographic Information System (GIS) data and maps of geology, topography, groundwater, and aquifer recharge. In addition, the data track wellhead protection areas, aquifer thicknesses, properties and depths, groundwater quality, drought, geologic resources, and hazards (such as earthquakes, abandoned mines, karst-influenced sinkholes, and landslides). The NJGWS maintains an active data base and GIS coverage of earthquakes in New Jersey and maintains an information circular on "Predicting Earthquake Damage in New Jersey" (NJDEP 2024).

Watershed and Land Management (WLM)

NJDEP's WLM Program was created on June 1, 2020, to align elements of the Land Use Management and WRM programs. This alignment unifies and strengthens aspects of the NJDEP's land use regulatory programs by taking a watershed-by-watershed approach to our stewardship of land-based resources that have a critical nexus to water quality. Through a holistic approach to planning, permitting, mitigation, and restoration of impacts to New Jersey's watersheds, WLM works to preserve, protect, and improve the integrity of New Jersey's water and natural resources while protecting life and property from environmental threats (NJDEP 2024).

Divisions of Land Resource Protection and Watershed Protection and Restoration: Together these two divisions are responsible for permitting and enforcing the regulatory programs established under the Coastal Zone Management rules; the Flood Hazard Area Control Act rules; the Freshwater Wetlands Protection Act rules; the Highlands Water Protection and Planning Act and the Stormwater Management rules. The statutes that these rules implement provide authority for the NJDEP to regulate development (including clearing of vegetation and filling) within environmentally sensitive areas such as beaches, dunes, wetlands, and floodplains and the regulation of stormwater. Under the Division of Land Resource Protection, the Bureau of Coastal and Land Use Enforcement responds to violations, conducts inspections, and conducts education and outreach (NJDEP 2024).

Division of Resilience Engineering & Construction (DREC): DREC, which consists of four bureaus, oversees large-scale coastal and fluvial flood protection projects, beach renourishment, flood risk analysis, dam safety, and the NFIP. DREC aims to assist communities across New Jersey in becoming more resilient to storms, flooding, and other climate change impacts (NJDEP 2024).

- *Coastal Engineering Element:* The Coastal Engineering Element is statutorily authorized to carry out shore protection projects in areas impacted by tidally-influenced waterways. They are also

responsible for beach nourishment and shore protection projects across the State, as well as coastal dredging, aids to navigation, and maintenance of completed projects. In addition, the Element also provides 24-hour operation of the Raritan Bayshore and Pews Creek Floodgates and is responsible for conducting storm surveys, damage assessments and emergency repairs for coastal storms impacting New Jersey. The Element maintains close relationships with federal, state, and local partners to create and build resilience throughout New Jersey. This includes the New York and Philadelphia Districts of the USACE. The Element works with these districts on all phases of coastal protection. The State has continued funding the non-lapsing Shore Protection Fund ($25 million per year) for shore protection projects associated with the protection, stabilization, restoration, or maintenance of the shore, including monitoring studies and land acquisition. In the past four fiscal years, the Fund has included an additional $20 million per year to account for additional project needs. The Fund is used to fund feasibility assessments, State-match in USACE projects, and State led coastal flood and shore protection projects (NJDEP 2024).

Dam Safety and Flood Engineering Element:

- *Bureau of Dam Safety:* The primary goal of the program is to ensure the safety and integrity of dams in New Jersey and, thereby, protect people and property from the consequences of dam failures. The bureau reviews plans and specifications for the construction of new dams or for the alternation, repair, or removal of existing dams and must grant approval before the owner can proceed with construction. Engineers from the bureau evaluate each project, investigate site conditions, and check recommended construction materials. Existing dams are periodically inspected to ensure that they are adequately maintained and owners are directed to correct any deficiencies found. The division also coordinates with the Division of State Police, local and county emergency management officials in the preparations and approval of Emergency Action Plans (NJDEP 2024).
- *Bureau of Flood Engineering and Climate Resilience Design:* The Bureau includes three units, the Flood Risk Mitigation Unit, the Flood Risk Analysis Unit, and the Community Assistance Program Unit and the Office of the New Jersey State NFIP Coordinator, which is responsible for coordinating NFIP program aspects of floodplain management throughout the State (NJDEP 2024).
    - *Flood Risk Mitigation Unit:* The Unit implements flood protection and control measures to protect life and property in New Jersey from the devastating effects of flooding. This includes both large federal and smaller State flood reduction projects. State funding for federal flood control projects is through annual State appropriations under the HR-6 Flood Control project budget. Annual State flood control funding is used to match federal funding to the USACE, for annual operation and maintenance of existing flood control projects and for project administration. The unit coordinates and assists the USACE in the planning, design, and construction of flood protection projects by obtaining all required State approvals and permits for the project designs. The unit schedules and attends meetings with the USACE, county and local government officials, and community groups; conducts field reconnaissance and surveys for and with the USACE, as necessary, in the planning and construction of flood protection projects; reviews economic analyses and engineering

designs including hydrologic, hydraulic, structural reports and, construction plans and technical specification documents; prepares applications and obtains all necessary State approvals and permits required for USACE flood protection projects; and monitors and inspects USACE flood protection projects during and after construction to ensure that project facilities are constructed and maintained in accordance with plans, specifications and operation manuals (NJDEP 2023). The unit is responsible for the 24-hour operation of the Pompton Lakes Dam Flood Gates. The unit also implements HUD funded Rebuild by Design Hudson and Rebuild by Design Meadowlands projects.

- *Flood Risk Analysis Unit:* As part of Risk MAP initiatives, NJDEP, and FEMA have a CTP agreement to perform map production together to build the next generation of FEMA and State flood mapping. New Jersey will continue to take the lead in prioritizing projects, coordinating available data sources and conducting outreach, and all essential components in the data production and map adoption. Moving forward, NJDEP will be developing new floodplain data, producing digital FIRMs and post-preliminary processing, and integrating its mapping program with the FEMA program (NJDEP 2024).
- *Community Assistance Program Unit:* The unit provides floodplain management assistance to local communities throughout the State through the NFIP Community Assistance Program. The program goal is to reach out to each NFIP participating community at least once over a five-year cycle through CAVs, CACs, workshops, and technical assistance contacts on flood issues, the NFIP, and the CRS. To ensure that New Jersey municipalities maintain the legal ability to enforce NFIP development requirements, the unit works with local communities to help them maintain local laws that are compliant with NFIP regulations. In particular, the unit provides local municipalities with a model local ordinance, worksheets, implementation guidance, and map adoption language, and reviews local ordinance amendments and replacements (NJDEP 2024).

New Jersey Department of Health (NJDOH)

NJDOH works to protect the public's health, promote healthy communities, and continue to improve the quality of health care in New Jersey. The scope of work for the public health system is ever-expanding, and the Department is on the frontlines in leading the response to public health challenges (NJDOH 2024). NJDOH has a wide variety of health-related data sources available to assist in various hazard mitigation and emergency response planning efforts, including population traits that increase social vulnerability. NJDOH maintains and updates these data sources and has data analytic capabilities to better understand trends in public health and public health needs.

New Jersey Department of State, Office of Planning Advocacy

The Office for Planning Advocacy supports and coordinates planning throughout New Jersey to protect the environment; mitigate development hazards; and guide future growth into compact, mixed-use development and redevelopment projects while fostering a robust long-term economy. In addition to being staff to the State Planning Commission (SPC), OPA coordinates the activities of the Interagency Working Group (IAWG), Development Opportunities Interagency Team (DOIT), Greyfields Interagency Team (GRIT),

and the Brownfields Redevelopment Interagency Team (BRIT). When any proposed changes to the State Development and Redevelopment Plan or other state or regional plans encourage development in hazard prone areas, cause potential threat to nearby areas, reduce open space that provides flood storage, or increase hazards anywhere in the state, recommendations and action can be taken to reduce those risks.

New Jersey Department of Transportation

The New Jersey Department of Transportation (NJDOT) is the agency responsible for maintenance, construction, and operation of state and interstate highways in New Jersey. NJDOT is also responsible for planning and developing transportation policy and assisting with rail, freight, and intermodal transportation issues.

511 Traffic Monitoring: The traffic monitoring system, 511NJ, is a free service for the public that supplies traffic information about the New Jersey Interstates, State Highways, New Jersey Turnpike, Garden State Parkway, Atlantic City Expressway, and all bridge and tunnel crossings to motorists. The system combines traffic data into up-to-date condition reports that are always available and accessible via text, voice, or internet service to commuters.

Capital Program: NJDOT uses GIS to create maps that are used in several areas, including planning and highway construction. The maps that are created using this information aid other agencies, including law enforcement, in finding solutions to reduce traffic incidents. The GIS data can also be used to identify geographical changes after a natural disaster so that any anomalies or problems can be addressed.

County Diversionary Route Plans: Diversion plans are a compilation of predetermined diversion routes developed to improve coordination between state and local agencies when incidents occur. These Diversion Plans offer the Incident Commanders viable alternate routes to utilize during incidents.

Division of Multimodal Grants and Programs: NJDOT, through the Division of Multimodal Services, is responsible for the oversight and/or support of several modes of transportation, including general aviation, maritime, light rail, and freight rail, making it a multimodal focused organization.

GIS: The department uses GIS to create maps that are used in several areas, including planning and highway construction. The maps that are created using this information aid other agencies, including law enforcement, in finding solutions to reduce traffic incidents. The GIS data can also be used to identify geographical changes after a natural disaster so that any anomalies or problems can be addressed.

Office of Maritime Resources - Dredged Material Management: NJDOT provides interagency support, program planning, and policy recommendations on maritime issues to the Governor. NJDOT serves as the primary advisory body for the support of New Jersey's $50 billion maritime industry, which includes ports and terminals, cargo movement, boat manufacturing and sales, ferry operations, marine trades, recreational and commercial boating, and maritime environmental resources. Management of dredging activities in New Jersey is generally divided into three main geographic areas – New Jersey/New York Harbor, Delaware River/Delaware River Ports, and the State's Navigation Channels. This program also promotes coordination and cooperation among federal, State, regional, and nongovernmental agencies.

Reverse-Lane Strategies (or contraflow operations): NJDOT has three contraflow plans in place. The New Jersey Turnpike Authority and the South Jersey Transportation Authority also have one plan each (Garden State Parkway and Atlantic City Expressway). When activated, for a temporary period of time, NJDOT and its partners expand the lanes available for all travel in an outbound direction (away from the anticipated area of danger) and facilitate its usage for outbound vehicular travel.

Right of Way (ROW) and Property Acquisitions: The Division of Right of Way and Access Management is not specifically tasked with hazard mitigation activities. However, the eminent domain/property acquisition process and the sale of surplus government property should be of interest to post-disaster-impacted communities seeking redistribution of land assets for transportation infrastructure protection.

Winter Readiness: NJDOT works to make winter travel as safe as possible. NJDOT has 13,295 lane miles of interstate, U.S., and State routes under its jurisdiction that it strives to keep open and passable at all times during winter weather. The goal during a winter storm is to maintain the roads for safe travel, at safe speeds, by using anti-icing materials and, when appropriate, removal of snow with plows.

New Jersey Department of Treasury: Division of Administration and the Emergency Response Unit (ERU)

The ERU is the State Treasurer's representative and coordinating agency for all of the Department of Treasury's roles and responsibilities in and to Emergency Management. The ERU acts as the lead for the Department of the Treasury and deployment coordinator for the Department of Planning, Mitigation, Response, and Recovery. The division coordinates and delegates mitigation and corrective action policies, programs, and projects within the Division of Administration and to other divisions of the department.

New Jersey Institute of Technology (NJIT) Technical Assistance for Resilience Program (TARP)

NJIT's TARP program provides technical assistance to communities in the State that require support in the preparation of applications for FEMA mitigation funds as well as identifying projects that can help communities be more resilient. NJIT TARP can assist those communities with application development and capacity building to provide New Jersey's under-resourced communities with those needed resources (NJIT n.d.). NJOEM is working with the NJIT to expand this program.

New Jersey League of Municipalities

New Jersey State League of Municipalities is a voluntary association created to help communities do a better job of self-government through pooling information resources and brain power. Authorized by state statute since 1915, it has been serving local officials throughout the Garden State. All 565 municipalities are members of the League. The League supports mitigation throughout New Jersey by hosting subject matter expert panel discussions and information sharing at the annual League conference.

New Jersey Office of Homeland Security and Preparedness (OHSP)

In March 2006, Executive Order No. 5 created OHSP as a cabinet-level agency within State government. The Executive Order defined the office's mission as the agency responsible "to administer, New Jersey's counterterrorism and preparedness efforts." Further, the Executive Order charged OHSP with coordinating "the emergency response efforts across all levels of government, law enforcement, emergency

management, nonprofit organizations, other jurisdictions, and the private sector, to protect the people of New Jersey". OHSP is the lead agency in preparing the State's Threat and Hazard Identification and Risk Assessment (THIRA).

New Jersey Office of Emergency Management

Emergency management functions at the State-level are coordinated by NJOEM of the New Jersey State Police. The Emergency Management Section Supervisor holds the rank of Major and serves as Assistant Deputy State Director, Office of Emergency Management (New Jersey State Police n.d.).

The Emergency Management Section is under the command of the Deputy Superintendent of Homeland Security, who is the Deputy State Director, Office of Emergency Management. The section organizes, directs, staffs, coordinates, and reports the activities of the Incident Support Bureau and Communications Bureau. The section is also responsible for planning, directing, and coordinating emergency operations within the State, which are beyond local control (New Jersey State Police n.d.).

The following bureaus make up Emergency Management Section:

- Communications Bureau,
- Emergency Response Bureau,
- Incident Support Bureau,
- Recovery Bureau; and
- Preparedness Bureau (New Jersey State Police n.d.).

Hazard mitigation efforts in the State are largely coordinated through the Recovery Bureau and Preparedness Bureau.

Recovery Bureau

The Recovery Bureau is composed of three units:

- Public Assistance Unit,
- Mitigation Unit, and
- Finance Unit (New Jersey State Police n.d.).

Public Assistance Unit

The Public Assistance Unit is responsible for managing the Public Assistance Grant Program before, during, and after Presidentially declared disasters or emergencies. During a declared disaster, the State of New Jersey, in conjunction with FEMA, provides supplemental aid to communities to help them recover from the effects of a disaster as quickly as possible (New Jersey State Police n.d.).

The Public Assistance Unit serves as the principal point of contact for the State and is responsible for conducting Preliminary Damage Assessments to determine the impact and magnitude of damage and the resulting unmet needs of individuals, businesses, the public sector, and the community as a whole. In the aftermath of a disaster, unit personnel are assigned to FEMA/State Preliminary Damage Assessment

Teams and coordinate the county and municipal damage assessment efforts as well. The results of damage assessment surveys are assembled by the Public Assistance Unit and are presented in a written report for the Governor's consideration (New Jersey State Police n.d.).

If federal intervention is requested and approved, the Public Assistance Unit provides information about various federal disaster reimbursement opportunities to officials of all eligible state, county, and municipal agencies as well as designated private, nonprofit organizations. The Public Assistance Unit is responsible for coordinating Applicants' Briefings and Kickoff Meetings to discuss the parameters of declarations, scope of work activities, eligible categories, and documentation required to receive state and federal assistance. The unit also provides technical expertise in the preparation and submission of federal grant/loan applications in accordance with the Robert T. Stafford Act. The Stafford Act requires that the delivery of eligible assistance be carried out as quickly and efficiently as possible, consistent with federal laws and regulations. The unit maintains appropriate files and develops related procedures that comply with all applicable laws, regulations, and Office of Management and Budget (OMB) circulars governing standard grant management practices. The Public Assistance staff is also responsible for assisting the Field Training Unit in the coordination and delivery of training programs and seminars related to the disaster reimbursement process.

New Jersey Emergency Management (NJEM) Grants

In an effort to provide better efficiency, transparency, and accountability, New Jersey joined a community of disaster-prone states by implementing the standard, national web-based disaster grant management tool, which has come to be known in New Jersey as NJEM Grants and can be accessed by going to NJEMGrants.org. The system tracks Emergency Management grants in New Jersey and manages the process from application through closeout. This site is for the online application and management of the Public Assistance (PA) and Hazard Mitigation Assistance (HMA) grants.

Mitigation Unit

The Mitigation Unit has the mission of enhancing state, county, and municipal risk reduction through the development and implementation of mitigation strategies. The Mitigation Unit accomplishes this task by implementing and administering several grant-based programs in conjunction with FEMA. The primary programs administered are Flood Mitigation Assistance (FMA), Legislative Pre-Disaster Mitigation (LPDM), and BRIC, the HMGP, and the Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Loan Fund (New Jersey State Police n.d.). Through integration of all available funding sources, NJOEM has been able to continue to fund the development and funding of all 21 county HMPs.

Since the 2019 SHMP, the Mitigation Unit has expanded staff capacity by hiring three additional staff, a State employee planner, and GIS support. The Unit distributes relevant insurance data such as RL and SRL lists upon request to establish improved awareness, understanding, and application of all relevant insurance data sources, status, and values as it may apply throughout the State (public and private) for greater resilience and mitigation opportunities in the future.

NJOEM has offered robust technical support in the last two planning cycles, with a focus on repetitive loss structures in socially vulnerable areas. NJOEM anticipates developing or advancing relations with academic institutions to further NJOEM's ability to provide necessary technical assistance. NJOEM is utilizing support from contractors and State higher educational communities strategically to develop strategies, actions, and applications. The Mitigation Unit regularly participates in conferences and provides trainings. NJOEM will continue to utilize the ESRI database for storyboards on the NJOEM Mitigation Unit webpage for public outreach and education. NJOEM has developed a severe repetitive loss mitigation strategy and has incorporated the strategy into the State's hazard mitigation standard operating procedures. Implementation of the strategy is an ongoing process supported by the Mitigation Unit. The Unit continues to stress the importance of insurance in furthering mitigation opportunities and lessening the reliance on recovery dollars. It is understood that the lack of insurance is a separate form of risk, therefore, the Mitigation Unit is trying to educate the public. NJOEM offers floodplain manager training to increase the distribution of information to the public.

NJOEM takes an all-hazards, universal approach using the Land and Building Asset Management System (LBAM) risk assessment process to identify timely, cost-effective opportunities to mitigate future risk. The Mitigation Unit encourages local entities identify their own critical facilities and advise NJOEM of their locations. Utilizing remote sensing resources, NJOEM is continuing to develop better quantitative data on risk and risk to structures to formulate proper mitigation actions, considering a wide variety of stakeholders and a whole-systems approach to protecting the structures. This has included establishment of first flood elevations with Rutgers for development of applications.

Finance Unit

The Finance Unit is responsible for maintaining the Recovery Bureau's budget. This includes maintaining accurate balance reports on accounts, reimbursing State agencies, municipalities, and other entities. The unit maintains files for audit and budgetary purposes while serving as a liaison between the Division of State Police, Office of the Attorney, and FEMA regarding the reimbursement process. The unit provides training to ensure the continued education and improvement functionality for the Disaster Recovery Specialist with the New Jersey Emergency Management Grants application. This ensures that the Recovery Bureau personnel comprehend the guidelines set forth in the Robert T. Stafford Act (New Jersey State Police n.d.).

Preparedness Unit

The traditional role of the Preparedness Unit has been in devising hazard-specific and multi-hazard plans, and in public outreach and education. The Preparedness Unit also coordinates a multitude of other planning efforts, including maintenance of the State Emergency Operations Plan and the State Emergency Procedures Directory. It also maintains checklists and standardized texts as technical guidance to local government on development of emergency plans and procedures. Hazard-specific plans include Winter Storm, Hurricane, Contraflow (reverse-lane) Evacuation Plans, and the State Drought Emergency Plan. Important strides have been made in improving Mental Health and Special Needs initiatives. The Preparedness Unit's growing public outreach program for natural hazards and evacuation includes social media updates about preparedness for natural hazard, participating in NWS social media campaigns such

as Hurricane Awareness Week and Severe Weather Awareness Week, annual updates to the New Jersey Hurricane Survival Guide, and participation, in coordination with the NJDOT and other emergency support functions, in the update of the New Jersey Hurricane Decision Support Tool.

The Preparedness Unit also maintains liaison and coordination of emergency activities with State departments and various allied support agencies and is responsible for the readiness of the State Emergency Operations Center. The unit is an integral player in the implementation of "ETeam" technology for use in the State EOC. Another critical role is the timely notification of the emergency management community of potentially dangerous weather conditions. The unit administers the NWS "StormReady" Communities program. The Preparedness Unit also coordinates the State's tidal and inland flood warning programs and systems, and participates in the New York City Evacuation, Trans-Hudson, and Port Authority emergency planning groups (New Jersey State Police n.d.).

State Emergency Operations Center (SEOC) Unit

The SEOC Unit provides coordination of the emergency response efforts of State agencies, allied agencies, county OEMs, and the private sector. They serve as the conduit through which the unmet emergency resource needs of the counties affected by a disaster are acquired from other counties, State of New Jersey governmental agencies, other states, the federal government, nongovernmental allied agencies, and private sector organizations. The unit monitors tidal and inland flood warning and weather systems and prepares appropriate messages for distribution by the NJ ROIC Intelligence Watch & Warning Unit to State, allied, and county emergency management organizations (New Jersey State Police 2023). Public Information Officers are located within the SEOC and amplify messaging through NJOEM social media platforms and ReadyNJ. The unit serves as a liaison to the State Director and/or his designee to provide situational awareness as warranted to an ongoing event. They oversee the overall operation of the SEOC and continually evaluate its effectiveness and process for successful efficiency when fully staffed during an incident (New Jersey State Police n.d.).

Support Services Unit

The Support Services Unit coordinates the development of all Citizen Corps Programs (Community Emergency Response Teams, Neighborhood Watch, Volunteers in Police Service, Fire Corps, and Medical Reserve Corps) throughout the State of New Jersey with a special emphasis on the urban areas of the State (New Jersey State Police n.d.).

Coordinating interactions with the New Jersey Volunteer Organizations Active in Disasters (VOAD), the Support Services Unit strengthens ties with the New Jersey business community and maintains a liaison with both the National and State emergency management communities (New Jersey State Police 2023).

The unit's training functions include Emergency Management Assistance Compact (EMAC) system training and A-Team certification to all branches of state, county, and municipal emergency management coordinators (New Jersey State Police n.d.).

In terms of preparedness, the Support Services Unit has built and maintains a comprehensive Resource Directory Database of all available emergency response assets in New Jersey (New Jersey State Police n.d.).

Training and Exercise Unit

The Training and Exercise Unit (TEU) is responsible for conducting emergency management training courses for state, county, municipal, and private sector individuals who have emergency management responsibilities or work in related fields. These training programs are designed to assist the public and private sectors in their ability to mitigate, plan for, respond to, and recover from the effects of natural and technological events. All training provided is consistent with training initiatives on the federal level (New Jersey State Police n.d.).

The unit offers a variety of interrelated courses designed specifically to improve the professional, managerial, and technical skills of people involved in the field of emergency management. These state-of-the-art training programs are designed to achieve a comprehensive and integrated emergency management system which addresses all hazards at the local, county, and state levels (New Jersey State Police n.d.).

The NJOEM TEU remains committed to holding classes throughout various regions in the State. Trainings provided by the TEU include (NJOEM n.d.):

- Basic workshops in emergency management
- Evacuation and re-entry planning
- Mitigation for emergency managers
- Public information basics
- The National Incident Management System

The TEU is also responsible for development of the State Community Relations (CR) Plan. The CR Plan is implemented following a large-scale emergency or disaster. Working in conjunction with FEMA, NJOEM CR officers work door-to-door in areas impacted by a disaster to collect and disseminate information to and from affected communities; locate individuals who may need special assistance or encouragement to initiate the disaster assistance application process; and identify political, social, religious, ethnic, business, and other interest group leadership for the purpose of developing a team effort in the recovery process (New Jersey State Police n.d.).

New Jersey Department of Corrections (NJDOC)

The mission of the NJDOC is advancing public safety and promoting successful reintegration in a dignified, safe, secure, rehabilitative, and gender-informed environment, supported by a professional, trained, and diverse workforce, enhanced by community engagement. NJDOC's Office of Emergency Management (NJDOC OEM) continues to perform hazard assessments on its facilities and assist with mitigation strategies to strengthen the Department's resolve. Most recently NJDOC OEM drafted a water emergency plan that protects against adverse outcomes when a facility is disconnected from its main water source.

NJDOC OEM continue to push out training on active shooter, drone intrusion, inclement weather considerations, and more.

Each of the 13 correctional facilities located in the State have an updated Continuity of Operations (COOP) Plan. A COOP Plan details all the activities, plans, and procedures an agency must have to ensure that essential services are provided to the State's citizens and businesses during emergencies. ESF-13 Public Safety and Security integrates federal public safety and security capabilities and resources to support the full range of incident management activities associated with potential or actual incidents requiring a coordinated federal response. Capabilities include:

- Special Operations Response Team
- Correctional Emergency Response Team
- Enhanced Security Transportation Unit
- Critical Incident Negotiation Unit
- Office of Emergency Management
- Hazmat Team (Chemical Ordnance -Biological Radiological Aid-Forward Area Strike Teams)

New Jersey Consortium on Earthquake Mitigation

The NJOEM has joined the New York Consortium on Earthquake Mitigation, along with New York City, New York State, New Jersey Geological Survey, Columbia and Princeton Universities, and several counties in the metro New York area. This Consortium is concentrating efforts on assessing the vulnerabilities of the metro New York area and identifying ways to better protect life and property from earthquakes by running model simulations. These computer exercises reveal which areas fail first, how damages result, and what economic and socioeconomic effects result, giving a comprehensive picture of total impact.

NJTransit

NJTransit is a State-owned public transportation system. NJTransit's comprehensive Resilience Program aims to make transit systems and infrastructure stronger and more reliable. In addition to the Resilience Program, Capital Programs uses its five-year Capital Plan prioritizes "resiliency" and "equity" in project criteria. NJTransit continues to implement and refine innovative tools such as the Storm Surge Warning Dashboard and operational protocols. To help inform mitigation solutions, NJTransit continues to work with the Rutgers Center for Advanced Infrastructure and Transportation (CAIT) to identify areas vulnerable to storm surge and sea-level rise. Additionally, NJTransit continues to look for ways to eliminate or reduce impacts from extreme heat events by incorporating mitigation measures into planning and operations.

New Jersey Turnpike Authority

The New Jersey Turnpike Authority operates the New Jersey Turnpike and the Garden State Parkway. In the Fall of 2020, the Turnpike Authority established a new $24.8 billion capital program with a toll increase that included an annual indexing. The capital program includes flood zone remediation projects, drainage improvement projects, and numerous other projects that will incorporate resilient measures. The Authority reviews hardening of critical assets on an ongoing basis. The Authority conducts trainings and exercises in conjunction with the State Police and Department of Corrections for hurricane evacuations. The main

element of the evacuation exercise is preparation to set up a contraflow on the Garden State Parkway and maximize the capacity of the roadway.

Metropolitan Planning Organizations (MPOs)

There are three MPOs in New Jersey composed of locally elected officials and representatives from each geographic urban area. Each MPO is a forum for continuing, coordinated transportation planning with its portion of federal funds in their Transportation Improvement Programs (TIPs). NJDOT is a voting member of each of the three regional MPOs. The maps that are created using this information aid other agencies, including law enforcement, in finding solutions to reduce traffic incidents. The GIS data can also be used to identify geographical changes after a natural disaster so that any anomalies or problems can be addressed.

North Jersey Transportation Planning Authority (NJTPA): The NJTPA is the federally authorized Metropolitan Planning Organization for the 13-county northern New Jersey region. The agency conducts studies and serves on various interagency committees and working groups to support resiliency planning in northern New Jersey. The NJTPA (MPO ID# 34198200) includes Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, and Warren County. Each year, NJTPA oversees over $2 billion in transportation improvement projects and provide a forum for interagency cooperation and public input (NJTPA 2024).

- *Plan 2050 and Transportation Improvement Program (TIP):* Plan 2050: Transportation. People. Opportunity and the TIP were approved by the NJTPA Board of Trustees on September 13, 2021. Among the priorities of Plan 2050:
    - Safety - Reducing crashes and ensuring the safety of all travelers must continue to be a primary focus across all policies, programs, and investment.
    - Equity - The transportation system must more fully address the needs of low-income and minority communities, which have been traditionally underserved.
    - Roads and Bridges – "Fix it first" is the priority to reduce the backlog of needed road and bridge improvements and upgrade facilities while also preparing infrastructure for climate change impacts.
    - Transit - Improving transit is a key to solving some of the most difficult challenges, but increased funding and more stable funding mechanisms are needed. The Hudson River tunnel project and the larger Gateway project are NJTPA's top transit investment priorities.
    - Climate Change – Support climate change policies and initiatives of the State of New Jersey – captured in the NJDEP's October 2020 Global Warming Response Act 80x50 Report.
    - Environment – A separate Environment chapter highlights the importance of efforts in the areas of air quality, climate change, and environmental mitigation.
    - Financial Element – The plan offers a fiscally constrained financial plan based on realistic projects along with scenarios addressing more limited or additional funding (NJTPA 2021).

Post-Hurricane Sandy Transportation Resilience Study of New York, New Jersey, and Connecticut: This Post-Sandy Study was part of a series of research projects funded by the Federal Highway Administration (FHWA) with a goal of mainstreaming the consideration of climate vulnerability and risk in transportation decision-making. The Post-Sandy Study was intended to inform the collective understanding of how to integrate climate resilience at multiple levels: in planning, during the project development process, and as part of operations and maintenance strategies, including asset management and emergency management (USDOT Federal Highway Administration 2017).

Port Authority of New York and New Jersey (PANYNJ)

PANYNJ oversees much of the regional transportation infrastructure, including bridges, tunnels, airports, and seaports, within the Port of New York and New Jersey.

- *Climate Resilience Guidelines (CRG):* CRG establishes climate risk-based design criteria for all applicable PANYNJ capital projects. The Guidelines ensure that consistent resilience standards are implemented for each capital project, resulting in tangible risk reduction.
- *Surge Inundation Risk Assessment (SIRA):* Through OEM's cutting-edge effort, the SIRA leverages thousands of synthetic storm tracks to probabilistically assess risk of surge inundation under current climate conditions and for two future climate scenarios and sea-level rise cases out to 2050. The results of this effort provided significant insight into the risk of inundation through mid-century. Expanding upon the success of prior efforts, OEM has initiated a follow-on assessment to extend the analysis through the end of the century and to incorporate significant methodological improvements, revised climate trajectories and sea-level rise projections, and new Global Climate Models used to generate synthetic storm tracks. Importantly, this effort also includes an analysis of inundation from extra-tropical cyclones to capture the (more) frequent "nuisance" flooding often associated with these events.
- *Climate Risk Assessment (CRA):* CRA is an asset-scale, multi-stressor exercise to identify key risks, develop corresponding risk mitigation measures, and prioritize cost-beneficial mitigations for investment. Currently, the PA is in the process of acting on this third-party feedback and is developing a Resilience Action Plan (RAP) as a roadmap to enhancing its organizational resilience capabilities.
- *Resilience and Sustainable Design (RSD):* The RSD unit comprises over a dozen staff who carry out the CRA and RAP and administer the agency's Climate Risk Guidelines.
- *Resilience Education and Training:* The agency offers customized live (virtual) and on-demand professional training focused on climate resilience. Training is targeted primarily at PANYNJ engineers who are responsible for the design development and delivery of the agency's capital projects.
- *Climate Resilience Working Group (CRWG):* The CRWG is an informal working group that conducts cross-departmental coordination on matters pertaining to climate resilience
- *Enterprise Risk Management (ERM):* The PANYNJ ERM group includes climate resilience as an enterprise risk, integrated into agency-level and departmental ERM activities.

- *Public Assistance/Disaster Recovery Program:* The PANYNJ Office of Emergency Management ensures awareness of repeated damages and ties funding for mitigation projects to Public Assistance funding and HMGP opportunities.

New Jersey Turnpike Authority

Rutgers, The State University of New Jersey, is an academic, health, and research statewide leader. The university has three main campuses in New Brunswick, Newark, and Camden cities. Rutgers University has additional facilities throughout the State, including oceanographic research facilities along the New Jersey coastline.

- *Center for Advanced Infrastructure and Transportation (CAIT):* CAIT research focuses on preserving, rehabilitating, and improving infrastructure; boosting network resilience; reducing lifecycle costs; and increasing mobility and safety (Rutgers University 2022). CAIT works with NJ Transit to identify transportation infrastructure that is vulnerable to storm surge and sea-level rise.
- *Edward J. Bloustein School of Planning and Public Policy:* The Bloustein School conducts mitigation planning, data gathering, and technical studies in support of statewide hazard mitigation. The school develops geospatial and analytical tools to support community engagement, policy reform, and State and regional planning efforts.
- *Jacques Cousteau National Estuarine Research Reserve (JCNERR):* The JCNERR encompasses approximately 116,000 acres in southeastern New Jersey, including a great variety of terrestrial, wetland, and aquatic habitats within the Mullica River-Great Bay ecosystem. The Reserve is a concentrated patchwork of federal and state lands managed in partnership through a variety of agencies. The JCNERR Coastal Training Program provides up-to-date scientific information, access to technologies, and skill-building opportunities to professionals responsible for making decisions about coastal resources and floodplain management (JCNERR 2021).
- *NJ ADAPT:* NJ ADAPT is a suite of data visualization and mapping tools developed by Rutgers University. The NJ ADAPT tools are designed to assist planners, community leaders, businesses, and residents to understand and adapt to the impacts of climate change on people, assets, and communities in New Jersey (Rutgers-New Brunswick n.d.). NJ HazAdapt: NJ HazAdapt is a hazard mitigation planning tool developed in collaboration with the NJOEM. It is intended to provide municipal and county hazard planners with easy access to data and other resources that can assist with development of HMPs consistent with guidance issued by FEMA. Additionally, this tool is designed to help State and local end users assess impacts of flooding on key lifeline sectors, socially vulnerable populations, and individual land parcels. It also includes data on heat hazards to assist end users with understanding impacts of heatwaves and urban heat island. Currently, this tool includes datasets on the following topics:
    - Flooding and heat hazards
    - Social vulnerability to hazards to assist hazard planners in preparing communities for natural hazards
    - Potential flood analysis for each tax parcel in New Jersey using the Parcels and MOD-IV Composite of New Jersey (Rutgers n.d.)

- *Office of the New Jersey State Climatologist (ONJSC):* The ONJSC is situated within the New Jersey Agricultural Experiment Station at Rutgers, the State University of New Jersey. The ONJSC mission is threefold: (1) gather and archive New Jersey weather and climate observations, (2) conduct and foster research associated with New Jersey's weather and climate, and (3) provide critical climate services to all seeking assistance (Rutgers n.d.). The ONJSC continues to operate the 66-stationRutgers NJ Weather Network. Observations of multiple weather variables are available in real-time every five minutes via njweather.org.
- *Rutgers Climate and Energy Institute:* The Rutgers Climate and Energy Institute is a University-wide effort to climate change through research, education, and outreach. The Institute draws upon strengths in many departments at Rutgers facilitating collaboration across a broad range of disciplines in the natural and social sciences, the humanities, engineering, law, and medicine (Rutgers-New Brunswick n.d.).
- *New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel (STAP):* A 2016 New Jersey STAP was convened by Rutgers University, culminating in a report that identified planning options for practitioners to enhance the resilience of New Jersey's people, places, and assets to sea-level rise, coastal storms, and the resulting flood risk. The same team at Rutgers University was engaged by the NJDEP to update the 2016 report based on the most current scientific information. Similar to the inaugural work, the 2019 STAP was charged with identifying and evaluating the most current science on sea-level rise projections and changing coastal storms, considering the implications for the practices and policies of local and regional stakeholders, and providing practical options for stakeholders to incorporate science into risk-based decision processes (Kopp 2019). The 2019 STAP is used by multiple State agencies including NJDEP and NJOEM for sea level rise and coastal flooding planning and project design purposes.

Stevens Institute of Technology: Coastal Engineering Research Laboratory (CERL)

The CERL is both a physical center for conducting innovative coastal research as well as an intellectual center for combining capabilities in observational, experimental, and analytical studies of the coast. The CERL conducts fundamental and applied research on the design, implementation, and monitoring of shore protection structures, systems, and beach fill projects (Stevens Institute of Technology n.d.).

- *Coastal Engineering Research Group:* The university conducts fundamental and applied research on the design, implementation, and monitoring of shore protection structures, systems, and beach fill projects.
- *Davidson Laboratory:* The Davidson Laboratory at Stevens Institute of Technology is a global leader in delivering new knowledge, advanced technologies, and higher education in support of forecasting for extreme weather events, coastal resilience, and marine hydrodynamics.
    - *Flood Advisory System:* The Davidson Laboratory provides accurate flood forecasts for the New York-New Jersey region 108 hours in advance of approaching storms through the Stevens Flood Advisory System. Flood forecasts are used to inform emergency management actions (Stevens Institute of Technology n.d.).

- *New York Harbor Observing and Prediction System (NYHOPS):* The NYHOPS was established to permit an assessment of ocean, weather, environmental, and vessel traffic conditions throughout the New York Harbor and New Jersey Coast regions. The system is designed to provide a knowledge of meteorological and oceanographic conditions both in real-time and forecasted out to 72 hours in the Hudson River, the East River, NY/NJ Estuary, Raritan Bay, Long Island Sound, and the coastal waters of New Jersey (Stevens Institute of Technology n.d.).

16.3.3 County and Regional Technical Capabilities Programs and Resources

Numerous county and regional agencies have specific capabilities that can support hazard mitigation in Essex County.

North Jersey Transportation Planning Authority (NJTPA)

Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure (December 2011): The primary objective of this project is to pilot the Federal Highway Administration's (FHWA) vulnerability and risk assessment Conceptual Model using New Jersey as a case study, providing feedback for the advancement of the Conceptual Model as well as a heightened awareness and understanding of the potential effects of climate change on transportation infrastructure in New Jersey. The project was led by the NJTPA.

The Conceptual Risk Assessment Model was developed to assist transportation agencies in identifying infrastructure at risk for exposure to climate change stressors and determining which threats carry the most significant consequences. It incorporates the following summary steps:

1. Build an inventory of relevant assets and determine which are critical
2. Gather information on potential future climate scenarios
3. Assess the potential vulnerability and resilience of critical assets

A portion of the study is conducted for the Central Study Area to quantify the potential impact of climate change on the exiting riverine 1 percent annual chance floodplain. The central study area covers portions of Burlington, Camden, Mercer, Salem, and Middlesex Counties. The impact of climate change on the riverine floodplain has been assessed through analysis of the effects of extreme precipitation as well rising temperatures. In this analysis, years 2050 and 2100 were considered.

Essex County Sheriff's Office

The Essex County Sheriff's Office – Office of Emergency Management (ECSO OEM) goal is to mitigate, prepare for, respond to and recover from the effects of natural or man-made disasters and other hazards or emergencies that may occur within our region. In addition to providing physical logistical support, the ECSO OEM maintains or facilitates the updating of more than 100 plans, annexes, appendices, and supporting documents that guide preparedness, response, and mitigation activities that can be applied to any disaster or emergency affecting the region. ECSO OEM works closely with all Essex County municipalities, all public safety disciplines, and critical private/public sector entities to engage in

comprehensive disaster planning and response guidelines for Essex County. In addition to serving as a liaison to local, county, state, and federal agencies, the ECSO OEM also serves as a liaison to utility companies, private sector companies, and Volunteer Organizations Active in Disasters (VOAD) within the region. These partners are key players who help support response and recovery efforts during emergencies.

Essex County Department of Public Works

The mission of the Department of Public Works is to enhance and sustain a healthy quality of life by providing efficient administration, planning, maintenance, construction management and technical engineering of the county's infrastructure. Services include permits, subdivisions and site plans, transportation planning, snow and ice removal, pothole repair, tree pruning, roadways repair and maintenance, and mosquito control (Essex County n.d.).

Division of Engineering: The Division provides professional engineering services which include design, construction, construction inspection, construction management, bridge inventory, and maintenance throughout Essex County. The Division is responsible for the reconstruction and non-routine maintenance of approximately 215 miles of existing County roads; construction of new County roads as required; the operation and maintenance of 4 swing bridges over the Passaic River; the non-routine maintenance of 131 stationary bridges with spans of twenty feet or more and 230 culverts with spans of less than twenty feet; and the non-routine maintenance of 460 signalized intersections and over 30,000 traffic signs. The Division is also responsible for performing all engineering services for all of the County's 18 parks, 5 reservations, and recreation facilities. The Division of Engineering also conducts the review of site plans and subdivisions submitted to the Essex County Planning Board. Site plans and subdivisions are reviewed for their traffic, drainage, and roadway impacts on the County roads (Essex County 2024).

Division of Planning: The Division of Planning functions include responsibility for long-range planning relating to development and conservation of land and resources in the County. This includes studies pertaining to the census, safety, land use, traffic, storm water, and transportation facilities (Essex County 2024). The Division of Planning includes the operations of the following:

Essex County Planning Board: Planning Board duties and responsibilities as defined in the State enabling legislation are to prepare and adopt a Master Plan for the physical development and orderly growth of the county; to review and approve applications for subdivision and site plans; to encourage the cooperation of the 22 county municipalities in matters of mutual concern; to advise the County Executive and Board of Chosen Freeholders with respect to the formulation of development programs and budgets for capital expenditures; to prepare the official County Map; and to be a depository of current municipal master plans and zoning ordinances. The Essex County Planning Board is also responsible for the State Review Process (Essex County 2024).

Essex County Construction Board of Appeals: The Board of Appeals listens to hearings for person(s) aggrieved by any ruling, action, notice, order or decision of a local enforcing agency that enforces either the State Uniform Construction Code or the Uniform Fire Code, including, without limitation, any refusal to

grant an application or any failure or refusal to act upon an application, but not including any order requiring the taking of emergency measures pursuant to N.J.A.C. 5:23-2.32(b) (Essex County 2024)

Essex County Transportation Advisory Board: The Essex County Transportation Advisory Board works with and advises the Division of Planning and serves as the principal non-staff advisor and commenter concerning the goals, policies, plans and direction of transportation planning in Essex County. The Essex County Transportation Advisory Board provides a public forum for discussion and resolution of County and Municipal transportation problems and issues. The goal of the Essex County Transportation Advisory Board is to contribute to the improved effectiveness and efficiency of the Essex County transportation system through a participatory public forum which discuses and resolves transportation problems in Essex County (Essex County 2024).

Division of Buildings & Grounds: The Division of Buildings and Grounds is responsible for operating, repairing, and maintaining all County-owned buildings, with the exception of Park facilities. The Division provides technical and mechanical services necessary for the safe and efficient operation of heating, ventilation, air conditioning, plumbing and electrical systems in all buildings. Additional responsibilities of this division include building maintenance functions and services such as housekeeping, pest control, locksmithing, carpentry, etc. In total, the Division maintains 51 buildings (Essex County 2024).

Division of Roads & Bridges: The Division of Roads and Bridges are responsible for maintaining 450 lane Miles of County roadway system in a safe, serviceable, and aesthetically pleasing condition. Roadways are maintained curb to curb for pavement, drainage system, street cleaning, and leaf collection and snow/ice control. Roads within County institution and parking lots are also included. Within County Right-of-Ways traffic signals and signal systems, regulatory, warning and guide signs and trees are maintained. The services/programs carried out by the Division are to provide for the safe passage of both motorists and pedestrians while using County roads (Essex County 2024).

Division of Fleet Management: The Division of Feet Management is in charge of acquisition maintenance and repair of over eight hundred County owned vehicles for all departments in the County (Essex County 2024).

Division of Environmental Affairs: The mission of Essex County's Division of Environmental Affairs is to provide effective, safe, economical, and environmentally friendly management of mosquito populations throughout the County (Essex County 2024).

Essex County Department of Health & Rehabilitation

Division of Community Health Services: The Division of Community Health Services is an umbrella agency that oversees the administration and management of grants made available for community health purposes. The definition of health is extended beyond its medical meaning to include quality of life issues, such as environmental health concerns, education and preventive programs, the integration of persons with disabilities into everyday situations, access to programs that nurture self-development and equity of services (Essex County 2019).

The Office of Addiction Services: Organizes, implements, and monitors programs for clients with alcohol and drug related issues, makes funding available to implement alcohol and drug treatment programs for Essex residents and provides substance abuse and behavior health counseling and referrals for Essex County government employees and their families through the Employee Assistance Program (Essex County 2019).

The Municipal Alliance Program provides funding to municipalities to support the creation and implementation of alcohol and drug prevention programs. It also provides municipal programs with technical assistance and training and conducts fiscal and program monitoring (Essex County 2019).

The Intoxicated Drivers Resource Center is a state-mandated program that provides education and treatment to clients to prevent the recurrence of a DWI/DUI offense.

The Office of the Disabled offers programs to assist clients of all ages. The Personal Assistance Services Program provides information, referrals and personal assistance services to permanently physically disabled adults ages 18 and older (Essex County 2019).

Special Child Health Services coordinates services for children with special needs from birth to age 21 and coordinates free multidisciplinary evaluations for children from birth to age 3 who has a developmental delay (Essex County 2019).

The Essex County Health Department services all of Essex County's 22 municipalities in the areas of solid waste enforcement, air noise and water pollution and hazardous response. The Health Department strives to be an environmental health education resource for all of Essex County (Essex County 2019).

The Domestic Violence Assessment Center is a court-referred program that addresses the epidemic of intimate and family violence by assessing, providing intervention plans and monitoring defendants with final restraining orders. Its goal is to enhance the safety of victims and their families while providing accountability and resources to the offender (Essex County 2019).

Hudson Essex Passaic Soil Conservation District (HESCD)

The HEPSCD, serving three counties, is a special purpose subdivision of the State of New Jersey Dept of Agriculture, Division of Agriculture & Natural Resources. HEPSCD is one of 14 soil conservation districts in New Jersey empowered to conserve and manage soil and water resources in cooperation with the State Soil Conservation Committee. The District addresses stormwater, soil erosion and sedimentation issues that result from land disturbance activities (primarily construction). District certification of plans for qualifying projects is a prerequisite to local construction permits (Hudson Essex Passaic Soil Conservation District 2024).

Sustainable Essex Alliance (SEA)

The SEA is a coalition of local municipal green teams and sustainability organizations working together to create solutions for local environments and economies. This helps to create the financial incentives needed to push sustainable actions such as reducing greenhouse gas emissions, using green energy

solutions, and cutting waste while simultaneously increasing awareness and education (Sustainable Essex Alliance n.d.).

Essex County Utilities Authority (ECUA)

The mission of the ECUA is to plan, develop, and implement cost-effective solid waste management methods for the County of Essex which emphasize the recovery of materials and energy with a minimum impact on the environment. ECUA develops and updates the Essex County Solid Waste Management Plan and develops and manages contracts for the environmentally safe and proper disposal of solid waste. The ECUA holds regular Household Hazardous Waste (HHW) events for Essex County residents to facilitate environmentally sound collection, recycling, and disposal of these materials (Essex County Utilities Authority n.d.).

Essex County Department of Parks, Recreation and Cultural Affairs

Essex County Department of Parks, Recreation and Cultural Affairs oversees the County's 24 parks, 5 reservations, and variety of recreation facilities.

Division of Cultural and Historic Affairs: The Division promotes further awareness of its vibrant arts and history community, working to expand opportunities for artists, arts, and historical organizations and increase public accessibility to their programs (Essex County 2024).

Essex County Environmental Center: The Environmental Center is an environmental education center with a mission to create awareness, understanding, and appreciation of the environment and its relationship to Essex County residents (Essex County 2024).

Essex County Environmental Commission: The Environmental Commission provides advice, outreach, and education to the office of the Essex County Executive, Board of Commissioners and the municipal Environmental Commissions in order to protect, restore and renew Essex County's natural resources and to increase environmental awareness, ensuring that all Essex County citizens can enjoy a healthy environment and an enhanced quality of life within a sustainable regional community (Essex County 2024).

Essex County Improvement Authority (ECIA)

The ECIA is a public body corporate and politic, constituting a political subdivision of the State of New Jersey, and was established as an instrumentality exercising public and essential governmental functions to provide for the public convenience, benefit and welfare and shall have perpetual succession. ECIA manages the Essex County Airport in the Township of Fairfield.

Essex County Department of Economic Development, Training and Employment

The Department of Economic Development, Training and Employment provides essential case management services, education and training opportunities, workforce planning and development, and job placement assistance. The Department is comprised of the following (Essex County 2019):

Division of Training and Employment: The Division of Training and Employment administers a wide range of Work First New Jersey (WFNJ) activities targeting Temporary Assistance for Needy Families (TANF), General Assistance (GA), and Able Body Adult without Dependent (ABAWD) clients. The Division provides essential services and opportunities to clients to form a coordinated One-Stop System with support from the Division of Welfare, and the New Jersey Department of Labor and Workforce Development (Essex County 2019).

*Workforce Development Board/One-Stop System: T*he Workforce Development Board/One-Stop System provides employment training development planning and offers training opportunities to dislocated workers and out of school youth (Essex County 2019).

Division of Housing and Community Development: The Division provides a choice of housing and community development services for projects in various participating municipalities throughout Essex County (Essex County 2019).

Essex County Community Organizations Active in Disaster (COAD): The Essex County Community Organizations Active in Disaster (COAD) brings together local organizations and houses of worship with local officials and emergency management professionals to strengthen the overall community response to a disaster and help the community better plan and prepare for whatever may lie ahead. The COAD does not deliver any services directly but fosters communication, coordination, collaboration, and cooperation among governmental and non-governmental organizations to provide the most effective services to our community. Through regular meetings, training, and information sharing, organizations build plans and form partnerships to respond better when a disaster strikes (Jersey Cares n.d.).

Mayors Council Rahway River Watershed Flood Control: The Rahway River Watershed encompasses 41 square miles of urban and suburban area in 24 municipalities in Essex, Union, and Middlesex counties in central New Jersey. Property owners and municipalities have limited capability to provide any significant flood risk reduction. The mayors in the Rahway River Watershed joined to regionally focus on solutions including Cranford, Union, Millburn, Rahway, Springfield, Kenilworth, Westfield, Winfield, and Garwood (Cranford n.d.).

Support for Socially Vulnerable Populations and Underserved Communities

The following section summarizes administrative and technical capabilities in Essex County that serve socially vulnerable populations.

Office of Public Health Management (ECOPHM)

Essex County Office of Public Health Management is organized to improve the overall health and welfare of Essex County residents. The primary focus of the ECOPHM is to ensure health equity for Essex County residents as well as facilitate timely and effective responses to public health threats and emergencies. ECOPHM promotes the welfare of the Essex County population, ensures its security and protects it from the spread of infectious disease and environmental hazards. ECOPHM helps to ensure quality care to benefit the Essex County residents (Essex County 2024).

Medical Reserve Corp (MRC): The MRC network comprises more than 300,000 volunteers in roughly 800 community-based units located throughout the United States and its territories. MRC units organize and utilize local volunteers who want to donate their time and expertise to prepare for and respond to emergencies and to support ongoing preparedness initiatives. MRC volunteers include medical and public health professionals as well as other community members without healthcare backgrounds who want to improve the health and safety of their communities (Essex County 2024)

Essex Regional Health Commission:

The Commission is a consortium of municipalities which together formed a regional health commission through a joint agreement with member municipalities. The Commission is also a subcontractor to the Essex County Office of Public Health Management, established for the purposes of meeting the standards of the County Environmental Health Act (Essex Regional Health Commission n.d.)

Essex County Department of Citizen Services

The Department of Citizen Services works to provide support and services to at risk residents and families through a network of supportive services. The Department includes:

- Office of Senior Services
- Division of Community Action
- Homeless Unit
- Tenant Resource Center – Utility Assistant/NJ Share
- Housing Supporting Persons with AIDS (HOPWA) Program
- Continuum of Care
- Coordinated Entry Unit
- Office of LGBTQ Affairs
- Division of Family Assistance and Benefits
- NJ Family Care – Interviewing and Processing
- Office of WorkFirst NJ Services
- SNAP Office
- OCSE (Child Support)
- Division of Youth Services

16.4 Fiscal Capabilities

Fiscal capabilities are the resources that a jurisdiction has access to or is eligible to use to fund mitigation actions. The sections below list funding programs for jurisdictions seeing funding. This section is not intended to be a comprehensive list, but rather a tool to help identify potential funding sources.

16.4.1 Federal Fiscal Capabilities

Essex County and its municipalities continue to apply for and secure federal funding to support hazard mitigation. As noted on the FEMA Hazard Mitigation Assistance (HMA) website

(https://www.fema.gov/hazard-mitigation-assistance), FEMA administers six programs that provide funding for eligible mitigation planning and projects that reduce disaster losses and protect life and property from future disaster damage:

Hazard Mitigation Grant Program (HMGP): The HMGP provides funding to states, local communities, tribes, and territory (SLTT) governments so they can rebuild in a way that reduces or mitigates future natural disaster losses in their communities. HMGP funding is authorized with a Presidential Major Disaster Declaration. A governor or tribal chief executive may request HMGP funding throughout the state, tribe, or territory when submitting a disaster declaration. Through HMGP, states can access up to 10 percent and local governments up to 5 percent of their HMGP award for management and administration costs (FEMA 2024).

Flood Mitigation Assistance (FMA): FMA grants provide funding to states, local communities, tribes, and territories to reduce or eliminate the risk of repetitive flood damage to buildings insured under the NFIP. FEMA distributes funds annually to develop community or individual flood mitigation projects. In addition, funding is also used for technical assistance and management costs. All sub-applicants need to be in good standing with the NFIP (FEMA 2024).

Building Resilient Infrastructure and Communities (BRIC): The BRIC program is a competitive annual grant program. The BRIC program aims to categorically shift the federal focus away from reactive disaster spending and toward proactive investment in community resilience. The BRIC program also offers non-financial Direct Technical Assistance (DTA) and encourages communities to participate. BRIC DTA gives full support to communities that may not have the resources to begin climate resilience planning and project solution design on their own. FEMA will give wide-ranging support to BRIC DTA communities, including climate risk assessments, community engagement, partnership building, mitigation and climate adaptation planning, and BRIC program requests throughout the grant lifecycle (FEMA 2024).

Public Assistance (PA) Section 406 Funds: FEMA funds cost-effective mitigation measures under the PA program for repairs, restoration, and replacement of eligible damaged facilities. This grant funding is commonly referred as "406 Mitigation" or PA Mitigation (FEMA 2024).

Legislative Pre-Disaster Mitigation (LPDM): The Pre-Disaster Mitigation Program (PDM) was active during the performance of the 2019 SHMP but was replaced with BRIC under the Disaster Recovery Reform Act of 2018. However, LPDM awards are still funded through direct congressional appropriations (FEMA 2024).

Safeguarding Tomorrow through Ongoing Risk Mitigation Revolving Loan Fund (STORM RLF): The STORM RLF program complements and supplements FEMA's Hazard Mitigation Assistance grant portfolio to support mitigation projects at the local government level and increase the nation's resilience to natural hazards and climate change. These low interest loans will allow jurisdictions to reduce vulnerability to natural disasters, foster greater community resilience and reduce disaster suffering (FEMA 2024).

The establishment of FEMA-identified Community Disaster Resilience Zones provides geographic focus for financial assistance for underserved communities for technical assistance and increased mitigation activities (FEMA 2024).

Table 16-4 summarizes additional fiscal capabilities available at the federal level to support hazard mitigation in Essex County.

Table 16-4. Federal Fiscal Capabilities Available to Support Mitigation

Capability	Details	
Extraordinary Circumstances	Responsible Agency:	FEMA
	Hazard(s):	All Hazards
	For PDM and FMA project subawards, the (FEMA) Region may apply extraordinary circumstances when justification is provided and with concurrence from FEMA Headquarters (Risk Reduction and Risk Analysis Divisions) prior to granting an exception. If this exception is granted, a local mitigation plan must be approved by FEMA within 12 months of the award of the project subaward to that community. For HMGP, PDM, and FMA, extraordinary circumstances exist when a determination is made by the Applicant and FEMA that the proposed project is consistent with the priorities and strategies identified in the State (Standard or Enhanced) Mitigation Plan and that the jurisdiction meets at least one of the criteria below. If the jurisdiction does not meet at least one of these criteria, the Region must coordinate with FEMA Headquarters (Risk Reduction and Risk Analysis Divisions) for HMGP; however, for PDM and FMA the Region must coordinate and seek concurrence prior to granting an exception: • The jurisdiction meets the small, impoverished community criteria (see Part VIII, B.2). • The jurisdiction has been determined to have had insufficient capacity due to lack of available funding, staffing, or other necessary expertise to satisfy the mitigation planning requirement prior to the current disaster or application deadline. • The jurisdiction has been determined to have been at low risk from hazards because of low frequency of occurrence or minimal damage from previous occurrences as a result of sparse development. • The jurisdiction experienced significant disruption from a declared disaster or another event that impacts its ability • to complete the mitigation planning process prior to award or final approval of a project award. • The jurisdiction does not have a mitigation plan for reasons beyond the control of the State, federally recognized tribe, or local community, such as Disaster Relief Fund restrictions that delay FEMA from granting a subaward prior to the expiration of the local or Tribal Mitigation Plan. For HMGP, PDM, and FMA, the Applicant must provide written justification that identifies the specific criteria or circumstance listed above, explains why there is no longer an impediment to satisfying the mitigation planning requirement, and identifies the specific actions or circumstances that eliminated the deficiency. When an HMGP project funding is awarded under extraordinary circumstances, the Recipient shall acknowledge in writing to the Regional Administrator that a plan will be completed within 12 months of the subaward. The Recipient must provide a work plan for completing the local or Tribal Mitigation Plan, including milestones and a timetable, to ensure that the jurisdiction will complete the plan in the required time. This requirement shall be incorporated into the award (both the planning and project subaward agreements, if a planning subaward is also awarded).	

Capability	Details	
Hazard Mitigation Grant Program Post Fire	Responsible Agency:	FEMA
	Hazard(s):	Wildfire
	The HMGP Post Fire program provides funding to help communities implement hazard mitigation measures focused on reducing the risk of harm from wildfire. HMGP Post Fire funding is authorized under Sections 404 and 420 of the Stafford Act and provides hazard mitigation grant funding to states, federally-recognized tribes and territories affected by fires resulting in a Fire Management Assistance Grant (FMAG) declaration on or after October 5, 2018. For more information regarding the HMGP Post Fire program, refer to https://www.fema.gov/grants/mitigation/post-fire.	
Individual Assistance	Responsible Agency:	FEMA
	Hazard(s):	All Hazards
	Individual Assistance (IA) provides help for homeowners, renters, businesses, and some non-profit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration. For homeowners and renters, those who suffered uninsured or underinsured losses could be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. Individuals are allowed to borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property, and an additional 20 percent for mitigation. For businesses, loans could be made to repair or replace disaster damages to property owned by the business, including real estate, machinery and equipment, inventory, and supplies. Businesses of any size are eligible. Non-profit organizations, such as charities, churches, and private universities are eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster but are restricted by law to small businesses only. IA is detailed on the FEMA website: https://www.fema.gov/individual-disaster-assistance	
Public Assistance	Responsible Agency:	FEMA
	Hazard(s):	All Hazards
	Public Assistance (PA) provides cost reimbursement aid to local governments (state, county, local, municipal authorities, and school districts) and certain non-profit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities or property used to deliver government-like services. This program is largely funded by FEMA with both local and state matching contributions required. PA is detailed on the FEMA website: https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit	
Department of Homeland Security Grant Program	Responsible Agency:	FEMA
	Hazard(s):	All hazards
	The Homeland Security Grant Program (HSGP) plays an important role in the implementation of the National Preparedness System by supporting the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation. In FY 2019, the total amount of funds available under HSGP was $1.095 billion. HSGP is comprised of three interconnected grant programs, including the State Homeland Security Program, Urban Areas Security Initiative (UASI), and Operation Stone garden. Together, these grant programs fund a range of preparedness activities, including planning, organization, equipment purchase, training, exercises, and management and administration. Additional information regarding HSGP is available on the website: https://www.fema.gov/homeland-security-grant-program.	
	Responsible Agency:	FEMA

Capability	Details	
Fire Management Assistance Grant Program	Hazard(s):	Wildfire
	Assistance for the mitigation, management, and control of fires on publicly or privately-owned forests or grasslands that threaten such destruction as would constitute a major disaster. Provides a 75 percent federal cost share, and the State pays the remaining 25 percent for actual cost. Before a grant can be awarded, a state must demonstrate that total eligible costs for the declared fire meet or exceed either the individual fire cost threshold - which is applies to single fires, or the cumulative fire cost threshold, which recognizes numerous smaller fires burning throughout a state. Eligible firefighting costs may include expenses for field camps; equipment use, repair and replacement; tools, materials and supplies; and mobilization and demobilization activities. Information on this program is available on the website: https://www.fema.gov/fire-management-assistance-grant-program	
Assistance to Firefighters Grant Program	Responsible Agency:	FEMA
	Hazard(s):	Wildfire
	The primary goal of the Assistance to Firefighters Grants is to enhance the safety of the public and firefighters with respect to fire-related hazards by providing direct financial assistance to eligible fire departments, nonaffiliated Emergency Medical Services organizations, and State Fire Training Academies. This funding is for critically needed resources to equip and train emergency personnel to recognized standards, enhance operations efficiencies, foster interoperability, and support community resilience. Information regarding this grant program is available on the website: https://www.fema.gov/welcome-assistance-firefighters-grant-program.	
High Hazard Potential Dams Grant Program	Responsible Agency:	FEMA
	Hazard(s):	Flood
	The Rehabilitation of High Hazard Potential Dams Grant Program provides technical, planning, design, and construction assistance in the form of grants to non-Federal governmental organizations or nonprofit organizations for rehabilitation of eligible high-hazard potential dams. Information regarding this program is available on the website: https://www.grants.gov/web/grants/view-opportunity.html?oppId=316238	
National Dam Safety Program (NDSP)	Responsible Agency:	FEMA
	Hazard(s):	Dam Failure
	The NDSP, which is led by FEMA, is a partnership of the states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety. Grant assistance is provided to states, providing vital support for the improvement of state dam safety programs that regulate most of the dams in the United States. Additional information regarding the NDSP is available on the website: https://www.fema.gov/emergency-managers/risk-management/dam-safety	
Small Business Administration Loan	Responsible Agency:	SBA
	Hazard(s):	All Hazards
	The Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, businesses of all sizes, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets. Homeowners could apply for up to $200,000 to replace or repair their primary residence. Renters and homeowners could borrow up to $40,000 to replace or repair personal property such as clothing, furniture, cars, and appliances that were	

Capability	Details	
	damaged or destroyed in a disaster. Physical disaster loans of up to $2 million are available to qualified businesses or most private nonprofit organizations. Additional information regarding SBA loans is available on the SBA website: https://www.sba.gov/managing-business/running-business/emergency-preparedness/disaster-assistance.	
Community Development Block Grant Program	Responsible Agency:	HUD
	Hazard(s):	All Hazards
	CDBG are federal funds intended to provide low and moderate-income households with viable communities, including decent housing, a suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, and planning and administration. Public improvements could include flood and drainage improvements. In limited instances and during the times of "urgent need" (e.g., post-disaster) as defined by the CDBG National Objectives, CDBG funding could be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event. Funding is split into two programs: *Community Development Block Grant Disaster Recovery (CDBG-DR) Program:* This program provides grant funds, which are appropriated by Congress and allocated by HUD to rebuild disaster-impacted areas and provide crucial seed money to start the long-term recovery process. These flexible grants help cities, counties, Indian tribes, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations. Since CDBG-DR assistance may fund a broad range of recovery activities, HUD can help communities and neighborhoods that otherwise might not recover due to limited resources. *Community Development Block Grant Mitigation (CDBG-MIT):* This program funds pose a unique opportunity for eligible grantees to use this assistance in areas impacted by recent disasters to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses. CDBG-MIT defines mitigation as activities that increase resilience to disasters and reduce or eliminate the long-term risk of loss of life, injury, damage to and loss of property, and suffering and hardship by lessening the impact of future disasters. Goals of CDBG-MIT funds: • Support data-informed investments, focusing on repetitive loss of property and critical infrastructure. • Build capacity to comprehensively analyze disaster risks and update hazard mitigation plans. • Support the adoption of policies that reflect local and regional priorities that will have long-lasting effects on community risk reduction, including risk reduction to community lifelines and decreasing future disaster costs. • Maximize the impact of funds by encouraging leverage, private/public partnerships, and coordination with other Federal dollars. Additional information regarding CDBG is available on the website: https://www.hudexchange.info/programs/cdbg-entitlement/	
	Responsible Agency:	U.S. DOT
	Hazard(s):	All Hazards

Capability	Details	
Federal Highway Administration-Emergency Relief	The Federal Highway Administration (FHWA) Emergency Relief is a grant program through the U.S. Department of Transportation (DOT) that can be used for repair or reconstruction of federal-aid highways and roads on federal lands that have suffered serious damage as a result of a disaster. New Jersey Department of Transportation serves as the liaison between local municipalities and FHWA. Additional information regarding the FHWA Emergency Relief Program is available on the website: https://www.fhwa.dot.gov/programadmin/erelief.cfm	
Federal Transit Administration - Emergency Relief	Responsible Agency:	U.S. DOT
	Hazard(s):	All Hazards
	The Federal Transit Authority (FTA) Emergency Relief is a grant program that funds capital projects to protect, repair, reconstruct, or replace equipment and facilities of public transportation systems. Administered by the Federal Transit Authority at the U.S. DOT and directly allocated to Metropolitan Transit Authority (MTA) and Port Authority, this transportation-specific fund was created as an alternative to FEMA PA. Currently, a total of $5.2 billion has been allocated to New Jersey-related entities. Additional information regarding the FTA Emergency Relief Program is available on the website: https://www.transit.dot.gov/funding/grant-programs/emergency-relief-program/emergency-relief-program	
Disaster Housing Program	Responsible Agency:	HUD
	Hazard(s):	All Hazards
	Emergency assistance for housing, including minor repair of home to establish livable conditions, mortgage and rental assistance available through the U.S. Department of Housing and Urban Development (HUD). Information on this program is available on the website: https://www.hud.gov/program_offices/public_indian_housing/publications/dhap	
HOME Investment Partnerships Program	Responsible Agency:	HUD
	Hazard(s):	All Hazards
	Grants to local and state government and consortia for permanent and transitional housing (including financial support for property acquisition and rehabilitation for low-income persons). Information on this program is available on the website: https://www.hud.gov/program_offices/comm_planning/affordablehousing/programs/home/	
HUD Disaster Recover Assistance	Responsible Agency:	HUD
	Hazard(s):	All Hazards
	Grants to fund gaps in available recovery assistance after disasters (including mitigation). Information on this program is available on the website: https://www.hud.gov/info/disasterresources	
Section 108 Loan Guarantee	Responsible Agency:	HUD
	Hazard(s):	All Hazards
	Enables states and local governments participating in the CDBG program to obtain federally guaranteed loans for disaster-distressed areas. Information on this program is available on the website: https://www.hudexchange.info/programs/section-108/	
Smart Growth Implementation Assistance program	Responsible Agency:	EPA
		All Hazards
	The Smart Growth Implementation Assistance (SGIA) program through the U.S. Environmental Protection Agency (EPA) focuses on complex or cutting-edge issues, such as stormwater management, code revision, transit-oriented development, affordable housing, infill development, corridor planning, green building, and climate change. Applicants can submit proposals under four categories: community resilience to disasters, job creation, the role of manufactured homes in sustainable	

Capability	Details	
	neighborhood design, or medical and social service facilities siting. Information on this program is available on the website: https://www.epa.gov/smartgrowth	
Partners for Fish and Wildlife	Responsible Agency:	U.S. Fish and Wildlife Service
	Hazard(s):	All Natural Hazards
	Financial and technical assistance to private landowners interested in pursuing habitat restoration projects, including those affecting wetlands and riparian habitats. Information on this program is available on the website: https://www.fws.gov/partners/	
National Fish Passage Program (NFPP)	Responsible Agency:	U.S. Fish and Wildlife Service
	Hazard(s):	All Natural Hazards
	The National Fish Passage Program partners with local communities on a voluntary basis to remove or bypass barriers, such as dams, to restore rivers and conserve aquatic resources. The program provides both financial and technical assistance for fish passage projects, which is any activity that improves the ability of fish or other aquatic species to move by reconnecting habitat that has been fragmented by a barrier. Information on this program is available on the website: https://www.fws.gov/program/national-fish-passage	
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	Responsible Agency:	U.S. DOT
	Hazard(s):	All Hazards
	Investing in critical road, rail, transit, and port projects across the nation. The RAISE program is previously as Better Utilizing Investments to Leverage Development (BUILD) and Transportation Investment Generating Economic Recovery (TIGER). Information on this program is available on the website: https://www.transportation.gov/tags/tiger-grants	
Community Facilities Direct Loan & Grant Program	Responsible Agency:	USDA
	Hazard(s):	All Hazards
	This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area and does not include private, commercial, or business undertakings. Information on this program is available on the website: https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program	
Emergency Loan Program	Responsible Agency:	USDA
	Hazard(s):	All Natural Hazards
	USDA's Farm Service Agency provides emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters, or quarantine. Information on this program is available on the website: https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/emergency-farm-loans/index	
Emergency Watershed Protection Program	Responsible Agency:	USDA
	Hazard(s):	All Natural Hazards
	The Emergency Watershed Protection (EWP) program provides assistance to relieve imminent hazards to life and property caused by floods, fires, drought, windstorms, and other natural occurrences through the Natural Resources Conservation Service. Information on this program is available on the website: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/	
Financial Assistance	Responsible Agency:	NRCS
	Hazard(s):	All Hazards

Capability	Details	
	The Emergency Watershed Protection (EWP) program provides assistance to relieve imminent hazards to life and property caused by floods, fires, drought, windstorms, and other natural occurrences through the Natural Resources Conservation Service. Information on this program is available on the website: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/	
Watershed Rehabilitation Program	Responsible Agency:	NRCS
	Hazard(s):	Flood, Dam Failure
	The Watershed Rehabilitation Program helps project sponsors rehabilitate aging dams that are reaching the end of their design lives. This rehabilitation addresses critical public health and safety concerns. NRCS selects projects based on the risks to life and property if a dam failure were to occur. Information on this program is available on the website: https://www.nrcs.usda.gov/programs-initiatives/watershed-rehabilitation	
Watershed and Flood Prevention Operations (WFPO) Program	Responsible Agency:	NRCS
	Hazard(s):	Flood, Dam Failure
	The purpose of the program is to help units of federal, state, local and federally recognized tribal governments (project sponsors) protect and restore watersheds. The WFPO program provides technical and financial assistance to States, local governments and Tribal organizations to help plan and implement authorized watershed projects for the purpose of: • Flood Prevention • Watershed Protection • Public Recreation • Public Fish and Wildlife • Agricultural Water Management • Municipal and Industrial Water Supply • Water Quality Management Information on this program is available on the website: https://www.nrcs.usda.gov/programs-initiatives/watershed-and-flood-prevention-operations-wfpo-program	
Emergency Management Performance Grants (EMPG) Program	Responsible Agency:	U.S. DHS
	Hazard(s):	All Hazards
	Emergency Management Performance Grant (EMPG) funding is available to the State of New Jersey to educate people and protect lives and structures from natural and technical hazards. The grant is to encourage the development of comprehensive emergency management, including terrorism consequence management, at the state and local level and to improve emergency management planning, preparedness, mitigation, response and recovery capabilities. Information on this program is available on the website: https://www.fema.gov/emergency-management-performance-grant-program	
Reimbursement for Firefighting on Federal Property	Responsible Agency:	U.S. DHS
	Hazard(s):	Wildfire
	Provides reimbursement only for direct costs and losses over and above normal operating costs. Information on this program is available on the website: https://www.usfa.fema.gov/grants/firefighting_federal_property.html	
Land & Water Conservation Fund	Responsible Agency:	National Park Service
	Hazard(s):	All Hazards

Capability	Details	
	Matching grants to states and local governments for the acquisition and development of public outdoor recreation areas and facilities (as well as funding for shared federal land acquisition and conservation strategies). Information on this program is available on the website: https://www.nps.gov/subjects/lwcf/index.htm	
Clean Water Act Section 319(h) Grants	Responsible Agency:	EPA
	Hazard(s):	Flood, Harmful Algal Bloom
	Clean Water Act Section 319(h) funds are provided only to designated state and tribal agencies to implement their approved nonpoint source management programs. State and tribal nonpoint source programs include a variety of components, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and regulatory programs. Each year, EPA awards Section 319(h) funds to states in accordance with a state-by-state allocation formula that EPA has developed in consultation with the states (USEPA 2024). Section 319(h) funding decisions are made by the states. States submit their proposed funding plans to EPA. If a state's funding plan is consistent with grant eligibility requirements and procedures, EPA then awards the funds to the state (USEPA 2024). In New Jersey, NJDEP uses these funds can be used to fund water quality improvements and to target restoration and tree planting projects, including impervious removal, retrofitting of stormwater management basins with green infrastructure within communities, specifically overburdened communities. Information on this program is available on the website: https://www.epa.gov/nps/319-grant-program-states-and-territories	
Coastal Zone Management Program	Responsible Agency:	NOAA
	Hazard(s):	Flood, Coastal Erosion
	The Coastal Zone Management Act (CZMA), administered by NOAA, provides for the management of the nation's coastal resources. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." The CZMA outlines three national programs, the National Coastal Zone Management Program, the National Estuarine Research Reserve System, and the Coastal and Estuarine Land Conservation Program (CELCP). The National Coastal Zone Management Program aims to balance competing land and water issues through state and territorial coastal management programs, the reserves serve as field laboratories that provide a greater understanding of estuaries and how humans impact them, and CELCP provides matching funds to state and local governments to purchase threatened coastal and estuarine lands or obtain conservation easements (NOAA 2025). Grant opportunities are often made available from additional Coastal Zone Management funding. Funding is also provided to the Jacques Cousteau National Estuarine Research Reserve. Information on this program is available on the website: https://coast.noaa.gov/czm/	
Community-Based Restoration (CBRP)	Responsible Agency:	NOAA
	Hazard(s):	Flood, Dam Failure, Fishing Failure
	The program grants support restoration projects that use a habitat-based approach to rebuild productive and sustainable fisheries, contribute to the recovery and conservation of protected resources, and promote healthy ecosystems and resilient communities. Information on this program is available on the website:	

Capability	Details	
	https://www.fisheries.noaa.gov/national/habitat-conservation/community-based-habitat-restoration	
USACE Planning Assistance to States (PAS) Program	Responsible Agency:	USACE
	Hazard(s):	Coastal Erosion, Flood, Harmful Algal Bloom
	Section 22 of the 1974 Water Resources Development Act provides authority for the US Army Corps of Engineers Planning Assistance to the States (PAS) and Indian Nations. Under this program, the USACE assists the States, local governments, Native American Tribes and other non-federal entities in the preparation of comprehensive plans for the development and conservation of water and related land resources. Types of work that can be done include: Water Quality Studies, Wetland Evaluation Studies, Flood Plain Management Studies, Coastal Zone Management/Protection Studies, Harbor/Port Studies, or other water resource planning investigations. The needed planning assistance is determined by the individual non-federal sponsors.	
USACE Continuing Authorities Program (CAP)	Responsible Agency:	USACE
	Hazard(s):	Coastal Erosion, Flood, Dam Failure
	Congress has provided USACE with a number of standing authorities to study and build water resource projects for various purposes without additional project-specific congressional authorization. The types of projects addressed by the CAP include emergency streambank and shoreline erosion, flood control projects, snagging and clearing for flood control, and small beach erosion control projects. Cost-share varies based on subprograms.	
USACE General Investigation (GI)	Responsible Agency:	USACE
	Hazard(s):	Coastal Erosion, Flood
	These are congressionally authorized studies under USACE's Civil Works program. Congress can authorize USACE to study, design, and construct major flood risk management projects. The feasibility study is cost-shared 50/50 and construction is cost-shared 65/35 between the federal government and non-federal sponsor. These are generally large-scale projects that cost more than $10 million. Congress can also authorize USACE to conduct other water-related studies/projects such as watershed assessments, ecosystem restoration, and navigation improvements.	
Section 206 Aquatic Ecosystem Restoration Projects	Responsible Agency:	USACE
	Hazard(s):	Flood, Dam Failure
	The purpose of the USACE ecosystem restoration activities is to restore significant ecosystem function, structure, and dynamic processes that have been degraded. Ecosystem restoration efforts involve examining the problems contributing to the system degradation and developing alternative means to solve these problems. This program has previously been used to fund dam removal and provide for fish passage. Cost shares vary by project type.	
Planning Assistance to the States	Responsible Agency:	USACE
	Hazard(s):	Flood, Dam Failure
	The USACE is authorized to provide planning assistance, usually for a specific technical item rather than detailed designs for construction. Dam safety/failure studies have been conducted in recent years. To request assistance, state, local, or tribal entities should submit a letter to the Chief of the Planning Division in their USACE district detailing the location and nature of the problem to be investigated. For more information and to review a sample request letter, visit the USACE webpage.	
Small Flood Control Program	Responsible Agency:	USACE
	Hazard(s):	Flood, Dam Failure

Capability	Details
	Under the Small Flood Control Program, the USACE works with communities to plan, design, and construct certain small flood control projects that have not already been specifically authorized by Congress. Studies are required to evaluate potential projects. Each project selected must be: • Economically justified, meaning the benefits of the project outweigh the cost of construction • Environmentally acceptable • Complete within itself

16.4.2 State Fiscal Capabilities

Table 16-5 summarizes the fiscal capabilities available to Essex County, at the state level.

Table 16-5. State Fiscal Capabilities to Support Pre- and Post-Disaster

Capability	Details	
New Jersey Clean Energy Program	Responsible Agency:	New Jersey Board of Public Utilities
	Hazard(s):	Hazards Impacted by Climate Change
	The New Jersey Clean Energy Program promotes increased energy efficiency and the use of clean, renewable sources of energy, including solar, wind, geothermal, and sustainable biomass. The results for New Jersey are a stronger economy, less pollution, lower costs, and reduced demand for electricity. The Clean Energy Program offers financial incentives, programs, and services for residential, commercial, and municipal customers. Refer to https://www.njcleanenergy.com/main/about-njcep/about-njcep for additional details on the program. The program also offers a Community Energy Plan Grant for government entities (e.g., municipality, county, Green Team or environmental commission, or other Sustainable Jersey organization within a community or county). The grant will provide funding for an entity to create a Community Energy Master Plan to align local communities with the State Energy Master Plan.	
NJDEP Grant and Loan Programs	Responsible Agency:	NJDEP
	Hazard(s):	All Hazards
	NJDEP offers a wide variety of funding opportunities for local governments and other types of organizations to fund numerous environmentally based projects involving mitigation of hazards such as flooding and wildfires. This includes funding for: air quality, energy, and sustainability; compliance and enforcement; engineering and construction; land use management; local government assistance; natural and historic resources; site remediation and waste management programs; and water resource management. Information on each of the programs can be found on the NJDEP website: https://www.nj.gov/dep/grantandloanprograms/.	
Green Acres Program	Responsible Agency:	NJDEP
	Hazard(s):	All Hazards
	Together with public and private partners, Green Acres has protected well over a million and a half acres of open space and provided hundreds of outdoor recreational facilities in communities around the state. Green Acres provides low interest (2 percent) loans and grants to municipal and county governments to acquire open space and develop outdoor recreation facilities. Green Acres also provides matching grants to nonprofit organizations to acquire land for public recreation and conservation purposes. Over the years, voters have authorized $3.3 billion in Green Acres funding, approving every bond referendum put before them.	

Capability	Details	
Blue Acres Program	Responsible Agency:	NJDEP
	Hazard(s):	All Hazards
	The Blue Acres Program purchases flood-prone properties. This land preservation program assists local government units and nonprofits in their efforts to increase and preserve permanent outdoor recreation areas for public use and enjoyment, and conservation areas for the protection of natural resources such as waterways, wildlife habitat, wetlands, forests, and view sheds. A secondary benefit of these laws and rules is that flood-prone properties are often purchased and not available for future development. Funding for Blue Acres is a combination of dedicated state funding from the cooperate business tax and federal grants. To date, the program has received five state funding appropriations from 2009-2019, ranging from $3 million to $12 million to effectuate buyouts in flood-prone areas. Most recently, the 3 Garden State Preservation Trust appropriation recommendation proposed Blue Acres receive an infusion of $10.5 million ($10 million for buyouts and $500,000 for administrative costs).	
Open Space and Farmland Preservation Programs	Responsible Agency:	Counties, New Jersey State Agriculture Development Committee, and the New Jersey Green Acres Program
	Hazard(s):	Flood, Severe Weather
	Farmland and open space preservation programs are often funded partially through grants administered by the New Jersey State Agriculture Development Committee and the New Jersey Green Acres Program. The objective of these programs is to expand the existing county and municipal park systems. Many counties in New Jersey also support land preservation acquisition through open space funding.	
New Jersey Water Bank	Responsible Agency:	NJDEP, New Jersey Environmental Infrastructure Trust
	Hazard(s):	Flood, Severe Weather
	The New Jersey Water Bank is a partnership between the NJDEP and the New Jersey Environmental Infrastructure Trust to provide low-cost financing for the design, construction, and implementation of projects that help protect and improve water quality and help ensure safe and adequate drinking water. The Water Bank finances projects by utilizing two funding sources. The Trust issues revenue bonds which are used in combination with zero percent interest funds to provide very low-interest loans for water infrastructure improvements. The NJDEP administers a combination of federal and state revolving fund capitalization grants, as well as the state's matching funds, loan repayments, state appropriations, and interest earned on such funds.	
NJDEP Dam Restoration and Inland Water Projects Loan Program	Responsible Agency:	NJDEP Dam Safety Program
	Hazard(s):	Flood, Dam Failure
	The New Jersey Dam Restoration and Inland Water Projects Loan Program was established by the "Green Acres, Clean Water, Farmland and Historic Preservation Bond Act of 1992", Public Law 1992, c. 88. The purpose is to provide loans to dam owners for dam restoration or inland waters projects.	
Dam Restoration Loan Program	Responsible Agency:	NJDEP Dam Safety Program
	Hazard(s):	Dam Failure
	The New Jersey Dam Restoration Loan Program was established by the "Dam, Lake, Stream, Flood Control, Water Resources and Wastewater Treatment Project Bond Act of 2003", Public Law 2003, c. 162. The purpose is to provide loans to dam owners for dam restoration projects.	
New Jersey Redevelopment Authority	Responsible Agency:	New Jersey Redevelopment Authority
	Hazard(s):	All Hazards

Capability	Details	
	The New Jersey Redevelopment Authority is an independent state financing authority committed exclusively to the redevelopment of New Jersey's urban areas. The Authority offers several financing resources, including site acquisition funding, predevelopment assistance, several development assistance resources, and technical assistance.	
New Jersey Department of Community Affairs	Responsible Agency:	NJDCA
	Hazard(s):	All Hazards
	The New Jersey Department of Community Affairs (NJDCA) is a state agency created to provide administrative guidance, financial support, and technical assistance to local governments, community development organizations, businesses, and individuals to improve the quality of life in New Jersey. NJDCA offers a wide range of programs, funding, and services that respond to issues of public concern, including fire and building safety, housing production, community planning and development, and local government management and finance. Among other funding sources, NJDCA administers CDBG funding and is typically the CDBG-Disaster Relief funding recipient for the State of New Jersey.	
New Jersey Board of Public Utilities (BPU)	Responsible Agency:	BPU
	Hazard(s):	All Hazards
	The New Jersey BPU works with private utility companies to provide analysis of natural hazard information affecting the provision of electric power, telecommunications, public water, sewage collection and treatment, and other regulated public utilities. The data are used during response and recovery efforts in the event of emergency or disaster and is also used to analyze impact of mitigation plans and projects. BPU also provides technical assistance for the Energy Resiliency Program.	
Environmental Infrastructure Financing Program	Responsible Agency:	NJDEP
	Hazard(s):	All Hazards
	Qualified borrowers receive loans in two equal parts: Approximately one half to three quarters comes from a 0-percent interest State Revolving Fund maintained by the NJDEP. The other portion comes from proceeds of highly rated tax-exempt revenue bonds sold by the Trust. Combining these two funds results in a loan that is 50 to 75 percent lower than traditional loan rates.	
New Jersey Small Cities Communities Development Block Grants	Responsible Agency:	NJDCA
	Hazard(s):	All Hazards
	The New Jersey Small Cities Communities Development Block Grants provide funds for economic development, housing rehabilitation, community revitalization, and public facilities designated to benefit people with low and moderate incomes or to address recent local needs for which no other source of funding is available to non-entitlement counties and municipalities. Information on the program is available on the website: https://www.nj.gov/dca/divisions/dhcr/offices/neighborhood.html.	
New Jersey Conservation Foundation	Responsible Agency:	New Jersey Conservation Foundation
	Hazard(s):	All Hazards
	The New Jersey Conservation Foundation is a private, not-for-profit organization. Through acquisition and stewardship, the Foundation protects strategic lands, promotes strong land use policies, and forges partnerships to achieve conservation goals. Grants are used to help fund preservation activities. Information on the program is available on the website: https://www.njconservation.org/what-we-do/.	
The New Jersey Infrastructure Bank	Responsible Agency:	NJDEP
	Hazard(s):	All Hazards

Capability	Details	
	The New Jersey Infrastructure Bank is an independent state financing authority responsible for providing and administering low interest rate loans to qualified municipalities, counties, regional authorities, and water purveyors in New Jersey. Two programs provide and administer low interest rate loans to qualified municipalities, counties, regional authorities, and water purveyors in New Jersey. Approximately $350 million is awarded annually. 1. New Jersey Environmental Infrastructure Trust for the purpose of financing water quality infrastructure projects that enhance ground and surface water resources, ensure the safety of drinking water supplies, protect the public health, and make possible responsible and sustainable economic development. 2. The New Jersey Transportation Infrastructure Bank is an independent state financing authority responsible for providing and administering low interest rate loans to qualified municipalities, counties, and regional authorities in New Jersey for the purpose of financing transportation quality infrastructure projects. The New Jersey Infrastructure Bank provides principal forgiveness opportunities and better financing packages for those projects that implement climate change resilience measures. Information on the program is available on the website: https://www.njib.gov/.	
Drinking Water State Revolving Fund	Responsible Agency:	NJDEP
	Hazard(s):	Flood, Drought
	The Drinking Water State Revolving Fund program assists water systems in financing the cost of infrastructure through the use of federal and New Jersey Infrastructure Trust funds. Additionally, the Water Supply program provides operator licensing and training support as well as financial assistance through the Fund. Information on the program is available on the website: https://www.state.nj.us/dep/watersupply/dws_loans.html.	
New Jersey Department of Transportation (NJDOT) Local Aid and Economic Development	Responsible Agency:	NJDOT
	Hazard(s):	All Hazards
	NJDOT is committed to advancing projects that enhance safety, renew the aging infrastructure and the state's economy and support new transportation opportunities. The Transportation Trust Fund provides the opportunity for state assistance to local governments for the funding of road, bridge, and other transportation projects. Annually, the Transportation Trust Fund provides $400 million in state aid to municipalities and counties for local transportation improvements. In addition, several programs which provide funding to counties and municipalities are funded with federal monies available through the Transportation Equity Act for the 21st Century (TEA 21) legislation. Information on the program is available on the website: https://www.state.nj.us/transportation/business/localaid/funding.shtm.	
Environmental Aid Act (NJSA 13:1H – 1 to 7) Office of Environmental Services Matching Grants Program for Local Environmental Agencies (N.J.A.C.7:5)	Responsible Agency:	NJDEP Office of Environmental Services
	Hazard:	Natural Hazards
	State aid may be granted by the department to a local environmental agency for any activity that the agency is authorized to perform by law and for the preparation of an environmental index. An environmental index shall be a report on environmental conditions within the locality and community objectives concerning open areas, parks, water supply, solid waste, wildlife protection, soil resources, air pollution, water pollution, and other related issues. The department may provide technical	

Capability	Details	
	assistance in addition to (or in lieu of) state aid to any local environmental agency for the purpose indicated in this act. The purpose of the funding dedicated under this act is to assist local environmental commissions and soil conservation districts with funding for a variety of local environmental projects, including community education projects; environmental resource inventories; beach monitoring and management projects; environmental trail designs; lake rehabilitation studies; stream and water quality testing; wellhead delineation; GIS mapping projects; National Environmental Performance Partnership System indicator projects; and surveys of threatened and endangered species. The maximum annual grant is $2,500. Applicants must match at least 50 percent of the total cost of the project (NJDEP n.d.). Projects funded by this grant are reported online. Examples of mitigation projects that have been funded in the past include Waterways Beach Monitoring and Management Strategy, Dune Project, Beach Protection and Storm Drainage Plan, Beach Storm Water Drainage Analysis, Stream Corridor/Greenway Protection Plan, Shoreline Bioengineering Demonstration and Outreach Project, Stream, and the Pamphlet/Education Project.	
Sewage Infrastructure Improvement Act Grants (N.J.A.C.7:22)	Responsible Agency:	NJDEP
	Hazard(s):	Flood
	New Jersey Sewage Infrastructure Improvement Act establishes comprehensive requirements for NJDEP and municipalities/authorities to address combined sewer overflows and stormwater management. NJDEP issues permits and provides below-market interest rate loans through the Environmental Infrastructure Financing Program to municipalities for capital improvements that improve water quality. To prioritize wastewater projects under the Environmental Infrastructure Financing Program, projects are ranked to address higher state priorities or high-water quality problems or improvements.	
Water Pollution Control Quality Act (NJSA 58:10A-1 to 60) Water Quality Management Planning Rules (N.J.A.C.7:15)	Responsible Agency:	NJDEP
	Hazard(s):	Flood
	This Act phased out the Construction Grants Program and required states to establish a State Revolving Fund Loan Program. The last year in which construction grants were made available for new projects in New Jersey was 1989. Grant awards are available currently to cover increased allowable costs for projects that previously received a construction grant. The rules serve two basic functions: (1) to establish the Department's general regulatory framework for water quality planning and (2) to supplement other Department rules pertaining to wastewater management. This Act is implemented through a number of regulations and programs throughout NJDEP, including but not limited to Freshwater Wetlands Protection Act (NJAC 7:7A), Stormwater Management (NJAC 7:8), Water Pollution Control (NJAC 7:9), Surface Water Quality Standards (NJAC 7:9B), Safe Drinking Water Act (NJAC 7:10), Flood Hazard Control Act (NJAC 7:13), Pollutant Discharge Elimination System (NJAC 7:14A), and Water Quality Management (NJAC 7:15). Through these rules, NJDEP regulates development location and intensity of uses, protects floodplain capacity and riparian buffers, funds restoration of lakes and streams, and funds infrastructure improvements that primarily provide environmental health. Secondarily, the rules allow NJDEP to provide mitigation in the form of reduced losses due to infrastructure failure. Wastewater Management Plans (WMP) are	

Capability	Details	
	integral components of area-wide Water Quality Management Plans. WMPs are the vehicle through which the continuing planning process integrates local and regional planning into the area-wide Water Quality Management Plans.	
New Jersey Department of Environmental Protection: WRM, Municipal Finance and Construction Element New Jersey Environmental Infrastructure Financing Program	Responsible Agency:	NJDEP
	Hazard(s):	Drought, Flood
	The New Jersey Environmental Infrastructure Financing Program is a revolving loan program for the construction of drinking water facilities, wastewater treatment facilities, sludge management systems, combined sewer overflow abatement, stormwater, and other non-point source management projects. The program also offers funding to publicly and privately-owned drinking water systems for the construction or upgrade of drinking water facilities, transmission and distribution systems, storage facilities, and source development. The Program also offers a disaster relief fund that will be able to provide short-term or bridge loans to entities that are in need of an upfront cash flow.	
New Jersey Turnpike Authority: Capital Program	Responsible Agency:	New Jersey Turnpike Authority
	Hazard(s):	Wildfire, Severe Storm
	The New Jersey Turnpike Authority (Authority) is dedicated to the safe and efficient movement of people and goods over two of the busiest toll roads in the United States – the New Jersey Turnpike and the Garden State Parkway. The Authority's highways are a critical link in the transportation network of the Northeast Corridor. Under the current 10-year, $7 billion capital program adopted in 2008, the Authority has expanded capacity, repaired deteriorating bridges, reconfigured entrance and exit ramps, improved maintenance yards and toll plazas, and expanded the use of technology for collecting and communicating information about roadway conditions. Under this capital program, the following projects have been advanced addressing hazard mitigation: Bridge Security Program, Forest Fire Prevention, Roadside Weather Information System (RWIS), Coastal Evacuation. Through the Asset Management Program, the Turnpike Authority invests approximately $50 million annually on drainage-related projects to better equip the Authority's roadways in response to major rainfall events.	
New Jersey Department of Transportation (NJDOT): Local Aid and Economic Development	Responsible Agency:	NJDOT
	Hazard(s):	Food
	NJDOT is committed to advancing transportation projects that enhance safety, renew aging infrastructure, and support new transportation opportunities at the county and municipal level. The Transportation Trust Fund and the Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFE-TEA) legislation provide the opportunity for funding assistance to local governments for road, bridge, and other transportation projects. NJDOT has established several local aid programs that provide financial support to counties and municipalities for capital improvements to transportation infrastructure.	
New Jersey Funding Navigator Program	Responsible Agency:	New Jersey Future
	Hazard(s):	Flood
	NJF's Funding Navigator Program is a nonprofit statewide program committed to helping localities access funding for drinking water, wastewater, and stormwater needs. This program connects communities, municipalities, and water systems with the funding and support they need, whether by assessing problems and identifying solutions or by connecting them to free technical assistance providers. Information on the program is available on the website: https://www.njfuture.org/new-jersey-funding-navigator/.	
	Responsible Agency:	NJDEP

Capability	Details	
Coastal Engineering and Restoration Projects	Hazard(s):	Coastal Erosion, Flood
	Funding for coastal engineering and restoration projects is available from a variety of state funding sources, including: • Coastal Engineering • Coastal and Land Use Enforcement • Dam Safety • Flood Control • Land Resource Protection • Resilience Engineering and Construction • Tidelands	

16.4.3 County and Regional Fiscal Capabilities

This section summarizes the fiscal capabilities available to Essex County, at the county level.

Essex County Recreation and Open Space Trust Fund

The Essex County Recreation and Open Space Trust Fund can be used for:

- Acquisition of lands for recreation and conservation purposes.
- Development of lands acquired for recreation and conservation purposes.
- Maintenance of lands acquired for recreation and conservation purposes.
- Acquisition of farmland for farmland preservation purposes.
- Historic preservation of historic properties, structures, facilities, sites, areas or objects, and the acquisition of such properties, structures, facilities, sites, areas or objects for historic preservation purposes.

16.5 Local Capability Assessment

All participating jurisdictions compiled an inventory and analysis of existing authorities and capabilities called a capability assessment. A capability assessment creates an inventory of a jurisdiction's mission, programs, and policies, and evaluates its capacity to carry them out. This assessment identifies potential gaps in the jurisdiction's capabilities.

The Planning Partnership views all core jurisdictional capabilities as fully adaptable to meet a jurisdiction's needs. Every code can be amended, and every plan can be updated. Such adaptability is itself considered to be an overarching capability. If the capability assessment identified an opportunity to add a missing core capability or expand an existing one, then doing so has been selected as an action in the jurisdiction's action plan, which is included in the individual annexes presented in Volume 2 of this plan.

Capability assessments for each planning partner are presented in the jurisdictional annexes in Volume 2. The sections below describe the specific capabilities evaluated under the assessment.

16.5.1 Planning and Regulatory Capabilities and Integration

Jurisdictions can develop policies and programs and implement rules and regulations to protect and serve residents. Local policies are typically identified in a variety of community plans, implemented via a local ordinance, and enforced through a governmental body.

Jurisdictions regulate land use through the adoption and enforcement of zoning, subdivision and land development ordinances, building codes, building permit ordinances, floodplain ordinances, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation.

16.5.2 Administrative and Technical Capabilities

Legal, regulatory, and fiscal capabilities provide the backbone for successfully developing a mitigation strategy; however, without appropriate personnel, the strategy may not be implemented. Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers and scientists, as well as personnel with capabilities that may be found in multiple departments, such as grant writers.

16.5.3 Development and Permitting Capabilities

Identifying previous and future development trends is achieved through a comprehensive review of permitting procedures and the identification of growth since completion of the previous plan and in anticipation of future development. Tracking previous and future growth in potential hazard areas provides an overview of increased exposure to a hazard within a community.

16.5.4 Fiscal Capabilities

Assessing a jurisdiction's fiscal capability provides an understanding of the ability to fulfill the financial needs associated with hazard mitigation projects. This assessment identifies both outside resources, such as grant-funding eligibility, and local jurisdictional authority to generate internal financial capability, such as through impact fees.

16.5.5 Education and Outreach Capabilities

Regular engagement with the public on issues regarding hazard mitigation provides an opportunity to directly interface with community members. Assessing this outreach and education capability illustrates the connection between the government and community members, which opens a two-way dialogue that can result in a more resilient community based on education and public engagement.

16.5.6 Floodplain Administration Capabilities

Local Plan Requirement C2—44 CFR Part 201.6(c)(3)(ii)

The plan shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements.

Flooding is the costliest natural hazard in the United States and, with the promulgation of recent federal regulation, homeowners throughout the country are experiencing increasingly high flood insurance premiums. Community participation in the NFIP provides an opportunity for additional grant funding associated specifically with flooding issues. Assessment of the jurisdiction's current NFIP status and compliance provides planners with a greater understanding of the local flood management program, opportunities for improvement, and available grant funding opportunities.

All municipalities in Essex County participate in the NFIP. The Community Classifications section in the jurisdictional annexes also provides information on participation in the Community Rating System (CRS) for communities that exceed the requirements of the NFIP. The Township of Fairfield (Class 6) is current the only CRS participant in Essex County.

16.5.7 Community Classifications

Other programs, such as the Community Rating System, NWS StormReady® Program, and Firewise USA®, enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs indicate a jurisdiction's desire to go beyond minimum requirements set forth by local, state, and federal regulations to create a more resilient community. These programs complement each other by focusing on communication, mitigation, and community preparedness to save lives and minimize the impact of natural hazards on a community.

16.5.8 Adaptive Capacity

An adaptive capacity assessment evaluates a jurisdiction's ability to anticipate impacts from future conditions. By looking at public support, technical adaptive capacity, and other factors, jurisdictions identify their core capability for resilience against changing conditions.

16.5.9 Capability Assessment Summary

Each jurisdictions capabilities were reviewed to determine their overall effectiveness in reducing hazard risks. Hazard capability effectiveness was rated for each hazard of concern using the following classifications:

- Strong: Various capabilities to reduce risk are actively used.
- Moderate: Capabilities may exist, but additional capabilities or improvements are needed to reduce risk.
- Weak: Capabilities to reduce risk do not exist or could use substantial improvement.

16.5.10 Opportunities to Improve Capabilities and Integration

Local Plan Requirement C1—44 CFR Part 201.6(c)(3)

The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.

Local hazard mitigation plans are required to document each jurisdiction's ability to expand on and improve existing policies and programs. For this plan, all planning partners reviewed their existing capabilities through the jurisdictional annex process (see Volume 2) and developed mitigation actions to address identified gaps in their capabilities or to expand on or improve existing capabilities.

16.6 Plan Integration

16.6.1 Current Integration

The assessment identified areas where the previous mitigation plan is currently integrated into other plans and programs. This includes transportation plans, local master plans, and emergency operation plans. Current integration is documented in the review of planning and regulatory capabilities sections of the annexes. The County will aim to update and maintain this integration using the updated HMP.

16.6.2 Future Integration

The assessment looked for opportunities to integrate this mitigation plan with the legal/regulatory capabilities identified. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. Planning partners considered actions to implement this integration as described in their jurisdictional annexes.

Future integration opportunities included using the information from the HMP to develop Substantial Damage Management Plans and Watershed Improvement Plans for each municipality in Essex County.

17 Mitigation Strategy

17.1 Review of Previous Mitigation Actions

Local Plan Requirement E2 – 44 CFR Part 201.6(d)(3)

The plan must document how the plan was reviewed and revised to document changes in development, progress in mitigation efforts, and changes in priorities.

For the 2025 HMP update, the actions were reviewed by the Planning Partners. For each action in their previous mitigation strategy, the Planning Partners provided a status update using the guidance below:

- No Progress – The mitigation action has not been completed, and evaluated if still a priority to address the identified risk.
- In Progress – Implementation of the mitigation action has begun but has not been completed. The action is included in the 2025 HMP update.
- Ongoing Capability – The mitigation action has been implemented and will be completed on an annual or regular basis (for example, maintenance activities, annual outreach, etc.). These actions were removed from the updated mitigation strategy and included as capabilities in the 2025 HMP update.
- Completed – The mitigation action has been fully implemented and was removed from the updated mitigation strategy.

Actions that were in progress or had no progress were evaluated to determine if they should be discontinued or included in the 2025 HMP update. Reasons for discontinuing an action include that the action has been evaluated as being duplicative, impractical, unfeasible, or undesirable, or if the problem that the action was originally developed for is no longer present. Actions that were identified for inclusion in the updated mitigation strategy received additional evaluation to determine if the action should be revised to reflect any new information obtained as part of the plan update process (for example, changes in risk, capabilities, lead agency, or available funding sources).

17.1.1 Mitigation Accomplishments Since 2010

Essex County first developed a Hazard Mitigation Plan in 2010. Since that time, the County has completed 3 updates. Major efforts have been made to establish backup power for critical infrastructure, improve outreach, and address stormwater issues. Discussion of mitigation accomplishments in each municipality is discussed in the municipal annexes in Volume II.

17.2 Mitigation Goals and Objectives

Local Plan Requirement C3 – 44 CFR Part 201.6(c)(3)(i)

The mitigation strategy must include a description of mitigation goals to reduce or avoid long-term vulnerabilities to identified hazards.

Mitigation goals represent broad statements that are consistent with the hazards identified in the HMP and achieved through the implementation of specific mitigation actions. Mitigation objectives are defined, short-term, measurable efforts that lead to achieving an overall goal. Mitigation goals and objectives provide the guidance for the development of the mitigation actions. The Steering Committee established a set of goals for the Essex HMP Update that were based on the effectiveness of the goals from the previous plan.

Table 17-1. Previous HMP Mitigation Goals

Number	Description	Objectives
1	Protect Life	Objective 1.1: Improve warning and emergency communication systems.
		Objective 1.2: Reduce the impacts of hazards on people, property, and vulnerable populations.
		Objective 1.3: Integrate the hazard mitigation plan into existing county and local planning, building, codes, ordinances, and enforcement.
2	Protect Property	Objective 2.1: Protect and increase resilience of critical facilities and lifelines to reduce disruption of essential activities during and after a hazard event.
		Objective 2.2: Reduce repetitive and severe repetitive losses.
		Objective 2.3: Protect environmental resources that serve a natural hazard mitigation function.
		Objective 2.4: Encourage cost-effective and environmentally-sound development and land use by incorporating green infrastructure.
3	Increase Public Preparedness and Awareness	Objective 3.1: Enhance and implement public education and outreach programs to increase awareness of hazard risks.
		Objective 3.2: Improve hazard information databases and maps and increase accessibility to those resources.
		Objective 3.3: Provide stakeholder training on mitigation and resilience-related topics to support the identification and implementation of projects and access to funding.
		Objective 3.4: Improve education of public officials, stakeholders, and the general public regarding the impacts of future conditions, sea level rise, and climate change on people, property, transportation assets, and the economy.
4	Increase the Understanding and Awareness of Risks from Hazards	Objective 4.1: Review and incorporate updated hazard data into the County Hazard Mitigation Plan and other county and local planning mechanisms.
		Objective 4.2: Increase support for the development of local mitigation planning and projects.
		Objective 4.3: Incorporate new State and FEMA guidance, rules and regulations into the Plan.
		Objective 4.4: Strengthen understanding of, and adaptation to, a changing climate.
5	Enhance County and Local Mitigation	Objective 5.1: Implement and monitor the progress of on-going mitigation activities within the County.

Number	Description	Objectives
	Capabilities to Reduce Hazard Vulnerabilities	Objective 5.2: Encourage and support additional related training and education of public officials.
		Objective 5.3: Encourage the formation of partnerships to leverage and share mitigation resources.
		Objective 5.4: Integrate the County Hazard Mitigation Plan with other county, regional and local planning initiatives.
6	Support Continuity of Operations Pre-, During and Post-Hazard Events	Objective 6.1: Ensure continuity of operations of essential county government services through training, planning and implementation of mitigation strategies.
		Objective 6.2: Increase resiliency by facilitating rapid disaster recovery ensuring that post-disaster efforts incorporate mitigation and adaptation strategies to minimize future losses.
		Objective 6.3: Support and encourage the implementation of alternative and sustainable energy sources.

The Steering Committee reviewed the goals from the previous HMP and the updated State of New Jersey 2024 All-Hazard Mitigation Plan and identified the following opportunities for modifications:

- Goal 4 could be updated to focus on climate change.
- A new Goal 7 could be added to focus on reducing risk of natural hazards for socially vulnerable populations and underserved communities.

The updated goals for the Essex HMP Update are presented in Table 17-2.

Table 17-2. Updated Mitigation Goals

Number	Description	Objectives
1	Protect Life	Objective 1.1: Improve warning and emergency communication systems.
		Objective 1.2: Reduce the impacts of hazards on people, property, and vulnerable populations.
		Objective 1.3: Integrate the hazard mitigation plan into existing county and local planning, building, codes, ordinances, and enforcement.
2	Protect Property	Objective 2.1: Protect and increase resilience of critical facilities and lifelines to reduce disruption of essential activities during and after a hazard event.
		Objective 2.2: Reduce repetitive and severe repetitive losses.
		Objective 2.3: Protect environmental resources that serve a natural hazard mitigation function.
		Objective 2.4: Encourage cost-effective and environmentally-sound development and land use by incorporating green infrastructure.
3	Increase Public Preparedness and Awareness	Objective 3.1: Enhance and implement public education and outreach programs to increase awareness of hazard risks.
		Objective 3.2: Improve hazard information databases and maps and increase accessibility to those resources.
		Objective 3.3: Provide stakeholder training on mitigation and resilience-related topics to support the identification and implementation of projects and access to funding.
4	*REVISED* Develop and Maintain an Understanding of	Objective 4.1: Review and incorporate updated hazard data into the County Hazard Mitigation Plan and other county and local planning mechanisms.
		Objective 4.2: Increase support for the development of local mitigation planning and projects.

Number	Description	Objectives
	Increased Risk from Climate Change Impacts to Natural Hazards	Objective 4.3: Incorporate new State and FEMA guidance, rules and regulations into the Plan.
		Objective 4.4: Strengthen understanding of, and adaptation to, a changing climate.
		Objective 4.5: Improve education of public officials, stakeholders, and the general public regarding the impacts of future conditions, sea level rise, and climate change on people, property, transportation assets, and the economy.
5	Enhance County and Local Mitigation Capabilities to Reduce Hazard Vulnerabilities	Objective 5.1: Implement and monitor the progress of on-going mitigation activities within the County.
		Objective 5.2: Encourage and support additional related training and education of public officials.
		Objective 5.3: Encourage the formation of partnerships to leverage and share mitigation resources.
		Objective 5.4: Integrate the County Hazard Mitigation Plan with other county, regional and local planning initiatives.
6	Support Continuity of Operations Pre-, During and Post-Hazard Events	Objective 6.1: Ensure continuity of operations of essential county government services through training, planning and implementation of mitigation strategies.
		Objective 6.2: Increase resiliency by facilitating rapid disaster recovery ensuring that post-disaster efforts incorporate mitigation and adaptation strategies to minimize future losses.
		Objective 6.3: Support and encourage the implementation of alternative and sustainable energy sources.
7	*NEW* Reduce the Risk of Natural Hazards for Socially Vulnerable Populations and Underserved Communities	Objective 7.1: Work with communities to identify the impacts of hazards on socially vulnerable populations
		Objective 7.2: Ensure hazard mitigation planning includes and is responsive to the entire community
		Objective 7.3: Direct resources to build capability in lower-resourced communities

Goals are directly linked to the mitigation actions identified in each jurisdictional annex in Volume II.

17.3 Mitigation Alternatives

Local Plan Requirement C3 – 44 CFR Part 201.6(c)(3)(ii)

The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effect of each hazard, with particular emphasis on new and existing buildings and infrastructure.

A range of potential mitigation opportunities is included in each hazard risk assessment (refer to Sections 6 through 14). The potential actions are categorized by:

- Who may implement the action:
    - Community scale (individuals or groups)
    - Organizational scale (businesses, non-profits, community-based organizations)
    - Government scale (any government agency that has permit authorities and police powers within the planning area)

- What the alternative would do:
    - Manipulate the hazard (actions to prevent hazard events from occurring)
    - Reduce exposure and vulnerability (actions to safeguard people, property, and the environment from the impacts of the hazard)
    - Build local capacity (actions to improve abilities to mitigate and respond to hazard events)
    - Use nature-based solutions (actions that use green solutions to mitigate the hazard and provide additional environmental services)

17.4 Developing Mitigation Actions

Local Plan Requirement C3 – 44 CFR Part 201.6(c)(3)(ii)	Local Plan Requirement C3 – 44 CFR Part 201.6(c)(3)(iii)
The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effect of each hazard, with particular emphasis on new and existing buildings and infrastructure.	***The hazard mitigation strategy shall include an action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction.***

Each jurisdiction reviewed the results of the risk and capability assessments, previous mitigation strategy, mitigation goals, catalogs of mitigation alternatives and selected actions to be included in their mitigation strategy in their jurisdictional annexes.

17.5 Prioritizing Mitigation Actions

Local Plan Requirement E2 – 44 CFR Part 201.6(d)(3)	Local Plan Requirement C3 – 44 CFR Part 201.6(c)(3)(iii)
The plan must document how the plan was reviewed and revised to document changes in development, progress in mitigation efforts, and changes in priorities.	***The hazard mitigation strategy shall include an action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction.***

The previous plan prioritized actions based on a modified STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) mitigation action evaluation methodology based on a set of evaluation criteria suited to the purposes of hazard mitigation strategy evaluation. This method provides a systematic approach that considers the opportunities and constraints of implementing a specific mitigation action.

Actions recommended in this 2025 update were reviewed and scored using an updated modified STAPLEE mitigation action methodology used in the 2024 New Jersey State Hazard Mitigation Plan. The updated methodology, called the Mitigation Action Prioritization Tool (MAP-T), removed redundancies, highlighted the State of New Jersey's mitigation priorities, and aligned prioritization with HMA grant program guidance. Some criteria were not changed, but additions to their definitions have expanded the scope of the individual

criterion. The following list describes the substantial changes to the STAPLEE methodology that have been adopted into the MAP-T:

- The "technical" criterion was eliminated as only technically feasible actions are included in the mitigation strategy. Actions lacking technical feasibility will be identified and removed from the mitigation strategy prior to prioritization.
- A fiscal criterion was added to gauge if the action is likely to have available funding.
- The social criterion has been modified to consider the benefits and potential negative impacts to socially vulnerable populations and underserved communities.
- A hazards of concern criterion was added to note if the action addresses a high-ranked hazard(s).
- A timeline criterion was added to identify if the action can be completed within the plan effectiveness period (five years).
- A community lifelines criterion was added to note if the action benefits a community lifeline.
- An optional recovery criterion was established that can be added following a disaster event to identify if the action aligns with the current disaster recovery funding sources (Hazard Mitigation Grant Program [HMGP], etc.) and disaster recovery needs. The scoring of the recovery criterion can also be updated when existing funding sources have modified eligibility requirements/areas of focus, when new funding sources are established, and when emerging disaster recovery needs based on communities impacted are identified. This will allow the prioritization of actions to be aligned with available funding and disaster recovery needs.

The Planning Partnership was asked to use these criteria to assist them in evaluating and prioritizing mitigation actions. Specifically, for each mitigation action, agencies were asked to assign a numeric rank (-1, 0, or 1) for each of the 15 evaluation criteria, defined as follows:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

The numerical results of this exercise were then used to help prioritize the action or strategy as Low, Medium, or High based on the following totals for numeric ranks:

- 0 – 6 = Low
- 7 – 11 = Medium
- 11 – 14 = High

Actions that resulted in a low prioritization were re-evaluated to determine if alternative approaches to the problem could perform better in the MAP-T prioritization evaluation. While the MAP-T provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, agencies may have additional considerations that could influence their overall prioritization of mitigation actions.

Table 17-3. Mitigation Action Prioritization Tool (MAP-T)

Criteria	Description	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric when appropriate
Life Safety	How effective will the action be at protecting lives and preventing injuries? Will the proposed action adversely affect one segment of the population?		
Property Protection	How significant will the action be at eliminating or reducing damage to structures and infrastructure? Developing in the floodplain or high-risk areas?		
Cost-Effectiveness	Are the costs to implement the action commensurate with the benefits achieved?		
Political	Is there overall public support for the action? Is there the political will to support it? Is the action at odds with development pressures?		
Legal	Does the jurisdiction have the authority to implement the action?		
Fiscal	Can the action be funded under existing program budgets (i.e., is this initiative currently budgeted for)? Or would it require a new budget authorization or funding from another source such as grants?		
Environmental	What are the potential environmental impacts of the action? Will it comply with environmental regulations? Are there co-benefits of this action?		
Social Vulnerability	Does the action benefit socially vulnerable populations and underserved communities? Additional considerations can include the SVI index and other appropriate measures of social vulnerability.		
Administrative	Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary? Does the scale and scope of the project align with the jurisdiction's capabilities?		
Hazards of Concern	Does the action address one or more of the jurisdiction's high-ranked hazards?		
Climate Change	Does the action incorporate climate change projections for the County? Is the action designed to withstand/address long-term conditions? Is the action consistent with the County/State's climate resilience goals?		
Timeline	Can the action be completed in less than 5 years (within the planning horizon of the HMP)?		
Community Lifelines	Does this project benefit community lifelines?		

Criteria	Description	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric when appropriate
Other State and Local Objectives	Does the action advance other jurisdictional objectives, such as capital improvements, economic development, environmental quality, or open-space preservation? Does it support the policies of other plans and programs?		
Total			
Priority (High/Medium/ Low)			

17.6 Mitigation Action Categorization

The identified mitigation actions are classified by the following action types.

17.6.1 Prevention

Preventive activities are intended to keep hazard problems from getting worse and are typically administered through programs or regulatory actions that influence the way land is developed and assets are built. In the context of this plan, prevention measures also include security initiatives. Prevention measures are particularly effective in reducing a jurisdiction's future vulnerability, especially in areas where development has not occurred, or capital improvements have not been substantial. Examples of preventive activities include:

- Planning and zoning
- Open space preservation
- Floodplain regulations
- Stormwater management regulations
- Drainage system maintenance
- Capital improvement programs
- Riverine / fault zone setbacks
- Security measures

17.6.2 Property Protection

Property protection activities involve the modification of existing buildings, assets, and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Acquisition
- Relocation
- Asset and building elevation
- Structural retrofitting

- Safe rooms, shutters, shatter-resistant glass

17.6.3 Public Education and Awareness

Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach projects
- Speaker series and demonstration events
- Hazard map information
- Library materials
- School-age educational programs
- Hazard expositions
- Social media campaigns

17.6.4 Natural Resource Protection

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, and steep slopes:

- Floodplain protection
- Watershed management
- Riparian buffers
- Habitat preservation
- Erosion and sediment control
- Wetland preservation and restoration
- Slope stabilization
- Forest and vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- Green infrastructure

17.6.5 Emergency Services

Although not typically considered a "mitigation" technique, emergency service activities do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning and communication systems
- First Responder Interoperability
- Evacuation planning and management
- Emergency response training and exercises
- Sandbagging for flood protection

17.6.6 Structural Projects

Structural mitigation activities are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by jurisdiction staff. Examples include:

- Reservoirs
- Dams, levees, dikes, and floodwalls
- Culvert placement and maintenance
- Diversions, detention, retention
- Channel modification
- Stormwater infrastructure expansion
- Water and sewer infrastructure improvements

17.6.7 Climate Resiliency

Climate resiliency actions incorporate methods to mitigate or adapt to the impacts of the changing climate. Examples include:

- Aquifer storage and recovery
- Incorporating future conditions projections in planning and project design
- Actions that specifically address climate change risks such as drought and extreme heat

17.6.8 Community Capacity Building

These actions increase local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences of hazards. Examples include:

- Staff training
- Memorandums of understanding
- Development of plans and studies
- Monitoring programs
- Mutual Aid Agreements

18 Maintaining the Hazard Mitigation Plan

18.1 Integrating the Plan

Local Plan Requirement D3 – 44 CFR Part 201.6(c)(4)(ii)

The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

The Planning Partners will integrate this hazard mitigation plan into relevant decision-making processes, plans, or mechanisms, where feasible. This includes integrating the requirements of the hazard mitigation plan into other planning documents, processes, or mechanisms, such as strategic planning initiatives, master plans, local capital improvement plans, stormwater plans, emergency operation plans, and other future plans. Opportunities to integrate the requirements of this plan into other planning mechanisms shall continue to be identified through future planning efforts. The Planning Partnership outlined the following mechanisms underway and under consideration:

- Using information from the hazard mitigation plan to develop Substantial Damage Response Plans and Watershed Improvement Plans.
- Ensuring that the goals and mitigation actions of new and updated local planning documents are consistent, or do not conflict with, the goals and actions of the hazard mitigation plan, and will not contribute to increased hazard vulnerability in the planning area.
- Integration of the hazard mitigation plan will be considered on a case-by-case basis and identified at the onset of plan development.
- Integration of the hazard mitigation plan into the capital improvement program scoring criteria (e.g., does the project advance mitigation) will be implemented if deemed feasible.

In recognition of the critical need for climate science to inform land use planning, on February 4, 2021, Governor Phil Murphy signed into law P.L. 2021, c6. This law requires municipalities to incorporate a climate change-related hazard vulnerability assessment into any Master Plan Land Use Element adopted after the signing. According to the amended law, these vulnerability assessments must rely on the most recent natural hazard projections and best available science provided by the New Jersey Department of Environmental Protection (NJDEP). They must analyze current and future threats to, and vulnerabilities of, the municipality associated with climate change-related natural hazards, including but not limited to increased temperatures, drought, flooding, hurricanes, and sea level rise (NJOEM 2024). It is anticipated that this law will result in better integration of the HMP into local master plans.

18.2 Implementing the Hazard Mitigation Plan Through Existing Programs

To successfully reduce future losses, implementing the actions within this plan is highly recommended. The Planning Partners involved a wide range of staff in the plan development process and many departments, divisions, or other partners participating in the Plan are responsible for implementing specific

mitigation actions identified by each jurisdiction. Every proposed action listed in the mitigation action plan is assigned to a specific "lead" department or partner in order to assign responsibility and accountability and increase the likelihood of implementation.

In addition to the assignment of a local lead department or partner, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. The Planning Partners will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, specific potential funding sources have been identified for proposed actions listed in the mitigation action plan.

The Planning Partnership will meet once per year during the five-year performance period of this Plan. This frequency of meeting will also assist in implementation tracking, as meetings will be coordinated with the strategic planning process. A key agenda item will be to determine which actions are being implemented by members of the Planning Partnership and potentially where technical assistance may be needed to advance action implementation.

18.3 Ongoing Public Involvement

Local Plan Requirement D1 – 44 CFR Part 201.6(c)(4)(iii)

The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

Public participation is an integral component to the mitigation planning process and will continue to be essential as this plan evolves over time. Public involvement procedures were reviewed as part of the 2025 Plan development process. As described above, significant changes or amendments to the plan shall require an opportunity for public comment prior to any adoption procedures by the Planning Partners. In addition, the Planning Partners intend to regularly post information about hazard and risk assessment on their communication channels (e.g., social media, webpages, etc.). These efforts are led by the Essex County Sheriff's Office. The County also maintains a hazard mitigation planning website that can be used to provide updates and post the most current version of the plan:

https://www.essexsheriff.com/oem/all-hazard-mitigation-plan/

By keeping the plan available on the County website with an invitation and instructions on providing feedback, public access and awareness will be maintained on a continuous basis. Public comment opportunities will be provided during any process to revise or update the plan, prior to jurisdictional approval and/or adoption. Other efforts to involve the public in the maintenance, monitoring, evaluation, and revision process will be made as necessary. These efforts may include the following:

- Posting minutes from Planning Partnership meetings to the County hazard mitigation website
- Utilizing available Planning Partner communication channels to update the public on any maintenance and/or periodic review activities taking place

- Keeping a current version on the hazard mitigation plan at Planning Partner facilities and on the County webpage

Additionally, continued public involvement will be accomplished through implementation of mitigation actions. This includes locally identified mitigation actions to enhance and expand outreach and a County mitigation action to identify education and outreach needs for emerging socially vulnerable populations and underserved communities.

18.4 Monitoring the Plan

Local Plan Requirement D2 – 44 CFR Part 201.6(c)(4)(i)

The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year-cycle.

Periodic revisions and updates of the Plan are required to ensure that the goals of the Plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable federal and state regulations. Periodic monitoring and evaluation of the plan will also ensure that specific mitigation actions are being reviewed and carried out according to the mitigation action plan. Monitoring refers to tracking the implementation of the plan over time. Evaluating refers to assessing the overall effectiveness of the plan intent and goals.

The Planning Partnership shall meet once annually at the June quarterly meeting of the Essex County Municipal OEM coordinators to monitor and evaluate the progress attained and to revise, where needed, the activities set forth in the plan. The Essex County Sheriff's Office will be responsible for reconvening the Planning Partnership for these reviews.

The annual meetings provide the Planning Partnership with an opportunity to perform the following:

- Review plan goals
- Document hazard occurrences that occurred during the prior year and their impacts on the planning area
- Document mitigation action implementation or status
- Evaluate the mitigation actions that have been successful
- Discuss why mitigation actions were not completed
- Revise the action plan if new timelines need to be established for projects (e.g., changing a long-term project to a short-term project due to funding availability)
- Consider recommendations for new mitigation projects
- Review new funding options, including grant opportunities, and determine if contract grant-writing support is needed to pursue the opportunities
- Document potential losses avoided due to the implementation of specific mitigation measures or other planning programs, if feasible

- Identify any new or additional vulnerabilities that may be faced by the County and may need to be addressed in a future update of this plan
- Update the hazard mapping and impact tool to reflect new or revised hazard data

Any findings or recommendations made during the annual review shall be documented in the form of a memo that can be shared with the governing bodies of the participating jurisdictions and interested stakeholders, including the public, through the County's website. Further, mitigation action progress can be monitored (i.e., tracked) using the Annual Progress Report template provided in Appendix G (Plan Maintenance Tools). The Planning Partnership will also meet following any disaster event warranting a reexamination of the mitigation actions being implemented or proposed for future implementation. This will ensure that the plan is continuously updated to reflect changing conditions and needs within the County.

18.5 Updating the Plan

18.5.1 Updating

Local Plan Requirement D2 – 44 CFR Part 201.6(c)(4)(i)

The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

The Essex County HMP will be thoroughly reviewed by the Planning Partnership every five years in alignment with federal regulations to ensure its consistency with these requirements. This update is also used to determine whether there have been any significant changes in the planning area that may, in turn, necessitate changes in the types of mitigation actions proposed, goals, or priorities. New development in identified hazard areas, an increased exposure to hazards, an increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the necessary content of the plan. The Essex County Sheriff's Office will be responsible for reconvening the Planning Partnership and conducting the five-year review. In general, the plan update development process begins approximately two years prior to plan expiration. First, resources to develop the plan must be obtained, such as obtaining a planning grant. This will be followed by the plan update process, led by the Core Planning Team and Steering Committee. Upon completion of the review and update/amendment process, the Essex County Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at NJOEM for a compliance review in accordance with 44 CFR 201. The plan will then be reviewed by FEMA Region 2. Once an "approved pending adoption" status has been issued by FEMA Region 2, the Planning Partnership can then review, approve, and adopt the plan. The Planning Partnership review consists of final approval by each planning partner's governing body during a public meeting.

18.5.2 Disaster Declaration

Following a federal disaster declaration, the Essex County Hazard Mitigation Plan may be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility of the Essex County Sheriff's Office to reconvene the Planning Partnership

and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

18.5.3 Plan Amendment Process

Unique circumstances, such as availability of critical data or an omission, may necessitate a plan amendment. Upon the initiation of the amendment process, Essex County will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected departments, community partners, and customers. Information will also be forwarded to NJOEM and FEMA. This information will be disseminated in order to seek input on the proposed amendment(s) for no less than a 45-day review and comment period (unless circumstances necessitate a shorter review). At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the Planning Partnership for final consideration. The Planning Partnership will review the proposed amendment along with the comments received from other parties, and if acceptable, the Planning Partnership will submit a recommendation for the approval and adoption of changes to the plan. In determining whether to recommend approval or denial of a plan amendment request, the following factors may be considered by the Planning Partnership:

- There are major errors, inaccuracies, or omissions made in the identification of issues or needs in the Plan
- New or previously unknown issues or needs have been identified which are not adequately addressed in the Plan
- There has been a change in information, data, or assumptions from those on which the Plan is based

If the Planning Partnership opts to move forward with the amendment, the revised plan must be reviewed and approved by NJOEM and FEMA. The Planning Partners will also need to approve the revised plan. Prior to adoption, the County shall post the updated plan to the County website for public comment. Each participating jurisdiction will review the recommendation from the Planning Partnership (including the factors listed above) and comments received from the public. Following that review, the governing bodies will take one of the following actions:

- Adopt the proposed amendments as presented
- Adopt the proposed amendments with modifications
- Refer the amendments request back to the Planning Partnership for further revision
- Defer the amendment request back to the Planning Partnership for further consideration and/or additional hearings